1990 PAPER ONE
SECTION A

1. Evaluate $\dfrac{0.42 \times 360}{14000}$

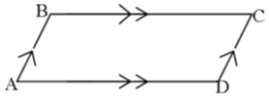
2. Solve the inequality $2x + 4 \geq 5x - 5$

3. Without using tables, find $(32)^{2/5} \times (2)^{-4}$

4. The points P(8,11) and Q(12,19) lie on a line which is parallel to another line passing through 0(0,0). Find the Equation of the line through 0(0, 0).

5. A chord of a circle of radius r centimeters is 10cm long and subtends an angle of 130^0 at the centre. Find r correct to two decimal places.

6.

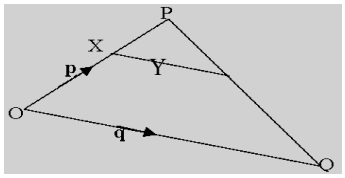


In parallelogram ABCD, $\overline{AB}$ = 2 cm, $\overline{BC}$ = 3cm and $\overline{AC}$ = 4cm. Find the size of angle ABC.

7. Given that $\mathbf{a} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} -5 \\ 4 \end{pmatrix}$, and $\mathbf{c} = \begin{pmatrix} -1 \\ -5 \end{pmatrix}$

Find the length of $\mathbf{a} + \mathbf{b} + \mathbf{c}$.

8. In the figure below, OP = ***p***, OQ = $\mathbf{q}$, PY = $\frac{1}{3}$ PQ and *X* is mid-point of **OP**. Find **XY**

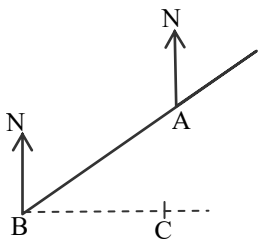


9. The transformation described by the matrix $\begin{pmatrix} 3 & x \\ y & 3 \end{pmatrix}$ maps the point A(3, 5) onto the point A^1 (6, 8), find the values of *x* and *y*.

10. Mr. Mugabi put Shs 2,400 in his savings account at the Bank. The Bank's simple interest rate was 5% per annum. Find the number of years he should leave the money in the Bank in order to be able to receive a total sum of Shs 2,700.

11. Given that $a*b = ab^2 + b - a$, evaluate 0.01 x 150. Correct to 3 significant figures.

12

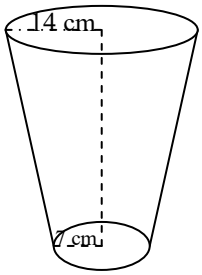


In the diagram shown, angle ABC is 50^0. Determine the bearing of B from A.

13. Given that $\log_{10}a = 1.621$ and $\log_{10}b = \bar{1}.152$, evaluate $\log_{10}a + \log_{10}b^{1/2}$

14. Two men leaving a point B, walk in opposite directions along a straight road with the same speed. Given that the first man takes four minutes to walk 100 metres. Find the distance from B walked by the second man in 2.5 minutes?

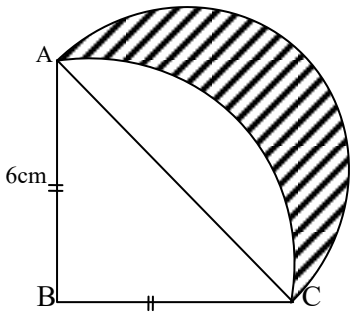
15



The diagram above represents a light circular pail with a circular base of radius 7cm and a circular top of radius 14cm. The pail is 40cm high. Find the capacity of the pail.

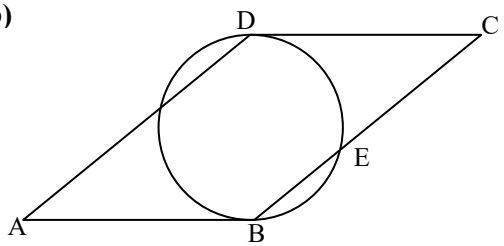
SECTION B

16 (a)



In the diagram above ABC is an isosceles right–angled triangle. The shaded area is bounded by the circular arcs. The outer arc is a semi-circle with AC as diameter and the inner arc is a quarter of a circle with centre B. Find the area of the shaded region.

(b)



In the figure above AB and CD are targets to the circle at points B and D respectively. ABCD is a parallelogram with AB = 4.5cm and BC = 6.3cm. Find (i) the radius of the circle

(ii) The length of the chord DE.

17. (a) Given the equation $ax^2 + bx + c = 0$, $(a \neq 0)$ derive

the formula ; $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

for finding the roots of the above equation. Use the formula to solve the equation $3x^2 + 14x - 24 = 0$

(b) To print wedding cards at the diamond printery one has to pay a deposit of Shs 50 and an amount which is directly proportional to the number of cards to be printed. The table below gives the total cost *c*, required to print *d* cards.

d	1	3	6	8
c	100	200	350	450

Find (i) *c* in terms of *d*.

(ii) The total cost of printing 248 cards.

18. A port B is 2.5 km East of Port C. A navigator observes that the bearing of C from his ship is 310^0 and that of B is 018^0. By an accurate scale drawing or otherwise; find the position and the bearing of the ship from B. given that the ship begins to sail at a speed of 10 kmh^{-1} on the bearing of 241^0. Find by drawing or otherwise the bearing and the position of the ship from C after 48 minutes.

19. In a class of 53 students 30 study chemistry, 20 study physics, and 15 study mathematics. 6 study both chemistry and Physics, four study both mathematics and Chemistry, 5 study both Physics and Mathematics. All students study at least one of the subjects.

(a) Find the number of students who study all the three subjects?

(b) A student is selected at random from the class, find the probability that:

(i) He studies physics only.

(ii) He studies physics but not mathematics.

20. (a) Using matrix methods find the values of *x* and *y* which satisfy the equations.

$2x - y = 1$

$3x + 2y = 12$

(b) Given that $M = \begin{pmatrix} 3 & -1 \\ 4 & 6 \end{pmatrix}$, find a matrix N such that $MN = \begin{pmatrix} 14 & 0 \\ 0 & 14 \end{pmatrix}$

Hence or otherwise find the inverse matrix for *M*.

21. (a) Given the vectors, $\mathbf{PQ} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}, \mathbf{QR} = \begin{pmatrix} 1 \\ 5 \end{pmatrix}$ and the point $Q(2,3)$ find:

(i) **PR**

(ii) The coordinates of the point *P*.

(b) The positions of the three points in a plane are L(-3, 4), M(8, -5) and N(*x*, 3). Given that OL is parallel to MN, where O is the origin, find the value of *x*.

22. Draw on the same coordinate axes the graphs of

$y = 2x^2 - 3x$ …… (i)

$y = 3(2x - 3)$…….. (ii)

(a) Using your graph, find the points of intersection of (i) and (ii).

(b) Find a quadratic Equation whose roots are the x-coordinates of the points you stated in (a)

1990 PAPER TWO
SECTION A

1. Given the sequence

$\frac{1}{4}, \frac{4}{9}, \frac{9}{16}, \frac{16}{25}$

Write down the seventh term (2 marks)

2. Factorize $25 - (x^2 + 2xy + y^2)$ *(3 marks)*

3. Given that $\cos\theta = -\frac{5}{13}$ and that θ lies between 0^0 and 180^0. Find without using tables the values of

(i) $\sin\theta$

(ii) $\tan\theta$ *(3 marks)*

4. Find, without using tables, the square root of 2500 x 1764. *(2 marks)*

5. A map is drawn to a scale of 1:250,000. Find actual distance in km, of a piece of a road represented by 3.6cm on the map. *(3 marks)*

6. The functions f and g are defined as follows; $f(x) = \frac{1}{2x-6}, g(x) = x^2 - 1$. Find the value of *x* such that $fg(x)$ is meaningless.

7. Solve the simultaneous Equations

$-x + 2y = 10$

$y - 4 = x$ *(3 marks)*

8. The following are the percentage marks obtained by ten pupils in a mathematics test.

12, 3, 39, 61,40,10,28,40,15,52.

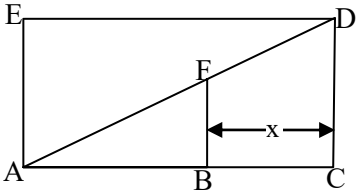
Find the probability of a pupil selected at random from this group having obtained a mark below the mean mark. *(3 marks)*

9. The position vectors of the vertices of a triangle ABC are $\mathbf{OA} = \begin{pmatrix} 2 \\ 0 \end{pmatrix}, \mathbf{OB} = \begin{pmatrix} 5 \\ 0 \end{pmatrix}$ and $\mathbf{OC} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$. Find the area of the triangle.*(2 marks)*

10. Petrol costs Shs 0.85 per litre in U. S. A. Find the price of petrol in pound sterling (£) if \$1= £ 0.48. *(2 marks)*

11. Given that $\mathbf{a} = \begin{pmatrix} 1 \\ 6 \end{pmatrix}, \mathbf{b} = \begin{pmatrix} 7 \\ 9 \end{pmatrix}$ Find the number *x* and *y* such that $x\mathbf{a} + y\mathbf{b} = \begin{pmatrix} 15 \\ 24 \end{pmatrix}$

12.



The figure above shows a rectangle ACDE in which $\overline{AB} : \overline{BC} = 5:3$. Given that **AC**=12cm, find *x*

13. Find the matrix A such that

$AP = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, Where $P = \begin{pmatrix} 3 & 1 \\ -1 & 3 \end{pmatrix}$ *(3 marks)*

14. Given that $x - y = 10$ and $a - b = 3$, evaluate

$\frac{10}{y-x} - \frac{3}{b-a}$ *(2 marks)*

15. Express $2.\dot{3}$ as a rational number *(3 marks)*

SECTION B

16. (a) Evaluate $\frac{3\frac{1}{2} - 1\frac{5}{6} \times \frac{3}{11}}{1\frac{3}{4} + 7\frac{2}{3} \div 3\frac{5}{6}}$

(b) In the triangle XYZ, $\overline{YZ} = 5.5$cm, $\overline{XZ} = 3.7$cm and $\overline{XY} = 7.8$. Find

(i) sinX**Y**Z

(ii) The radius of the circumcircle of the triangle XYZ.

17(a) A shirt and a pair of trousers were each sold at 6000. The shirt was sold at a profit of 25% and the pair of trousers was sold at a loss of 20%. Find the percentage loss on both articles.

(b) A total of 1200 exercise books is to be shared by four classes, 4A, 4B, 4C and 4D. Senior 4A is given $\frac{1}{3}$ of books, of the remainder $\frac{2}{5}$ is to go to 4B.The other two classes share the remainder with 4C getting 60 more books than 4D. Find the fraction of the total number of books obtained by 4D.

18. Use graph paper for this question.

Scale: 1cm to 1 unit on the x-axis.
1cm to 0.5 units on the y-axis.

(i) Plot the triangle PQR: P(1,2), Q(0,0), R(2,0).

(ii) Write down the coordinates of PQR as a 2 by 3 matrix A.

(iii) Multiplying A on the left, by T_1 the transformation matrix. $\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$ to give the image of triangle PQR under T_1.

(iv) Plot P'Q'R'

(v) Find the coordinates of P"Q"R", the image of P'Q'R' under T_1 whose matrix is $\begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$

(vi) Plot P" Q" R"

(vii) Write down the matrix of a single transformation which would map PQR onto P"Q"R".

19. Use graph paper. Draw x and y axes for:

x – axis from $^-3$ to $^+5$
y – axis from $^-4$ to $^+6$.

On both axes use 1cm: 1unit.

(a) Draw and label the graphs of the following lines:

(i) $x + y = 3$

(ii) $y = x - 4$

(iii) $y + 3x = 0$

(b) By shading the unwanted regions, show clearly the region R which satisfies the inequalities

$x + y \leq 3$
$y \geq x - 4$
$y \geq -3x$

Given that P(x, y) = $5x + 4y$, find the two positive values of $P(x, y)$ in R for which $x = 1$ and y is an integer.

20. The table below shows the frequency distribution of weights in kg of luggage for 100 passengers boarding the Uganda air lines plane traveling from Dubai to Entebbe.

Weight (kg)	Frequency
50 – 54	1
55 – 59	2
60 – 64	5
65 – 69	11
70 – 74	21
75 – 79	20
80 – 84	17
85 – 89	10
90 – 94	6
95 – 99	4
100 –104	2
105 – 109	1

Find;

(i) The mean weight.

(ii) The median weight.

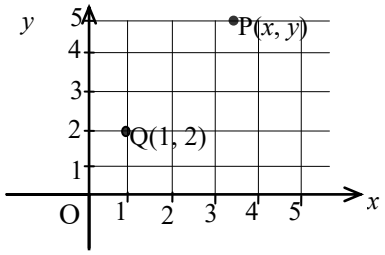
(iii) The model weight

21. (a) The daily cost per child in a Kampala family is partly constant and partly inversely proportional to the number of children in the family. Given that the cost per child for a family of 10 is Shs 350 and for a family of 20 is Shs 300, find the cost per child for a family of

(i) 50 children

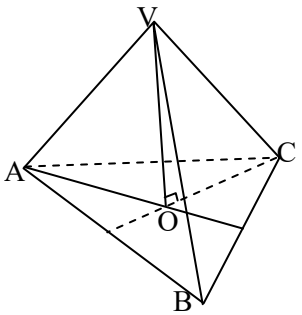
(ii) n children

(b)



In the figure above the point P moves in the plane in such away that its distance from (0, 0) is Equal to its distance from Q. find the locus of P in terms of x and y.

22



The figure above shows a regular tetrahedron VABC with $\overline{VA}$ = 6cm.

Calculate

(i) The height of V above the base ABC.

(ii) The angle between the edge VA and the base ABC.

(iii) The volume of the tetrahedron.

1991 PAPER ONE
SECTION A

1. Without using tables or calculator, evaluate *(3 marks)*

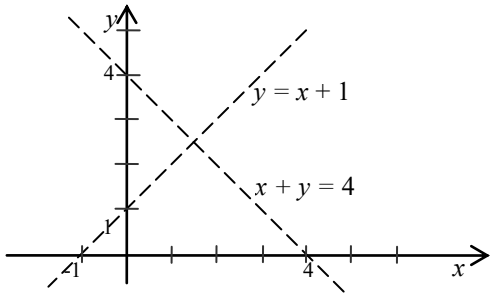
$3\log_{10}2 + \log_{10}20 - \log_{10}1.6$

2. Given $f(x) = (x - 3)^2$, find the values of x such that $f(x) = 16$. (3 marks)

3. Factorize $x^3 - xy^2$ (2 marks)

4. Express the recurring decimal number $0.36\overline{36}$ as a fraction.

5.



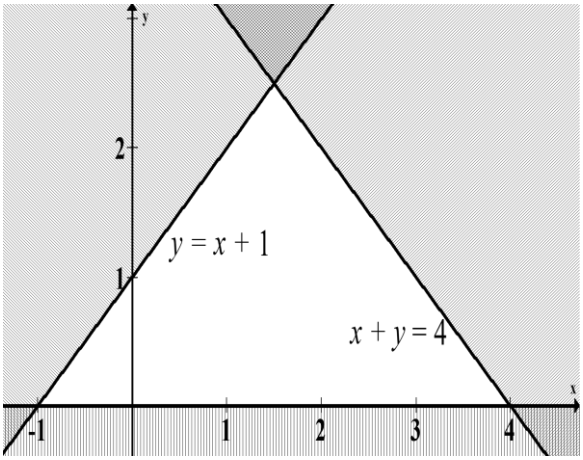
Copy the above diagram and show the region satisfying the inequalities.

$y < x+1, x+1 < 4$ and $y > 0$ (4 marks)

Solution

For $y < x + 1$, the boundary line is $y = x + 1$ taking point (0, 0), LHS = 0, RHS=1 since LHS <RHS hence point (0,0) is in the wanted region.

For $x + y < 4$, the boundary line is $x + y = 4$ taking point (0, 0), LHS = 0. RHS = 4 since LHS < RHS, hence point (0, 0) is still in the wanted region. Hence we have;

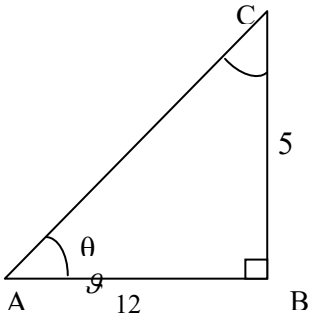


6. Given that operation ⍑ is defined by L⍑M = the smaller of the two numbers L and M, find -3⍑(4⍑3) *(2 marks)*

7. A man bought a shirt at 20% discount. If he paid Shs 2,000, find the original price of the shirt.

8. Find all the integers x that satisfy the inequality $7x^2 < 63$

9. Given that $\tan\theta = 5/12$, calculate without using tables or calculator, the value of $\cos\theta - \sin\theta$ *(3 marks)*



$AC^2 = 5^2 + 12^2$

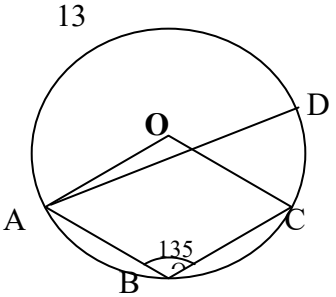
$= 25 + 144 = 169$

$AC = 13$

$\cos\theta - \sin\theta = \frac{12}{13} - \frac{5}{13}$

$= \frac{7}{13}$

10



In the diagram above O is the centre of the circle. Given that angle ABC=135^0 find the angle ADC and the reflex angle AOC. *(3 marks)*

11. The mean of three numbers is 3 and the sum of the smallest and the middle numbers is 5. Find the largest number. *(3 marks)*

12. The scale of a map is 1cm: 20km. Two towns on the map are 5cm apart. A man driving a car covers this distance in 80 minutes. Find his speed in kmh^{-1}.

13. Given that E = 1.42×10^2, D =144×10^6 and $V = \frac{E^2}{D}$

.Find *v* in the scientific form

14. The bearing of P from C is 060^0. What is the bearing of C from P?

15. A spider made the following four moves **OA** = $\begin{pmatrix}2\\3\end{pmatrix}$, **AB** = $\begin{pmatrix}-3\\1\end{pmatrix}$, **BC** = $\begin{pmatrix}4\\0\end{pmatrix}$ and **CD** = $\begin{pmatrix}2\\-8\end{pmatrix}$. What single vector is equivalent to these four movements?

SECTION B

16. (a) Given the matrices $A = \begin{pmatrix}1 & 2\\4 & 6\end{pmatrix}$, $B = \begin{pmatrix}9 & 9\\1 & 1\end{pmatrix}$ and $C = \begin{pmatrix}5 & 0\\1 & 4\end{pmatrix}$ Find $(ABC)^{-1}$

(b) If $\begin{pmatrix}4 & 1\\x & -1\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix} = \begin{pmatrix}4\\8\end{pmatrix}$.

Determine the values of *x* and *y*

17. (a) By plotting suitable graphs on the same axes, find the solution of the equations.

$-3x + 2y = -16$

$x + y = 7$

(b) Plot the graph of $x^2 - 5x - 24$ for $-5 \le x \le 10$ use your graph to find the roots of the equation $x^2 - 5x - 24 = 0$

18. Using a ruler, pencil and a pair of compasses only,

(i) Construct a triangle PQR with angles RPQ = 60^0, PQR = 45^0 and PQ = 8.4 cm, measure the length of PR and QR.

(ii) Construct the line ST 12.6cm long bisecting and perpendicular to QR and meeting PQ at T. What is the size of angle STQ?

(iii) Join S to R and Q. Draw the circle circumscribing the triangle QRS. From your diagram determine the radius of the circle.

19. Copy and complete the table below showing the number of senior four candidates of a certain school who passed a zonal mock examination in mathematics.

Marks	*x*	*f*	*fx*
35-39	37	60	2220
40-44	___	72	___
45-49	47	___	3760
50-54	52	___	2600
55-59	___	48	___
60-64	___	35	___
65-69	___	___	2010
70-74	___	25	___
75-79	___	___	924
80-84	___	5	___
85-89	___	2	___
90-94	___	1	___
		$\sum f$=420	$\sum fx$ = ___

(a) State:

(i) the class width.

(ii) the modal class

(b) if a distinction was awarded for a score of 70 or more marks, determine the percentage number of candidates who passed with distinctions.

(c) Calculate the mean mark.

20. Three points P, Q and R in a plane have position vectors **p** = $\begin{pmatrix}4\\6\end{pmatrix}$, **q** = $\begin{pmatrix}1\\2\end{pmatrix}$ and **r** = $\begin{pmatrix}12\\0\end{pmatrix}$ respectively .

a) Find:

(i) The lengths of PQ, QR and PR.

(ii) The size of the angle QPR

(iii) The area of triangle PQR

b) Given that S is the midpoint of QR, find:

(i) The coordinates if S,

(ii) The equation of the line through S having the same gradient as PQ

21. A plane flew west from Entebbe (E) at the speed of 200kmh^{-1} for $1\frac{1}{2}$ hours to reach Kasese (K). At Kasese it altered its course and flew North-East to Moroto (M) at 150kmh^{-1}. The total time when the plane was in air was 5 hours.

(i) By using a scale drawing determine the distance and bearing of Entebbe from Moroto. (Use the scale 1cm to 50km).
(ii) On its way to Moroto the plane passed over Soroti which is North of Entebbe. Estimate the distance between Soroti and Moroto.

(iii) If the plane flew back to Entebbe via Soroti at the speed of 200kmh^{-1}, determine the time it took to fly from Moroto to Entebbe.

22. Two transformations T_1 and T_2 are represented by matrices $\begin{pmatrix}3 & 1\\ 2 & 4\end{pmatrix}$ and $\begin{pmatrix}3 & 1\\ 4 & 2\end{pmatrix}$ respectively. A point P(a, b) in the plane under T_1 followed by T_2 is mapped into the point P(a + 2, 12b + 48). Find the values of a and b and the coordinates of the image P^1.

1991 PAPER TWO
SECTION A

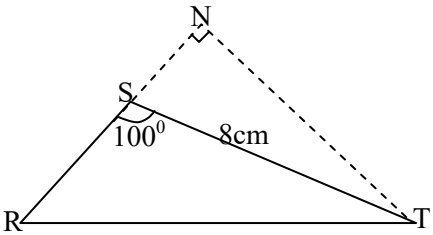
1. Simplify $\dfrac{3^x \times 9^{x+1}}{27^{x-1}}$ *(3 marks)*

2. Without using tables or calculators, evaluate 5.2 x ($3.75^2 - 1.25^2$) *(3 marks)*

3. Given that $f(x) = x^2 + 1$ and $g(x) = x - 1$, find the value of a for which $fg(a) = gf(a)$ *(3 marls)*

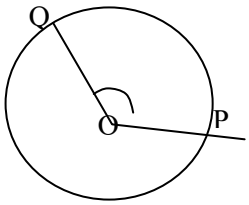
4. Given that the operation * is defined by the relation $a*b = a + b + ab$, evaluate 2 * (1 * 3)

5.



In the diagram above determine the length of the perpendicular NT from T to RS. (Correct your answer to 2 s.f) *(3 marks)*

6.



In the diagram above, the length of the minor arc PQ is equal to diameter of the circle. Determine the obtuse angle POQ where O is the centre of the circle. *(4 marks)*

7. Given that $x : y = 6:4$ and that $x + y = 30$, determine the value of y. *(3 marks)*

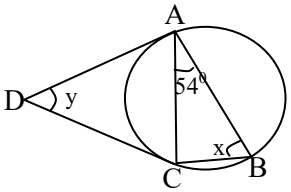
8. It is given that $\mathbf{OP} = \begin{pmatrix}5\\3\end{pmatrix}$ and $\mathbf{OQ} = \begin{pmatrix}-2\\5\end{pmatrix}$. Find the magnitude of **QP**. *(3 marks)*

9. Given that $\begin{pmatrix}2 & 4\\ 1 & 0\end{pmatrix}\begin{pmatrix}a\\ b\end{pmatrix} = \begin{pmatrix}24\\ 6\end{pmatrix}$, find the values of a and b. *(2 marks)*

10. Given that $R = 4m\sqrt{(xn/k^3)}$ express x in terms of R, m, n and k. *(2 marks)*

11. A number is selected at random from the set B = {3, 6, 9, 12, 15, 18, 21}. Find the probability that the number is even.

12.



In the diagram above AB is the diameter of the circle and DA and DC are tangents to the circle at A and C

respectively. Given that angle CAB = 54^0, find the values of x and y. *(3 marks)*

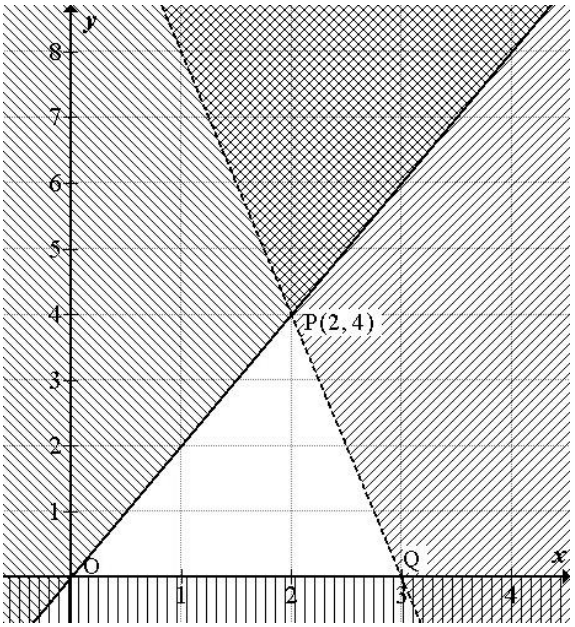
13 The size of an interior angle of a regular polygon is one and a half times the exterior angle. Find the number of sides of the polygon.

14. When the rays of the sun make an angle of 30^0 with a horizontal ground the length of the shadow of a pole on the ground is 10cm. find the height of the pole. *(2 marks)*

15. Find the median of the following numbers 27, 28, 04, 19, 11, 32, 10, 46, 03, 14. *(2 marks)*

SECTION B

16



In the figure above find all the inequalities satisfying the un shaded region OPQ. Determine the maximum value of $2x + 3y$ over the region *OPQ*.

17. In a senior four class of 30 students, 18 play football (F), 15 play volleyball (V) and 13 play hockey (H). The number of students who play all the three games equals the number of those students who do not play any of these games. Ten students play both F and V, and 3 play only H and V.

Determine;

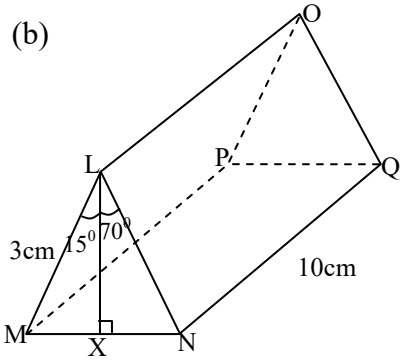
(i) The number of students who play all the three games.
(ii) The number of those who play only one game.
(iii) The probability that a student selected at random from the class plays two or more of these games.

18. Plot the points A (-2, 1), B (-1, 2), C(2, 2) and D (0, -1) on a graph paper. The quadrilateral ABCD is enlarged to another one whose points are P (1, 3), Q (3, 5), R (9, 5) and S(5, -1) respectively.

(i) Determine the coordinates of the centre T and the scale factor of the enlargement.
(ii) Determine the area of the quadrilateral PQRS.

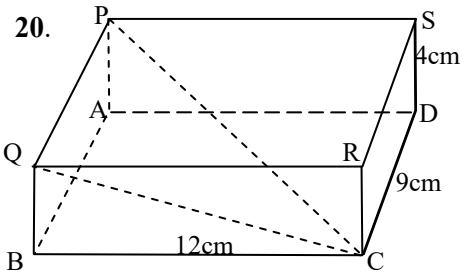
19. (a) The height of a right cone is 12cm and the angle at the vertex of the cone is 30^0. Find the surface area of the cone. Take π =3.14

(b)



The diagram above shows a triangular prism LMNOPQ of length 10cm and edge LM=3cm. LX is perpendicular to MN such that $\angle MLX = 15^0$ and $\angle MLN = 85^0$. Find the volume of the prism.

20.



The above diagram is a cuboid with the dimensions as shown.

Calculate

(i) the length QC
(ii) The length PC
(iii) $\angle PCQ$ and
(iv) The angle between the planes PQC and PQRS.

21. Asabat, Bitumoko and Cholimar form a trade partnership. Asabat contributes Shs 750,000, Bitumoko Shs 500,000 and Cholimar Shs 900,000. Twenty percent (20%) of the annual gross profits are to remain as development capital and a monthly taxation of Shs 10,000 is to be paid by each share holder.

The net profit is shared in the ratio of the initial contribution of the shareholders.

If at the end of the first year the partnership recorded gross profits amounting to Shs 3,160,000, how much did each member get as his net profit?

22. At Jenga-mwili supermarket, Ali bought 5 trays of eggs and 7 kg of Irish potatoes at Shs. 11,800. Moses bought 6 trays of eggs and 8kg of Irish potatoes at Shs. 14,000. If Shs t and Shs p are the prices of a tray of eggs and a kg of potatoes respectively,

(i) Write two equations to describe the purchase of the two men.
(ii) By combining the two equations to a matrix form determine the cost of purchasing each item.
(iii) How much would Dulu pay for 2 trays of eggs and 2 kilograms of Irish potatoes?

1992 PAPER ONE
SECTION A

1. Express $\frac{1}{6}\div\frac{2}{9}-\frac{0.56}{0.64}$ in the form $\frac{a}{b}$, where a and b are integers.

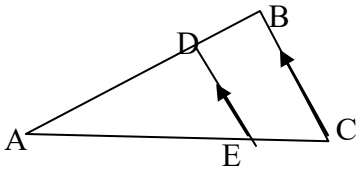
2. Factorise $ax^4 - a$ completely

3. A man borrowed Shs 200,000 from the bank at a simple interest rate of 2.5% per annum. He paid back the money in 24 Equal monthly installments over a period of two years. How much money did he pay every month?

4. Given that $\log_{125} x + \log_{125} 5x = \frac{1}{3}$,

Find the values of *x*.

5



In the figure above **AD**: **AB** = 4 : 5 and **DE** is parallel to BC. Find the ratio of the areas of the triangle ADE and the quadrilateral BCED.

6. Solve the inequalty $-x-16 \geq 3x$ *(2 marks)*

7. In a group of 10 people, 7 people speak English, 4 speak French and 2 speak neither of the two languages. How many people speak both languages?

8. $\frac{6}{3\sqrt{2}-2\sqrt{3}} = a\sqrt{3}+b\sqrt{3}$, find the values of *a* and *b*.

9. Given the function $f(x)=\frac{3}{4x-3}$, find the value of *x* for which f(*x*) = 3.

10. Given that $x\Lambda y = \frac{1}{3}x^2 y$, evaluate $3\Lambda(2\Lambda 3)$

11. Given that $\begin{pmatrix}1 & 3\end{pmatrix}\begin{pmatrix}4 & y\\ x & 2\end{pmatrix} = \begin{pmatrix}7 & 7\end{pmatrix}$,

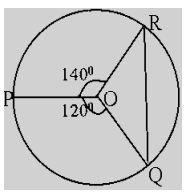
Find the values of *x* and *y*.

12. The numbers 3, 4, 5 are arranged in a random order so as to form a three-digit number. No digit is repeated in a number formed.

(i) Write down the possibility space for the numbers formed.

(ii) Determine the probability that the number formed is not odd.

13



The diagram above shows a circle with centre O. Given that $\angle POR = 140^O$ and $\angle POQ = 120^O$. Determine the angle of triangle OQR.

14. Find the image of the point (2, 1) under the reflection in the line $y = x$

15. Given that $\cos\theta = 0.599$ and $0^o < \theta < 90^o$, find in degrees, the value of Θ.

SECTION B

16. Copy and complete the table for the relation $y = (x+2)$

(i)

x	-7	-6	-5	-4	-3
y				4	

-2	-1	0	1	2	3
		4			25

17. The following is a frequency table for the weights, in kg, of adult patients who visited a certain doctor in a certain week.

Weight (kg)	Frequency
50-54	3
55-59	5
60-64	8
65-69	11
70-74	21
75-79	19
80-84	18
85-89	11
90-94	4

(i) Calculate the mean weight of the patients.

(ii) If the above data is representative of the type of patients that visit the doctor. Find the probability that the weight of the first patient in the next week belonged to the model class.

18. A transformation represented by the matrix $\begin{pmatrix}4 & 6\\ 1 & 2\end{pmatrix}$ maps the vertices A, B, C of a triangle onto the points A^1 (6, 2) B^1 (16, 7) and C^1 (22, 9) respectively.

Find

(i) The coordinates of A, B and C.

(i) The determinant of the matrix.

(ii) The areas of ABC and its image $A^1 B^1 C^1$.

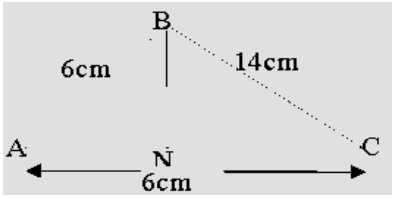
19. Mukasa is to travel from station A to station B, 400km a part, on the bearing of 065^0. On his start of the journey, he makes a mistake and sets off on a bearing of 056^0 and moves for 300km. Using scale drawing

(i) Determine how far he then is from station B.

(ii) If he is to move to station B from where he is, on what bearing should he set off?

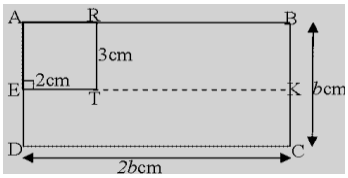
(iii) If his speed is 80kmh^{-1}, determine the time wasted due to the mistake made at the start of the journey?

20 (a)



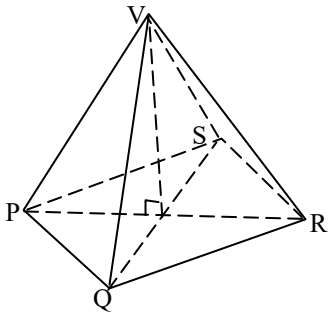
In the figure above BN is perpendicular to AC. Find the ratio of the area of triangle ABN to that of ABC.

(b)



Using the information given in the diagram above,
(i) Find in terms of b the area of CDEK.
(ii) Show that area of RBKT is equal to $6b - 6$.
Given that the area of RBKT is three times the area of ARTE, find the value of b and hence the dimensions of CDEK.

21.



The figure above shows aright pyramid standing on a horizontal rectangular base PQRS. Given that **PQ** = 6cm, **QR** = 8cm and V is 12cm vertically above the horizontal base PQRS. Find:
(i) The length of **VQ**.
(ii) The angle between **VQ** and the horizontal base.
(iii) The angle between the planes VPQ and VSR.

22. A school lorry and a school bus are to be used to transport students to a certain function. The capacities of the lorry and the bus are 50 and 70 students respectively. The number of students to attend the function should not exceed 350. Each trip made by the lorry or the bus cost Shs 3,000/=. The money available for the transportation is Shs 18,000/=. The number of trips made by the lorry should not exceed that made by the bus. If x and y are the number of trips to be made by the lorry and the bus respectively.
(i) Write down five inequalities representing this information.
(ii) Plot these inequalities on the same axes.
(iii) By shading the unwanted region show the region satisfying all the inequalities.
(iv) If all the available money for transport is to be used, list all the possible number of trips that each vehicle will make. (Assume that for each trip a vehicle makes it must be full).
(v) Find the greatest number of students that can be transported.

1992 PAPER TWO

SECTION A

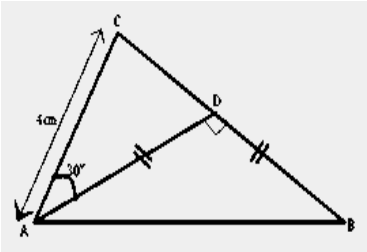
1. Simplify 20.1− .623 ÷0.23 (*2 marks)*

2. If the position vector of point A is $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$ and $\mathbf{BA} = \begin{pmatrix} 5 \\ 2 \end{pmatrix}$, find the position vector of B*(2 marks)*

3. In a group of 22 tourists visiting Uganda it was found that 12 had been to Karuma falls and 11 to Entebbe zoo. Find the minimum possible number of tourists who had visited both the falls and the zoo. *(2 marks)*

4. Given that $h(x) = \frac{1}{2x^2 + 9}$ and $k(x) = \frac{1}{x} - 9$, evaluate *kh* (-1) *(4 marks*)

5.



In the figure above AD is perpendicular to BC. $\overline{AD} = \overline{DB}$. $\overline{AC}$ = 4cm and $\langle CAD = 30^0$. Find $\overline{AB}$ *(4 marks)*

6. In a certain class there are 72 boys. If the ratio of the number of girls to the total number of pupils in the class is 3:7, find the number of girls in the class.

7. Given that $81^x = (\frac{1}{3})^{x-5}$ find the value of *x*

8. Given that $\tan x = -\frac{3}{4}$ and $0^0 \leq x \leq 360^0$. Without using tables or calculator, find the possible values of $\cos x + \sin x$ *(4 marks)*

9. Express $4.4\overline{54}$ as a national number.

10. An insect moves along straight lines from point A(2, 0) to point B(0, 3) and finally to point C(5, 4). How far away is the insect from its starting point?

11. The scale of a map is 1:25000. The distance between two schools on the map is 8cm. find the actual distance, in km, between the two schools.

12. Form a quadratic equation whose solution set is (-2, 3)

Solution

Note: for roots (*a*, *b*), the quadratic equation in *x* is given by:

$(x - a)(x - b) = 0$

So for (−2, 3), the quadratic equation is given by:

$(x - 2)(x - 3) = 0$

$(x+2)(x - 3) = 0$

$x(x - 3)+2(x-3) = 0$

$x^2 - 3x+2x - 6 = 0$

$x^2 - x-6 = 0$

13. Factorize $20x^2y^2+xy-1$

14. If the determinant of the matrix $\begin{pmatrix} 3a & a-8 \\ -6 & a-2 \end{pmatrix}$ is zero. What are the values of a? (*3 marks*)

15. The total weight of a train with *n* coaches is T. The weight of the engine alone is E and the average weight of the coaches is A. Write down an equation connecting T, E, *n* and A. (*1 mark)*

SECTION B

16. (a) A farmer bought a machine at sh. 2,200,000/-. If the machine depreciates at the rate of 15% per annum, find the value of the machine after two years.

(b) In a certain country the income tax is levied as follows;

A person's monthly gross income has certain allowances deducted from it before it is subjected to taxation. (this includes family relief and insurance value).

The allowances are as follows

Married man	sh 1,800
Unmarried man	sh 1,200
Each child below eleven years	sh 500
Each child above eleven but Below eighteen years	sh 700
Insurance premium	sh 1,200

Peter earns sh 64,000. He is married with 3 children of ages between eleven and eighteen years and 2 children below eleven years.

Given that he is insured and has claimed transport allowance of sh 1,700, calculate the income tax he pays under the income tax rates below;

Taxable income	rate (%)
0-10,000	10
10,001- 20,000	25
20,001- 30,000	30
30,001- 40,000	45
40,001 and above	50

17. (a) The solution of the simultaneous equations $2ax + by = -4$ and $bx +3ay = 1$ where *a* and *b* are constants is $x = 1$ and $y = 2$.

Find the value of *a* and *b*.

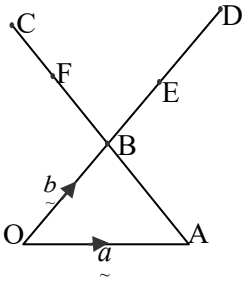
(b) Given that $A=\begin{pmatrix}3 & 1\\ 2 & 4\end{pmatrix}$ and $B=\begin{pmatrix}\frac{5}{2} & 7\\ 1 & 3\end{pmatrix}$

(i) Show that det(AB)=det(A) det(B)

(ii) Hence write down $\det(A^2)$

(iii) A geometrical figure of area $18cm^2$ is transformed by the combined matrix AB. Find the area of the transformed figure.

18.



In the diagram above **OA** = ***a*** and **OB** = ***b***; 2**OD** = 5**OB** and **AC = 3AB, E** and **F** are midpoints of $\overline{OD}$ and $\overline{AC}$ respectively. Find in terms of a and b , the vectors **ED**, **OF**, and **CD**

19. A circle passes through the points A(-3.5, 1) B(0.5, 5) and C(4, 3).

(i) Using 2cm to represent one unit, plot the points A, B and C on a graph paper.

(ii) By construction find the centre and radius of the circle.

(iii) Calculate the area of part of the sector (segment) cut off by the line segment AB.

20. Of the 35 candidates in senior four, 13 registered for Biology (B), 20 registered for History (H) and 17 registered for Fine Art (A).
If 9 registered for both Biology and Fine Art and $n(B\cap H) = 3$, $n(B\cap H\cap A) = 2$ and $n(H\cap A\cap B^1) = 8$, represent these information on a venn diagram.

From the diagram

(a) Find

(i) the number of candidates who registered for History only.

(ii) the number of candidates who registered for at least two of the three subjects.

(b) Which of the subjects had to be taken with at least one other subjects?

(c) How many candidates did not take any of the three subjects?

21. When Mukasa was 5km from home and walking at $2\frac{1}{2}$ kmh^{-1} on his way to visit his aunt 15km from his home, his brother Musoke decided to run after him at $4mkh^{-1}$.

(i) When and where did Musoke catch up with Mukasa?

(ii) If Musoke continued to run at the same speed, how long did he have to wait at his aunt'e home before Mukasa joined him? (Express your answers in minutes)

22. From a point P on the top of a cliff 150m high , two ships A and B are observed on the bearings of 240^0 and 150^0 respectively.
If B is 720m from A on the bearing of 120^0, calculate the angles of depression of A and B from P.

1993 PAPER ONE

SECTION A

1. Given that $f(x) = px + 3$ and $f(5) = 33$, find the value of (i) p, (ii) f(-2). *(4 marks)*

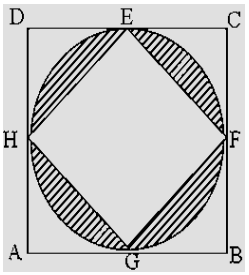
2. A rectangular piece of land is 12m by 15m. Find the area of the land in cm^2 on a map whose scale is 1:500.

3. Given that $\sqrt[4]{px^2 + a} = L$ express x in terms of a, L and p. hence determine the values of x for which $a = 4$, $p = 4/3$ and L = 2. *(4 marks)*

4. In a class, 15 pupils play cricket, 11 play hockey, 6 play both games and every one plays at least one of the games.

Find (i)The number of pupils in the class.
(ii) The probability that a pupil picked at random plays only one game. *(4 marks)*

5



The diagram above shows a circle inscribed in a square ABCD of side $2x$ and a square EFGH inscribed in the circle. Find the expression for the area of the shaded region.

6. Astick 10cm long on a 0.57m high plat form rests against a vertical wall making an angle of 40^0 with a horizontal ground. Find the height of the top of the stick above the ground.

7. The lengths of the sides of a right angled triangle are a, $2a$ - 1, and $2a$ + 1. Find the value of a and hence the sides of the triangle. ($a > 0$)

8. The image of (0, 2) under an enlargement scale factor 3 is (4, 6). Determine the centre of enlargement.

9. Given that matrix $A = \begin{pmatrix} 3 & x \\ y & 4 \end{pmatrix}$

det(A) = $3x$ +12, determine the value of x and y.

10. Determine the equation of the line passing through the points (2, 1) and (3, 3)

SECTION B

11. Triangle ABC has its vertices at A(2,0), B(4 , 0) and C(4 ,3). The triangle is given a positive quarter turn about (0, 0) to produce $A^IB^IC^I$ the image of ABC; followed by a reflection in the line $x + y = 0$ to produce $A^{II}B^{II}C^{II}$, the image of $A^IB^IC^I$.

(i) Determine the co-ordinates of $A^1B^1C^1$ and $A^{II}B^{II}C^{II}$.

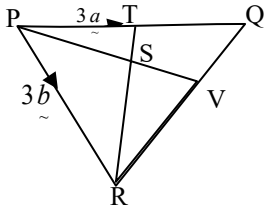
(ii) Describe fully a single transformation which maps ABC onto $A^{II}B^{II}C^{II}$.

12. (a) Find the inverse of $A = \begin{pmatrix} 4 & -1 \\ 2 & 3 \end{pmatrix}$

(b) Tom bought 2 eggs and 3 tomatoes at a total cost of Shs 370. The cost of 4 tomatoes is Shs 90 more than that of one egg.

(i) Write down this information as a pair of simultaneous equations.
(ii) Find the cost of one egg.
(iii) Calculate the cost of one tomato.
(iv) Determine the number of eggs and tomatoes Shs 1470 fetched if twice as many tomatoes as eggs were obtained.

13.



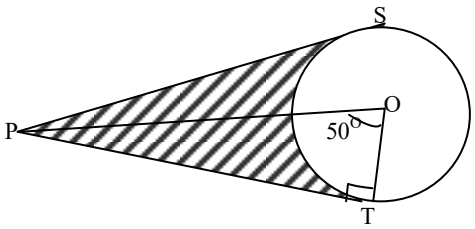
In diagram above **PQ** = 4**PT**; 2**PS** = **PV**; 3**RS** = 2**RT**; **PT** = $3\underset{\sim}{a}$ and **PR** = $3\underset{\sim}{b}$

(a) Express in terms of ***a*** and ***b***.
(i) **RS**
(ii) **PV**
(iii) **RQ**

(b) Find the ratio of **RV** to **RQ**

14. In a country with a population of 14,000,000 people, 55% are females, 45% of the male population are employed and 25% of the females are employed.
Find:
(i) The male population in the country.
(ii) The female population unemployed.
(iii) The ratio of the male population employed to the female population employed.
(iv) The total number of people employed in the country.

15



(a) In the above diagram PT and PS are tangents to the circle with centre O. if

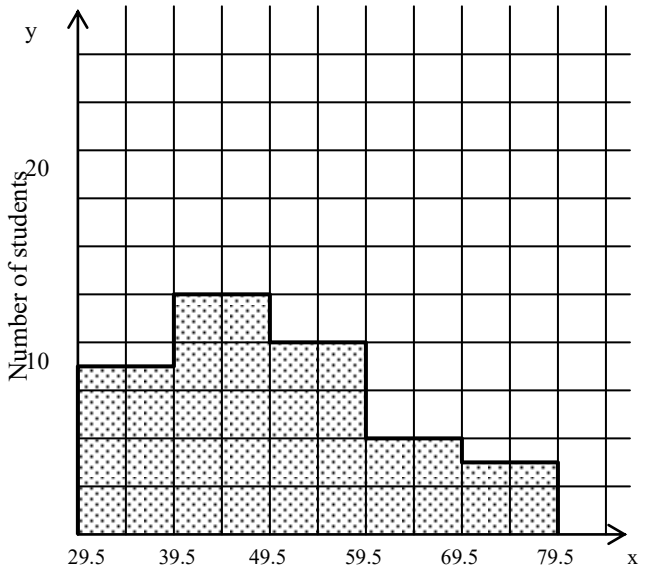
OT = 6cm and angle POT=50^0. Calculate the area of the shaded region. (Take π =3.14).

(b) Two Equal circles of radius 5cm intersect at right angles.

(i) Find the distance between the two centers of the circles.

(ii) Calculate the area of the common region of the circles.

16.



Study the bar graph given above showing the ranges of marks obtained by students in a certain math test

(i) Determine the number of students who sat the test.
(ii) Write down class groups and their frequencies.
(iii) State the modal and median class.
(iv) Use your results in (ii) above to calculate the mean mark obtained in the test.

17. Draw the graph of the curve $y = \cos 3x$

for $0^o \le x \le 150^o$. Using your graph determine the values of $x(0^0 \le x \le 150^0)$ for which $4\cos 3x + 3 = 0$

1993 PAPER TWO

SECTION A

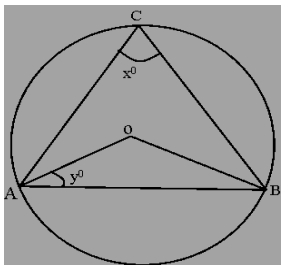
1. Determine the values of k for which the expression $\frac{k^2 - k - 6}{k + 2}$ is zero

2. A fair die is tossed once. Find the probability that
(i) The die shows a number greater than two.
(ii) An odd or even number less than four shows up.

3. Two right angled triangles ABC and PQR are similar.
Given that angle ABC=angle PQR=90^0
$\overline{AB}$ =10cm, $\overline{BC}$= 6.5cm and $\overline{QR}$ = 52cm,
Find $\overline{PQ}$.

4. Factorise completely $x - x^2 + y + y^2$ (*4 marks*)

5.



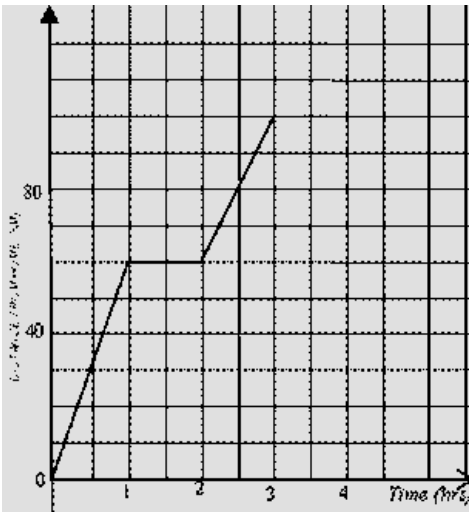
The figure above shows a circle centre O circumscribing a triangle ABC.

Determine (i) The reflex angle AOB.
(ii) An expression of y in terms of x (*4 marks*)

6. Solve the simulatenous equations
$3x + 4y = 20$
$x + 2y = 0$ *(4 marks)*

7. The images of I(1,0) and J(0,1) under a transformation represented by a 2x2 matrix are $I^1(2,0)$ and $J^1(0,3)$ respectively. Determine the coordinates of K^1, the image of K(1,1) under the same matrix transformation. *(4 marks)*

8. The coordinates of the points P and Q are (2, 3) and (4, -1) respectively. Calculate the length of PQ.



.

The graph above shows motion of a lorry from Tako's home to the city, O to C.

(i) How far did the lorry travel in the first two hours?

(ii)For how long did the lorry have a stop over?

(iii) Determine the average speed of the lorry for the journey from home to the city.

10. Without using a calculator, evaluate $\sqrt[3]{0.002406}$ to 3 decimal places.

SECTION B

11. Plot on the same axes the graphs of $xy = 24$, for $1 \leq x \leq 24$ and $x + y = 12$

Using your graph

(i) Find the coordinates of the points of intersection of the line and the curve.

(ii) Estimate the area enclosed between the line and the curve.

12. A plane flies 540 km from station A to station B on bearing 060^0. From B it travels 465 km to station C on bearing of 150, From C it heads for station D 360km away on bearing of 265^0.

(i) Draw to scale a diagram showing the route of the plane (use the scale 1cm:5km)

(ii) (ii)From your diagram determine the distance and bearing of station A from station D.

(iii) Determine how long it would take a plane traveling at a speed of $400kmh^{-1}$ to travel direct from station A to station C.

13. The following results were obtained in an experiment to measure the lengths of leaves from the stalk to the a pex (to the nearest tenth of a cm)

6.6	8.5	7.4	10.8	11.2	9.1	8.7	9.9
12.4	10.0	6.5	7.3	12.8	8.2	6.4	8.9
8.9	8.1	8.3	9.0	7.6	7.1	8.8	10.4
11.7	9.2	10.2	9.8	9.5	12.3	6.2	8.8
7.0	7.9	9.3	6.9	7.7	6.2	8.6	7.4

(i) Starting with 6.0-6.9 as the first class and using classes of Equal length draw up the freqnency table for the data in (i) above.

(ii) Give the modal class for the grouped data in (i) above.

(iii) Calculate the mean length of the leaves

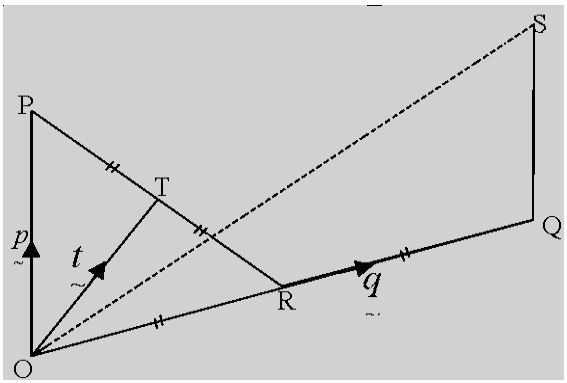
14. A line whose end points are P(1, 3) and Q(3, 4) undergoes a rotational transformation. The images of the endpoints of line PQ are P^1 and Q^1 respectively.

(i) Draw the line and its images in the same set of axes using a scale of 2cm to 1 unit.

(ii) Find the centre and angle of the rotation.

(iii) Determine the image of PQ when its image P^1 Q^1 further undergoes a rotation of 120^0. State the size of angle formed between PQ and the image of P^1 Q^1.

15.



In the diagram above, **OP** = $\underset{\sim}{p}$, **OQ** = $\underset{\sim}{q}$ and **OT** = $\underset{\sim}{t}$. R and T are mid-points of **OQ** and **PR** respectively.

(i) Express $\underset{\sim}{t}$ in terms of $\underset{\sim}{p}$ and $\underset{\sim}{q}$.

(ii) Given that $\overline{OP}$ is parallel to $\overline{QS}$ such that $\overline{OP} = 2\overline{QS}$, find OS in terms of $\underset{\sim}{p}$ and $\underset{\sim}{q}$

(iii) Taking O as the origin and P(0, 8) and Q(6, 4) determine the lengths of $\overline{OS}$ and $\overline{PS}$.

16. Using compases and ruler only, construct a triangle ABC in which **AC** = 8cm, **AB** = 6cm and angle BAC = 30^0.

On the same side AC construct a triangle such that **AS** = **SC** and **BS** = 8cm. A point K is on the same side of BS as C. Its distance from BS is the same as the distance of C from BS.

Construct the locus of K.

Given that angle BKS = 90^0, find by construction two possible positions K_1 and K_2 of K. Measure $\overline{K_1K_2}$.

17. A manufacturer makes two types of hoes A and B. The following conditions apply to daily production.

(i) Each type of A costs sh 3000/- and each type of B costs sh. 5000/- and the manufacturer has a maximum of sh. 450,000/= available.

(ii) Due to labour shortage the production of type A plus four times that of B should not exceed 160.

(iii) A study of the market recommended that the number of type B produced should not exceed twice the number of type A produced.

(a) Given that x hoes of type A and y hoes of type B are made, write down three inequalities a part from $x \geq 0$, $y \geq 0$, satisfying the above conditions.

(b) Show graphically the region containing the points satisfying the above conditons.

(c) Taking $x + 2y$ as a suitable expression for the manufacturer profit, find the number of each type of hoe that should be made to obtain the greatest profit.

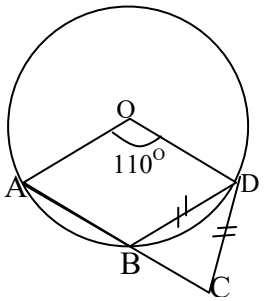
1994 PAPER ONE
SECTION A

1. (i) Express $\frac{108}{8}$ as a product of its prime factors.

(ii) Simplify $\frac{4^2 \times 2^3 \times 16^{1/2}}{8^3}$

2. x ,y and z are connected by the relation $x = \frac{ky^2}{z}$, where k is a constant. Given that $x = 6$ when $y = 1000$ and $z = 9$, find the value of z when $x = 2$ and $y = 5$. (Give your answer in standard form)

3.



In the figure above, O is the centre of the circle and ABC is a straight line BD = CD and angle AOD=110^0. Find the size of angle (i) DBC (ii) BDC

4. Betty and Alex are to share 144 oranges, with Betty getting twice as many oranges as Alex. Find how many oranges each will get.

5. Two areas on a map represented by two rectangles OABC and OPQR are similar with length AB corresponding to **PQ** = 42cm, and **OC** to **OR**; and width **BC** = 5cm corresponding to **QR** = 20cm and **AO** corresponding to **PO**.

(i) Determine the length of AB.
(ii) If the width QR = 20cm on the map measured on actual ground is 50km, state the scale of the map.

6. Given that $f(x) = x - 2x^2$ and $gf(x) = 3 - x$ determine an expression for $gf(x)$. Hence evaluate $gf(-2)$.

7. y is known to be inversely proportional to the square of x. when $x = 2$, $y = 2$. Find the value of x when $y = 32$.

8. In a showroom, the price of a car is given as Shs 5,800,000. During sale, a discount of 15% is allowed.

(a) How much does a customer pay for a car?

(b) After the car has been bought, in the first year its value deprecates by 25% and by 20% during the second year. Find the price of the car after (i) one year (ii) two years.

9. Given that $\log_{10} 7 = 0.845$ and $\log_{10} 2 = 0.301$, use this information to find $\log_{10}\left(\frac{49}{64}\right)$ Hence determine the value of $\frac{49}{64}$ giving your answer to 3 significant figures. (4 *marks)*

10. A and B are two matrices such that

$$A = \begin{bmatrix} 1 & 3 \\ 4 & 11 \end{bmatrix}, B = \begin{bmatrix} -1 & 2 \\ 1 & 3 \end{bmatrix}$$

Find: (i) matrix P = (AB)

(ii) P^{-1}

SECTION B

11(a) The table below shows a sample of ages (to the nearest tenth of a year) of patients randomly selected from a group of patients who sought medical treatment at a certain clinic during a certain week

0.6	2.0	18.0	3.4	19.0
15.0	16.3	14.0	7.0	12.2
18.9	5.9	1.5	12.0	9.0
5.0	12.8	17.0	7.7	0.2
8.0	14.0	5.4	15.8	17.8
5.5	11.4	6.0	6.9	16.0
10.0	0.8	13.6	11.0	3.9
13.0	9.0	6.6	10.9	4.0

(i) Form a frequency distribution table for the ages having equal class intervals of 5 years and starting with 0.0 − 4.9 class. State the modal class of the distribution

(ii) Draw a histogram (bar chart) to show the data

b) The mean of four numbers is 25, their median is 23. if the largest number exceeds the smallest by 30, and the largest number is one and a half times the second largest number, determine the four numbers

12. (a) Show by shading the unwanted regions the region satisfying the inequalities $y \le 2x + 1$ and $y \ge 3$

(b) Find the equation of the line through the points A(2, 7) and B(5, 13). The points A and B are reflected in the line $x = y$.

(i) Determine the coordinates of A^1 and B^1 the images of A and B respectively.

(ii) Find the equation of the line through A^1 and B^1.

13. In a certain game a die and a coin are each thrown and tossed once respectively. One side of the coin is labeled T(tail) and the other H(head). The number which appears on the upper face of the die is the players' score. In addition, if a tail appears the player receives a score of 4, and a score of 6 when a head appears. The score obtained by tossing a coin is then divided by the score obtained by throwing a die. If this quotient is a prime number a player takes the first prize. A player takes the second prize if his quotient is a recurring decimal and a third prize if the quotient is a triangular number.

Copy and complete the table below giving the possibility space of the game

Score on die	1	1								6	6
Score on coin	4	6									
Quotient	4	6									

Find the probability that a player wins

(i) The first prize

(ii) The second prize

(iii) The third prize

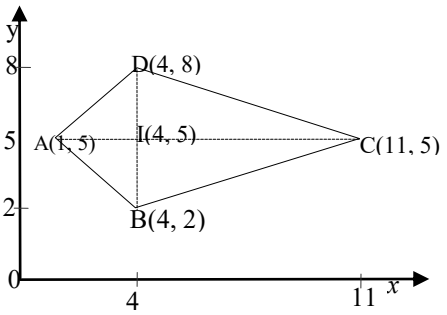
(iv) None of the prizes given that there are only three prizes.

14. The points A(1, 5): B(4, 2):C(11, 5) and D(4, 8) are vertices of a quadrilateral ABCD.

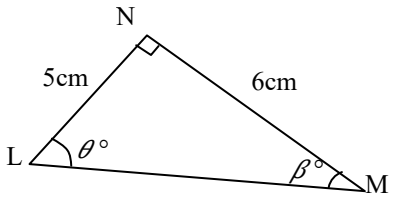
(i) Find the lengths of the sides of the quadrilateral. Hence state the name of the quadrilateral.

(ii) Given that **AC** meets **BD** at a point I, find the coordinates of I and show that the points A, I and C are collinear.

(iii) Find the area of the quadrilateral

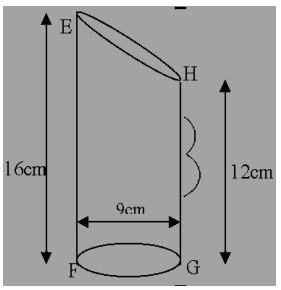


15(a)



In the above figure angle MNK = 90^0, **NM**=6cm and **NL** = 5cm. Calculate the value of $\sin\theta^o + \cos\beta^o$, correct to two significant figures.

(b)



The figure above shows a container EFGH (part of a cylindrical can) used by shopkeepers for scooping out sugar from a sack. Calculate the

(i) Maximum volume of sugar the container can scoop

(volume of a cylinder is $\pi r^2 h$, $\pi = \frac{22}{7}$)

(ii) Ratio of the volume of the cut-off piece of the cylindrical container to that of the container EFGH.

16. (a) Mr. Kapere deposited Shs 2.421 million on his savings account at the bank at a compound interest

rate of 8.5% per annum. Determine the number of years his money will take to accumulate to Shs 2.85 million.

(b) The following is an advertisement of a canon photocopier.

GET YOURSELF A PHOTOCOPIER CHEAPLY WHILE STOCK LASTS:
TERMS: CASH AT USH 960,000
OR HIRE PURCHASE: DEPOSIT 15% OF MARKED PRICE AND PAY EITHER USH. 75,000 WEEKLY FOR 12 WEEKS OR USH. 245,000 MONTHLY FOR 4 MONTHS.

Calculate:

(i) The saving a customer would make by buying the photocopier on cash terms rather than weekly hire purchase.

(ii) The percentage profit made on the monthly hire purchase if the wholesale cost of a photocopier is 17.5% below the cash prize.

17. Using a ruler and a pair of compasses only,

(i) Construct a triangle ABC where AB = 3cm and AC = 5cm and angle ABC = 90^0

(ii) Bisect the triangle ABC and let the point at which the angle bisector cuts line AC be the centre of enlargement of triangle ABC. Using the centre, enlarge ABC by a linear scale factor of -2 to form $A^1B^1C^1$.

(iii) Determine the area of the figure $ABCA^1B^1C^1$

1994 PAPER TWO
SECTION A

1. Convert

(i) 0006 hours to the 12 hours time

(ii) 250 US dollars ($) to pounds sterling (£). If 1 US $ = Ush 980 and 1(£) = U.sh 1750 (4 *marks*)

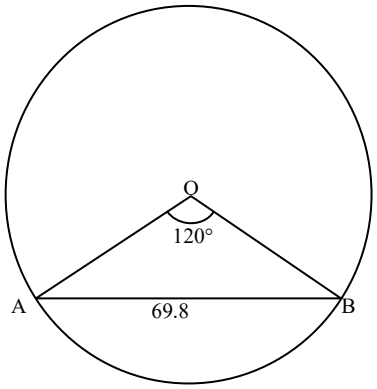
2. Given that $\mathbf{OP} = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$, and $\mathbf{PQ} = \begin{pmatrix} 5 \\ 1 \end{pmatrix}$ Where O is the origin, find

(i) The position vector of Q.

(ii) $|OQ|$ *(4 marks)*

3. Given that $f(x) = ax^2 + bx, f(1) = 5$ and f(2) = 14, find the values of *a* and *b*. (4 *marks*)

4.



In the figure above, AB is a chord of the circle whose centre is O. Angle AOB is 120^0 and $\overline{AB}$ = 69.8mm. Calculate the radius of the circle. (Give your answer to 3 sf) (4 *marks*)

5. In a certain game Bob scored the following points 3, 12, 2, 8, 0, 3, 5 and 7. Determine the median and mean of the points Bob scored in the game. (4 *marks*)

6. Given matrices $P = \begin{pmatrix} 2 & -2 \\ 0 & 1 \end{pmatrix}$, $Q = \begin{pmatrix} 3 & 2 \\ 4 & -1 \end{pmatrix}$ and $R = \begin{pmatrix} 3 & -4 \\ -1 & 2 \end{pmatrix}$. Determine

(i) P.Q + R

(ii) The determinant of (P.Q + R)

7. Given two sets A and B such that $n(A) = 12, n(B) = 13, n(A \cup B) = 20$ and $n(\varepsilon) = 24$, find,

(i) $n(A \cap B^1)$

(ii) $n(A \cup B')$, where ε is the universal set and B^1 represents the complement of B. (4 *marks*)

8. Find the *solution* set of the equation

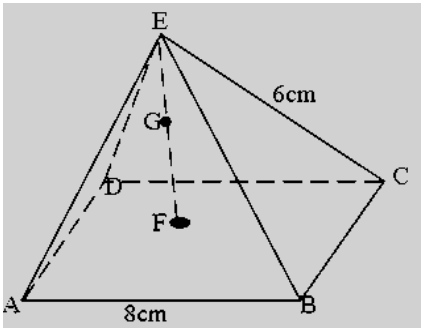
$2x^2 + x - 10 = 0$ (4 *marks*)

9. An observer at a point A sees an object on a bearing of 100^0. Another observer at point B sees the same object on bearing of 150^0. Given that the distances of the object from A and from B are equal. Determine the bearing of A from B. *(4 marks)*

SECTION B

11. On the same axes draw the graphs of
$y = x^3 - 2$ and $y = 3x + 2$: for $-3 \le x \le 3$
From your graph, estimate
(i) The value for $x^3 - 2 = 0$
(ii) The solution of the equation $x^3 - 2 = 3x + 2$

12.



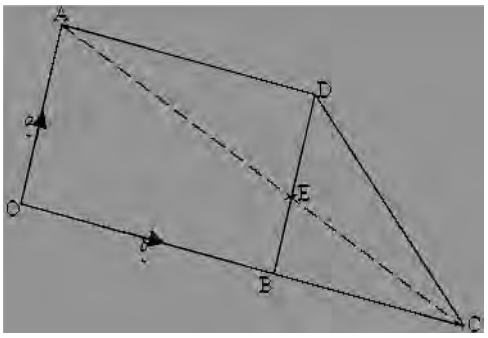
In the figure above, a pyramid whose base ABCD is a rectangle of sides 8cm by 6cm has slanting edges $\overline{AE}$ = $\overline{DE}$ = $\overline{BE}$ = $\overline{CE}$ = 6cm.F is the point of intersection of the diagonals of the rectangle. G is a point on $\overline{EF}$ such that $\overline{FG} = \frac{2}{3}\overline{FE}$ .Find

(i) angle AEC
(ii) The lengths $\overline{EF}$ and $\overline{AG}$
(iii) The angle which each of slanting planes makes with the base.

13. The unit square OIKJ where O(0,0), I(1,0), K(1,1) and J(0,1) is reflected in the line $y = -x$ to give image $OI^1K^1J^1$.

(i) Obtain the matrix of transformation R for this reflection.
(ii) Use R to find the image points of OI'K'J'.
If OI'K'J' is then enlarged by a linear scale factor of -2 at the origin to give OI"K"J", find
(iii) The matrix E for the Enlargement.
(iv) The coordinates of the image OI"K"J"
(v) The area of OI"K"J"
(vi) The matrix which maps OI"K"J" back to OIKJ.

14.



In the diagram above **AD** is parallel to **OC** and **OA** parallel to **BD**. 30C=50B. E is the point where $\overline{AC}$ meets $\overline{BD}$. AE: EC = 3 :2
Find (i) in terms of the vectors **a** and **b**, the vectors **AC**, **DC**, **ED**, **AE** and **OE**.

(ii) The ratio **BE** : **ED**.

15. (a) The speed at which water comes out of a pipe is inversely proportional to the cross-sectional area of the pipe. Given that water comes out of a pipe of cross-section $5cm^2$ at the speed of $1ms^{-1}$, determine the difference in the cross-section of two pipes from which water comes out at speed of $0.8ms^{-1}$ and $1.2ms^{-1}$.

b) A circle of radius 2cm and centre O, has points A, B and C along its circumference. A and C are joined to form chord $\overline{AC}$ such that it subtends an angle of 80^0 at point B, calculate the perimeter of the region enclosed between the chord $\overline{AC}$ and the major arc ABC.

16. The distance from Lira to Kampala is 380km. A bus leaves lira at 0730 hours and travels non stop to Kampala at $60kmh^{-1}$. At 0850 hours a Pajero car leaves Kampala and travels towards Lira at a steady speed of $120kmh^{-1}$.
On the same axes draws distance–time graphs showing the journey of both vehicles. Hence or otherwise determine when and at what distance from Lira they meet. If the bus then increases its speed by $10km^{-1}$,

(i) Calculate the time at which the bus arrived in Kampala.
(ii) Determine the difference in the times of arrival of two vehicles (Use scales of 2cm to represent 50km and 2cm to represent 1 hour).

17. The table below shows the tax structure on taxable income of citizens in the working class of a certain country.

Income (sh) per annum	Tax rate (%)
(i) 1st sh 80,000	7.5
(ii) Next sh 80,000 (160,001-240,000	12.5
(iii) Next sh 80,000(160,001-240,000	20.0
(iv) 240,001- 320,000	30.0
(v) 320,001- 400,000	36.5
(vi) 400,001- 480,000	45.0
(vii) 480,001- and above	52.6

A man's gross annual income is sh 964,000. The allowances including insurance accrued to him were;

(i) Housing sh 14,500 per month.
(ii) Marriage: one tenth of his gross annual income
(iii) Medical sh 50,700 p.a.
(iv) Transport sh 10,000 per month
(v) He has to pay an insurance premium of sh 68,900 per annum.
(vi) Family allowances for only four children at the following rates sh 3,400 for each child above the age of 18, 4,200 for each child above 10 but below 18 years and sh 5,400 for each child below 9 years. Given that he has a family of five children with three of them below the age of 8, one 16 and the elder child 20 years, determine;
   (a) His taxable income.
   (b) The income tax he pays annually as a percentage of his gross annual income.

1995 PAPER ONE
SECTION A

1. Without using tables or calculator evaluate $\left(\frac{8}{125}\right)^{-2/5} \cdot \left(\frac{5}{8^{1/2}}\right)^{-2}$

2. The functions f(x), and g(x) are defined as $f(x) = x + 2$, and $g(x) = \frac{x^2}{4}$.

Find the values of x for which $fg(x) = 3$

3. Juma takes 10 days to dig a certain piece of land. John takes 15 days to dig the same piece of land. Assuming that both work at the same rate, determine the number of days they will both take do dig the same piece of land if they work together.

4. Given that $\log_{10} x$ 2.304 and $\log_{10} y = \bar{2}.872$, find the value of $x^{1/4} y^{-1/2}$. Correct to 2 decimal places.

5. Given that $\tan \alpha = \frac{15}{8}$, calculate without using tables or, calculate the value of $4\cos\alpha - \sin\alpha$

6. Find the equation of the line which is the perpendicular bisector of the line passing through the points A(3, 4) and B(1, 10).

7. If matrices M and N are such that

$M = \begin{pmatrix} 2 & 1 \\ 2 & 3 \end{pmatrix}$ and $MN = \begin{pmatrix} 12 & 0 \\ 0 & 12 \end{pmatrix}$. Find matrix N.

8. The mean weight of a class of 30 boys is x kg. When two boys with a total weight of 150kg are absent, the mean weight of those present is 2kg less than the mean weight of the whole class. Find the value of x.

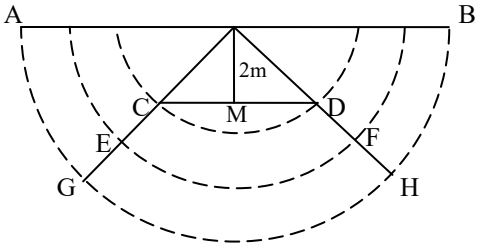
9. Given $\frac{5}{\sqrt{5}} + \sqrt{20} = a\sqrt{5}$ Determine the value of a.

SECTION B

10. If vectors $\underset{\sim}{a} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$, $\underset{\sim}{b} = \begin{pmatrix} 1.5 \\ 3 \end{pmatrix}$

Find the length of $\frac{1}{2}\underset{\sim}{a} + 3\underset{\sim}{b}$

11.



In a seminar, the high table CD which is 3m long is used by guest speakers. The table is placed in front of and parallel to wall AB. Some chairs are arranged behind the high table with the front legs of each chair occupying 0.5m along CD. Participants are seated on chairs arranged in circular form placed in front of the

high table along the arcs EF, GF, and IJ of circles whose centers are the point O along AB as shown in the diagram above. The chairs are also arranged such that each occupies 0.5 m of the length along the arcs. Given that the perpendicular line from O bisects CD at point M and CE = EG = GI = 2M

(i) Find the angle COD

(ii) The maximum number of guest speakers that can get seated at the seminar.

(iii) The maximum number of participants that can get seated in chairs arranged along the arcs. (correct your answers (number of people to the nearest whole number)

12. A circle passes through the points P(0.5, -3), Q(2, 4.7) and R(4.5, 1).

(i) Plot and join the points P, Q and R on a graph paper. (Use 2 cm to represent one unit on either side).

(ii) By construction determine the centre and radius of the circle.

(iii) Calculate the area of the minor segment cut off by the chord PQ.

13. The monthly salaries of 300 employees working in a certain bottling company are as follows;

Salary range	Number of employees
26001 – 36000	56
36001 – 46000	74
46001 – 56000	82
56001 – 66000	38
66001 – 76000	25
76001 – 86000	15
86001 – 96000	10

(i) Represent this data on a histogram.

(ii) Calculate the mean monthly salary.

(iii) Estimate the median salary.

14. On the same axes draw the graphs of the lines $y - 2x = 1$, and $y + 3x = 6$ for $-3 \le x \le 3$. Use your graphs to solve the equations.

$y - 2x - 1 = 0$

$y + 3x - 6 = 0$

15. Aggrey and Bob are to travel from town **A** to town **B** ridding on a bicycle and motorcycle respectively. When Aggrey is 21km away from town **A** and ridding at a steady speed of 18.5kmh^{-1}, Bob sets off for town **B** on his motor cycle at a steady speed of 36kmh^{-1}. Bob is expected to ride for $3\frac{1}{4}$ hours to reach town **B**.

(a) Calculate:

(i) The distance between **A** and town **B**.

(ii) When and where Bob will catch up with Aggrey.

(iii) How long Bob will take waiting for Aggrey to join him in town **B**.

(b) Represent Aggrey's and Bob's journeys on the same distance time graph.

16. A flag mast slants towards the west at an angle of 13^0 to the vertical. From a point **M** to the east and 20 metres away from the foot **F** of the mast, the angle of elevation of the top **P** of the mast is 35^0. From another point **N** to the west of the mast the angle of elevation of the top **P** is 22^0. If **M**, **F** and **N** are on level ground, determine to 4 significant figures.

(i) The vertical distance of the top P from the ground.

(ii) The distance of the foot of mast F from N.

(iii) The length PF.

17. A triangle ABC where A, B and C are the points (2, 3) (6, 3) and (4, 6) respectively is given a transformation represented by the matrix $\mathrm{M} = \begin{pmatrix} 0 & -3 \\ -1 & 2 \end{pmatrix}$ followed by the matrix $N = \begin{pmatrix} 2 & 3 \\ 1 & 0 \end{pmatrix}$ to give the final image A^1, B^1 and C^1

(i) Find the image points A^1, B^1 and C^1

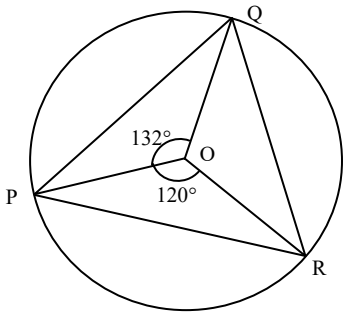
(ii) Describe the single matrix transformation that is represented by the combined matrix transformation **M** followed by **N**.

(iii) Obtain a single matrix that would map A^1, B^1 and C^1 back onto ABC.

1995 PAPAR TWO
SECTION A

1. Simplify $\dfrac{2^x \times 8^{x-1}}{16^{x-1}}$

2



The diagram above shows a circle centre 0 circumscribing a triangle PQR. Given that angle POQ=132^0 and angle POR=120^0, find the angles of triangle PQR.

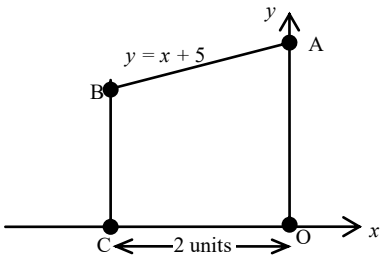
3. Given that $f(x) = \dfrac{1}{1-x}$

(i) find $f(2)$

(ii) State the value of x for which $f(x)$ is not defined.

4. A butcher sells 5kg of meat at sh 7,000. If the cost of meat is increased by 25%, determine how much kilograms of meat can be bought with the same amount of money after the increase.

5



In the diagram above the Equation of the line AB is $y - 5 = x$ and C is 2 units from 0. Find the area of OABC.

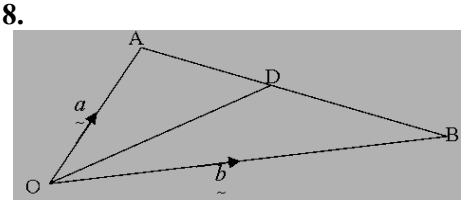
6. Solve the Equation $10^{6-x} = (20 \times 0.5)^{x^2}$

7. Given the matrix $A = \begin{pmatrix} 4.5 & 1 \\ 0 & 7 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & -1 \\ 3 & 1 \end{pmatrix}$,

find matrix M such that

3M-2I = 2A-B, where I is an identity matrix of order 2.

8.



In the figure above **OA** = $\underset{\sim}{a}$; **OB** = $\underset{\sim}{b}$ 3**AD**=**AB**

Find **OD** in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$.

9. Determine the ***solution*** set of the inequality = $\dfrac{x-2}{4x-2x^2} < \dfrac{2}{3}$

10. A three digit number is formed using each of the digits 2, 4 and 6 only once. List the possible numbers that are formed. Calculate the probability that the number formed is greater than 430.

SECTION B

11. The figure below shows the marks in percentage obtained by candidates in an English test.

43	70	50	35	64	62	50	53
46	62	65	83	59	54	58	64
52	54	32	59	48	54	35	48
40	58	64	40	71	74	55	70
72	48	75	45	55	40	57	55

(i) Starting with 30 as the lower class limit of the first class and using equal class intervals of 5 marks, form a frequency distribution table for this data.

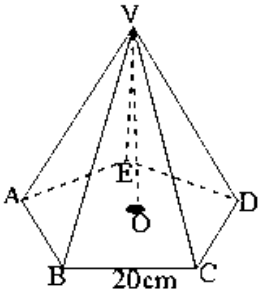
(ii) Plot a cumulative frequency curve for the data. Use your data to estimate the median mark.

(iii) Calculate the mean mark using an assumed mean of 57%.

12. (a) A line passes through the points (a, o) and (o, b). Find the Equation of the line.

(b) Given that a line, L passing through the point (0, 2) is perpendicular to the line $2y = 5x + 3$, find the point of intersection of the line L with the line $2x = 3y - 5$.

13.



The diagram above shows a solid object with a regular pentagonal base ABCDE of side 20cm and centre 0. The vertex V is vertically above 0 and $\overline{VO}$ = 30cm.

(i) Find angle BCO.

(ii) Calculate the length OC.

(iii) Obtain the length of $\overline{VC}$ and the angle at which it is slanting to the horizontal (give your answer correct to a decimal of a cm)

14. Using a ruler and a pair of compass only, construct a triangle ABC such that $\overline{AC}$ =9.6 cm, $\overline{BC}$= 4.8cm and the angles, BAC=30^0 and ABC=90^0. D is a point on $\overline{BC}$ produced 2.7cm away from $\overline{AB}$. Construct angle BDE = 45^0 with $\overline{DE}$ =10.1cm. join the points A

to D and B to E, construct a circle circumscribing triangle ACD such that it also passes through the point E.

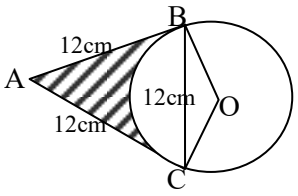
Measure:
(i) Lengths AB and BE.
(ii) Angle ADC.
(iii) The radius of the circle.

15. Sarah bought a four-inch mattress (a mattress whose thickness is 4 inches). She then went to John, a tailor, and bought a cloth which can exactly fit the mattress as a cover. John sold her 4.6m^2 of cloth while according to John's experience the 4.6m^2 of cloth was exactly enough to cover all the sides of the mattress.

(a) Given that 1 inch is approximately 2.5cm; the width of the mattress is w cm and length 2w cm, find w.

(b) If she paid the mattress and its cover cloth Uganda shillings 52,500 and 36,500 respectively, calculate in pounds sterling, £, given that 1 United States dollar $ is equivalent to U Shs 950 and 1£ = 1.8$, the
(i) Price of the mattress.
(ii) Total cost of the mattress and its cover.

16.



In the figure above, AB and AC are targets to the circle at points B and C respectively. O is the centre of circle. Given that $\overline{AB} = \overline{BC} = \overline{AC}$ = 12cm. Determine
(i) The obtuse angle BOC.
(ii) The radius of the circle.
(iii) The area of minor sector BOC and hence the area of the shaded region.

17. A soccer club wishes to intensively train its top and second division players by residential training in preparation for soccer league tournaments. The cost of maintaining a player is sh 60,000 and sh 45,000 per top and per second division player respectively. The club has a maximum of sh 1,800,000 for the residential training. One and a third times the number of top players must not exceed the number of second division players. Given that the club can only train up to 35 players who must be selected from the two divisions of players.
(i) Write down the set of inequalities representing the above information.
(ii) Using a scale of 2cm to represent 10 units on each axis, draw on the same axes graphs for these inequalities.
(iii) Shade out the unwanted regions and find the maximum number of players from each division the club can train.

1996 PAPER ONE
SECTION A

1. Without using tables or calculator, evaluate $\frac{32.135^2 - 17.865^2}{0.7135}$ *(4Marks)*

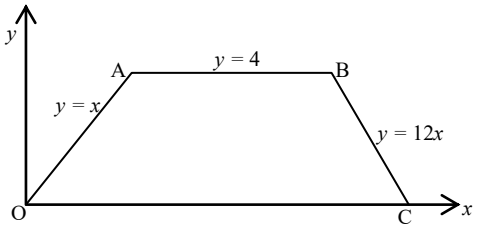
2. A car's petrol tank is three quarters full at the beginning of a journey. If the car uses two-thirds of a tank-full of petrol for the journey, what fraction of a tank full remains at the end of the journey?
On returning the car refuels such that at the end of the return journey the car is one-fifth tank full. What fraction of a tank full of petrol was bought?

3. Without using tables or calculator, simplify $\frac{1}{2}\log_{10} 16 - 2\log_{10}\left(\frac{a}{5}\right) + \log_{10} a^2$

4. Given that $124_n = 52_{ten}$, determine the value of the natural number n.

5. In a class of boys and girls, the average age is $15\frac{1}{2}$ years. The class has 12 boys whose average age is $16\frac{3}{4}$ years. Find the size of the class if the average age of girls is 15 years.

6.



In the diagram above OABC is a trapezium formed above the x-axis by the intersections of lines $y = x$, $y = 4$ and $y = 12 - x$.

7. Find the ***solution*** set of the equation $(x-3)^2 = 4^2$

8. Two right cones are similar with linear scale factor 2. If the larger cone has radius of 14cm and height of 27cm, calculate the volume of the smaller cone. (Take $\pi = \frac{22}{7}$, volume of cone = $\frac{1}{3}$ × height × base area

9. Three points O, P and Q in the same plane have position vectors
$O = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$, $\mathbf{p} = \begin{pmatrix} 4 \\ 7 \end{pmatrix}$, and $\mathbf{q} = \begin{pmatrix} 8 \\ 9 \end{pmatrix}$. Find the coordinates of R, the mid-point of **PQ** and the distance of R from O.

10. Two mirrors M_1 and M_2 are placed 12cm a part parallel to each other. An object O is placed 4cm away from M_2. If M_1 (0) denotes the image, O^1 of O after a reflection of O in M_1, determine the distance

from O of M_2 [(M_1 (O)], the image, O^{11}, of O^1 after a reflection of O^1 in M_2.

SECTION B

11. In a certain trading centre there are 56 shops, 28 of which sell soft drinks, 24 sell food stuffs and 32 sell textiles. 10 shops sell both food stuffs and soft drinks, 6 sell both food stuffs and textiles and 4 shops sell all the three categories of commodities; both food stuffs and textiles and 4 shops sell all the 3 categories of commodities.

(a) (i) Represent this information on a Venn diagram.
(ii) Determine the number of shops which sell both soft drinks and textiles only.

(b) If a customer is to choose a shop at random, what is the probability that the shop he goes to sells

(i) At least two of these categories of commodities.

(ii) Only one of the three categories of commodities.

12. Using a ruler, pencil and a pair of compasses only,
(i) Construct a triangle ABC, where
BC = 7.2 cm, AC = 8.4 cm and angle
ABC = 75^0. Measure AB and angle ACB.
(ii) Draw a circle circumscribing triangle ABC. State the radius of the circle.

13. (a) Two saloon cars A and B are hired to carry people going to attend a wedding ceremony. With six trips each, the two cars can carry 60 people. A total of 62 people can be transported if A makes seven trips and B makes five trips. Determine the number of people each car can carry per trip.

(b) Otim and Mukasa stay in the same home. When Otim walks from home to school at a constant speed of 5.4 kmh^{-1}, he arrives 10 minutes early. When Mukasa walks at a constant speed of 3.6kmh^{-1}, he arrives late by 15 minutes. Calculate how far the school is from their home.

14. A food Aid Agency carried out a survey to ascertain the average monthly expenditure on food by a family in a certain urban centre. The expenses on food were found to be in two parts; a constant expenditure and another part varying as the square of the number of children in the family.
A family of 3 children needed Shs19,000/= while that of 5 children needed Shs31,000/=.

(a) Write down an expression for the total expenditure on food, E, Spent per month by a family with n children.

(b) What is the monthly food expenditure for
(i) A childless family?
(ii) A family with 4 children?

(c) How many children are in a family which needs an average food expenditure of Shs39,250/- per month?

15. Draw on the same co-ordinate axes, graphs of $y = x(2x-3)$ and $y = 2(x-1)$ for $-3 \le x \le 4$

(i) Using your graph, determine the points of intersection $y = x(2x-3)$ and $y = 2(x-1)$

(ii) Use your graph to find the roots of $2x^2 - 3x = 0$

16.

Scores	Class Mark	Frequency	Frequency X Class Mark
40-49	_	_	450
50-58	_	16	_
59-67	63	_	1575
68-76	_	_	864
77-85	_	13	_
86-94	90	4	360
		_____	_____

The table above shows the number of students who passed an end of year English promotional examination in terms of mark scores.

(a) Study the table and the information available to complete the missing details.

(b) (i) State the class interval of the scores.
(ii) Calculate the average score of the marks.

(C) If all the above students were promoted and represented 4/5 of the class, find the number of students in the class who sat the examination.

17. A plane flew due west from air strip A at a speed of 280 kmh^{-1} for ¾ hours before reaching air strip B. It then altered its course and flew North-west to airport C at 220kmh^{-1}. From there, it flew on a bearing of 060°to air strip D at 240 kmh^{-1} for $1\frac{1}{2}$ hours. The total time of flight between the four air strips was $4\frac{1}{2}$ hours.

(i) By scale drawing, determine the distance and bearing of A from D. (use a scale of 1cm to 50km).

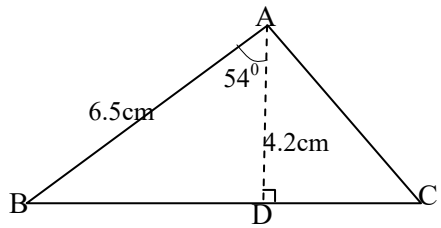
(ii) Determine the total distance of flight from A to D and hence the average speed for the journey.

(iii) If the plane flew directly back to A at a speed of 200kmh^{-1}, determine how long it took to fly back to A.

1996 PAPER TWO
SECTION A

1. Given that $a*b = a^2 - b^2$, find the value of x in $x * \sqrt{3} = 7 * 4$

2.



In triangle ABC above, AD = 4.2cm is the altitude, angle BAC = 54^0 and $\overline{AB}$ = 6.5cm. Find:

(i) The size of angle CBA

(ii) Length $\overline{AC}$

3. Given that y varies as the cube of x and $y = 8$ when $x = 4$, find the value of x when $y = 1$.

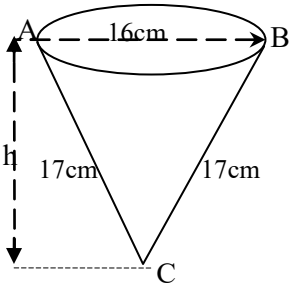
4. Solve the equation $3x^2 - 7x + 2 = 0$

5. If $x : y : z = 2 : 3 : 5$, determine the value of z when:

(i) $x + y + z = 200$

(i) $y = 84$ (4 marks)

6.



The diagram above shows a right circular cone ABC of vertical height h cm and slant side AC = BC =17cm and base diameter AB = 16cm.
Find:

(i) h

(ii) The capacity of the cone.

(Use π =3.142, volume of cone= $\frac{1}{3}h \times$ (base area)

7. When a cyclist has traveled a distance of 105km in $1\frac{2}{3}$ hours, he cycles at an average speed of $54kmh^{-1}$ for further $2\frac{1}{3}$ hours. Calculate the average speed for the;

(i) First $1\frac{2}{3}$ hours

(ii) Whole journey

8. Using matrix methods, determine the values of x and y which satisfy the equations.

$2y - 4x + 2 = 0$

$3x - 2y = 5$ (4 marks)

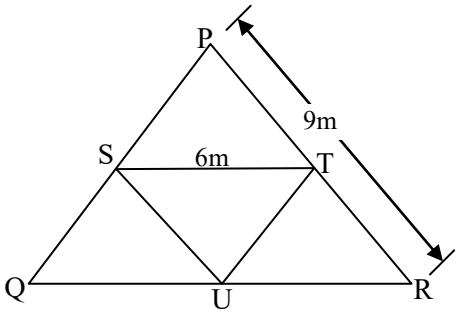
9. If $U = \begin{pmatrix} -2 \\ 4 \end{pmatrix}$, $V = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$ and $W = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$, Find the value of a and b such that

$a(\underset{\sim}{u}) + b(\underset{\sim}{v}) = \underset{\sim}{w}$

10. Express $0.\overline{891}$ as a rational number in its simplest terms.

SECTION *B*

11.



The diagram above shows part of a rafter of a building. QR is parallel to ST. PQR is an isosceles triangle with Q and R as base angles. U is the mid-point of QR. $\overline{PS} : \overline{SQ} = 3 : 2$, $\overline{ST}$ = 6cm and $\overline{PR}$ = 9m.
Calculate the;

(i) Lengths of QR, TR and PU

(ii) Size of angle PQU.

(iii) Area of DPQR.

12. (a) If x^3 = 3.375, use tables to find the value of x; correct to three significant figures.

(b) Given that $\log_{10}2 = 0.3010$ and $\log_{10}3 = 0.4771$, find without using tables or calculator, the value of:
(i) $\log_{10}72$
(ii) x if $\log_{10}x = 1.6020$

13. A builder makes concrete blocks by mixing cement and sand in the ratio $1:20$. From every 3 buckets of mixture he makes 2 blocks, one bucket of cement costs sh3,000/= and one bucket of sand sh 25/-. Find the cost of cement and sand required to make 6,300 blocks.

(b) A grocery sells two kinds of meat products A and B. Athieno bought 4 kg of A and 6kg of B paying a total of sh 5280/=, Namusisi bought 5kg of A and 3kg of B at a total cost of sh 4,440/-.

(i) Write down two equations to describe Athieno's and Namusisi's purchase.

(ii) By combining the two Equations in matrix form, determine the cost of 1kg of each meat product.

(iii) How much would Mugisha pay for 6kg of A and 5kg of B.

14. In a certain school there are 87 students in S.3. Of these 43 play hockey, 42 play football and 47 play volleyball, 15 play hockey and volleyball, 17 play volleyball and football and 21 play hockey and football. Each student plays at least one of the three games while x students play all the three games.

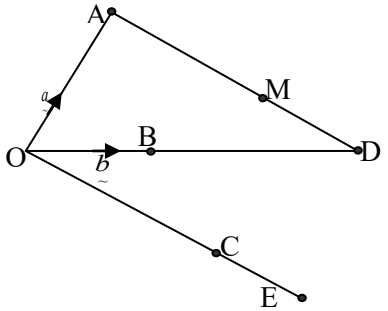
(i) Represent this information in a Venn diagram, showing clearly the number of students in each region.
(ii) Write down an equation in x and hence find x.
(iii) If a student is chosen at random from the class, what is the probability that he plays exactly two games?
(iv) Find the number of students who play at least two of these games.

15. (a) Copy and complete the table below of values of $S = t - 3 + \frac{4}{t}$ where S is the distance covered (in m) by a particle from a fixed point P after t seconds.

S	5.5		1.17		1.1	1.33			3.67
t	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0	6.0

(b) Draw a graph of S against t for t = 0.5 to t = 6.0 inclusive. (Use 2cm to represent one unit of t and 4cm to represent one unit of S)
From your graph estimate:
(i) The times when the particle will be 3cm from P.
(ii) For how long the particle will be less than 2m away from P.
(iii) The distance the particle travels between t = 2.5 and t = 4.5 seconds.
(iv) The speed of the particle between t = 0.5 and t = 2.5 seconds.

16.



In the figure above **OA** = $\underset{\sim}{a}$ and **OB** = $\underset{\sim}{b}$, **3OB = 2BD**, M is a point on AD such that **MD** : **AM** = 1 : 2, **OC = 3CE = 3AM**

(i) Express the vector **AD**, **BM** and **DC** in terms of vectors $\underset{\sim}{a}$ and $\underset{\sim}{b}$.

(ii) Show that **AD**: **OE** = 3 : 8

17. A factory makes two kinds of bottle tops "Coca-cola" tops and "Pepsi tops". The same equipment can be used to make either. In making Coca-cola tops one man can supervise 10 machines and this batch will give a profit of pounds sterling (£) 50 per week. Pepsi tops yield a profit of £250 a week, using 25 machines and 8 men. There are 200 machines and 40 men available. By taking x batches of coca-cola tops and y batches of Pepsi tops, write down inequalities for;

(i) The number of machines used.
(ii) The number of men employed.
(iii) An expression for profit P.

Use these inequalities to draw a suitable graph showing the region which satisfies them. From your graph, determine the numbers of Coca-cola and Pepsi tops which should be made to obtain the maximum profit. Hence find the maximum profit.

1997 PAPER ONE
SECTION A

1. A teacher awards two marks for each correct answer plus three marks as an incentive for test attendance. If Q is the number of questions attempted and M the total marks a candidate gained in the test.

(i) Write down a relation between Q and M.

(ii) What is the maximum mark score for a test with only nine questions?

2. Solve for x in $\frac{x-3}{5}-\frac{x+2}{3}=\frac{x}{2}-\frac{1}{3}$

3. Otti takes 6 days to plough a certain piece of land. Mpoza takes 12 days to plough the same piece of land.

Assuming that both work at the same rate, how long will the two men take to plough the piece of land if they work together?

4. Given that $f(x) = px - 4$ and $f(3) = 14$, find:

(i) The value of P.

(ii) $f(1)$

5. Factorise $a^2 - 2ab - 5a + 2b + 4$

6. Given the vectors $\mathbf{p}=\begin{pmatrix}2\\3\end{pmatrix}, \mathbf{q}=\begin{pmatrix}-5\\3\end{pmatrix}$ and $\mathbf{r}=\begin{pmatrix}6\\-2\end{pmatrix}$,

Find the length of $(p + q + r)$.

7. Given that $\log_{10} x = 1.699$ and $\log_{10} y = \bar{1}.913$,

evaluate without using tables or calculator

$\log_{10} x + \log_{10} y^{1/3}$

8. Simplify $\frac{1}{\sqrt{3}+\sqrt{2}}+\frac{3}{\sqrt{3}-\sqrt{2}}$

9. The numbers 0, 1 and 2 are arranged in a random order so as to form two digit and three-digit numbers. No digit is repeated in a number formed.

(i) Write down the possible numbers that can be formed.

(ii) Find the probability that a two-digit number formed has the same numerical value as the three-digit number formed

10. Given that H denotes half turn about the origin and X denotes reflection in the X-axis, find a single transformation to XH on the points of the unit square.

SECTION *B*

11. The vertices of triangle ABC; A(1, 0); B(1, 2); C(5, 2) are mapped onto the triangle A^1 B^1 C^1 by the transformation whose matrix $M=\begin{pmatrix}1&0\\2&4\end{pmatrix}$

(a) Find the

(i) Coordinates of the vertices of the image triangle.

(ii) Ratio of the area of triangle ABC to the area of triangle A^1 B^1 C^1.

(b) Plot on the same axes triangle ABC and its image.

(c) Determine the matrix of the transformation which maps $A^1B^1C^1$ back to ABC.

12. The table below shows the marks scored in an English test marked out of 100 by students of S.2 in a certain school.

Score	f(x)
0-19	2
20-39	6
40-49	12
60-79	9
80-89	1

(i) Represent this information on a bar-chart.

(ii) Use the frequency table above to estimate the median and mean mark score.

13. Fifty-two students of S.3 in a certain school were interviewed to find out how many of them had ever visited the towns of Arua, Kasese or Mbale. Only 4 had visited neither towns. It was found out that an equal number of students had visited Arua and Kasese of whom 12 had visited both Arua and Kasese. 24 students altogether had visited Mbale of whom 11 had visited both Mbale and Arua and 13 had visited Mbale and Kasese. Eight had visited all the towns,

(a) Present this information on a Venn diagram.

(b) How many students in the class had

(i) visited Kasese

(ii) Not visited Arua?

(c) Given that three students are taken at random from the class, what is the probability that they belong to the set of students who only visited two towns?

14. Using matrix methods find the values of x and y which satisfy the equations.

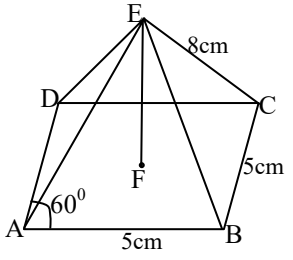
$2x - 3y = 12$

$x + 2y + 1 = 0$

(b) given that matrix $A=\begin{pmatrix}3&-2\\-4&5\end{pmatrix}$, find a matrix B such that $AB=\begin{pmatrix}7&0\\0&7\end{pmatrix}$

Hence otherwise find the inverse matrix of A.

15



The figure shows a pyramid whose base ABCD is a rhombus of sides 5cm and whose acute angle is 60^0.

AE = DE = CE = BE = 8cm. F is the point of intersection of the diagonals of the rhombus. Find
(i) Length EF (ii) Angle AEB (iii) The angle each of the slanting planes makes with the base.

16. (a) The length of the sides of an equilateral triangle ABC is *x* units.

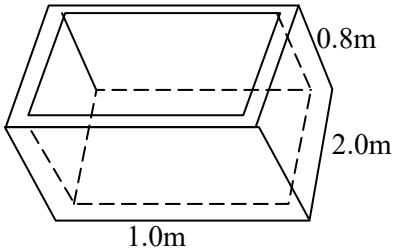
(i) Show with the help of the triangle that $\sin 60^0 = \frac{\sqrt{3}}{2}$

(ii) Without using tables or calculator, find the value of

$$\left(\frac{\sin 60^0}{\sin 30^0} + \tan 60^0\right)^2$$

(b) Draw the graph of $y = \cos 3x$ for $0 \le x \le 150^0$

17



The figure above shows an open metallic water tank made of material which is 2.0 cm (0.020m) thick. The metal used for making he tank costs Shs 100 for every $50cm^3$ (5×10^{-5} m^3).

(i) Find the cost of making this tank.

(ii) If the tank is to be filled with water at a fee of 5 cents (Shs 0.05) per litre, determine (in Shs) the cost of filling the tank. ($1m^3 = 10^6$ litres).

1997 PAPER TWO
SECTION A

1. A musical tape costs pounds sterling (£) 8.95. Given that the exchange rates are US dollar \$1.56= £1.00 and Ug sh. 1045 = 1\$, find the equivalent cost of the musical tape in
(i) U.S dollar.
(ii) Ug. Shillings *(4 marks)*

2. Determine the area of figure enclosed by the *x*-axis, the line $2x + y = 8$ and the reflection of this line in the *y*-axis.

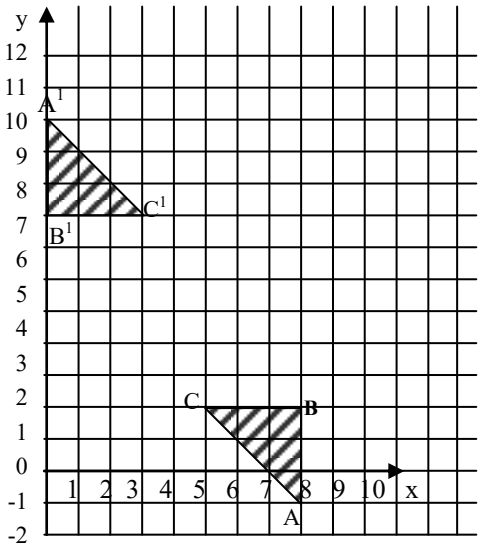
3. The scale of a map is 1:200,000. Two trading centres on the map are 4.5cm a part. Determine in km the actual distance between the two trading centres.

4. Under the matrix transformation $\begin{pmatrix} 1 & a \\ b & -4 \end{pmatrix}$, the point P (3, -2) is mapped on the point P^1(-1, 17). Find the values of *a* and *b*. (3 marks)

5. Four athletes ran a 100m races. Their times taken to complete the race in second(s) were 16.5, 13.6, 10.8 and 12.4.

(i) Write down the median, in (s) of the four times.
(ii) Calculate the time taken by a fifth athlete, if the mean of all the five times was 13.4 seconds.

6.

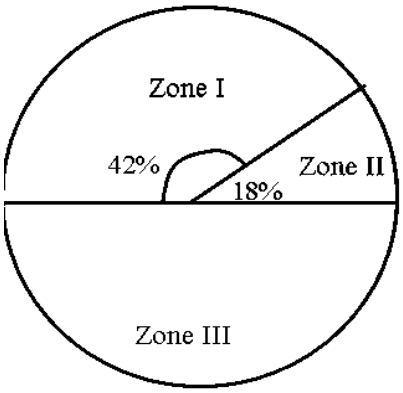


In the graph A'B'C' is the image of ABC under an enlargement with scale factor f. Determine the

(i) Value of *f*.

(ii) Co-ordinates of the centre of enlargement.

7.



The pie chart shows the percentage of people living in three L.C.1 zones I, II and III of a certain village. The sector representing people living in zone II is 18% while the one representing those living in zone I is 42%. If the number of people living in zone III is 240, find the

(i) Population of the village.

(ii) Number of people who live in zone I.

Solution

(i) Let x = population of the village

The percentage of people living in zone III is

$$100 - 60 = 40\%$$

$$\Rightarrow \frac{40x}{100} = 240$$

$$x = \frac{240 \times 100}{40}$$

$$= 600$$

Therefore the population of the village is 600

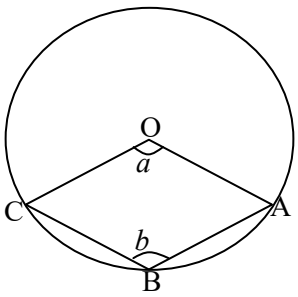
(ii) People who live in zone I $= \frac{42}{200} \times 600$

$$= 252$$

Hence the number of people who live in zone one is 252.

8. A blouse and skirt were each sold at sh. 12,420. On the blouse a profit of 15% was realized while on the skirt a loss of 12.5% was recorded. Calculate the percentage loss on both articles.

9.

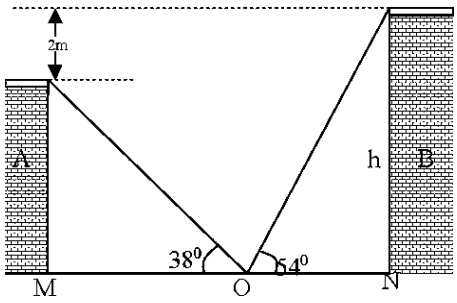


In the figure above, O is the centre of the circle and $b = 118^0$, find the value of a.

10. Mukasa, Kaija and Obita are to share sh. 90,000 in the ratio 3:4:5, respectively. Calculate the amount each will receive. (4 marks)

SECTION B

11 (a)



From the point O on level ground MON, between two buildings, A and B, the angles of elevation of the tops of buildings A and B are 38^0 and 54^0 respectively. Building B, h metres high, is 2m higher than building A and $\overline{MO} = 24$m.

Calculate:

(i) The height of building A.

(ii) How far building B is from point O.

(b) A ship is observed moving away from the top of a cliff which is 80m high. Within a time span of 10s the angle of depression decreases from 30^0 to 20^0. Determine the distance covered within this time range. Hence find the speed of the ship in meters per second (ms^{-1})

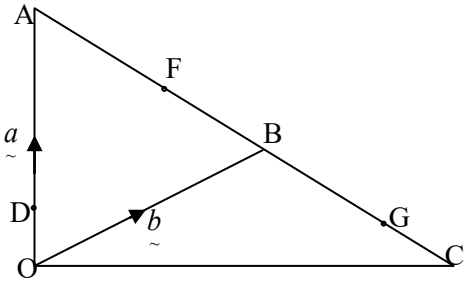
12 (a) A dispenser produces medicine in two different sized cylindrical plastic cans. The cans are similar. The area of the bottom of the small can is $12cm^2$ and that of the bottom of the large can is $48cm^2$, given that the small can holds 100ml of the medicine, calculate;

(i) How much medicine is contained in the large can.

(ii) The height of the large can.

(b) The dispenser uses exactly half of the medicine of the small can and then mixes it thoroughly with 37.5 ml of distilled water to obtain a mixture for treatment of patients. Calculate the height (in cm) of the mixture in the small can.

13.



In the figure above **OA** = $\underset{\sim}{b}$; F and G are points on $\overline{AC}$ such that AF: **AB**=3:4 and **AG**:**AC**=2:3, respectively. D is a point on OA such that **OD**: **DA** = **FB** : **BG** =1:2.

(i) Express AG and AC in terms of **AB**. Hence find in terms of vectors $\underset{\sim}{a}$ and $\underset{\sim}{b}$ the vectors; **AB**; **AC**; **DG** and **OF**.

(ii) Determine the ratio **DG**: **OC**

14. (a) The line $y = 2x$ meets the line $x = 3$ at the point A.

(i) Give the coordinates of A.

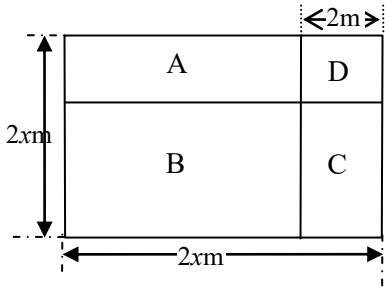
(ii) If the x-axis is the axis of symmetry of triangle OAB, find the coordinates of B.

(iii) Find the equation of OB.

(iv) Write down the inequalities for a point (x, y) inside the triangle OAB.

(b) Calculate the area of triangle PQR where P is (3, 3), Q is (4, -1) and R(-8, -4).

15.



The diagram shows four rectangles A, B, C and D which together form a square of side 2xm. Given that, one side of D is 2m, and that the area of A+D is $4m^2$, express the other side of D in terms of x.

Given also that area of A + B + C is $11m^2$. Show that $4x^3 = 11x + 4$.

16. The position vector of a point (x, y) is written as the column vector $\begin{pmatrix} x \\ y \end{pmatrix}$. A geometrical transformation is represented by the equation.

$$\begin{pmatrix} x^1 \\ y^1 \end{pmatrix} = \begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$

a) Write down the image of (1, 0) and (0,1) under this transformation.

b) Show that the image of (1, 0) under a rotation of $+30^0$ about the origin is $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$ and find the image of (0,1) under the same rotation.

c) Using your answers to part (a) and (b) above or otherwise, write down the matrix M of this rotation.

d) Calculate M^2 and write down the coordinates of the image of (1, 0) and (0,1) under the transformation of M^2.

Explain your answer geometrically.

17. When traffic lights flash green, two taxis A and B move off from rest in the same direction and on a straight road. The speed of taxi A increases at a uniform rate of $2ms^{-2}$ while taxi B moves as shown in the table below.

Time (S)	0	1	2	3	4	5	6	7
Velocity (ms^{-1})	0	0.5	1.5	4	10	15	18	19.5

Using suitable scales, draw on the same axes the velocity-time graphs find the,

(c) Time the two taxis have Equal speeds and state the magnitude of that speed.

(d) Difference in the speeds of the two taxis after a period of 6 seconds.

(e) Distance covered by taxi A by the way of estimating the area under curve described by the motion of taxi A for a period of 85.

1998 PAPER ONE
SECTION A

1. (a) Without using tables or calculator evaluate
$14 \times 398 - 198 \times 14$ (2 *marks*)
(b) Factorise completely $2a^2$-32

2. Given that $\tan\theta = \frac{-12}{5}$ and θ lies between 0^0 and 180^0. Find, without using tables or calculator the values of $\sin\theta$ and $\cos\theta$.

3. Kato bought a car and sold it to Tom at a loss of 25%. If his selling price was sh. 3.6 million, find the cost price of the car.

4. The image of the point (4, -7) under an enlargement of scale factor -2 is (1, 2). Determine the coordinates of the centre of enlargement. (3 *marks*)

5. Given that $f(x) = x^2$ and $g(x) = (x - 1)$, determine $fg(x)$. Hence evaluate $fg(-1)$

6. A family spends its income on the following items in a month.

Item	Food	Rent	Transport	Others
Amount (sh)	35,000	12,000	10,000	15,000

Show the family's expenditure in a pie-chart.

7. Use the matrix method to solve the pair of simultaneous equations.
$2x - 3y = 7$
$14 + 4y = 5x$

8. Soma college school is located on a stretch of land of area 22.5km^2. On a certain map its area is 3.6cm^2. Determine the scale of the map.

9. Two dice are thrown once. Find the probability that both dice show even number.

10. Given that curve $y = 2x^2 + 3x$ and $y = 5x + 4$, determine the coordinates of the points of intersection of the curve and the line

SECTION B

11. Faces of 52 small wooden cubes are to be painted either grey, blue or yellow. Of the cubes, 15 have all their faces painted grey, and 9 all faces blue. There are 6 cubes with grey and blue faces, 10 with yellow and blue and 7 cubes with grey and yellow faces. The cubes whose faces are all yellow are four more than those whose faces are all blue. Given that G is the set of cubes with at least a grey face, B that of cubes with at least a blue face and Y the cubes with at least a yellow face.

a) Represent all the above information in a Venn diagram. Show any remaining information
b) Find the number of cubes with
   i. All the three different colour faces
   ii. At least one of each of the three colour faces.
c) If a cube is picked at random what is the probability that it is grey or blue `only?

12. Sixty 13–year old senior one students from a certain school were tested to find their resting Pulse-rates and the following figures were obtained for a number of beats per minute.

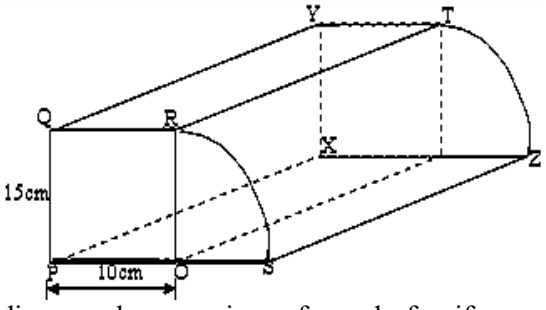
72	70	66	74	81	70	74	53	57	62
58	92	74	67	62	91	73	68	65	80
78	67	75	80	84	61	72	72	69	70
76	74	65	84	79	80	76	72	68	63
82	79	71	86	77	64	72	56	70	67
76	56	86	63	73	70	75	73	81	64

a) By arranging the data in classes of 50 - 54, 55 - 59, etc make frequency a table.
b) Draw a bar Chart displaying the given data.
c) Using your grouped data, calculate the mean and median pulse-rate,

13. A plane flies from air strip K due north for 350km to air strip R. it then flies on a bearing of 295^0 for 250km to airstrip N. From there it flies on a bearing of 090^0 for 500km to another airstrip M.

a) Draw a sketch diagram to show the route of the plane. Hence draw accurate diagram using a scale of 1cm to represent 50km.
b) From your diagram, find the distance and bearing of airstrip K from M.
c) If the plane flies back to airstrip K by the direct route, and it travels at an average speed of 250kmh^{-1}, find the time (in hours) taken for the whole journey.

14.



The diagram shows a piece of wood of uniform cross-section PQRS in which OPQR is a rectangle and ORS is a quadrant of a circle, centre, O. the other rectangles are PQYK and PXZS.
Given that PQ =15cm, PO = 10cm and QY=40cm, calculate (giving your answers correct to 3 s.f), the

(a) Area of the cross section PQRS
(b) Volume of the wood.
(c) Total surface area of the piece of wood (Take $\pi = 3.142$)

15 (a) Copy and complete the following table of values for the curve $y=(x-1)(x-3)$ between $x = -1$ and $x = 5$.

X	-1	0	1	2	3	4	5
x-1			0		2		

x-3					0		
$y = (x-1)(x-3)$			0		0		

(b) Using the values in (a) Draw the graph of $y = (x-1)(x-3)$ for $-1 \leq x \leq 5$

(c) Use your graph to solve

(i) $x^2 - 4x + 3 = 0$

(ii) $x^2 - 4x + 1 = 0$

(d) From your graph find the

(i) Range of values for which $(x-1)(x-3) < 0$

(ii) Minimum value of the function.

16. Towns A and B are a distance of 138km from each other. Dick leaves town A for town B cycling at a steady speed of 24kmh^{-1}. When he has traveled a distance of 18km from A, Bob sets off from the same spot Dick started, cycling steadily at 30kmh^{-1}.

a) Find when and where Bob over took Dick.

b) If Bob maintained his speed even after over taking dick determine how long it took him waiting for Dick to join him.

c) Given that Dick then increased his speed such that they both arrived in town B at the same time; by how much did Dick increase his speed immediately after he was overtaken?

17. Supporters of a certain soccer team wish to accompany their team for a soccer match. They are to travel by a taxi and a mini-bus. The capacity of the taxi is 18 people while that of the mini-bus is 27 people. The number of supporters to go will not exceed 108. Each trip the taxi and mini-bus make, costs sh.24,000 and sh. 30,000 respectively. The money contribution for transportation of the supporters is sh. 240,000. The number of trips made by the taxi should not exceed those made by the mini-bus by more than 2. If x and y are the number of trips made by the taxi and mini-bus respectively.

a) Write down five inequalities representing the above information.

b) Plot on the same axes the above inequalities.

c) By shading the unwanted region, show the region satisfying all the inequalities.

d) List the possible number of trips each vehicle will make, given that all the money for transport is to be used.

e) What is the greatest number of supporters that was transported?

1998 PAPER TWO

SECTION A

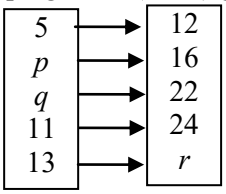
1. Without using a calculator or tables, simplify

$$2\tfrac{1}{2} \div \frac{4\tfrac{1}{3} - 2\tfrac{1}{4}}{4\tfrac{1}{6}}$$

2. By expressing each of the numbers in the form $a \times 10^n$, where n is an integer, evaluate $\dfrac{0.24}{0.0006}$

3. Express $\dfrac{9}{\sqrt{5}-\sqrt{2}}$ in the form $a\left(\sqrt{b}+\sqrt{c}\right)$, where a, b and c are integers.

4. Find the unknown values in the arrow diagram for the mapping $x \rightarrow 2(x+1)$ given below.



5. TM is a tangent drawn from a point T to a circle, centre O, and radius 8 cm. if OM = 17cm, calculate the length of TM.

6. Given that $A = \begin{pmatrix} 1 & 2 \\ -2 & 1 \end{pmatrix}$, $B = \begin{pmatrix} 2 & -1 \\ -1 & 2 \end{pmatrix}$, find **AB** – **BA**

7. If A and B are two sets of objects and n(A) = 10, n(B) = 7, $n(A \cup B) = 13$. $n(A \cup B)^1 = 2$, find

(a) $n(\varepsilon)$, where ε, is the universal set

(b) $n(A \cap B)$

8. M is the mid-point of the line $\overline{PQ}$, where P is (2, 6) and Q(-8, 2). Calculate the distance of M from the point R(1, 0).

9. Without using tables or calculator, evaluate $\log_{10}40 + \log_{10}50 - \log_{10}20$

10. OAB is a triangle with position vectors **OA** = $\underset{\sim}{a}$ **OB** = $\underset{\sim}{b}$. Express in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$ the position vector of OC, where C divides $\overline{AB}$ in the ratio 1:2

SECTION B

11. By using a ruler and a pair of compasses only, construct a quadrilateral ABCD in which $\overline{AB} = \overline{AC} = \overline{AD}$ = 8cm. Angle ABC=60^0 and BAD=120^0.

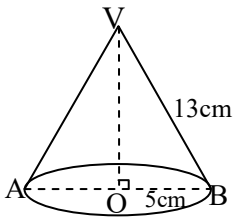
(c) Identify the type of quadrilateral. Bisect angle ACB. Let the bisector meet $\overline{AB}$ at E and DA produced at F. Construct a circle circumscribing triangle AEF.

(d) Measure the distance from the centre of circle O to the vertex B. What is the radius of the circle?

12. Mbarara is about 260 km away from Kampala. An express bus leaves Kampala for Mbarara at 6.45 a.m traveling at a steady speed of 52kmh^{-1}. A commuter taxi leaves Kampala $1\frac{1}{3}$ hours later and travels non-stop at a speed of 84kmh^{-1}. Draw on the same axes distance-time graphs showing the journey of the two vehicles.
[Use scales of 2cm to represent 30km and 2cm to represent 1 hour]. Hence or otherwise determine the time and distance from Kampala when the commuter overtakes the bus. If the bus then increases its speed by 20kmh^{-1}

Calculate the
(a) Time when the bus arrives in Mbarara.
(b) Differences in the times of arrival of the two vehicles.

13



The figure above shows a right circular cone AVB. The radius of the base is 5cm and the slanting edge 13cm.
a. Calculate angle AVB.
b. Find the:
i. Volume of the cone.
ii. Total surface area of the cone [take π =3.142].

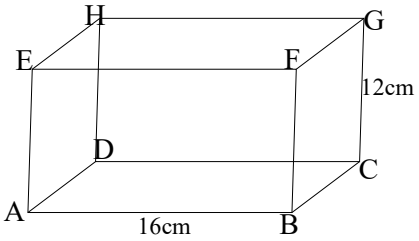
14. The points A(-2, 1), B(-2, 4), C(1, 4) and D(1,1) are vertices of a square ABCD. The images of A, B, C and D under a reflection in the line $x - y = 0$ are A', B' and D'. The points A', B', C' and D' are then mapped onto the points A", B", C" and D" respectively under an enlargement with scale factor 2 and centre of enlargement the origin O(0, 0).

a) (a)Write down the matrices of the reflection and enlargement.
b) Find the coordinates of the points
i. A', B', C' and D'
ii. A", B", C" and D"
c) Determine the matrix of a simple transformation that would map ABCD onto A", B", C", D"

15. Three points A, B and C lie on the same level ground. A vertical pole NP stands in between points A and B such that $\overline{AN}$ =21m. Angle BAC=72^0 and $\overline{AC}$ =21m. The angles of elevation of the top of the pole, P from A and B are 18^0 and 57^0 respectively.

Calculate the
(a) Height of the pole NP.
(b) Length AB.
(c) Angle of elevation of P from C.

16.



The figure ABCDEFGH is a rectangular box with square ends BCGF and ADHE of side 12cm. AB = 16cm. Calculate the
(a) Lengths BD and BH.
(b) Angle between lines BH and plane ABCD.
(c) Angle between planes CFH and BCGF.

17. A certain country's income tax structure is such that a person's gross monthly income has certain allowances deducted from it before it is subjected to taxation. The allowances spelt out are as follows;
Marriage allowances one-twentieth of the gross monthly income.
Family relief and Insurance sh. 120,000 per annum.
Water and electricity sh. 12,500 per month.
Housing sh. 35,000 per month.
Medical (self and family) sh. 240,000 per annum.
Transport sh. 800 per day.
Family allowance for four children only at the following rate; sh. 5,800 for each child above the age of 16, sh. 7,200 for a child above 10 years but below 16 years and sh. 9,000 for a child below 10 years. Joy has a family of four children with two of them below the age of 9, the elder child is 20 and the other 14 years. Given that she earns sh. 680,000, calculate

(a) The taxable income and the income tax she pays under the income tax rates below.

Taxable income (sh)	Tax rate %
0-15,000	8.50
15,001-84,000	16.50
84,001-170,000	24.00
170,001-285,000	30.00
285,001-435,000	37.50
Above 435,000	48.50

(b) Determine the percentage of her gross monthly income paid in tax.

1999 PAPER ONE

SECTION A

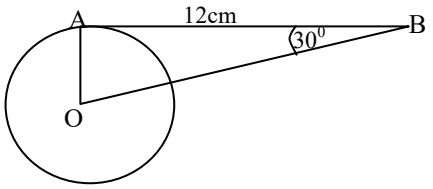
1. Without using a calculator or tables, simplify $4(0.04)^{-\frac{1}{2}} - 8(4^{-1})(16)^{\frac{3}{4}}$

2. By writing each of the number in the form $a \times 10^n$ where *n* is even, find the square root of 0.25 × 0.64.

3. Show that $\sqrt{18} + \sqrt{50} - \sqrt{72} = 2\sqrt{2}$

4. Given that f(x) = ax^2+4x and f(3) = 21, find the value of a. Hence find f(-1)

5



In the figure above, AB=12cm is a tangent to a circle, at A. Angle OBA=30^0. Find the
(i) Length of OB.
(ii) Radius of the circle.

6. Matrices $P = \begin{pmatrix} 0 & 1 \\ -1 & 1 \end{pmatrix}$ and $Q = \begin{pmatrix} 1 & 2 \\ 0 & -1 \end{pmatrix}$ are used to map the point A(3, -2) onto A^1. What are the co-ordinates of A^1 under the matrix transformation Q followed by P.

7. P and Q are two sets of objects such that $n(\varepsilon) = 12$, $n(P \cap Q) = 5$, n(Q)=8 and $n(P \cup Q)^1 = 3$ Find
(a) $n(P \cup Q)$
(b) n(P)

8. R is a point which is 13 units from the origin O. If its x-coordinate is 12, find the possible values of the y-coordinate.

9. Evaluate $\log a^5 b^2$, without using tables or calculator, if $\log_a = 0.234$, $\log b = 1.185$

10. Given that OA= $\underset{\sim}{a} = \begin{pmatrix} 12 \\ 6 \end{pmatrix}$ OB= $\underset{\sim}{b} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$

Calculate the length of AB.

SECTION *B*

11. Using a ruler and pair of compasses only construct.

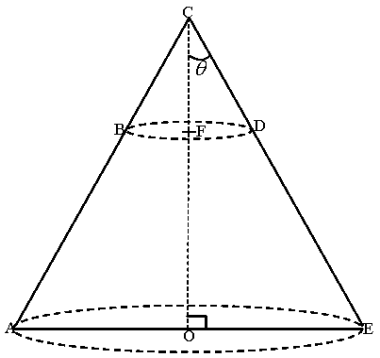
(a) a quadrilateral PQRS such that $\hat{QRS} = 45^0$, $\overline{QR}$=4.5cm, $\overline{RS}$ = 6.0cm, $\overline{SP}$ = 7.5cm and $\overline{PQ}$=10.5cm

(b) Point T on $\overline{QR}$ produced such that $\overline{PT} = \overline{ST}$ join the point P, S and T. Measure length $\overline{PT}$ and angle PTS

(c) A circle passing through the points P, T and R. Measure the radius of the circle.

12. Kampala and Mbale are about 229km a part. A mini-bus heading for Kampala leaves Mbale at 8.55a.m with a steady speed of 56kmh^{-1}. At 9.40a.m, a saloon car traveling at 80kmh^{-1} leaves Kampala and travels steadily towards Mbale. Using scales of 2cm to represent 20km and 2cm to represent 1 hour, draw on the same axes distance- time graphs showing the journeys of the mini-bus and the car. Hence or otherwise determine when and at what distance from Kampala the two vehicles will meet given that the mini-bus then increases its speed by 14kmh^{-1}, calculate the
(i)Time when the mini-bus arrives in Kampala
(ii) Difference in the time of arrival of the two vehicles.

13



ABCDE is a right solid cone. CE = 10cm,
θ = 30^0,
CD : DE = 2 : 3. The cone BCD was cut off.
Calculate the:
(i) Total surface area of the remaining portion ABDE.
(ii) Volume of the cone BCD.

14. The points P(0, 2), Q(1, 4) and R(2, 2) are vertices of a triangle PQR. The images of P, Q and R under a reflection in the line x-y = 0 are P', Q' and R' respectively. The points P', Q' and R' are then mapped onto the points P", Q" and R" respectively, under an enlargement with scale factor -2 and centre of enlargement O(0, 0).

(**a**) Write down the matrix for the
(i) Reflection
(ii) Enlargement
b) Determine the coordinates of the points
(i) P', Q' and R'
(ii) P", Q" and R"

c) Find the matrix of a single transformation which would map triangle PQR onto P" Q" R"

Solution

(a) (i) Matrix of reflectionin the line y = x is $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$

(ii) Matrix of enlargement with scale factor -2 and centre O(0,0) is $\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$

b) (i) $\begin{matrix} & P & Q & R \end{matrix} \quad \begin{matrix} P' & Q' & R' \end{matrix}$

$$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}\begin{pmatrix} 0 & 1 & 2 \\ 2 & 4 & 2 \end{pmatrix}=\begin{pmatrix} 2 & 4 & 2 \\ 0 & 1 & 2 \end{pmatrix}$$

Hence P'(2, 0), Q'(4,1) and R'(2, 2)

$$\text{(ii)}\ \begin{matrix} P' & Q' & R' \end{matrix} \quad \begin{matrix} P'' & Q'' & R'' \end{matrix}$$

$$\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}\begin{pmatrix} 0 & 4 & 2 \\ 0 & 1 & 2 \end{pmatrix}=\begin{pmatrix} -4 & -8 & -4 \\ 0 & -2 & -4 \end{pmatrix}$$

Hence P''(-4, 0), Q''(8, -2) and R''(-4, -4)

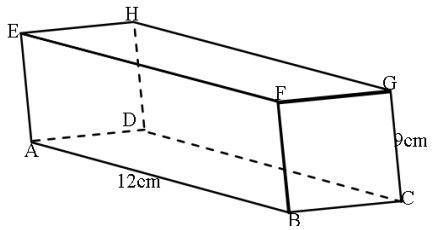
c) Single matrix that maps PQR onto P'', Q'' and R''

$$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}=\begin{pmatrix} 0 & -2 \\ -2 & 0 \end{pmatrix}$$

15. The points P, Q and R are on level ground, a vertical flag pole ST stands between P and Q such that Q is 12m away from S, the base of the pole. The angles of elevation of T from P and Q are 61^0 and 15^0 respectively. If angle PQR = 22.6^0 and $\overline{QR}$ = 13cm, calculate the

(a) Height of the flag pole ST.
(b) Length PQ
(c) Angle of elevation of T from R.

16.



The figure ABCDEFGH is a rectangular box with square ends BCFG and ADEH of side 9cm, AB=12cm. Calculate:

(a) Length AC and AG,
(b) The angle between the line AG and plane ABCD.
(c) The angle between the planes DEG and ADEH.

17. The table shows the tax structure on taxable income of a certain working class of people.

Income (sh) per month	Tax rate (%)
0-30,000	10.0%
30,001-90,000	16.5%
90,001-190,000	23.5%
190,001-340,000	32.0%
340,001-500,000	40.0%
Above 500,000	49.5%

An employee earns sh. 750,000. His allowances include;
Marriage allowances one-fifteenth of his gross monthly income
Water and electricity sh.15,000 per month
Relief and insurance sh. 180,000 per annum
Housing allowances sh. 40,000 per month
Medical sh. 300,000 per annum
Transport allowance sh. 36,000 per month
Family allowances for four children only. For children in the age bracket 0 to 10 years sh. 12,500/- per child; between 10 and 18 years sh. 8,250/- per child; and over 18 years sh.5,000 per child.

(a)Calculate the man's taxable income and the income tax he pays, given that he has three children, two of whom are aged between 0 and 10, and the other child 13 years.
(b)What percentage of his gross income goes to tax?

1999 PAPER TWO
SECTION A

1. (a) Without using tables or calculator evaluate $0.25 \times 2195 - 1795 \times 0.25$ *(2 marks)*

(b) Factorize completely $27-3x^2$ *(2 marks)*

2. Given that $\sin\theta = 0.500$, find the two possible values of θ , what would be the two values of θ if $\sin\theta = -0.500$.

3. The price of a car in a show room is sh. 6.4million. A 7.5% cash discount is allowed when a customer pays cash for the car, while on hire purchase basis a customer, pays sh. 1.65 million per installment for four months. Determine how much a customer saves by paying cash for the car than purchasing it by hire purchase.

4. Under an enlargement of scale factor 3, the image of (1, 3) is (4, 5). Find the coordinates of the centre of enlargement.

5. If $g(x) = 2x$ and $f(x) = x + 3$,find $gf(x)$. Hence evaluate $gf(2)$

6. The number of visitors accommodated per night by a certain hotel was recorded over a period of a month. The figures are given in the table below.

No. of visitors	0-<10	10-<20	20-<30	30-<40	40-<50
No. of nights	2	8	12	5	3

Using a scale of 1cm to represent 2 nights and 1cm to represent 10 visitors, display the given data on a bar-graph. Use your bar-graph to estimate the modal number of visitors accommodated by the hotel. *(5 marks)*

7. Use the matrix method to solve the pair of simultaneous equations.

$x + 4y = 4$

$9y - 5x = 9$

8. A piece of land measures 33.6m by 16.5m. Find the area of the land, in cm^2, on a map whose scale is 1:120.

9. In a certain game a die is thrown once. When a 1 or 6 appears that player wins and when a 3 or 4 appears the player loses. Determine the probability that a player neither wins nor loses. *(3 marks)*

10. Find the coordinates of points of intersection of the curve $y = x^2 - 3$ and the line $y = 5x - 9$.

SECTION B

11. Faces of 36 small wooden cubes are to be painted either green or black or white. Of these, 10 cubes have all their faces painted green and 6 have all their faces painted black. There are 5 cubes with green and white, 8 white and black and 4 green and black. Cubes with all faces painted white are three more than those with all faces black.

Given that G represents the set of cubes with at least a green face, W represents that of cubes with at least a white and B represents the cubes with at least a black face.

(a) Represent the above information in a Venn diagram, showing the remaining information.

(b) Find the number of cubes with

(i)All the three different colour faces.

(ii)At least one of each of the three colour faces.

(c) If the cube is picked at random, what is the probability that it is black or white only?

12. The table below shows ages of 120 students entering senior one.

Age: years	12.5-12.9	13.0-13.4	13.5-13.9	14.0-14.4	14.5-14.9
No. of students	8	35	52	17	8

(a) State the (i) class with

(ii) Modal class

(b) Determine the mean and median age of the students.

13. Three points A, B and C on the same horizontal level are such that B is 150km from A on a bearing of 060^0. The bearing of C from A is 125^0. The bearing of C from B is 160^0.

(a) By scale drawing, using 1cm to represent 25km. Find the distance of C from

(i) A

(ii) B.

(b) An aeroplane flies from A on a bearing of 340^0 at 300kmh-1. After 40 minutes of flying, the pilot changes course at point D and flies directly to C at the same speed. Include in your diagram in (a) above the route of the plane. Hence find the

(i) Time (in hours) the plane takes to travel from A to C.

(ii) Bearing of D from C.

14. Three solids, a sphere, a right cone and a right cylinder are of equal surface area and the radii of their circular sections are also equal. Given that the volume of the sphere is 288π cm^3, find the

(i) Radius of the sphere.

(ii) Height of the cylinder.

(iii) Length of the slant slide of the cone.

Hence calculate the volume of the:

(iv) Cylinder

(v) Cone.

[Take π =3.142, volume of sphere = $\frac{4}{3}\pi r^2$ and

volume of cone = $\frac{1}{3}\pi r^2 h$.

Surface area: sphere = $4\pi r^2$; Cone (curved surface area) = πrl; where l is length of slant side].

15. (a) Copy and complete the following table of values for the curve $y = x^2 - 2x - 6$ and
$y = 4x-5$ for values of x between $x = -4$ and $x = 7$.

x	-4	-3	-2	-1	0	1	2	3	4	5	6	7
x^2	16							9	16	25	36	49
$-2x$	8	-	4	2	-	-2	-	-	-	-	-12	-14
x^2-2x-6	18	-	2	-	-	-	-	-3	-	-	18	29
$4x$	-	-	-8	-4	0	-	8	-	-	-	24	28
$y = 4x-5$	-21	-	-13	-	-5	-	-	-	-	-	19	23

(b) On the same axes plot the graph of the curve $y = x^2-2x-6$ and the line $y = 4x - 5$ for $-4 \leq x \leq 7$

(c) Using your graph estimate the

(v) Coordinates of the points of intersection of the curve and the line.

(vi) Roots of the equation $y= x^2 – 2x – 6= 0$

16. Otim and Mukasa wish to travel to the next trading centre which is 30.8km away. They will travel by their bicycles. When Otim had covered 9km, traveling steadily at $4kmh^{-1}$, Mukasa started riding at a steady speed of $7kmh^{-1}$ from where Otim started. Both Mukasa and Otim maintained their cycling speeds until Mukasa overtook Otim.

a. Find the time and distance at which Mukasa overtook Otim.

b. Given that Mukasa then reduced his speed and maintained the new speed till he arrived at the trading centre, there by arriving 0.6 hours later than if he had maintained the $7kmh^{-1}$ speed.

i. Calculate by how much he reduced his speed.

ii. For how long was he in the trading centre before Otim joined him?

17. A wildlife club in a certain school wishes to go for an excursion to a national park. The club has hired a mini-bus and a bus to take the students. Each trip for the bus is sh. 50,000 and that of a mini-bus sh. 30,000. The bus has a capacity of 54 students and the mini-bus 18 students. The maximum number of students allowed to go for the excursion is 216. The number of trips the bus makes do not have to exceed those made by the mini-bus. The club has mobilized as much as sh. 30,000 for transportation of the students. If x and y represent the number of trips made by the bus and mini-bus respectively.

(iii) Write down five inequalities representing the above information.

(iv) Plot these inequalities on the same axes

(v) By shading the unwanted region, show the region satisfying all the above inequalities.

(vi) List the possible number of trips each vehicle can make.

(vii) State the greatest number of students who went for the excursion.

2000 PAPER ONE
SECTION A

1. Without using tables or calculator evaluate

$$\frac{30.25^2 - 30.15 \times 30.25}{0.0025}$$

2. Given that $x^2 - y^2 = 135$, and $x - y = 9$. Find the values of x and y.

3. Given the sets:
A= {all natural numbers less than 30}
B= {all prime numbers between 10 and 30}
Find (i) $n\{AB^1\}$
(ii) $n\{A^1 \cap B\}$, where A^1 and B^1 are complements of sets A and B, respectively.

4. Solve the simultaneous equations

$$4y - 3x = 2$$
$$2y + 1 = 2x$$

5. A straight line passes through the origin and the point (1, -1). Find the equation of the line

6. Shs. 6,000 is to be shared among David, Daniel and Diana. Daniel is to get one and half times as much as David, while Diana is to get three and half times as much as David. Determine the ratio in which the money is to be shared.

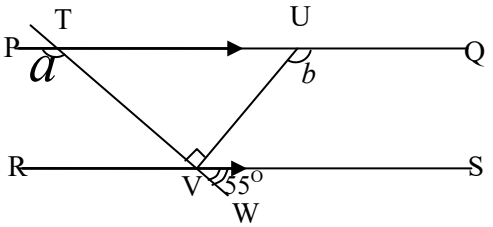
7. Given the points L(3, 4) and M(7, 7), Find the:

(i) Vector **LM**

(ii) Lengh of **LM**

8. By removing the brackets factorize completely $y(ay – x) + x(y – ax)$

9. In the figure below **PQ** is parallel to **RS**. Angle SVW=55^0. **UV** is perpendicular to **TW**. Determine the values of the angles labeled a and b.



10. Find the value of x, correct to 2 decimal places, given that $3^x = 5$

SECTION B

11. Using a ruler, pencil and a pair of compasses only, Construct a triangle PQR, where angle QPR = 135^0, **PQ** = 8.4cm and **QR** = 12.5 cm. state the length of PR.

S and T are points such that **TS** bisects QR, where T is on **QR** and, S on the same side as **PQ**. Draw circle to circumscribe the points P, Q, R and S. Measure and state the

(i) Length **ST**

(ii) Radius of the circle.

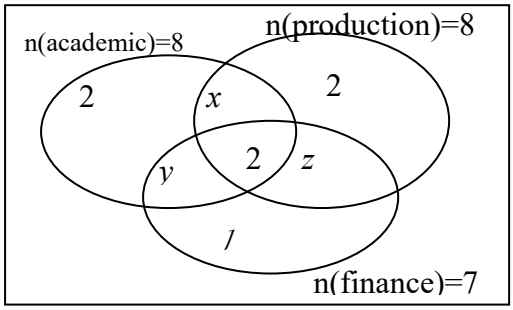
12. (a) Express $1.\overline{24}$ as a fraction in its simple form.

(b) If $S = \sqrt{kd(l-d)}$ express l in terms of *d*, *k* and *s*.

(c) Express $\dfrac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ in the form $p + q\sqrt{r}$,

where *p, q* and *r* are constant.

13. The diagram below shows the allocation of the members of the board of governors of a school to different committees?



(iv) Determine the values of *x, y* and *z.*

(v) What is the total number of members on the board of governors?

(vi) What is the probability that a member chosen at random from the members of Board of governors belong to.

(iv) Both finance and production committee.

(v) Only one committee?

14. The data below represent the times in seconds of an oscillation of a given pendulum as recorded by different students.

10.3	9.7	10.2	9.8	10.1
9.9	10.1	9.9	10.1	10.2
10.3	10.0	10.2	10.1	9.8
9.9	10.1	10.0	10.1	9.9
10.1	10.1	10.1	10.1	9.9
9.8	9.8	10.0	9.9	10.2

(a) The frequency table below was drawn out to represent the above data.

Copy and complete the table

Time(s) *x*	Freq.(*f*)	Cum. Freq	*x*(*f*)
9.7	__	1.0	__
9.8	4.0	5.0	__
9.9	__	__	__
10.0	3.0	__	__
10.1	__	__	__
10.2	__	__	__
10.3	__	__	__
	$\sum f$ = ___		$\sum fx$ =_

(b) Use the table to

(i) State the modal time of oscillation.

(ii) Calculate the mean and median times of oscillation.

15. The table below shows the speed (vms^{-1}) of a car after time (t s)

vms^{-1}	0	15	28	42	48	35	0
time(*t*s)							

(iv) Plot a speed – time graph showing the motion of the car.

(v) Use the graph to estimate the:

(c) Speed of the car at $t = 6$s.

(d) Times when the speed of the car is 32.5 ms^{-1}.

(e) Distance traveled between time interval $t = 10$s to $t = 14$s.

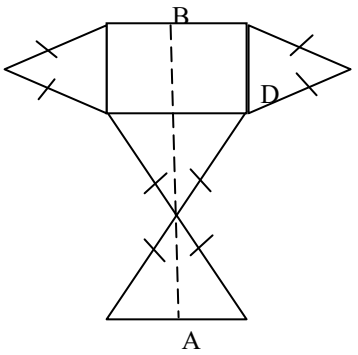
(vi) Describe the motion of the car between

(iv) $t = 10$s and $t = 14$s

(v) $t = 14$s and $t = 20$s

(d) By drawing a tangent to the curve at t = 17s, estimate the rate of speed at that instant.

16. The diagram below shows a square of side 12 cm and four congruent isosceles triangles, representing the net of a pyramid on a square base.



Given that $\overline{AB} = \overline{CD}$ = 40cm, calculate the:

a)

(i) Height of the vertex of the pyramid from the square base.

(ii) Angle between a triangular face and the base of the pyramid

(iii) Volume of the pyramid.

b) If the pyramid is cut horizontally at a vertical height of 2.6cm from the square base, and the upper part of the pyramid containing the vertex is thrown away, what volume remains?

17. (a) Customs duty and purchase tax are levied on certain imported goods as follows

Customs duty = 35% of the value of the good.

Purchase tax =15% of (value + duty)

Find the total amount levied on an electric kettle valued Shs. 40,000. Hence calculate the percentage rate for the two taxes combined.

(b) A man borrowed Shs. 39.6 million from a housing finance company to build a commercial house at a compound interest rate of 10.5% per annum. He has to repay the loan and interest within two years in 8 equal instalments.

Calculate

(i)Total amount of money the man paid the company.

(ii)Interest he paid on the loan.

(ii) Amount he paid per installment.

2000 PAPER TWO

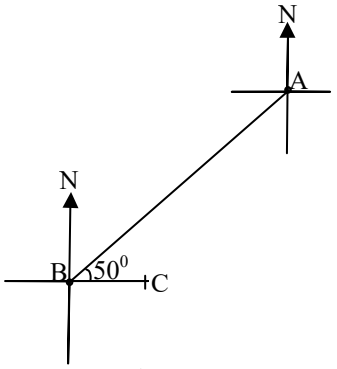
SECTION A

1. Given that $a * b = \dfrac{a^2 + b^2 - 2ab}{a - b}$

i) 4 * 3 *(02 marks)*

ii)8 * (4 * 3) *(02 marks)*

2. In the diagram below angle ABC=50^0. What is the bearing of B from A. *(04 marks)*



3. Solve the inequalities $\dfrac{1}{2} - \dfrac{x}{6} > \dfrac{-5}{2}$

4. In a triangle ABC, angle BAC =150^0, $\overline{AB}$ = 5cm and $\overline{AC}$ = 4cm, calculate the area of the triangle ABC.

5. Given that $\cos\theta = \dfrac{-8}{17}$ for $0^0 \leq \theta^0 \leq 180^0$,

Find without using tables or calculator, values of $\sin\theta$ and $\tan\theta$.

6. Given that $f(x) = x^2 + 3$ and $g(x) = x - 1$, find the value of a for which $fg(a) = gf(a)$

7. Without using tables or calculator evaluate $(0.008)^{\frac{1}{3}}$

8. A pole is fixed on horizontal ground. The angle of depression of the foot of the pole from the top of a cliff 57.7m high is 30^0. Find how far away the foot of the cliff is from the pole.

9. Two coins have each one side labeled H and the other T. they are together tossed once.
Write down the possibility space. Find the probability that the labels on the two coins are different.

10. Given the matrix $\mathbf{M} = \begin{pmatrix} 3a & a-6 \\ -6 & a+2 \end{pmatrix}$, find the values of a for which the determinant of **M** is zero.

SECTION *B*

11. Draw the graph of the curve $x^2 - 2x + 1$ for $-3 \leq x \leq 3$. Use your graph to find the ***solution***s of the following equations.

(i) $x^2 - 2x + 1 = 0$

(ii) $x^2 - x - 6 = 0$

12. The image of the vertices P(2,3); Q(2, 2) and R(4,2) of a triangle PQR under a rotational transformation are P^1(-1, 2), Q^1(0,2) and R^1(0,4) respectively. The image of PQR, P'Q'R' then undergoes a further rotation of 52^0 to give the image P"Q"R".

(i) Represent triangle PQR and its images on the same coordinate axes. (Use a scale of 2cm to 1 unit).

(ii) Determine the centre and angle of rotation of PQR.

(iii) Find the coordinates of the final image P"Q"R". State the angle formed between PQR and P"Q"R".

13. In triangle ABC L, M and N are the mid-points of $\overline{BC}, \overline{CA}$ and $\overline{AB}$ respectively. **AM**= **m**; **AN** = **n** and 3**AG** = 2**AL**.

(a) Express in terms of vectors **m** and **n**. the vector

(i) AB

(ii) AC

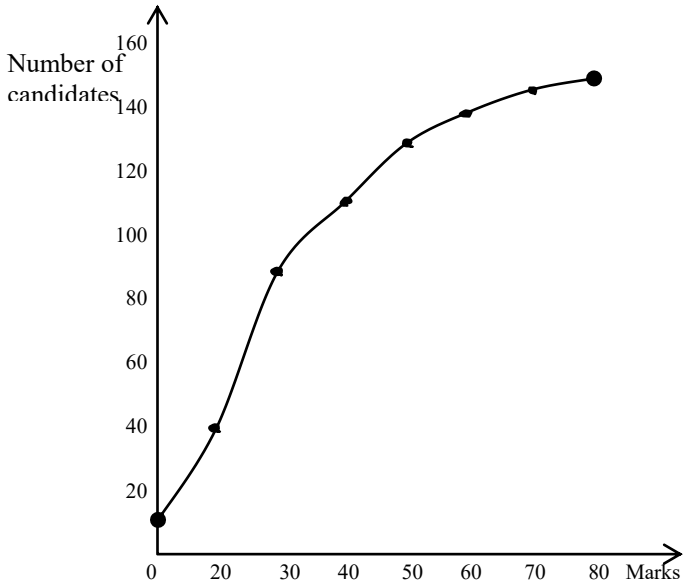
(iii) BC

(iv) BG

(v) GM

b) Show that B, G and M lie on a straight line and $3\overline{BG} = 2\overline{BM}$

14. The cumulative frequency graph below shows the marks scored by 150 students in an end of term examination marked out of 80 marks. Study the graph and use it to:



a) Estimate the;

(i) Median mark

(ii) Number of students who obtained distinction if 60 marks and above are distinction scores.

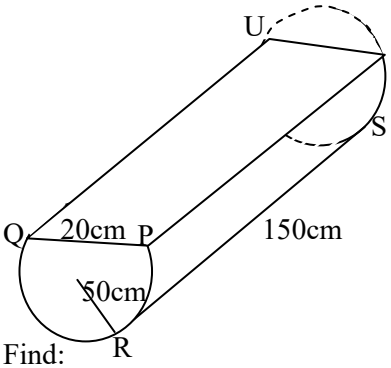
(iii) Number of students who scored 30 or less marks.

(iv) Pass mark if 92 students passed the examination.

b) Construct a table of the frequency distribution of the students' performance. Hence calculate the mean mark.

15. The diagram below shows a hollow right cylinder PQRSTU of negligible thickness, Part of which has been cut off as shown below.

If the radius of the circular end is 50cm, $\overline{RS}$ =150cm and $\overline{PQ} = \overline{TU}$ =20cm,



Find:

(i)The area of the cross-section PQR

(ii)How much water (in litres) would fill this container [use π =3.14].

16. On a shore running from east to west are two ports P and Q which are 18km apart. A town R on an island on the same level as P and Q is on a bearing of 230^0 from P and 140^0 from Q respectively. A pilot flying a plane above port P observes town R at an angle of depression of 6^0. Calculate the

(i)Distances $\overline{PR}$ and $\overline{QR}$

(ii)Vertical height of the plane above P.

(iii)Angle of elevation of the plane from port Q.

17. The table below shows the tax structure on taxable income of employees of a certain industry.

Income (sh) per month	Rate (%)
18,001-36,000	8.75
36,001-54,000	12.50
54,001-72,000	18.00
72,001-108,000	24.50
108,001-180,000	30.00
Above 180,000	40.50

An employee earning a gross income of sh. 425,000 a month is allowed the following.

Allowance	**Amount (sh)**
Transport and lunch	45,000 per month
Housing	80,000 per month
Water and electricity	2,100 per month
Annual medical	900,000 per annum
Marriage	$\frac{1}{20}^{th}$ of gross monthly income

[NB. A month is taken to be 30 days and a year 360 days]. The employee is allowed a family allowance for any three of his children according to age distribution.

Age	**Shs**
0-12	6,000
13-18	4,500

19-21	2,500

Given that this employee has a family of five children with the older child aged 22, the other 15 years and the rest aged between 2 and 12 years, calculate the employee's.

(i) Total monthly allowance
(ii) Taxable income
(iii) Income tax

Determine the percentage of the employee's income that goes to tax.

2001 PAPER ONE
SECTION A

1. Given that $Q = I^2Rt$, make I the subject.
Hence evaluate I for Q = 1000, t = 20, and R =2

2. In the figure below, $\overline{AC} = \overline{AD} = \overline{BD}$, angle DAC = 48^0. Find the size of angle x. (4 *marks*)

3. Given that $\begin{pmatrix}1 & x\\ 1 & 1\end{pmatrix}\begin{pmatrix}3\\ y\end{pmatrix} = \begin{pmatrix}23\\ 7\end{pmatrix}$, Find the values of x and y. *(4 marks)*

4. A floor measuring 2.5m is to be covered by square tiles measuring 25cm each. Find the number of tiles that will be needed to cover the floor.

5. A chord of length 6cm is 4cm from the centre of a circle. Determine the circumference of the circle.

6. Without using tables or calculator, solve for x in the equation $32^x \times \frac{1}{8} \times 4^{(x+3)} = 2^{24}$ *(4 marks)*

7. Find the discount on a bicycle priced Shs 64,000 but sold off at a discount of $7\frac{1}{2}\%$. How much was paid for it?

8. In a parallelogram OBCA, $\mathbf{OA} = \begin{pmatrix}4\\ 1\end{pmatrix}$ and $\mathbf{OB} = \begin{pmatrix}1\\ 3\end{pmatrix}$, where O is the origin.
Find (i) vector **BC**
(ii) The co-ordinates of C *(4 marks)*

9. Given that $\log_{10}x = 2.852$, and $\log_{10}y = \bar{2}.581$. Use tables to evaluate $\frac{x^{\frac{1}{2}}}{y}$
Connect to 3 significant figures. *(4 marks)*

10. A triangle PQR whose area is $12cm^2$ is mapped onto its image $A^1B^1C^1$ by a transformation represented by the matrix $\begin{pmatrix}2 & 1\\ 3 & 4\end{pmatrix}$. Find the area of $A^1B^1C^1$ *(4 marks)*

SECTION B

11. (a)Given that functions $f(x) = \frac{x+3}{2}, g(x) = \frac{1-2x}{5}$, determine the value of x for which $fg(x) + gf(x) = 0$. *(6 marks)*

(b) Express $x^2 - x - \frac{3}{4}$ in the form $(x + p)^2 + q$. Hence solve the equation $x^2 - x - \frac{3}{4} = 0$ *(6 marks)*

12. (a) Find the point of intersection of the lines $y = 2x - 3$ and $y = -x - 3$. Calculate the area of triangle enclosed between the two lines and the x-axis. (6 *marks*)

(b) Find the Equation of the line which is a perpendicular bisector of the line passing through points A(5, 4) and B(3, 8).

13. Using a ruler, pencil and pair of compasses only, construct triangle ABC such that **AB =** 8cm, angle ABC = 60^0 and BAC = 45^0.
Construct the perpendicular from C onto **AB** to meet it at D. Measure the length **CD**.
Draw a circle circumscribing triangle ABC.
Measure its radius.
Find the area of triangle ABC. (12 marks)

14. The following table shows the marks obtained in a mathematics test by S.5 students in a certain school.

50	53	31	56	38
33	39	51	38	41
69	57	63	50	54
40	41	45	48	64
59	61	55	36	52

Using class internal of 5 marks, make a frequency distribution table, starting with the 30-34 class.
Use your table in (i) above to estimate the mean mark.
State the modal class.
Draw a histogram for the data. Use it to estimate the modal mark. (12 *marks*)

15. In a certain school there are 50 students who play three games, namely Chess, Tennis and Volleyball, 24 play Chess, 26 play Tennis and 29 play Volleyball, 9 play both chess and volleyball, while 13 play both tennis and volleyball, 11 play both Chess and Tennis. Each of these students play at least one of the three games.
(a) Represent the above information on a Venn diagram.

(b) Find;
(i) How many students play all three games?
(ii) The number of students who play only one game.
(iii) The probability that a student selected at random plays only tennis.
(iv) The probability that a student selected at random plays only two of the games.

16. A transformation represented by the matrix $\begin{pmatrix} 6 & -4 \\ 2 & -1 \end{pmatrix}$ maps the vertices of triangle KLM onto its image vertices $K^1(8, 3)$, $L^1(32, 11)$ and M^1 (2,2) respectively. The image of triangle KLM further under goes transformation represented by matrix $\begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$

Find (i) The coordinates of vertices K, L and M.
(ii) The coordinates of K", L" and M"
(iii) A single matrix of the transformation which would map triangle K" L" M" back onto triangle KLM. (12 marks)

17. A whole saler wishes to transport 870 crates of soda from a factory. He has a lorry which can carry 150 crates at a time and a pick-up truck which can carry 60 crates at a time. The cost of each journey for the lorry is Shs. 25, 000 and for the pick-up Shs. 20,000. The pick-up makes more journey than the lorry because it travels faster. The amount of money available for transporting the soda is Shs. 220,000.

(i)Write down five inequalities, representing the above information.
(ii)Plot a graph for the inequalities, shading out the unwanted regions.
(iii)How many journeys should the lorry and the pick-up make so as to keep the transport cost as low as possible. State how much money the wholesaler saves by making these journeys.

2001 PAPER TWO
SECTION A

1. Find the H.C.F of 18, 42 and 48. *(4 marks)*

2. Without using tables or calculator evaluate $16^{\frac{1}{2}} + 64^{\frac{1}{3}} + \left(\frac{8}{125}\right)^{\frac{2}{3}}$ *(4 marks)*

3. A television set costs British pound sterling (£) 220. Given the exchange rates:
One United States dollar (1 US$) = £0.75, and
1 U$ = USh.1, 800, determine the cost of the set in Uganda shillings. *(4 marks)*

4. Using a number line, find the integral values of x which satisfy the sets

$$\{3x > 2x + 5\} \cap \{3x < 32 - x\}$$

5. In the table below, y is known to be inversely proportional to x.

y	P	45	12
x	5	8	q

Find the values of p and q *(4 marks)*

6. Olga bought a motor cycle and sold it to Okello at a loss of 25%. If he sold it at Shs. 1, 200,000, find how much money Olga paid for it.*(4 marks)*

7. Solve the Equation $\frac{x+1}{2x+5} = \frac{x-1}{3}$ *(4 marks)*

8. Express $0.\overline{321}$ as a fraction *(4 marks)*

9. A cylindrical tank of diameter 1.4m and length 2m has a capacity of 3.08m^3. Find the radius and height of a similar tank of capacity 83.16m^3.*(4 marks)*

10. The table below shows the age of pupils in a certain class.

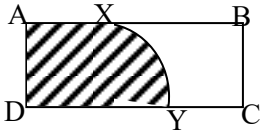
Age (years)	11	12	8
No. of pupils	a	10	a

If the mean age of the pupils is 10, find the value of a *(4 marks)*

SECTION B

11 (a) The length of a rectangular floor is 8 meters more than its width. If the area of the floor is 65m^2, find the dimensions and perimeter of the floor. *(6 marks)*

(b) In the figure below ABCD is a rectangle. $\overline{AB}$ =10cm, $\overline{AD} = \overline{AX}$ = 6cm and xy is an arc of a circle, centre D.



Calculate the area of the shaded region. (Take π =3.14) *(6 marks)*

12. Given the Equation of a curve $y = 2x^2 + 5x - 3$

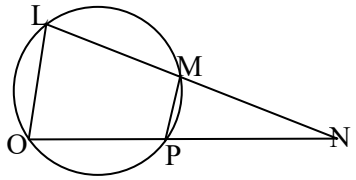
(i) Copy and complete the table below.

x	-4.0	-3.5	-3.0	-2.5	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0
$2x^2$					8					0.5	
$5x$					-10					2.5	
-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3
y					-5						

(i) On the same axes and using the same scales plot the graphs of $y = x + 1$ and $y = 2x^2 + 5x - 3$

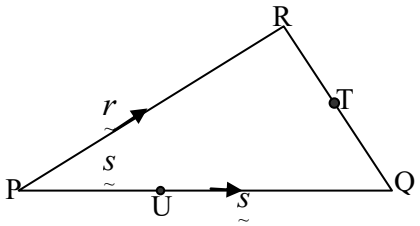
(ii) Using your graph solve the Equation $x^2 + 2x - 2$

13. In the figure below $\overline{OL}$ = 4.5cm, $\overline{PM}$ =3cm $\overline{NM}$ = 4cm and $\overline{LN}$ = 7.5cm.



Find:
(i) lengths ON and OP
(ii) The radius of the circle
(iii) Area of OLMP

14. In the figure below, vector PQ = s, $PR = r$, $2\overline{QT} = 3\overline{TR}$ and $\overline{PU} : \overline{UQ} = 2:3$



(a) Find in terms of vectors r and s, vectors
(i) **QR** (ii) **QT** (iii) **PT**
(b) Show that UT is parallel to PR

15. In a certain country, income tax is computed after deducting the following allowances.

Type of allowances	**Amount UShs**
Marriage	10,000
Single	4,000
Each child above 10 but below 20 years.	3,000
Each child under 10 years	2,000

Omoja is married with 3 children, two below 10 years of age and the other child 12 years old. Mbili is single but has two depedents aged 11 and 15 years. Each month Omoja and Mbili earn gross incomes of Shs. 130,000 and 120,0000 respectively. The income tax is calculated as follows.

Ush	**% age tax**
1st :01-10,000	20%
Next:10,001-50,000	15%
Rest:50,001 and above	10%

(a) Calculate the
(i) Taxable income for Omoja and Mbili.
(ii) Income tax for Omoja and Mbili.

b) Express the total income tax for each man as percentage of their respective taxable incomes.

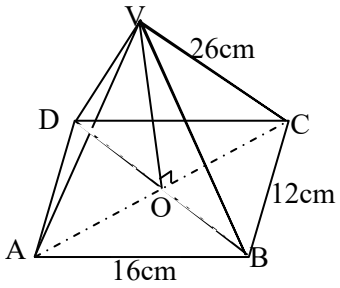
16. A helicopter flies from Moroto due South for 300km. It then flies on a bearing of 255^0 for 350km. From there is flies on a bearing of 020^0 for 400km.

(i) Draw an accurate diagram showing the journey of the helicopter using a scale of 1cm to represent 50km.

(ii) From your diagram, find the distance and bearing of Moroto from the final position of helicopter.

(iii) Given that the helicopter flies at a steady speed of $200kmh^{-1}$, find how long the whole journey took.

17. The diagram below shows a right pyramid with a rectangular base ABCD $\overline{AB}$ =16cm, $\overline{BC}$=12cm and each slant edge of length 26cm.



Calculate the

(i) Height of **OV** above the base.

(ii) Angle between line **VB** and the base.

(iii) Angle between the planes BCV and ABCD.

2002 PAPER ONE

SECTION A

1. Without using tables or calculator evaluate

(a) $3.142^2 - 3.042 \times 3.142$ *(2 marks)*

(b) $\dfrac{1.21 \times 10^{-2} \times 40}{2.2 \times 11}$ *(2 marks)*

2. Given that $a^2 - b^2 = 63$ and $(a + b) = 21$ find the values of a and b.

3. Given that p= {the square of all prime numbers} and Q = {the first ten square numbers}.
Write down the members of $(P \cap Q)$ *(4 marks)*

4. Solve the pair of simultaneous Equations

$2x + 3y = 8$

$2y - x = 3$ (4 *marks*)

5. A straight line of gradient -1, passes through the point (3, -2)

(a) Determine the Equation of the line.*(2 marks)*

(b) Through which point does the line cut the y-axis? *(2 marks)*

6. Three boys John, Michael and Tom share Shs 4,000. Given that Tom gets six times as much as Michael and John gets half of what Tom gets, find how much money each boy gets.

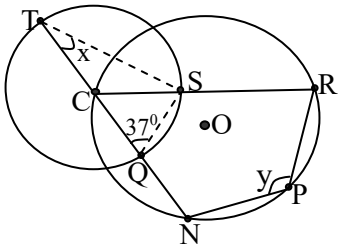
7. Two points P(5, 2) and Q(2, 4) are in a plane. Find the

(a) Coordinates of M, the mid-point of **PQ**

(b) $|\mathbf{OM}|$, where O is the origin *(2 marks)*

8. Factorise completely $16x^3y + 2y$ *(4 marks)*

9. In the diagram below, C and O are centers of two intersecting circles. Angle CQS= 37^0



Find the values of x and y *(4 marks)*

10. Without using tables or calculator, evaluate

$4\log_{10} 2 - \log_{10} 48 + \log_{10} 30$ *(4 marks)*

SECTION B

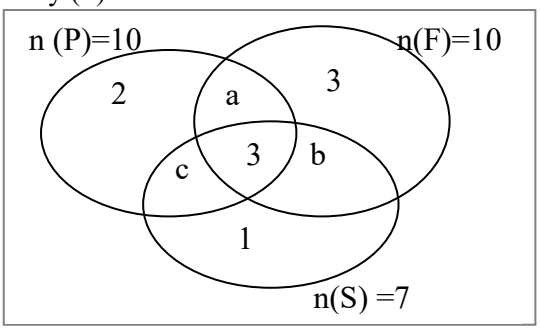
11. Using a ruler, pencil and pair of compasses only,

(a) Construct a triangle ABC, where angle ABC=105^0, BC = 9.2cm and AC = 12cm. Measure and state length AB and angle BAC.

(b) Draw a circle circumscribing triangle ABC. State the radius of the circle.

12. The Venn diagram below shows representation of members of a community council to three different

committees of Finance (F), Production (P) and Security (S)



Determine the values of a, b and c.

Find the:

(i) total number of members that make up the community council.

(ii) number of members who belong to more than one committee.

Given that a member is chosen at random from the council members, what is the probability that the member belongs to

Only one committee

Not more than two committees?

13. (a) Express 1.252525 as a fraction.

(b) Given that $2g - e = 3g(g - e)$, express g in terms of e in its simplest form.

(c) Express $\dfrac{\sqrt{4}+\sqrt{3}}{\sqrt{4}-\sqrt{3}}$ in the form $a+b\sqrt{c}$, where a, b and c are constants.

14. The distance d(m) traveled by a car after time t(s) is given by the following table.

d(m)	0.0	10.0	22.0	29.0	31.5	36.0
t(s)	0	2	54	7	8	10

(a) Plot a distance – time graph to show the motion of the car. (Use scales: 2.0cm to 1.0 sec and 2.0cm to 5.0m on the horizontal and vertical axes respectively)

(b) Use your graph to estimate

(i) The distance the car had traveled after $t = 4$s.

(ii) At what time the car had covered 34.0m.

(iii) The average speed of the car between $t = 3$s and $t = 7$s.

15. The marks obtained by a class of 40 pupils in an English test are given below.

50	71	40	48	61	70	30	62
44	63	60	51	55	25	32	65
54	62	65	50	45	40	25	45
48	45	30	38	30	28	24	48
30	48	28	35	50	48	50	60

(a) Using a class internals of 5 marks, construct a frequency table starting with the 20-24 class group.

(b) Represent this information on a histogram. Use the histogram to estimate the model mark.

(c) Estimate the mean using a working mean of 47.

16. The base of a right pyramid is a rectangle 10.0cm by 8.0cm and the slant edges are each 13cm.

Calculate the;

(a)Total surface area of the pyramid.

(b)Angle between two opposite slanting sides of the pyramid whose base length is 10.0cm.

17 (a) Customs duty and purchase tax levied on certain imported commodities are calculated as follows;

Customs duty: 30% of the value of the commodity.

Purchase tax: 20% of (value + duty)

Calculate the total amount of money levied on a commodity valued at Shs 18,600. Hence determine the percentage rate for the two taxes combined.

(b) A company borrowed 14.85 million shillings to boost its business. The bank rate is 12% compound interest per annum. The company had to repay the loan and interest within two years. It is to repay these bank dues in six Equal installments. Calculate the

(i) Total amount the company paid to the bank.

(ii) Interest the company paid to the bank.

(iii) Amount of money the company paid per installment.

2002 PAPER TWO
SECTION A

1. Given that $r * s = \dfrac{r^2 + s^2}{10s}$, find

(a) 4*⁻8

(b) 7*(4* ⁻8)

2. Express the bearing South South-East (SSE) in degrees. (4 marks)

3. Solve the inequality $\dfrac{1x}{4} + 5 \geq 1 + \dfrac{x}{2}$ (4 marks)

4. Given that $\mathbf{OA} = \begin{pmatrix} 3 \\ 5 \end{pmatrix}, \mathbf{OB} = \begin{pmatrix} 2 \\ 0 \end{pmatrix}$, where **OA** and **OB** are position vectors of A and B respectively, find the area of the triangle OAB.

5. Given that $\tan\theta = \dfrac{5}{12}$, without using tables or calculator , find the value of $\cos\theta$ -$\sin\theta$. (4 marks)

6. Given that $f(x) = \dfrac{1}{2}(3x + 5)$ find the value of x such that $f(x) = 10$.

7. Without using tables or calculator find $\sqrt[4]{40.0081}$

8. K, L and M are three points on a circle of radius 8cm such that KLM is an equilateral triangle. What is the shortest distance of any side of the triangle from the centre of the circle?

9. Two dice are thrown up at once. What is the probability that the sum of the scores on the dice is less than 8?

10. Given that matrices $A = \begin{pmatrix} 1 & 3 \\ 4 & 11 \end{pmatrix}$, $B = \begin{pmatrix} -1 & 2 \\ 1 & 3 \end{pmatrix}$

Find (a) P = A.B

(b) P^{-1} (4 marks)

SECTION B

11(a) Copy and complete the table below

x	-4	-3	-2	-1	0	1	2	3	4
x^2-2									
-x^2+6									

b) Plot on the same axes the graphs of $y = x^2 - 2$ and $y = 6 - x^2$, for $-4 \leq x \leq 4$

Using your graphs solve the equation x^2-2 = 6-x^2

12. In a triangle OPQ, x is a point such that $\overline{OX} = \dfrac{2}{3}\overline{OP}$ and Y the mid point of $\overline{PQ}$. The point Z on OQ is such that $\overline{OQ} = \overline{QZ}$. Given that OP= $\underset{\sim}{p}$ and OQ = $\underset{\sim}{q}$.

a) Determine in terms of $\underset{\sim}{p}$ and $\underset{\sim}{q}$, the vector (i) OX (ii) OY (iii) OZ (iv) XY (vi)YZ

b) Hence or otherwise show that x, y and z lie on a straight line. State the ratio of the lengths $\overline{XY}$ and $\overline{YZ}$.

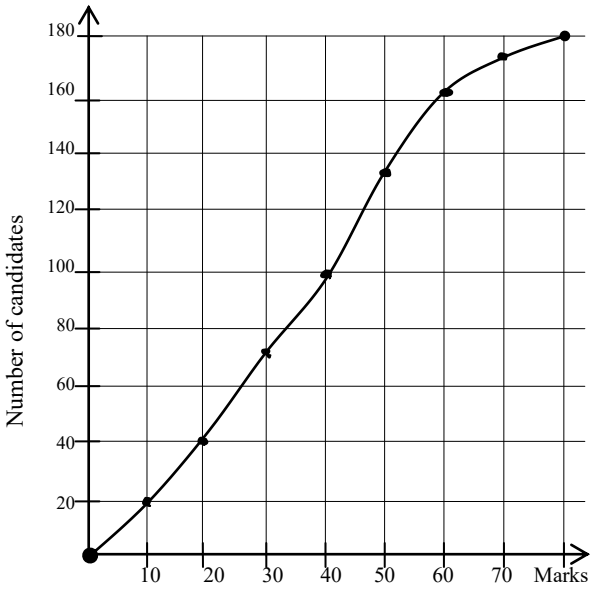
13. The end points of line AB whose coordinates are A (3, -1) and B (4, -3) undergo a rotational transformation to give the image line A'B' with A'(1,3) and B'(3,4) respectively.

a. Plot the line AB and its image on the same set of axes using a scale of 2cm to 1 unit.

b. Determine the centre and angle of rotation of the line.

c. Find the new image A"B" of AB when its image A'B' further undergoes a rotation of 128^0. State the size of the angle formed between AB and A"B".

14. The cumulative frequency graph below shows marks scored by 180 students in an end of year examination marked out of 80 marks. Study the graph and use it to.



a) Estimate the

(i) Median mark.

(ii) Number of students who scored 30 or less marks.

(iii) Number of students who obtained distinction if 61 or more marks were distinction scores.

(iv) Pass mark of the examination if 94 students passed.

b) Construct a table of the frequency distribution of the students' performance. Hence calculate the mean mark

15. Three towns A, B and C lie on the same level ground. Town B is 15km away from Town C. the bearings of towns B and C from A are 060^0 and 150^0 respectively. The bearing of C from B is 200^0. To a pilot flying an aircraft above A, the angle of depression of C is 7.5^0. Calculate the:

a) distances $\overline{AB}$ and $\overline{AC}$.

b) vertical height of the aircraft above A.
c) Angle of elevation of the aircraft from B.

16. A rectangular swimming pool is constructed such that when the pool is completely full, the shallow end is 1 metre deep and the deeper end is 4 metres deep. The pool is 25 metres long from the shallow end to the deep end and 20 metres wide.

(a)Calculate the:
(i)Inclination of the floor of the swimming pool to the horizontal.
(ii)Volume of the water (in m^3) that can fill the pool.
(b)Starting with the pool empty, a tap which delivers water at a rate of 400 litres per minute is used to fill the pool. How long (to the nearest hour) will the pool take to fill?

17. In a certain school a teacher's salary includes the following tax-free allowances.

Type of allowances	Amount
Legally married teacher	Shs. 10,000/-
Each child under 10 years	Shs. 2,500/-
Each child above 10 years	Shs. 2,000/-
PTA	Shs. 50,000/-
Head of department/ subject	Shs. 10,000/-
Class teacher	Shs. 5,000/-
House master/mistress	Shs. 5,000/-
Unmarried teacher	Shs. 6,000/-

Mr. Mugisha and Ofuti are senior teachers in this school. Mr. Mugisha is married with two children under 10 years and one child above 10 years. He is also a class teacher and head of mathematics department. Mr. Ofuti is single but has two children under 10 years and is also a house master and a class teacher. Their gross incomes at the end of the month are each subjected to a "PAYEE" (Pay As You Earn) which has the following rates.
For the fist Shs. 10,000 taxable income the tax is 20% while the rest is taxed at 15%. At the end of the month Mr. Mugisha's gross income was Shs 150,000 and Ofuti's gross income Shs 130,000
Calculate the:
a) Taxable income for each teacher.
b) Tax paid by each teacher.
c) Tax paid as a percentage of the gross income for each teacher.

2003 PAPER ONE

SECTION A

1. Simplify $\dfrac{2^{-2}\times 3^{-3}}{2^{-4}\times 3^{-6}\times 18}$ *(4 marks)*

2. Simplify $\dfrac{\sqrt{63}+\sqrt{28}}{\sqrt{175}-\sqrt{63}}$ as far as possible

3. The diagonals of a rhombus are 20cm and 48cm respectively. Determine the length of the side of the rhombus. (4 marks)

4. Factorize $8a^2-18b^2$ completely *(4 marks)*
$8a^2 - 18b^2 = 2(4a^2 - 9b^2)$
$= 2(2^2a^2 - 3^2b^2)$
$= 2(2a + 3b)(2a - 3b)$

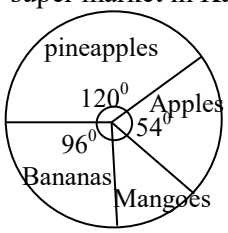
5. Use logarithm tables to evaluate $\dfrac{780\times 0.25}{1.09}$ correct to 2 decimal places. *(4 marks)*

6. If $A=\begin{pmatrix}2 & 0\\ 0 & 2\end{pmatrix}$, $B=\begin{pmatrix}4 & 8\\ 2 & 6\end{pmatrix}$,Find det(A.B)

7. Find the equation of the line passing through the points (2, -1) and (5, 8) (04 *marks*)

8. Given that $f(x) = ax - 7$and $f(8) = 17$, find value of
(i) a
(ii) $f(4)$ *(4 marks)*

9. The pie-chart below shows the fruits popularly sold in a daily super market in Kampala.

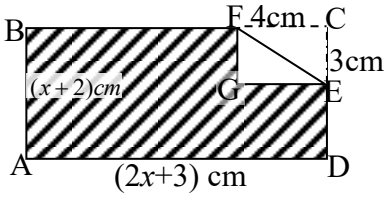


If 420 apples were sold on a given day, Determine,
(i) The total number of fruits that were sold that day.
(ii) How many mangoes were sold that day

10. There are enough chicken feeds to feed 360 chicken for 21 days. Find how many more chicken would be needed for the same feeds to last 15 days. (4 marks)

SECTION B

11. The figure below shows a rectangular piece of paper ABCD which has been folded along EF such that C maps onto G.



Given that **EC** = 3cm and **FC** = 4cm, **AB** = (x +2) cm and **AD** = ($2x$ + 3)cm.

(a) Find:

(i) The area of triangle ECF.

(ii) An expression for the area of shaded region ABFGED in terms of x.

(b) If the shaded area is $43cm^2$, show that $2x^2 + 7x - 49 = 0$. Hence find the length of $\overline{AD}$ (*12 marks*)

12. Using a pair of compasses and a ruler only,

Construct triangle PQR, such that angle PQR = 60^0, $\overline{QR}$ = 9.0cm, $\overline{PR}$ = 8.5cm. Measure the length $\overline{QP}$,

Bisect the sides $\overline{PQ}$ and $\overline{PR}$. Produce the line bisectors to intersect at point M.

Using M as the centre, draw a circle to circumscribe triangle PQR. Measure the radius of the circle. Hence calculate the area of the circle. (Correct to 2 significant figure) (12 *marks*)

13. A retail trader ordered for shirts from a Kampala wholesale shop as follows;

	Size			
olour	Small	Medium	Large	Extra large
Blue	0	40	20	0
Green	30	0	25	0
Yellow	0	20	0	10

Given below is the cost for each size of shirt.

	Size			
	Small	Median	Large	Extra large
Cost (UShs)	3000	3600	4200	4800

(a) Write down a

(i) 4 × 3 matrix for the order of the shirts made.

(ii) 4 × 1 cost matrix.

(b) Given that the trader had to pay a tax of 17% of the cost of shirts purchased, find his expenditure on the order. (12 *marks*)

14. The table below shows the marks scored by 90 students in a test marked out of 50 marks.

Marks	Frequency(f)
15-19	1
20-24	13
25-29	29
30-34	25
35-39	19
40-44	3

Represent the above on a histogram. Use your histogram to estimate the mode.

Calculate the mean mark of the test using a working mean of 27.

15. A school has a teaching staff of 22 teachers. 8 of them teach Mathematics, 7 teach Physics and 4 teach Chemistry. Three teach both Mathematics and Physics and one teaches Mathematics and Chemistry. No teacher teaches all the three subjects. The number of teachers who teach Physics and chemistry is Equal to that of those who teach chemistry but not Physics.

(a) Represent the above information on a Venn diagram

(b) Find the number of teachers who teach

(i) Mathematics only.

(ii) Physics only.

(iii) None of the three subjects.

(c) Find the probability that a teacher picked at random teaches only one or none of these subjects.

16. The distance between two towns A and B is 432 km. A lorry traveling at a steady speed of $72kmh^{-1}$ leaves town A at 6:45 a.m. for town B. one and a half hours later, a minibus leaves town A at a steady nonstop speed of $108kmhr^{-1}$ heading for town B.

(a) On the same axes, show the journeys of the two vehicles (use scales of 2cm to represent 40km and 2cm to represent 1hour)

(b) Use your graph to estimate the:

(i) Time and distance from town A when the mini-bus overtakes the lorry.

(ii)Times when the two vehicles arrive in town A

(iii) Differences in the times of arrival of the two vehicles

17. A farmer plans to plant an 18hectare field with carrots and potatoes. The farmer's estimates for the project are shown in the table below.

	Carrots	Potatoes
Harvesting cost per hectare	Shs 95, 000	Shs 60,000
Number of working hours	12 days	4days
Expected profit per hectare	Shs 228,000	Shs 157,000

The farmer has only Shs 1,140,000 to invest in the project. The total number of working days is 120.

By letting x represent the number of hectares to be planted, with carrots and y the number of hectares to be planted with potatoes,

(a) Write down inequalities for;

(i) Cost of the project

(ii) Working days

(iii) Number of hectares used in the project

(iv) The possibility that the field will at least be used for planting either carrots or potatoes

(b) Write down an expression for the profit, P, in terms of x and y

(c) (i) on the same axes plot graphs of the inequalities in (a) and (b) above, shading out the unwanted regions

(ii) Use your graph to determine how the farmer should use the field to maximize profit. Hence find the farmers maximum profit.

2003 PAPER TWO
SECTION A

1. Without using tables or calculator evaluate

$$\left(\frac{1}{16}\right)^{-1/2} \times \left(\frac{1}{64}\right)^{-1/3}$$

2. Without using tables or calculator, evaluate

$7.46^2 - 2.54^2$ (4 marks)

3. Given that a*b= $a^2 + \sqrt{(ab)}$, find (1*4)*3

4. Use logarithm tables to find the square root of 0.0576.

5. Given that y is directly proportional to x^3 and that y is 250 when $x = 10$, find the equation connecting x and y. hence find the value of y when $x = 4$.

6. Given that A = x: $-2 \leq x \leq 1$ and B = $\{x: 0 < x \leq 5\}$ represent A ∩ B on a number line. State A ∩ B. (4 marks)

7. A student wrote $(p + q)^2$ as $p^2 + q^2$. Find the percentage error the student made in evaluating $(p + q)^2$ when p = 7 and q = 3. (4 marks)

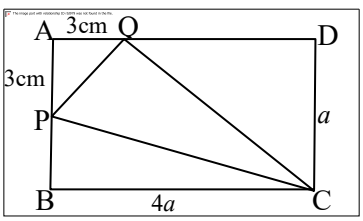
8. A lake of area 120km^2 is represented by the area of 4.8cm^2 on a map. Find the length (in km) of a horizontal road measuring 6cm on the map.

9. Mary is five years younger than John and Peter is twice as old as Mary. The sum of their ages is 49. Find Peter's age. (4 marks)

10. A box contains green, blue and red balls. The probability of picking a green ball from the box is $\frac{1}{5}$ and that of a blue ball $\frac{1}{2}$. What is the probability of picking a red ball from the box?

SECTION B

11. In the diagram below ABCD is a rectangle in which BC = 4$a$cm and CD = a cm. P and Q are points on AB and AD respectively. Such that AP = AQ = 3cm.



(i) Find the sum of the areas of triangles BCP and CDQ in terms of a.

(ii) Given that the area of triangle PQC is 40.5cm^2, find the value of a

(iii) Express the area of triangle PCQ as a ratio of the area of the rectangle ABCD.

12. On the same coordinate axes, draw the curve $y = 4x^2$ for $-2 \leq x \leq 2$ and the line $y=1$, show by shading the unwanted region, the region represented by

(i) $y > 1$

(ii) $y < 4 - x^2$

Hence state the integral coordinates of the points which lie in the region $\{y > 1 \cap y < 4-x^2\}$

13. In a sports field, four points A, B, C and D are such that B is due south of A and due west of D, **AB** = 10.8m, **BD** = 18.8m, **CD** = 16.6m. $\angle BAD = 60^0$, $\angle CDB = 40^0$ and $\angle BCD = 80^0$. A vertical pole created at D has a height of 4.8m.

(a)(i) Draw a sketch of the relative positions of the points on the sports field.

(ii) Using a scale of 1cm to represent 2m, draw an accurate diagram to show the relative positions of the points and the pole.

(b) Find the:

(i) Distances **BC** and **AD**

(ii) Bearing of B from C.

(iii) Angle of elevation of the top of the pole from B.

(c) If an athlete runs from point A through points B, C and D and back to A in 16 seconds, find the athlete's average speed.

14. In a triangle ABC, M and D are midpoints of **AC** and **CN** respectively. N is appoint on **AB** such that **AN** = 3**NB**

If **AB** = ***p*** and **AC** = ***q,*** express the following vectors in terms of vectors ***p*** and ***q***

(i) **AM**

(ii) **AN**

(ii) **ND**

(b) Show that **MD** is parallel to **AB** and that **MD: AB = 3 : 8**

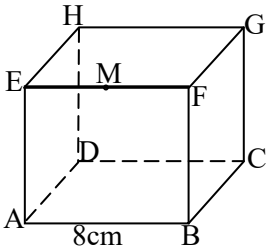
15. Town B can be reached using two different routes. Using a shorter route, it takes the driver 2hrs 26min. the driver covered the first *x*km at an average speed of $54km^{-1}$ and then covered the remaining *y*km at an average speed of $37.5km^{-1}$. using the second route, which is 5km longer than the shorter route, it takes the driver 2hrs 12min at an average speed of $60km^{-1}$

(i) Show that the time taken using the shorter route is given by the equation $25x + 36y = 3285$

(ii) Form an equation in terms of x and y that represents the time taken using the second route.

(iii) Find how long it would take a driver traveling at a steady speed of $65kmh^{-1}$ to move from town A to town B by the shorter route

16. The diagram below shows a cube ABCDEFGH of sides 8cm and EM = MF. A tetrahedron AMHE is cut off the cube.



Find:

(i)Area of triangle HAM

(ii)Angle between HAM and the plane AEHD

(iii)Volume of the remaining part of the cube after the tetrahedron has been cut off

17. The monthly income tax system of a country is given as below.

Basic pay (U Shs.)	Tax (%)
1st 0-150,000	Free
Next:15,1000-250,000	10.0
Next:251,000-350,000	12.5
Next:351,000-450,000	16.0
Next:451,000-550,000	22.5
Next:551,000-650,000	30.5

An allowance in excess of Shs. 80,000 is subjected to a tax of 25% of the monthly allowance. Two employees A and B are such that A earns a basic monthly pay of Shs. 355,000 and a top up allowance of Shs. 185,000 per month while B earns only a basic ,monthly pay of Shs 540,000.

(i) Who of the two employees pay more monthly? Income tax than the other and by how much?

(ii) Express employee A's Income tax as a percentage of his monthly earnings.

2004 PAPER ONE
SECTION A

1. Simplify $\dfrac{3^3 \times 9^2 \times 125^{1/3}}{9^3}$ *(4 marks)*

2. If $\dfrac{\sqrt{2}}{\sqrt{3}+\sqrt{2}} = a + \sqrt{b}$, find the values of a and b.

3. ABCD is a quadrilateral in which angles ABC and CDA are 90^0 each. If AB = 6cm. AC = 10cm and CD= 5cm. Find
(a) Length BC
(b) Angle ACD

4. Factorize $x^3 - 9xy^2$ completely (4 *marks*)

5. Given that $A = \begin{pmatrix} 2 & 2 \\ 1 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 1 \\ 1 & 2 \end{pmatrix}$ Find:
(a) The matrix P such that **AB** = P
(b) P^{-1} *(4 marks)*

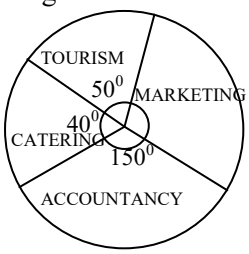
6. Use the fact that $\log_{10} 2 = 0.301$ and x = 4, to find the value of $\log_{10} x^2$. *(4 marks)*

7. Given that $f(x) = \dfrac{x^2}{3} + 5$, find the value of x for which $f(x(= 17$ *(4 marks)*

8. Find the Equation of the line passing through the points (-1, 3) and (4, 2) (*04 marks)*

9. A food store has enough food to feed 200 students for 15 days. For how long will the food last if 50 students join the group?

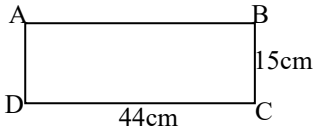
10. The pie-chart below represents the number of students who attend various courses in a commercial college.



If the number of students studying Accountancy is 120.
(a) Determine the student population of the college.
(b) Find the number of students who study marketing.

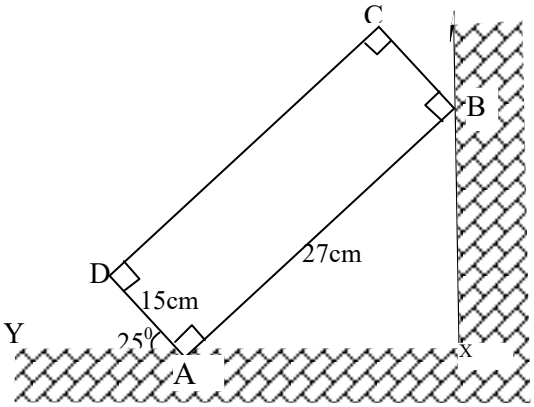
SECTION B

11. (a) The diagram below shows a rectangle ABCD of length 44cm and width 15cm.



If it was curved in such a way that **AD** and **BC** come together to form a hollow cylindrical figure, find the volume of the cylindrical figure formed.

(b) A rectangular piece of cardboard measuring 27cm long and 15cm wide rests against a vertical wall as shown in the diagram below.



If angle $DAY = 25^0$, find the length of C above the ground

12. Using a pair of compasses and ruler only
Construct triangle ABC such that
BC =10.6cm and angles ACB = 75^0 and ABC = 60^0,
Construct a circumcircle of triangle ABC with O as its centre.
(c) Measure lengths AB and AC and the radius of the circle. *(12 marks)*

13. Three secondary school football teams X, Y and Z qualified for a football tournament which was played in two rounds with other teams. In the first round:
Team X won one game, drew one and lost three games.
Team Y won three and lost two games.
Team Z won two, drew and lost one game in the second round.
Team X won two, drew two and lost one game.
Team Y won four and drew one game while team Z won three games, drew one and lost one.
(a) Write down
(i) a 3×3 matrix to show the performance of the three teams in each of the two rounds.
(ii) A matrix which shows the overall performance of the teams in the two rounds. *(4 marks)*
(b) If three points are awarded for a win, two points for a draw and no point for a loss, use matrix multiplication to determine the winner of the tournament.
(c) Given that Shs. 475,000 is to be shared by the three teams according to the ratio of their points scored in the tournament. Find how much money each team will get.

14. The distance from town A to town B is 360 km. An express bus leaves town A at 6:30a.m and travels at a steady speed of 80kmh^{-1} towards town B. At the same time, a taxi Omnibus leaves town B traveling non-stop towards town A at a steady speed of 100kmh^{-1}. On the same axes draw a distance time graph for the journeys of the two vehicles. Use a scale of 2cm to represent 1 hour and 2cm to represent 50kmh^{-1}.

From the graph;

(i) Find the difference in the time of arrival of the bus and the taxi.

(ii) Determine when and at what distance from town A the two vehicles will meet.

15. A packet has 60 different vitamin tablets. Each tablet contains at least one of the vitamins A, B and C. Twelve of the tablets contain only vitamin A. Seven contain vitamin B only and eleven contain only vitamin C. Six contain all the three vitamins.

Giventhat $n(A' \cap B \cap C) = n(B' \cap A \cap C) = n(C' \cap A \cap B)$, find the:

(i) Number of tablets that contain vitamin A.

(ii) Probability that a tablet picked at random from the packet contain vitamin C.

(iii) Probability that a tablet picked at random from the packet contains both vitamins A and B.

16. The table below shows the weight (in kg) of 40 students of a class and their corresponding cumulative frequencies.

Weight(kg)	cumulative Freq.
30-34	2
35-39	7
40-44	12
45-49	21
50-54	28
55-59	34
60-64	38
65-69	40

(a) Draw a cumulative frequency curve, use your graph to estimate the

Median weight of the students.

25th and 75th percentile weights.

(b) Calculate the mean weight of the students.

17. A private car park is designed in such away that it can accommodate *x* pick-ups and *y* min-buses at any given time. Each pick-up is allowed 15m^2 of space and each min-bus 25m^2 of space. There is only 400m^2 of space available for parking. Not more than 35 vehicles are allowed in the park at a time. Both types of vehicles are allowed in the park. But at most 10 min-buses are allowed at a time.

(a) (i) Write down all the inequalities to represent the above information.

(ii) On the same axes plot graphs to represent the inequalities in (i) above, shading out the unwanted region.

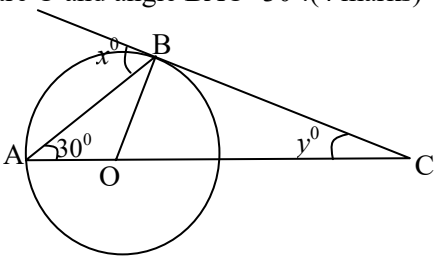
(b) If the parking charges for a pick-up is Shs 500 and that for a min-bus is Shs 800 per day, find how many vehicles of each type should be parked in order to obtain maximum income. Hence find the maximum parking income per day. *(3 marks)*

2004 PAPER TWO
SECTION A

1. Express 784 as a product of prime factors. Hence find the square root of 784.

2. If the exchange rate of a Kenya shilling to Uganda shilling is 1K.sh = 24 Ush, and an American dollar to Uganda shilling is $1 = Ush 1,950. How many American dollars would one get in exchange for Ksh 9,750?

3. In the diagram below, $\overline{BC}$ is a tangent to the circle with centre O and angle BAO=30^0.(4 marks)

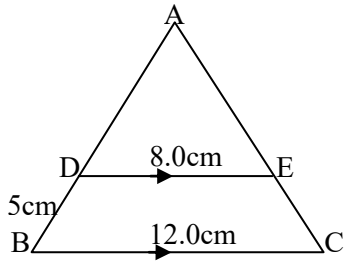


Find the size of the angles *x* and *y*.

4. Given that the representative fraction of a map is $\frac{1}{250{,}000}$, find the length of a horizontal road on the map whose length on the ground is 66.25km long.

5. The transformation described by the matrix $\begin{pmatrix} 2 & b \\ c & 3 \end{pmatrix}$ maps the point P(-1, 3) onto its image p^1(10,8).Find the values of *b* and *c*

6. In the figure below, $\overline{DE}$ = 8.0cm, $\overline{BC}$=12.0cm and $\overline{BD}$ = 5.0cm.



Given that $\overline{DE}$ is parallel to $\overline{BC}$, find length $\overline{AD}$.

7. Solve the equation $3x^2 + 10x = 8$

8. Given that $133_n = 43_{ten}$, find the value of *n*.

9. A fair die with faces marked 1,2,3 …., 6 and a fair coin with one side showing a court of arms (C) and the other side a fish (F) are tossed together once. Construct a possibility space showing all the possible out comes. Find the probability that a six and a fifth will show up.

10. The angle of depression of the sun's rays to a man's head is 14^0. If the man whose height is 1.7m, is standing up right on horizontal ground. Find the length of his shadow, correct to 2 significant figures.

SECTION B

11 (a) At the beginning of the year, a customer deposited sh 1,900,000 in a bank which offers a compound interest rate of 2.75% per four months. Find how much interest he earned at the end of the year.

(b) A cooking oil factory offers a trade discount of 2% to its customer. It also offers a 1% cash discount to any customer who pays cash for the oil bought. If the factory price for a 20 litre jerrican of cooking oil is sh 30,000, find the amount of money a customer saves by paying for 100 jerricans of the oil.

12. The coordinates of the vertices of a triangle OAB are O(0, 0), A(1, 0) and B(1, 1)

a) Find the co-ordinates of the image formed when:

(i) Triangle OAB undergoes a translation of $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ to form $O^1A^1B^1$.

(ii) OAB is transformed by the matrix $\begin{pmatrix} -2 & 0 \\ 0 & -3 \end{pmatrix}$ to form $O^{11}A^{11}B^{11}$.

b) (i) plot triangle OAB and its images on the same graph

(ii) Use your graph to find the area of $O^{11}A^{11}B^{11}$

13. Two cyclists C_1 and C_2 start at the same time from trading centre P travelling to trading centre Q which are 24km a part. Cyclist C_1 starts at a steady speed of $10kmh^{-1}$ greater than that of cyclist C_2 who also travels at a steady speed. When C_1 has covered half the distance, he delays for three quarters of an hour, after which he travels at a speed 25% less his original speed and arrives in trading centre Q fifteen minutes earlier than cyclist C_2.

a) Determine the speeds of cyclists C_1 and C_2.

b) If cyclist C_2 started from trading centre Q at the same time as cyclist C_1 started from trading centre P, both of them traveling non-stop on the way, find how far from Q the two cyclists would meet. After how long would they meet?

14. (a) Plot the graph of $y = 3x^2 + 2x - 16$ for values *x*: $-3 \le x \le 3$

b) Use your graph to solve the equation

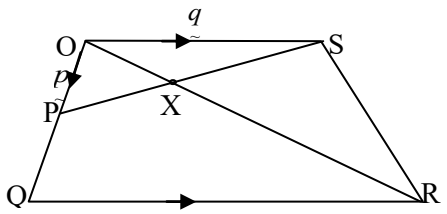
$3x^2 + 2x - 8 = 0$

$3x^2 + 2x - 16 = -8$

15. The bearing of tower A from point O is 060^0 and that of tower B from O, 200^0 $\overline{OA}$=24km and $\overline{OB}$ =33km. tower C is exactly half way between towers A and B.

a) Using a scale of 1cm to represent 5km, draw an accurate diagram showing the positions of the towers.
b) Use your diagram to find:
   i. Distances $\overline{AB}$ and $\overline{OC}$.
   ii. The bearing of tower B from tower A.
   iii. The bearing of tower C from O.
c) Find:
   i. The average speed of a cyclist who takes $2\frac{1}{4}$ hours to travel directly from A to B.
   ii. How long it takes another cyclist to travel from A and B via O at a steady speed of 4.5kmh^{-1} faster than that of the cyclist in (c) (i) above.

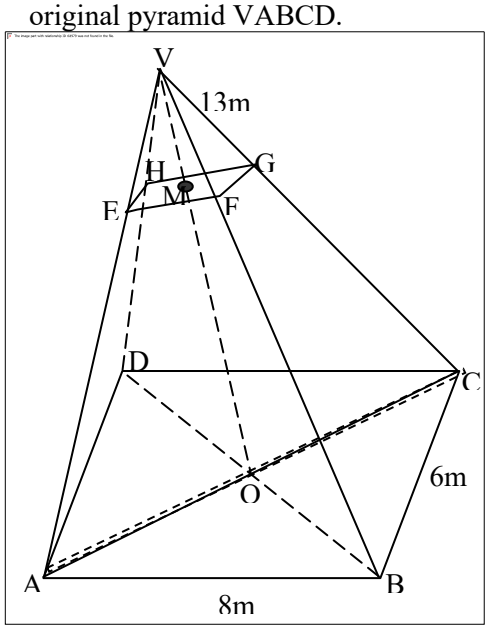
16. The diagram below shows a quadrilateral OSRQ. **OS** = $\underset{\sim}{q}$, **OP** = $\underset{\sim}{p}$ and **SX** = k(**SP**)



(i) Express vectors SP and OX in terms of $\underset{\sim}{p}$, $\underset{\sim}{q}$ and k.

(ii) If **OQ** = 3 $\underset{\sim}{p}$ and **QR** = 2**OS**, and **OX**=l**OR**, find the values of k and l. hence find the ratio **SX**: **XP**.
(12 marks)

17. In the diagram below VABCD is a pyramid with a rectangular base ABCD and V, the vertex, O is the centre of the base ABCD.
$\overline{AB}$ = 8m, $\overline{BC}$ = 6m, $\overline{VC}$ = $\overline{VB}$ = $\overline{VA}$ = $\overline{VD}$ =13m. M is a point on VO such that 3 $\overline{MV}$ = $\overline{OV}$. M is also the centre of base EFGH of a small pyramid VEFGH similar to VABCD which is to be cut off from the original pyramid VABCD.



Find the (i) Dimensions of the base EFGH.
(ii) Height of pyramid VABCD.
(iii) Volume of the remaining part of pyramid VABCD when VEFGH is cut off.

2005 PAPER ONE
SECTON A

1. Write down the next term of each of the given sequences.
(i) 2, 3, 1, 4, 0,…
(ii) 1, 4, 20, 120,….

2. Without using tables or calculator find the value of
   i. Cos780^0
   ii. Sin390^0

3. Without using tables or calculator simplify
$$\frac{\sqrt{30}+\sqrt{35}}{\sqrt{6}+\sqrt{7}}$$

4. At lunch time a certain hotel received 80 customers. Of these 45 had a posho (P) meal and 50 had matooke (M).
(i) Represent this information in a Venn diagram.
(ii) Find the number of people who had a meal of both P and M.

5. If the point (2, -1) undergoes a translation represented by the matrix $\begin{pmatrix}11\\-4\end{pmatrix}$, find the image of P. (4 *Marks*)

6. Calculate the simple interest on Shs 96,000 for 10 months at rate of $8\frac{1}{3}$ % per annum.

7. Using mathematical tables evaluate $(0.48)^{\frac{3}{5}}$ correct to 2 dp.

8. A stretch of land on a map of scale 1:15,000 has an area of 300cm^2. Determine the actual area of the land in km^2.

9. A floor measuring 6m × 4m is to be covered with square tiles measuring 50cm each. Find the cost of covering the floor, if the price of a dozen of tiles is Shs. 15,000.

10. Show that the points $(3x, -2y)$, $(2x, y)$ and $(0, 7y)$ lie on a straight line.

SECTION B

11. (a) Express $x^2 + x - 12$ in the form $(x + a)^2 + b$. Hence solve the Equation $x^2 + x - 12 = 0$
b) Given that functions f(x) = $\frac{x+3}{2}$, and g(x) = $\frac{1-2x}{5}$, determine the values x for which
$$fg(x) = \frac{9+24x+8x^2}{10}$$

12. (a) Use matrix method to solve the following pair of simultaneous equations.

$$x + y = 3$$
$$3x - 2y = -1$$

b) A transformation maps (1, 2) onto (-1, 4), and (2, 3) onto (-1, 7). Find the matrix of this transformation. Hence determine the image of (3, 0) under the transformation.

13. Using a ruler, pencil and pair of compasses only,

Construct a triangle ABC such that $\overline{AB}$ =8.7cm, $\overline{AC}$ = 10.6cm and angle BAC=60^0.

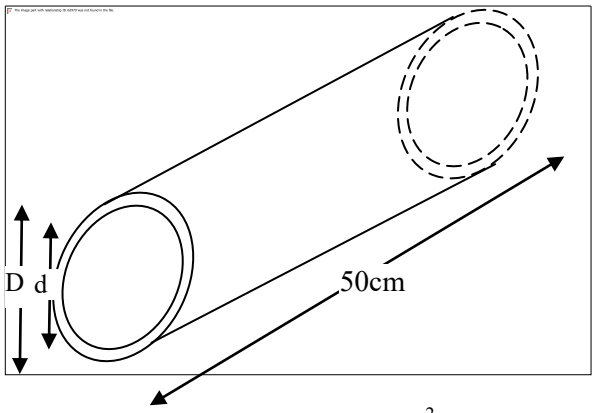
Inscribe a circle on the triangle ABC,

Construct a perpendicular from B onto $\overline{AC}$ to meet it at point D.

Measure length $\overline{BC}$ and the radius of the cycle.

Measure $\overline{BD}$ and calculate the area of triangle ABC.

14. The figure below shows a hollow pipe of external diameter 16mm, internal diameter 10mm and length 50cm.



(i) Calculate the surface area (in cm^2) of the pipe correct to 2 dp. (use π =3.142)

(ii) What would be the surface area of a similar pipe of length 150cm, external diameter 48mm and internal diameter 30mm.

15. The table below shows the marks obtained in a chemistry test by 54 students in a certain school.

54	49	60	58	54
60	51	57	56	54
53	59	56	52	55
57	62	54	54	56
48	51	52	55	58
65	55	54	57	61

(a) Using class width of 3 marks and starting with the class of 48 – 50, make a frequency distribution table.

b) Use your table to

(i) draw a histogram.

(ii) determine the median and mean mark.

16. (a) Okello bought 3 pens and 2 rulers from a bookshop at shs. 3,150. Mukasa bought 2 pens and 3 rulers from the same bookshop at sh. 2,850.

(i) Find the cost of each pen and a ruler.

(ii) If Mugisha spends sh. 6,000 to buy *n* pens and *n* rulers. Find the value of *n*.

(b) A pick up van can be bought by cash at Shs. 8,750,000 or can be bought on hire purchase by paying 25% deposit of cash price and 12 monthly installment of sh.600,000 per month.

Calculate:

(i) Cost of pick up by hire purchase.

(ii) Extra money paid for the pick-up by hire purchase than by cash.

17. A transport company has 8 lorries of 8-tonnes carrying capacity each, and 5 lorries of 10-tonnes capacity each. There are 12 drivers available. The company was contracted to transport 480 tonnes of cement from the factory to a town on a given day. The 8-tonne lorries can make 6 journeys in a day and the 10 tonne lorries 4 journeys a day. The costs of using an 8-tonne lorry and a 10-tonne lorry are sh. 40,000 and sh. 60,000 respectively.

(i) Write down the inequalities to represent the above information

(ii) Plot a graph for the inequalities, shading out the unwanted regions

(iii) From your graph, find the number of 10-tonne and 8-tonne lorries the company used, keeping its costs as minimal as possible

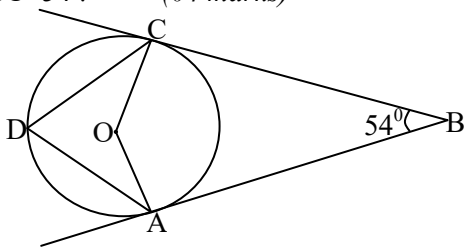
2005 PAPER TWO
SECTION A

1. Find the highest common factor (HCF) of 18, 45 and 42.

2. When thirty times a number is increased by 32, the result is equal to twice the square of the number. Find the number.

3. If the exchange rate for a French Franc to a pound sterling is £1 = 9.00 Francs and £1 =$1.53 (American dollars), find how many American dollars one would get in exchange for 1,000 Francs.

4. In the diagram below, O is the centre of the circle. $\overline{AB}$ and $\overline{CB}$ are tangents to the circle. Angle ABC=54^0. *(04 marks)*



Find angle ADC

5. The representative fraction of a map is $\frac{1}{250{,}000}$.

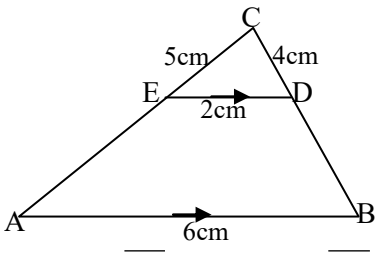
Find the area of a lake (in km^2) which is represented on the map by an area of $4.6cm^2$.

6. If $135_n = 75_{ten}$, find the value of *n*

7. Use matrix method to solve the pair of simultaneous equations.

$2x - y = 8$
$4x - 3y = 14$ (04 marks)

8. In the figure ABC, $\overline{AB}$ = 6cm, [ ] = 2cm, $\overline{CD}$= 4cm and $\overline{CE}$= 5 cm.



If [ ] is parallel to $\overline{AB}$, find length $\overline{AE}$

9. A fair coin with one side showing court of arms (A) and other side showing a cow (C) is tossed twice. Find the probability that at least a cow (C) will show up in the two tosses. (04 marks)

10. The angle of elevation of the top of a flag pole to a policeman of height 1.7m is 20^0. If the policeman is standing at a distance of 16m from the pole on level ground, find the approximate height of the flag pole, correct to 2 significant figures.

SECTION B

11. Mr. Lwanga and Mr. Okot were each given Uganda shillings 980,000 at the beginning of 1999. Mr. Lwanga exchanged his money to United States dollars and then banked it on his foreign currency account at a compound interest rate of 2% per annum, while Mr. Okot banked his money without exchanging it, at a compound interest rate of 12% per annum. The exchange rates in 1999 and 2000 were Ug. Sh 1,250 and Ug. Sh1,500 to a dollar respectively. If Mr. Okot withdrew sh. 120,000 at the end of 2000.

(i) Calculate the amount of money (in Ug.sh) each man had in the bank at the end of 2000.
(ii) Who had more money and by how much?

12. Two cyclists C_1 and C_2 begin travelling at the same time from town A to town B, 18 km a part. C_1 travels at a steady speed of 15 kmh^{-1} faster than that of cyclist C_2 who also travels at a steady speed. When C_1 has covered half the distance, he delays for half an hour, after which he travels at a speed 20% less his original speed. He arrives in town B 15 minutes earlier than cyclist C_2.

(i) Determine the speeds of the two cyclists C_1 and C_2.
(ii) If cyclist C_2 started from town B while C_1 at the same time started from town A and all the two travel non-stop, determine the distance from town A where the two cyclists will meet. After how long will they meet?

13. Using suitable scales, plot on the same axes the graphs of $y = 2x^2$ and $y = \frac{5x}{2} + 5$ for $-2 \leq x \leq 3$. Use your graphs to estimate the solutions of the equations.
(i) $4x^2 - 5x - 10 = 0$
(ii) $6x^2 + 10x - 30 = 0$n Correct to 2dp

14. Town B is 100km away from town A on bearing of 135^0. Town D is on a bearing of 090^0 from town B, 124km a part. Town C 160km away from town D is on bearing 030^0 from D.
Using a scale of 1cm to represent 20km, make an accurate drawing to show the relative positions and distances of towns A, B, C and D.
Determine the:
a. Shortest distance and bearing of town C from A.
b. Distance and bearing of town B from town C.

15. a) (i) Find the images of the points A(1, 4), B(1,1) and C(2, 1) of a triangle ABC under a transformation L whose matrix is $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$

(ii) Plot triangle ABC and its image $A^1B^1C^1$ on the same graph. Describe the matrix transformation L. hence deduce the matrix transformation which would map triangle $A^1B^1C^1$ onto triangle ABC.

b) Triangle $A^1B^1C^1$ is mapped onto triangle $A^{11}B^{11}C^{11}$ by matrix transformation M = $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$

(i) Find the coordinates of $A^{11}B^{11}C^{11}$.

(ii) Plot $A^{11}B^{11}C^{11}$ on the same graph in (a) (ii) above. Use your graph to describe a single transformation that will map triangle ABC onto triangle $A^{11}B^{11}C^{11}$. Hence find the single matrix transformation which maps triangle ABC onto $A^{11}B^{11}C^{11}$.

(ii) The single transformation that maps ABC onto $A^{11}B^{11}C^{11}$ is half turn about the origin (0, 0). Single equivalent matrix.

M . L

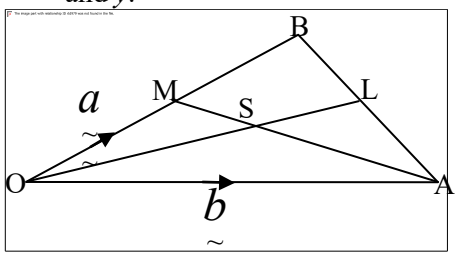
$$\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$$

16. In a triangle OAB, OA = $\underset{\sim}{a}$, OB = $\underset{\sim}{b}$. A point L is on the side AB and M on the side OB. OL and AM meet at S. AS = SM and OS = $\frac{3}{4}$ OL.

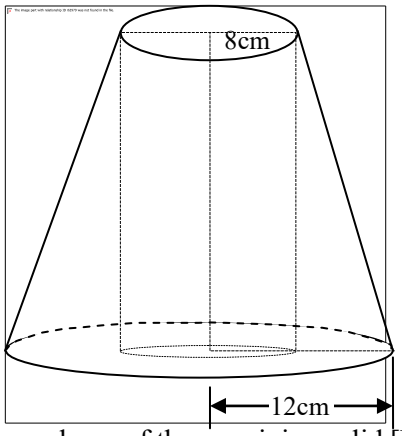
Given that OM = xOB and AL = yAB. Express the vectors,

(i) AM and OS in terms of a, b and x.

(ii) OL and OS in terms of $\underset{\sim}{a}$, $\underset{\sim}{b}$ and y. hence find x and y.



17. The figure below shows part of a solid right circular cone whose original height was 20cm before part of its top was cut off. The radius of the base is 12cm and that of the top is 8cm. A circular hole of radius 8cm was drilled through the centre of the solid as shown.



Calculate the volume of the remaining solid [Use π = 3.142].

2006 PAPER ONE

SECTION A

1. Simplify $\dfrac{(12)^{\frac{3}{2}} \times (16)^{\frac{1}{8}}}{(27)^{\frac{1}{6}} \times (18)^{\frac{1}{2}}}$

2. Solve for x in the equation $(x + 2)(x - 4) < x^2 - 6$

3. Express $\dfrac{1+\sqrt{3}}{2+\sqrt{3}}$ in the form $a+b\sqrt{3}$. Hence evaluate $\dfrac{1+\sqrt{3}}{2+\sqrt{3}}$ correct to 3 significant figures if $\sqrt{3}$ = 1.732.

4. A trader made a 35% profit after selling a goat at sh 45,900. How much profit did the trader get?

5. Simplify Log75+2Log2-log3

6. Find the values of a and b such that

$$\begin{pmatrix} 3 & b \\ 4 & a \end{pmatrix}\begin{pmatrix} -7a \\ 2 \end{pmatrix} = \begin{pmatrix} 43 \\ 30 \end{pmatrix}$$

7. A line of gradient $\dfrac{7}{9}$ passing through the point Q (3, 4), cuts the y-axis at a point P. Find the coordinates of P.

8. The height of a small box is 2cm and its volume $10cm^3$. If the height of a similar box is 6cm, what is its volume?

9. The points: A, B, and C and D are on the circumference of a circle of centre O and $\angle ADC = 30^0$. Find the values of the marked angles *a* and *b*. *(4 marks)*

10. Solve the equation $x = \dfrac{15 - x^2}{2}$ *(4 marks)*

SECTION B

11. Shown below are marks obtained by 50 candidates in a certain S.4 mathematics mock examination.

25	30	29	60	72	59	40	40	62	70
40	39	62	65	40	59	39	43	80	21
58	29	19	25	30	32	56	59	40	55
69	90	81	50	31	45	60	20	51	49
31	30	56	58	50	50	50	60	40	70

(i) Construct a grouped frequency table having class intervals of 10 marks, beginning with the 15-24 class group.
(ii) Use your grouped frequency table to calculate the mean mark of the mock examination.
(b) Represent the above mock results on a histogram and use it to estimate the mode.

12. (a) (i) Plot on a graph the triangle ABC whose vertices are (1, 1), (3, 2) and (2, 4) respectively.

(ii) On the same graph, enlarge the triangle ABC using (-1, -1) as the centre of enlargement and a scale factor of 2 to obtain its image $A^1 B^1 C^1$.
(iii) State the coordinates of $A^1 B^1 C^1$ the image of triangle ABC.

(b) Using your graph, find the area of the triangle ABC. Hence, determine the area of the triangle $A^1 B^1 C^1$.
(12 marks)

13. Using a pair of compasses and ruler only;
a) (i) Construct triangle ABC, such that $\overline{AB} = 10.0cm$, $\overline{BC} = 9.2cm$ $\angle ABC = 105^0$.
(i) Measure length AC
(b)(i) construct an inscribed circle of triangle ABC with center O
(ii) Measure the radius of the circle (12 marks)

14. A poultry farm has three units; A, B and C. unit A produces 30 trays of eggs and 20 broilers every month. Unit B produces 40 trays of eggs and 15 broilers and unit C, 35 trays of eggs and 10 broilers during the same period. If a tray of eggs costs Shs 3,000 and a broiler Shs 4,000.

a) (i) Represent the above information in matrix form of order 3 × 2 for the eggs and broilers.
(ii) Form a 2 × 1 cost matrix produced on the farm for the eggs and broilers.
(iii) Find the sales of the farm if all eggs and broilers were sold.
b) If the farm charges a 17% VAT, find the total income from the sales of the farm every month.

a) (i)

	eggs	broilers
A	30	20
B	40	15
C	35	10

15. (a) An FM radio commercial section charges fees for any radio announcements as follows; the first ten words Shs 5,000 and any additional word Shs 100 each. Find the total charge for the announcement below
"Mr. John Musoke, the chairman organizing committee of the wedding preparatory meetings of Mr. James Lima and Miss Vanessa Tukko announces the cancellation of the wedding meetings which were scheduled to begin on Wednesday, 11th August, 2004 at Kalori gardens, national theatre, Kampala. Any inconveniences caused are highly regretted. A new date and venue for the meetings will be announced later".

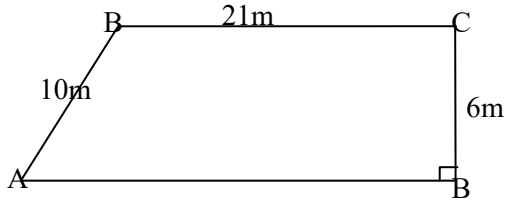
b) Mr. Ronald Anguyo bought a car at Shs 4,500,000. The car depreciates at a rate of 12% per annum. After 2 years, Ronald decided to sell the car to his friend at

25% less of the value of the car then. Find the price at which his friend bought the car.

16. At a graduation party, the guests are to be served with beer and soda. At least twice as many crates of beer as crates of soda are needed. A crate of beer contains 25 bottles and a crate of soda contains 24 bottles. More than 200 bottles of beer and soda are needed. A maximum of Shs 500,000 may be spent on beer and soda. Assume a crate of beer costs Shs 40,000 and that of the soda costs Shs 15,000.

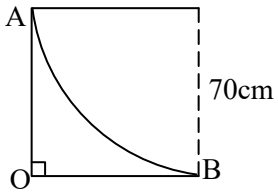
a) (i) Form inequalities to represent the above information.
(ii) Represent the above inequalities on the same axes.
(iii) By shading the unwanted region, represent the region satisfying the inequalities in (a) (i) above.
b) From your graph, find the number of crates of beer & soda that should be bought if the cost is to be as low as possible. Find the amount that was paid for these crates of beer and soda.

17.



The figure ABCD shows a plot of land in form of a trapezium. Lengths $\overline{BC} = 6\text{m}$, $\overline{CD} = 21\text{m}$ and $\overline{DA} = 10\text{m}$.
(a) Find the
(i) Length $\overline{AB}$ of the plot
(ii) Area of the plot. *(6 marks)*

(b) The diagram below shows road AO intersecting road OB at 90^0 at point O. the two roads are also connected to A and B by an arc-like shaped road measuring a quarter of a circle 70m in radius.



Find the distance saved by a motorist who goes through the arc-shaped road instead of going through AO and OB.

2006 PAPER TWO

SECTION A

1. Simplify (i) $1\frac{1}{4} + 2\frac{1}{2} - 1\frac{3}{4}$
(ii) $2\frac{1}{2} \times 3\frac{1}{3} \div 1\frac{5}{6}$ *(4 marks)*

2. Solve for x in $\frac{x^2}{2} = \frac{4}{x}$

3. An examination is marked out of 130 marks. If Rita obtained 60% in the examination, how many marks did she get out of 130?

4. Given that $p\{x, y\}: 2x - 3y \leq 6\}$ and $Q=\{x, y\}: x + y < 0\}$
Show by shading the unwanted region, the region representing $P \cap Q$. *(4 marks)*

5. Use logarithm tables to evaluate $\frac{22.60}{47.80 \times 0.329}$ correct to 2 decimal places.

6. Evaluate $5600 \div 80{,}000$, leaving your answer in the form $a \times 10^n$ where $1 \leq a < 10$ and n is an integer

7. In a home work marked out of 20, a group of pupils obtained the following marks:- 15, 20, 18, 17, 8, 18, 16, 20, 18, 17, 12 and 19. Find the mode and median marks.

8. Under an enlargement of scale factor 3, the image of the point P(0, 3) is $P^1(4, 5)$. Find the coordinates of the centre of enlargement.

9. Express $0.3\dot{8}$ as a fraction in its simplest form.

10. A fair die is tossed only once and the number which appears on its top face noted. What is the probability of a top face showing?
(i) A number greater than 4?
(ii) An odd number or prime number?

SECTION B

11. Draw graphs $y = 2x^2 + 3x - 3$ and $y - 7x + 3 = 0$ for $-3 \leq x \leq 3$ using a scale of 1cm: 2 units for the vertical axis and 1cm: 0.5 units for the horizontal axis. Using your graph find the

(a) Point of intersection of the line and the curve.
(b) Gradient of the curve between the points of intersection of the line and the curve.

12(a) At a certain point on the level ground the angle of elevation of the top of a tower T is $28^{0.}$ At another point 100 metres away from the first point, the angle of elevation is 35^0. Find the two expressions for the height of the tower, hence find the height of the tower and give your answer to the nearest metre.

b) If $\cos x = -0.634$ for $90^0 < x < 270^0$, find the two possible values of x. *(5 marks)*

13. A helicopter left Kampala at 06:00 hours and flew on a bearing of 090^0, at a velocity of 300 kmh^{-1}. It landed at Nairobi Airport at 08 30 hours. At exactly 09 00 hours, it left Nairobi Airport and flew on a bearing of 340^0 at the same original velocity. It then landed at Kitgum Airstrip at 12 00 hours. Using graphical construction and a scale of 1cm: 100km, find the

a) Distance of Kitgum from Kampala.
b) Bearing of Kampala from Kitgum.

14. Two cars A and B start off from rest at the same time moving in the same direction on a straight road. The speeds of the two cars in ms^{-1} are shown in the table below.

t(s)	0	2	4	6	8	10	12
Speed of car A(ms^{-1})	0	4.5	9.0	13.5	18.0	22.5	27.0
Speed of car B(ms^{-1})	0	2.0	5.0	10.5	23.0	27.0	28.5

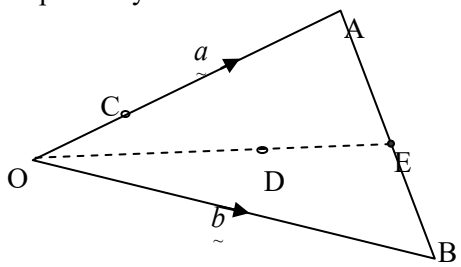
Using a suitable scale, draw on the same axes the velocity-time graphs of cars A and B. From your graph find the

a) Time taken when the two cars have equal speed and the magnitude of that speed.

b) Different in speed after a period of 9 seconds.

c) Distance covered by car A by way of estimating the area under the curve described by car A for the 12 seconds.

15. OAB is a triangle, OA= $\underset{\sim}{a}$, and OB = $\underset{\sim}{b}$. Points C and E are points on lines $\overline{OA}$ and $\overline{AB}$ such that they divide the lines $\overline{OA}$ and $\overline{AB}$ in the ratios 1:2 and 3:1 respectively. Point D lies on OE such that $\overline{OD} = 2\overline{DE}$.



a) Find the vectors **AB** and **CB** in terms of vectors $\underset{\sim}{a}$ and $\underset{\sim}{b}$.

b) Show that the points B, D and C lie on a straight line.

16. A man earns a gross annual income of Shs 10,500,000. He is entitled to the following monthly allowances.

Children	Shs 15,000 for each child aged 12 and below. Shs 12,000 for each child between age 15 and 18 inclusive.
Lunch	Shs 60,000
Transport	Shs 110,000
Medical	$\frac{1^{th}}{10}$ of gross monthly income.
Marriage	$\frac{1^{th}}{25}$ of gross monthly income.
Housing	$\frac{1^{th}}{100}$ of gross annual income.

The man is married with five children of whom two are aged 12 and below, the other two aged 21 and 24 and the other aged 17. The following tax structure is applicable on the taxable income in excess of Shs 30,000.

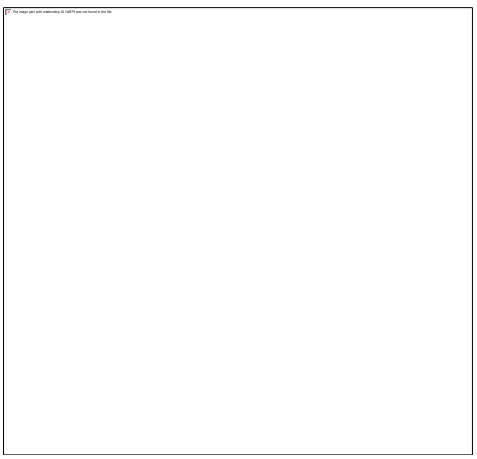
Taxable income (Shs)	Rate (% ages)
00001–30,000	Free
30,001–130,000	8.0
130,001–260,000	14.5
260,001–380,000	23.0
380,001– 490,000	28.5
490,001– 590,000	35.0
590,001 and above	42.5

(NB: A month has 30 days and a year 360 days)
Calculate:

a) The man's (i) Total monthly allowance
(ii) Monthly taxable income
(iii) Monthly income tax

b) The percentage of his gross annual income that goes to tax. *(12 marks)*

17.



The figure above (in thick, heavy lines) shows a lampshed ABCD bounded by circles of radii 15cm and 25cm. The slanting side AB is 30cm. If the lampshed was cut from an original figure OABCD, of a complete cone, calculate the;

a) (i) Slanting length of the cone OAB.
(ii)The angle formed by producing CD and BA to O.
b) (i) Vertical height of the lampshed.

(ii) Volume of the lampshed. (*12 marks*)

2007 PAPER ONE
SECTION A

1. Express $2.\dot{3}\dot{6}$ as improper fraction in its simplest form.

2. If $a=14, b=8$ and $\frac{a}{c}+\frac{a-1}{2c}=b,$ find the value of C.

3. A line is given by the equation $45-15x+3y=0$ Find the co-ordinates of its x – intercept.

4. Given that $f(x)=2x+4$ and $g(x)=x+5$, find $fg(x)$. Hence evaluate $fg(4)$.

5. Expand the expression: $a\left(1-\frac{ax}{2}\right)^2$

6. A butcher sells 5Kg of meat at she 10,000. If the cost of meat is increased by 20%, find the weight of meat which can be bought at shs3,600.

7. The data given below represents the ages in years of 30 Senior four students of a certain school:

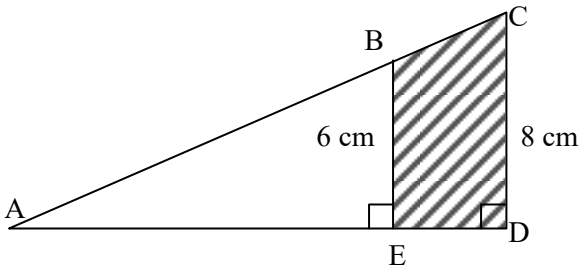
Ages	15-17	18-20	21-23	24-26
Number of students	7	11	9	3

Use the table above to draw a histogram and state the modal class.

8. Triangle ABC with vertices A(0, 0), B(1, 0) and C(1,1) underwent two transformations represented by T_2T_1. If T_1 is a translation represented by $\begin{pmatrix}2\\3\end{pmatrix}$ and T_2 is a reflection in the x-axis, find the co-ordinates of the final image of the triangle.

9. Given $A=\begin{pmatrix}1 & 2\\3 & 4\end{pmatrix}$ and $B=\begin{pmatrix}-1 & -2\\0 & 1\end{pmatrix}$, evaluate $(A+B)^2$

10. Study the diagram below



If AD=12, find the area of the shaded region.

SECTION B

11 (a) Given that $\frac{1}{3x-4}+\frac{x}{x+1}=1,$ solve for x.

(b) Solve the simultaneous equations

$x^2 + 4y^2 = 4$

$y = x - 1$

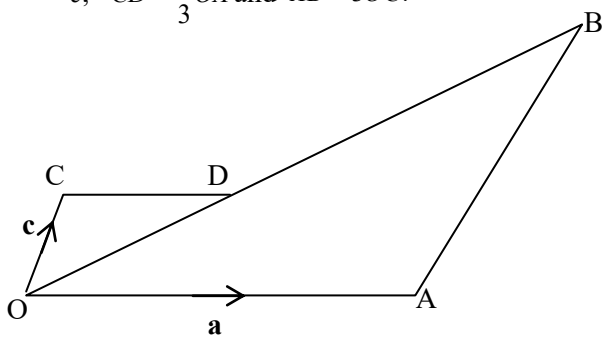
12. Using a pencil, a ruler and a pair of compasses only, construct a triangle ABC in which AB = 9.2cm, angle CAB= 45^0 and angle ABC=75^0

(a) Measure the length of BC

(b) Draw a circumscribing circle through the points A, B and C.

(c) Measure the radius of the circle.

13.(a) In the figure below, vectors **OA** = **a** and **OC** = *c*, $\overline{CD} = \frac{1}{3}\overline{OA}$ and $\overline{AB} = 3\overline{OC}$.



(i) By expressing vectors in terms of **a** and **c**, Find **OD, AB** and **OB**.

(ii) Show that points O, D and B are collinear.

(b) Points A and B have co-ordinates (0,-1) and (-6, &) respectively.
Find:

(i) **AB**

(ii) the magnitude of **AB**

14. In a certain school, a simple of 100 students was picked randomly. In this sample, it was found out that 78 students play Netball (N) 82, play Volleyball (V), 53 play tennis (T) and 2 do not play any of the three games. All those that play tennis also play Volleyball. 48 play all the three games.

(a) Represent the given information on a Venn diagram.

(b) How many students play both Netball and Volleyball but not Tennis?

(c) If a student is picked at random from the sample, what is the probability that the student plays two games only?

15 (a) Draw a table showing the values of Sin $2\theta for 0^0 \le \theta \le 90^0$, using values of θ at intervals of 15^0

(b) Use the table in (a) above, a horizontal scale of 2cm for 15^0 and a vertical scale of 2cm for 0.5units to draw a graph of sin 2θ.

(c) From the graph, find the values of Θ for which sin $2\Theta = 0.6$

16. A manager of an industry earns a gross salary of Shs2,000,000 per month, which includes an allowance of Shs500,000 tax free. The rest of her income is subjected to an income tax which is calculated as follows:

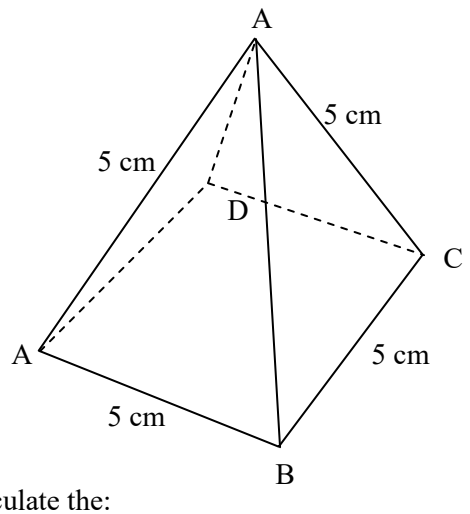
7.5% on the first Shs 800,000
12.5% on the next Shs 500,000
20% on the next Shs 100,000
30% on the next Shs 60,000
35% on the remainder.

(a) Find her taxable income.

(b) Calculate her monthly income tax.

(c) Express her monthly income tax as a percentage of her monthly gross salary.

17. In the figure below, ABCDH is a right pyramid on a square base ABCD of side 5m. Each of the slanting edges is 5m.



Calculate the:

(a) height of the pyramid, correct to two decimal places.

(b) angle between the plane HBC and the base.

(c) Volume of the pyramid, correct to one decimal place.

2007 PAPER 2
SECTION A

1. If $a * b = \frac{a}{b} + \frac{b}{a}$, evaluate $\frac{1}{2} * \frac{2}{3}$

2. Make C the subject from the expression: $a = b - \left(\sqrt{b^2 + c^2}\right)^2$

3. the point R(10,7) is reflected in the line y = x to given point S. Given that M is the mid-point of RS. Find the co-ordinates of M.

4. Find the area of a triangle whose sides are 13cm, 24cm and 13cm.

5. Given the sets:
A = {All natural numbers less than 30}
B = {All prime numbers between 10 and 30}
Find (a) n(A∩B')
(b) n(A'∩B)
Where B^1 stands for the complement of the set B.

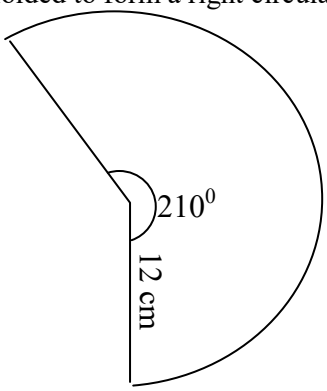
6. If $\begin{pmatrix} 2 & 4 \\ -3 & 3 \end{pmatrix} + k\begin{pmatrix} 3 & 1 \\ 0 & n \end{pmatrix} = \begin{pmatrix} 8 & 6 \\ -3 & -1 \end{pmatrix}$,
find the values of k and n

7. Use the prime factor method to find the cube root of 3375.

8. In a Revenue Authority Department, the tax earned income is calculated as follows:
The first shs120,000 is tax free and the remaining income is taxed at 25%. Find the tax payable on an earned income of:
(a) Shs100,000
(b) Shs440,000

9. Given that V is inversely proportional to t^2 and $V = 25$ when $t = 2$ find V when $t = 5$.

10. The figure below shows a net of a cone which can be folded to form a right circular cone.



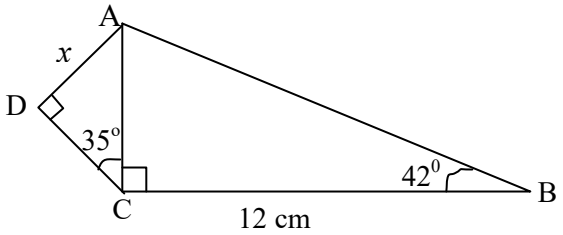
Calculate the radius of the cone formed.

SECTION B

11. (a) Given that $212_n = 25_{nine}$, find the base that n represents.

(b) A positive integer r is such that $Pr^2 = 168$, where p is such that $3 \le p \le 5$. Find the integral values of r.

12.(a) Find the length marked x in the diagram x in the diagram below correct to two significant figures.



(b) A dog tied a silk rope 4.5m long is tethered to a tree stamp 2.5m from a straight path. For what distance along the path is one in danger of being bitten by the dog?

13. By shading the unwanted regions, show the region which satisfies the inequalities.
$x + y \le 3$
$y > x - 4$
$y + 7x \ge -4$
Find the area of the wanted region.

14. The table below show the weight in Kilograms of 28 children sampled in a Primary School:

Weight(kg)	Number of children
15-19	2
20-24	4
25-29	7
30-34	3
35-39	5
40-44	6
45-49	1

(a) State the modal class
(b) Calculate the cumulative frequency and
(i) hence, estimate the median weight correct to one decimal place,
(ii) Calculate the mean weight of the children
(iii) find the probability that a child selected at random from the school weighs 40kg and above.

15. (a) Musa is a businessman who deals in an agricultural produce business. Visited four markets in a certain week:
In market A he bought 3 bags of beans, 5 bags of maize, 10 bags of potatoes and 3 bags of millet,
In Market B, he bought 1 bag of beans, 4 bags of potatoes and 2 bags of millet,
In market C he bought 5 bags of beans, 1 bag of maize,
In market D he bought 4 bags of beans, 3 bags of maize, 6 bags of potatoes and 1 bag of millet. He bought eash bag of beans at Shs 45,000, a bag of maize at Shs30,000, a bag of potatoes at shs 15,000 and a bag of millet at Shs 50,000. He later sold all the produce he had bought at shs 50,000 per bag of beans, Shs35,000 per bag of maize,

shs18,000 per bag of potatoes and shs55,000 per bag of millet.

(a) Form a 4 × 4 matrix to show the produce Musa bought from the four markets.

(b)(i) Form a cost matrix for the price of the produce,

(ii) By matrix multiplication, find the amount of money spent on the produce in each market.

(c) Find also the amount of money he got from the sale of the produce.

(d) Find Musa's profit.

16. Town A is 170Km from town B. A Tata lorry left town B for town A at 8:25am and travelled at a steady speed of 40kmh^{-1}. A saloon car left town A for town B at 8:55am. And travelled at a steady speed of 80kmh^{-1}.

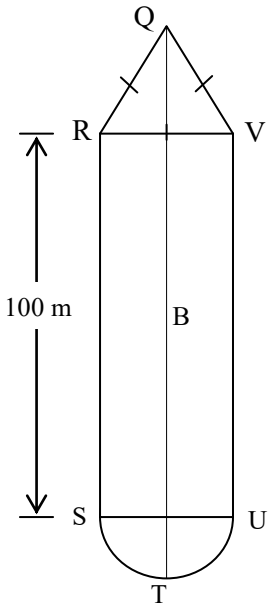
(a) Calculate the:

(i) distance from town A to the point at which the two vehicles met.

(ii) time at which the two vehicles met.

(b) Just as they met, the Tata lorry driver increased the speed by 10kmh^{-1}. Find the difference in their times of arrival at their destinations.

17. The figure QRSTUV below, is a plan of Mr. Rukidi's farm. The area marked A is in form of an equilateral triangle, area B is rectangular and C is a semi-circle. $\overline{RQ} = 14m \text{ and } \overline{RS} = 100m$



Find the:

(a) length $\overline{QT}$ which divides the farm into two equal parts,

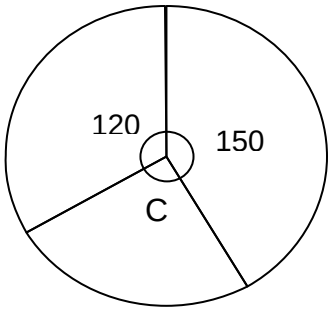
(b) area of the farm

(c) length of barbed wire required to fence Rukidi's farm.

2008 PAPER ONE
SECTION A

1. Find the Lowest Common Multiple (LCM) and the Highest Common Factor (HCF) of 54 and 84.

2. The pie-chart represents yields of beans from three fields A, B and C.

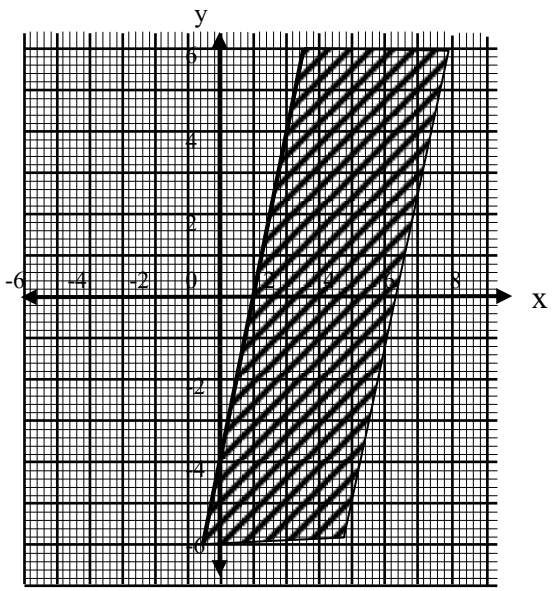


If the total yield of beans was 300 sacks, calculate the number of sacks got from field C.

3. Express $2\log_3 18 + \log_3 3^{-1} - \log_3 6^2 + 1$ as a single logarithm $\log_3 Q$. (04 marks)

4. Given that $\mathbf{P} = \begin{pmatrix} 3 & 1 \\ -1 & 3 \end{pmatrix}$, find a matrix $\mathbf{P}^{-1}$ such that $\mathbf{PP}^{-1} = \mathbf{I}$ where **I** is the identity matrix of order 2.

5. Study the graph below:



Find the inequality representing the shaded region.

6. Evaluate $\left(\frac{16}{81}\right)^{\frac{-3}{4}}$

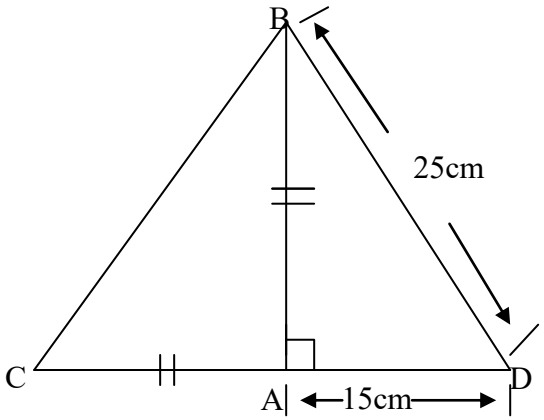
7. Solve for *w*: $\frac{1}{5}(w+6) - \frac{1}{15}(2w-5) = \frac{1}{3}(1-w)$

8. Given that f(x) = 2x – 5, find

(a) f(-2)

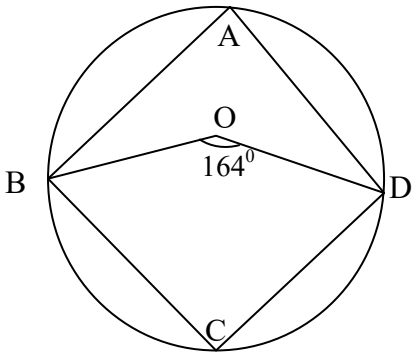
(b) $f^{-1}(x)$

9. In the triangle BCD, AD=15cm, BD = 25cm, AB = AC and AB is perpendicular to CD.



Find the length of CB correct to **one** decimal place.

10. In the diagram below O is the centre of the circle and angle BOD = 164^0



Find

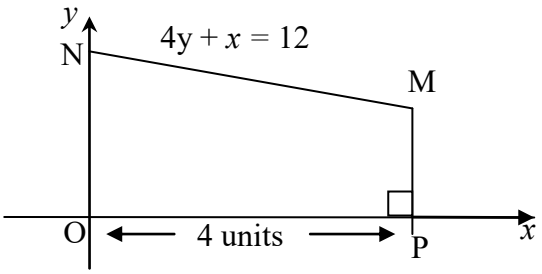
(a) angle BAD

(b) angle BCD (04 marks)

SECTION B

11. (a) The points (-1, *q*) and (*r*, 2) lie on the line y = 2 – *x*. Find the values of *q* and *r*.

(b) In the figure below, P is 4 units from O. the equation of the line MN is $4y + x = 12$.



Find the area of OPMN.

12 (a) Adikini bought a television set for which the cash price was shs:599,000. she bought the television set on a hire purchase scheme and had to pay an extra shs:71,000. if shs made eight equal monthly instalments, how much did she pay per month? (04 marks)

(b) musaka wants to buy a house which is priced at shs: 56,000,000. a deposit of 25% of the value of the house is required. A bank will lend him the rest of the money at a compound interest of 15% per annum and payable after two years. Calculate the:

(i) deposit musaka must make.

(ii) Amount of money musaka will have to pay the bank after two years.

(iii) Total money which musaka will spend to buy the house.

13. A club held swimming tests in Crawl (C), Backstroke (B) and Driving (D) for 72 members. Those who passed Crawl were 49, 30 passed Backstroke and 30 passed Driving. 5 passed Crawl and Backstroke but not Diving. 4 passed Backstroke and Diving but not Crawl. 6 passed Crawl and Diving but not Backstroke. 14 passed all the three tests.

(a) draw a venn diagram to represent the given information.

(b) use the venn diagram to find the members who:

(i) Passed the Crawl test only.

(ii) Did not pass any test.

(c) If a member is picked at random, what is the probability that the member passed two tests only?

14. Given that the points A has co – ordinates (-8,6).

Vectors AB = $\begin{pmatrix} 12 \\ 4 \end{pmatrix}$ and M is the mid – point of AB.

(a) Find the

(i) column vectors AM.

(ii) co – ordinates of M

(iii) magnitude of OM.

15. (a) a unit square whose vertices are O(0,0), i(1,0), j(0,1) and k(1,1) is transformed by rotating through a positive quarter trun about the origin. Find the matrix for this transformation.

(b) given T = $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ and

M = $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$, find the:

(i) image of the points A(0,3) and B(5,3) under the transformation TM. (04 marks)

(ii) matrix of transformation which will map the images of A and B back to their original positions.

16.(a) Copy and complete the table below for the equation $y = 2x^2 - 3x - 7$

x	-1½	-1	-½	0	½
$2x^2$		2		0	
$-3x$		3		0	
-7		-7		-7	
y		-2		-7	

1	1 ½	2	2 ½	3

(b) Plot the points (x, y) obtained from the completed table on a graph paper using 2 cm to represent 1 unit on the x – axis and 1 cm to represent 1 unit on the y – axis. Hence draw a graph for $y = 2x^2 - 3x - 7$.

(c) Use your graph to solve the equation
$2x^2 - 3x - 8 = 0$

17. (a) The dimensions of a rectangle are 60 cm by 45 cm. if the length and width are each reduced by 10%, calculate the percentage decrease in area.

(b) A container has a volume of 6400 cm^3 and a surface area of 8000 cm^2. find the surface area of a similar container which has a volume of 2700 cm^3.

2008 PAPER TWO

SECTION A:

Simplify: $\dfrac{1\frac{1}{2} - \left(8\frac{1}{3} \div 2\frac{1}{2}\right)}{1\frac{1}{5} \ of \left(1\frac{1}{4} + 1\frac{2}{3}\right)}$

2. Factorise completely:
$2p^2q^3 - pq^3 + pq - 2p^2q$

3. Simplify $\dfrac{3\times10^{-13}\times\left(6\times10^{5}\right)^2}{80}$. Give your answer in standard form.

4. Given the vectors **QR** = $\begin{pmatrix}2\\4\end{pmatrix}$, **ST** = $\begin{pmatrix}1\\6\end{pmatrix}$ and **SR** = $\begin{pmatrix}-4\\3\end{pmatrix}$, find the vector **QT**.

5. If $\dfrac{4^x \times 2^y}{2^{x+2y}} = 2^p$, express p in terms of x and y.

6. Given that D = {All odd numbers less than 20} and M= {All multiples of three less than 20}, find n(D∩M).

7. Find the equation of the line of gradient $\dfrac{-3}{5}$ and passing through the point (3, 4).

8. A farm is on a piece of land whose area is 5.6km^2. What would be the area of this farm in cm^2 on a map whose scale is 1: 40,000?

9. A forex Bureau buys one US dollar at Ug.shs 1,900 and sells one pound sterling at Ug.shs3, 450. Atim wants to exchange 3,000 US dollars to pound sterlings. How many pound sterlings will she get?

10. Two points A (5, 1) and B(6, 0) are given a transformation defined by the matrix $\begin{pmatrix}3 & 1\\1 & 0\end{pmatrix}$. Find the Co-ordinates of their images.

SECTION B

11.(a) A man gave half of his welfare allowance to his wife, $1/5$ to each of his two sons and the rest to his daughter.

Find

(i) the fraction given to the daughter.

(ii) his welfare allowance if each son was given shs: 16,000.

(b) The difference between the values of y when x = 10 is 16. Given that y is inversely proportional to the square of x, find the equation relating x and y.

12. The table below shows the weights in kilogrammes of thirty pupils.

48	44	32	52	54	44
53	38	37	35	53	46
59	51	32	37	49	42
48	59	52	40	54	46
45	62	35	54	48	35

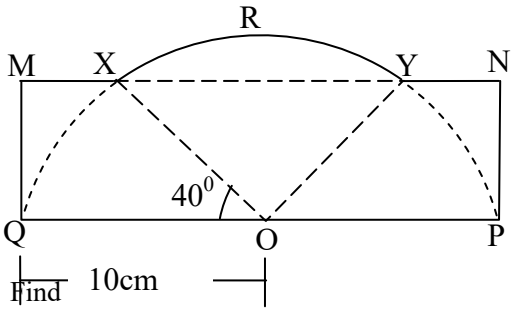
(a) Construct a frequency table with a class width of 5 starting from the class of 30 – 34. (b) Use table in (a) to: (i) Estimate the mean weight of the pupils. (ii) Draw a histogram and use it to estimate the modal weight of the pupils.

13. Four students; Kale, Linda, Musa and Naana went to a stationary shop.
Kale bought 4pens, 6 counter books and 1 graph book.
Linda bought 10pens and 5 counter books.
Musa bought 3 pens and 3 graph books.
Naana bought 5 pens, 2 counter books and 8 graph books.
The costs of a pen, a counter book and a graph were shs: 400, shs: 1,200 and shs: 1,000 respectively.
(a)(i) Write a 4 × 3 matrix for the items bought by the four students.
(ii) Write a 3 × 1 matrix for the costs of each item.
(b) Use the matrices in (a) to calculate the amount of money spent by the each student.
(c) If each student was to buy 4 pens, 10 counter books and 6 graph books, how much money would be spent by all the four students?

14.(a) The lines $ax + 2y = 3$ and $ax - by = 5$ intersect at (1, 2). Find a and b.

(b) If $\begin{pmatrix} 4 & 1 \\ x & -1 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 4 \\ 8 \end{pmatrix}$, determine the values of x and y. (07 marks)

15. In the figure below, QXRYP is a semi-circle with centre O and radius 10cm. MN is parallel to the diameter QP. Angle $XOQ = 40^0$.

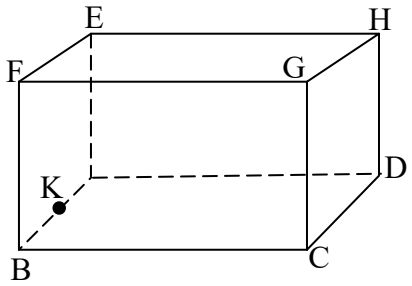


Find
(a) length of:
(i) the arc XRY. [take $\pi = 3.14$]
(ii) MQ
(iii) MX (09 *marks*)
(b) Perimeter of the given figure

16. A school constructed an office block which required 34 tonnes of sand. The school hired a lorry and a tipper truck with capacities of 7 tonnes and 5 tonnes respectively to transport the sand. The cost per trip either by lorry or by tipper truck was shs: 30,000. The money available for transportation was shs: 180,000. The trips made by the lorry did not exceed those made by the tipper truck.

(a) If x and y represent the number of trips made by the lorry and the tipper truck respectively.
(i) Write down **five** inequalities to represent the given information. (04 marks)
(ii) Plot these inequalities on the same axes, shading the unwanted regions. (05 marks)
(b)(i) From your graph in (a)(ii)above, list all the possible numbers of trips, that each vehicle can make so as to maximise the total tonnage of sand transported.
(ii) Find the number of trips by each vehicle that made the greatest total tonnage. (03 marks)

17. The figure below shows a cuboid ABCDEFGH in which BC = 8cm, BF= 6cm and CD = 5 cm. K is the mid-point of AB.



Find the:
(a) (i) length AG.
(ii) Angle which AG makes with the planes ABCD. (08 marks)
(b) angle between planes KGH and FGHE.

2009 PAPER ONE

SECTION A

1. use factors to evaluate

$617 \times 793 + 786 \times 793 + 597 \times 793$

2. Determine the solution of the inequality

$x^2 - x - 6 < 0$

3. Given that $\log p = 2.476$ and $\log q = \bar{1}.811$, find $\log\left(\frac{p}{q^2}\right)$

4. Solve for p in the equation $\frac{4p-1}{3} - \frac{3p-1}{2} = \frac{5-2p}{4}$

5. Find g(3) given that $g^{-1}(x) = \frac{x+1}{x}$

6. Evaluate $\frac{(y^2)^{\frac{1}{6}}}{(9x)^{\frac{1}{2}}}$ when $x = 16$ and $y = 8$

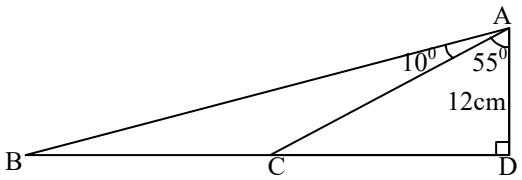
7. Given the matrix $A = \begin{pmatrix} 2 & 3 \\ 5 & 7 \end{pmatrix}$, find a matrix ***B*** such that $A + B = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

8. The table below shows the number of goals scored by a team in a series of football matches.

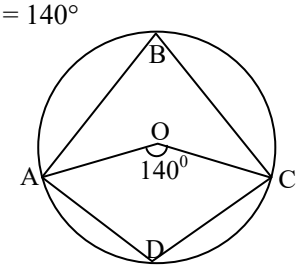
Number of goals	1	2	3	4	5
Number of matches	3	4	1	x	2

If the mean number of goals is 3, find x

9. Find the length of BC in the diagram below



10. In the figure below, O is the centre of the circle and angle $AOC = 140°$



Find: (i) angle ABC
(ii) angle ADC

SECTION B

11 A group of 55 students were asked if they liked the food; Matooke (M), Posho (P) or Rice (R). 19 liked Matooke, 24 liked Posho and 25 liked Rice. 3 liked Matooke and Rice only. None of the students liked Matooke and Posho only. 4 students disliked all the foods.

a) Represent the given information on a Venn diagram.

b) Find the umber of students who liked:

(i) all the three types of food
(ii) Matooke only
(iii) Posho only
(iv) Rice only

c) Find the probability that a student selected at random from the group liked only one of the foods

12. Triangle ABC with vertices A(2, 1), B(4, 4) and C(2, 4) is reflected in the line is reflected in the line is reflected in the line $y = 0$ to get triangle A'B'C'. Triangle A'B'C' is then given a negative quarter turn about the origin to get triangle A"B"C"

a) i) Draw the three triangle on the same graph paper
ii) Write down the coordinates of A'B'C' and A"B"C"

b) Use your graph to describe fully the transformation which maps A"B"C" back onto ABC

13. a) Given the points P(2, 4) and Q(−4, 8), find the

(i) Coordinates of the midpoint of the line segment $\overline{PQ}$

(ii) Equation of the line with gradient $\frac{3}{2}$ passing through the midpoint of $\overline{PQ}$

b) Find the coordinates of the point of intersection of the line $y - 5x = 2$ and the curve $y = 2x^2 + 5$

14. A motor company had an advertisement as shown below:

EASY TERMS ON SALOON CARS
MADE IN JAPAN

CASH: SHS. 8.5 MILLION
CASH DISCOUNT: 8% OF THE CASH VALUE

HIRE PURCHASE: DEPOSIT 60% OF THE VALUE AND PAY 7 MILLION PER MONTH FOR 3 MONTHS

a) Calculate the saving Chris would make if he bought the vehicle by paying cash rather than by hire purchase.

b) Chris bought the vehicle by hire purchase and then sold it at 35 million after one year. Find the percentage loss he made

15. a) Copy and complete the table below

x	-2.0	-1.5	-1.0	-0.5	0	0.5	1	1.5	2	2.5	3
$2x^2$	-8		-2	-0.5	0		-2	-4.5	-8		-18
$3x$	-6		-3	-1.5	0		3	4.5	6		9
6	6	6	6	6	6	6	6	6	6	6	6
y	-8		1	4	6		7	6	4		-3

b)i) Use the completed table in (a) above to draw a graph of $y = 6 + 3x - 2x^2$ for values of x for $-1 \le x \le 3$.

Use 2 cm to represent one unit on the x-axis and 1 cm to represent one unit on the y-axes

ii) On the same axes, draw a line whose equation is $y = 2x$

c) Use the graph in (b) above to solve the equation $6 + x - 2x^2 = 0$

16. Given the vectors $\boldsymbol{a}$ = , $\boldsymbol{b} = \begin{pmatrix} 8 \\ 11 \end{pmatrix}$ and $\boldsymbol{c} = \begin{pmatrix} 4 \\ -5 \end{pmatrix}$, find:

(i) $\boldsymbol{a} + 2\,\boldsymbol{b} + \boldsymbol{c}$.

(ii) the length of $\boldsymbol{a} + 2\,\boldsymbol{b} + \boldsymbol{c}$.

(b) the position vectors of D and E are $\begin{pmatrix} 6 \\ 4 \end{pmatrix}$ and $\begin{pmatrix} 12 \\ -11 \end{pmatrix}$ respectively. M is on $\overline{DE}$ such that $\overline{DM} : \overline{DE}$ = 2:3. Find:

(i) DE
(ii) DM,
(iii) The position vectors of M

17. A rectangle of length $(4x - 1)$ cm and breadth $2x$ cm has an area of 10cm^2.
Find:

a) the value of x
b) its length and breadth
c) its perimeter

2009 PAPER TWO

SECTION A

1. Simplify $\dfrac{3\frac{1}{6} + 1\frac{2}{3}}{\frac{2}{3} \times \frac{5}{12}}$ **(04 marks)**

2. Find the equation of a line which passes through the point (0,5) and is parallel to the line $3x - y = 7$ (04 marks)

3. Given $A = 2\pi\sqrt{\dfrac{C}{B}}$

(i) express B in terms of A, π , and C
(ii) find the value of B if C= 240, π = 3.14 and A = 12.56 (04 marks)

(ii) Substituting for C = 240, π = 3.14 and A = 12.56, we have

$$B = \frac{4 \times 240 \times (3.14)^2}{(12.56)^2} = 60$$

4. If set F = {All factors of 12} and set T = {All triangle numbers less than 20}
F = {1, 2, 3, 4, 6, 12}}
Find the members of F $\cap$ T. Hence find n(F $\cap$ T).

5. Factorise completely $2ab - 3 + 2a - 3b$ (04 *marks*)

6. A translation T maps A (−2, 3) onto A^{I} (−6, 10). Find the image B^{I} of B(5,4) under the translation T

7. Express $\dfrac{1}{\sqrt{5} - \sqrt{2}}$ with a rational denominator

8. The price of an article is shs 24,000. If a discount of 12% is given, calculate the selling price of the article (04 marks)

9. Given that **OA** = $\begin{pmatrix} -2 \\ 2 \end{pmatrix}$, **OB** = $\begin{pmatrix} 8 \\ 4 \end{pmatrix}$ and M is a point on $\overline{AB}$ such that $\overline{AM} : \overline{MB} = 1:1$ find;

(i) **AB**
(ii) **AM** **(05 marks)**

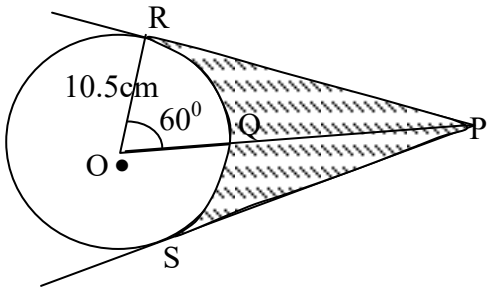
10. If an area of 4cm2 on a map represents an area of 576km2 on land, find the Representative Fraction (R.F) of the map? (04 marks)

SECTION B

11. (a) The ages of Lacor and Nankya are in the ratio 4 : 1.After 6 years, the ratio of their ages will be5 : 2. Find their present ages. (06 marks)

(b) Ouma takes 20 days to plough a garden. Mukasa takes 30 days to plough the same garden. How long will it take the two men to plough the garden if they worked together?

12.The diagram below shows a circle with centre O and radius 10.5 cm. Two tangents PR and PS are drawn from a point outside the circle .Angle POR = 600 and PO = intersects the circle at Q



Calculate the:
(a) lengths ot the tangents (04 marks)
(b) area bounded by the tangents and the arc SQR.

$\left(Use\ \pi = \frac{22}{7}\right)$ (08 marks)

13. Agroup of students obtained the following marks in a Maths test.

28 35 94 78 70 56 57
58 60 76 77 62 84 66
67 68 69 70 51 64 73
74 75 61 62 54 80 83
88 90 41 47 64 70 75

(a) (i) Form a grouped frequency table for the data starting from the Class 20−29. (09 marks)

(ii) Represent the marks obtained in the Maths test on a bar chart (03 marks)

14. (a) Solve the following simultaneous equations

$x - 2y = 12$
$x = 12 + 2y$ (05 marks)

(b) In a certain supermarket, a school bag costs **b** shillings and a pair of shoes costs S shillings. Kato bought 3 school bags and 2 pairs of shoes at shs 103,00 and Atim bought 5 school bags and 1 pair of shoes at shs 132,000.
Find the cost of:
(i) a school bag
(ii) a pair of shoes (07 marks)

15. A bicycle factory assmbles two types of bicycles; Roadmaster and Hero on different assembly lines. An assembly line for Roadmaster occupies an area of $60m^2$ and that of Hero occupies an area of $30m^2$ of the floor space. The floor space available for all the assembly lines is $420m^2$. The assembly line for Roadmaster needs 10 men to operate it and that of Hero needs 16men to operate it. The assembly lines need a maximum of 120 men to operate them

(a) if x and y represents the number of assembly lines for Roadmaster and Hero respectively

(i) form **four** inequalites to represent the given information

(ii) draw graphs on the same axes to represent the inequalities in (i) a bove. Shade the unwanted regions (04 marks)

(b) The assembly line for Roadmaster produces 30 bicycles per day and that of Hero produces 20 bicycles per day. Find the:

(i) number of assemly lines for each type of bicycle that should be operated so as to produce the highest total number of bicycles per day

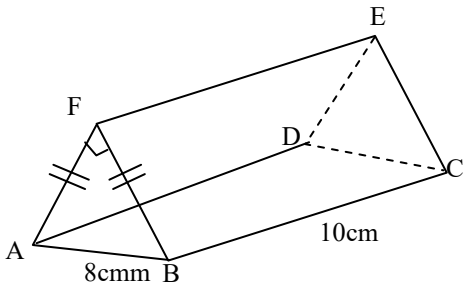
(ii) highest total number of bicycles that can be produced per day.

16. (a) Find the values of x and y given that:

$$\begin{pmatrix}1 & 3 & 2\end{pmatrix}\begin{pmatrix}4 & 3\\ x & 2\\ 10 & y\end{pmatrix} = \begin{pmatrix}39 & 25\end{pmatrix}$$

(b) Given that matrix P = $\begin{pmatrix}2 & -2\\ -3 & 4\end{pmatrix}$, find a matrix ***Q*** such that $PQ = \begin{pmatrix}2 & 0\\ 0 & 2\end{pmatrix}$.Hence find the inverse of matrix ***P.***

17. The figure below shows a prism ABCD with an isosceles right- angled triangle as the cross- section and a horizontal rectangular base ABCD.



Calculate the
(a) Lengths of
(i) AF
(ii) BE (05 marks)
(b) angle between BE and the base ABCD (05 marks)
(c) Volume of the Prism (02 marks)

2010 PAPER ONE

SECTION A

1. If $125_n = 82_{ten}$, find n.

2. In a group of 29 girls, 22 liked Rice (R) and 18 liked Matooke (M). All the students liked **at least one** of the foods. How many liked both?

3. Solve the inequality: $10 - 3x < 4(x - 1)$.

4. Without using mathematical tables or a calculator, evaluate: $\dfrac{21.35 \times 41.35 - 21.35^2}{0.02}$

5. Two quantities y and x are related by the equation $y = a + bx$. When $y = 4$, $x = 2$ and when $y = 6$, $x = 4$. Find the values of a and b.

6. Given that $\sin\alpha = \dfrac{3}{5}$ and α is obtuse, without using mathematical tables or calculator, find the values of $\cos\alpha$ and $\tan\alpha$.

7. A shopkeeper bought an item at Shs5,500 and sold it at 30% more than the buying price. Find the shopkeeper's:
(a) selling price,
(b) profit.

8. Given the matrix $P = \begin{pmatrix} -5 & 6 \\ -2 & 2 \end{pmatrix}$, find P^2.

9. Use tables or logarithms to evaluate:
$$\frac{0.0875 \times 0.0243}{0.003142}$$

10. Solve the following pairs of simultaneous equations
$5x - 9y = 1$
$4y - 2 = x$

SECTION B

11. The following table shows marks obtained by 40 pupils in a Mathematics test.

11	17	35	34	42	45	28	46
16	21	14	36	41	31	49	37
20	33	37	38	18	38	39	27
26	28	40	33	43	32	29	47
29	32	41	24	44	35	36	23

(a) Draw a frequency distribution table for marks starting with a class of 10 – 14.
(b) State the
i. class interval,
ii. modal class.
(c) Calculate the:
i. mean mark,
ii. median mark.

12.(a)(i) Determine the range corresponding to the domain {-3, -2, 0, 1, 3, 4} for the mapping $x \longrightarrow x^2 + 1$
(ii) Represent the mapping in (i) on an arrow diagram.
(b) Given the functions $h(x) = x + 2$, $g(x) = x^2$ and $f(x) = -x$; find the values of x for which $g[h(x)] = f(x)$.

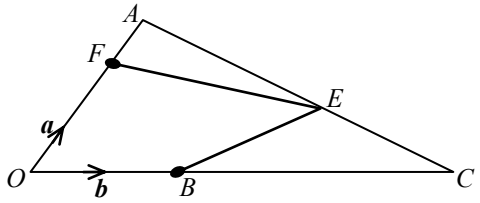
13. A triangle with vertices $A(2, 4)$, $B(6, 4)$ and $C(1, 6)$, undergoes two successive transformations P_1 and P_2. The transformation P_1 is represented by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ and P2 by matrix $\begin{pmatrix} 0.5 & 0 \\ 0 & 0.5 \end{pmatrix}$.
(a) Find the coordinates of the vertices of:
(i) triangle A'B'C' the image of ABC under P_1,
(ii) triangle A"B"C" the image of A'B'C' under P_2
(b) Show on the same axes the three triangles ABC, $A'B'C'$ and $A''B''C''$
(c) Use your graph in (b) above to describe fully the transformations represented by
(i) P_1 (ii) P_2

14. (a) A student had his photograph of dimensions 30cm by 20cm framed with uniform border. If the area of the border is 216cm^2, how wide is the border?
(b) A cone has a radius of 7cm and vertical height of 30cm. Find:
(i) it's volume,
(ii) the volume of another similar bigger cone which has linear scale factor 2. [use $\pi = \dfrac{22}{7}$]

15. (a) Find the equation of the line passing through a point (2, 0) and perpendicular to the line joining the points (¯10, 3) and (6, ¯9)
(b). A triangle PQR has vertices with coordinates P(3, – 1), Q(7, 6) and R(0, 2). Find the equation of its line of symmetry.

16. A hawker sells handkerchiefs at Shs500 each. He sold 50 handkerchiefs in the first week. In the second week, he sold 20% more than in the first week. In the third week he sold 10% more than in the second week. Each week he receives a commission of 8% on the price of the first 20 handkerchiefs sold, and 12% for any handkerchief sold in excess of 20.
(a) Express the number of handkerchiefs sold in the 3rd week as a percentage of the number sold in the first week.
(b) Calculate the commission he received in the third week.
(c) If in the fourth week the hawker received a commission of 2,000/-, calculate the number of handkerchiefs he sold in that week.

17. In the diagram below, $\boldsymbol{OA} = \mathbf{a}$, $\boldsymbol{OB} = \mathbf{b}$, $\overline{OB} = \overline{BC} = 1 : 3$, $3\boldsymbol{OF} = 2\boldsymbol{OA}$ and E divided AC in the ratio 3 : 2.



Express the following vectors in terms of $\boldsymbol{a}$ and $\boldsymbol{b}$:
(a) BC.
(b) CA.
(c) BE.
(d) FE.

2010 PAPER TWO

SECTION A

1. Express 0.341666... in the form p/q, where $q \neq 0$.

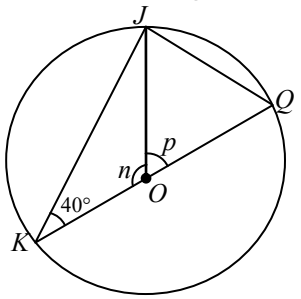
2. Solve for x in $32^{3/5} \div x^{1/2} = 2$.

3. Given two points $P(4, 5)$ and $Q(-2, 9)$, find the equation of the line through P and Q.

4. Simplify $\sqrt{20} - \sqrt{45} + \sqrt{125}$. Give your answer in the form $a\sqrt{b}$ where a and b are constants. (04 *marks*)

5. A rectangle 6cm long and 5cm wide is enlarged so that its area becomes 270cm^2. Find the linear scale factor of the enlargement. (04 *marks*)

6. In the figure below, O is the centre of the circle, angle JKQ = 40° and KOQ is a straight line



Find the angles marked n and p. (04 *marks*)

7. Given that $\boldsymbol{a} = \begin{pmatrix} -2 \\ -9 \end{pmatrix}$, $\boldsymbol{b} = \begin{pmatrix} 7 \\ 2 \end{pmatrix}$ and $\boldsymbol{m} = \boldsymbol{a} + 2\boldsymbol{b}$, find the magnitude of **m**. (04 *marks)*

8. If $n = x\sqrt{\left(\frac{2}{4m^2 - 1}\right)}$, express m in terms of n and x.

9. A function $f(x) = \frac{3}{1 - x^2}$. Find the values of x for which $f(x) = 4$. (04 *marks*)

10. Three girls; Auma, Asiimwe and Nakato shared Shs 10,500. Nakato got twice as much as Asiimwe and Asiimwe got twice as much as Auma. Find how much money Asiimwe got.

SECTION B

11. A speed-boat sets off from an island M on a bearing of 080° to an island X at an average speed of 150 kmh^{-1}. Island X is 450 km from island M. At X, it alters its course to a bearing of 200° and maintains the average speed of 150 kmh^{-1} for 3 hours until it reaches island Y. It then moves to island P which is west of island M at an average speed of 200 kmh^{-1}. Island P is 400 km from island ***M*.**

(a) Using a scale of 1 cm to represent 50km, construct a scale drawing to show the route of the speed-boat. (06 *marks*)

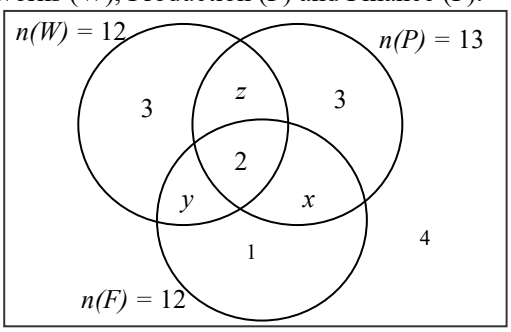
(b) Use the scale drawing in (a) above to find the distance PY.

(c) Calculate the

(i) total time taken for the speed-boat to **m**ove from M to P.

(ii) speed-boat's average speed for the whole journey.

12. The Venn diagram below shows the members of a District Council who sit on three different committees of works (W), Production (P) and Finance (F).



(a) Determine the values of x, y and z.

(b) Find the total number of members who

i. make up the District Council

ii. belong to more than one committee

(c) Given that a member is selected at random from the District Council, find the probability that the member belongs to only **two** committees.

13. (a) Express $\frac{2}{(x+4)} + \frac{4}{(x-3)} - \frac{4(x+4)}{(x^2 + x - 12)}$ in the form $\frac{a}{(x+b)}$ (05 *marks*)

(b) A mini-bus travels from Migyera to Kampala, a distance of 156km, at a certain average speed of Vkm/hr. On the return journey, it increases the average speed by 4km/hr and takes 15 minutes less. Find the average speed V from Migyera to Kampala.

14. The table below shows the time (t) in seconds and velocity (V) in m/s of an object.

t(s)	0	1	2	3	4	5	6
V(m/s)	0.0	1.0	1.7	2.0	1.7	1.0	0.0

(a) Using a scale of 2 cm to represent one second on the horizontal axis and 4 cm to represent 0.5 m/s on the vertical axis, plot the values of t and V and join the points with a smooth curve.

(b) Use your graph in (a), to find the

i. times at which the speed of the object is 0.8m/s,

ii. acceleration of the object when the time is 2 seconds.

(c) If the total distance covered by the object was 7.5m, what was its average speed?

15. (a) Without using mathematical tables or calculator, find the value of

$$2\log_{10}50 + \log_{10}80 - \log_{10}2.$$

(b) (i)Find the prime factors of 150.

(ii) Use your result in (i), find $\log_{10}150$, given that $\log_{10}5 = 0.6990$, $\log_{10}3 = 0.4771$ and $\log_{10}5 = 0.3010$.

16. (a) Solve the following simultaneous equations using the matrix method

$5x + 2y = 5$,
$3x - 0.2y = 10$.

(b) Given that $\boldsymbol{P} = \begin{pmatrix} 2 & -1 \\ 3 & -2 \end{pmatrix}$, $\boldsymbol{Q} = \begin{pmatrix} 1 & 5 \\ 2 & -3 \end{pmatrix}$ and $\boldsymbol{R} = \begin{pmatrix} 4 & 3 \\ 1 & -2 \end{pmatrix}$ find:

(i) $\boldsymbol{QR - P}$
(ii) the determinant of $\boldsymbol{QR - P}$

17. Mr. Oketcho's monthly salary is shs900,000 which includes the following allowances:

Water and electricity	20,000
Relief and insurance	30,000
Housing allowance	50,000
Medical allowance	25,000
Transport allowance	28,000
Marriage allowance	20,000

Family allowance

(for only 4 children):

- From 0 to 9 years — 20,000 per child
- Between 9 and 16 years — 15,000 per child
- Over 16 years — 10,000 per child

Mr. Oketcho has five children; two of whom are aged between 0 and 9 years, one aged 14 years and the other two are over 16 years. The income tax structure is shown in the table below:

Taxable income per month in shillings.	Tax rate %
01 – 50,000	10.0
50,001 – 110,000	20.0
110,001 – 200,000	24.5
200,001 – 350,000	35.0
350,001 – 600,000	40.0
Above 60,000	49.0

(a) Calculate Mr. Oketcho's
  i. taxable income
  ii. income tax.
(b) Express the income tax as a percentage of his monthly gross salary.

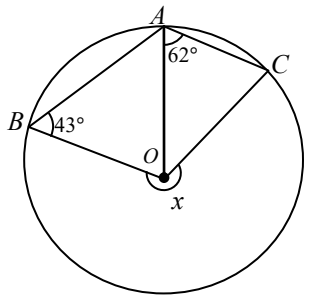
2011 PAPER ONE

SECTION A

1. Make p the subject of the formula $S = \frac{3x}{2y - p} - 1$.

2. Solve for n in the inequality $\frac{n+1}{2} - \frac{n-3}{4} < \frac{n+2}{3}$.

3. In the figure below, O is the centre of the circle. Angle $ABO = 43°$ and angle $OAC = 62°$.



Find the value of x.

4. Point A(0, 3) is reflected in the line $y + x = 0$. Find the coordinates of the image A'

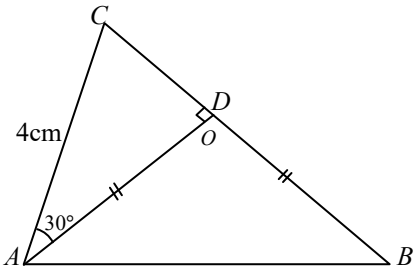
5. A box contains 5 black balls and 3 red balls. Two balls are randomly picked one after the other without replacement. Find the probability that both balls are red.

6. Given that $a*b = ab^2$, find the value of
(i) $2 * 5$
(ii) a if $a*3 = 63$.

7. Solve the equation $2x^2 + x - 1 = 0$.

8. Find the inverse of matrix $\boldsymbol{B} = \begin{pmatrix} 5 & 4 \\ 3 & 2 \end{pmatrix}$.

9. In the figure below, AD is perpendicular to BC, $AD = DB$, $AC = 4$ cm and andle $CAD = 30°$.



Find the length of AB.

10. Use the grouped frequency distribution table below to answer the questions that follow.

Class	Frequency	Cumulative frequency
30 – 39	19	–
40 – 49	21	–
50 – 59	19	–
60 – 69	12	–
70 – 79	08	–
80 – 89	01	–

(a) Complete the cumulative frequency column
(b) Determine the median class.

SECTION B

11. (a) Given that $a^2 - b^2 = 16$ and $a + b = 8$, determine the values of a and b..

(b) Two taxis, a Nissan and a Toyota transported students from Jinja to Kampala. When the Nissan had made 3 journeys, the Toyota had made 4, and they had transported 116 students altogether. When the Nissan had made 2 journeys and the Toyota 5, they had transported 110 students. If each journey made was at full capacity, find the capacity of each taxi.

12. Using a pencil, a ruler and a pair of compasses only,

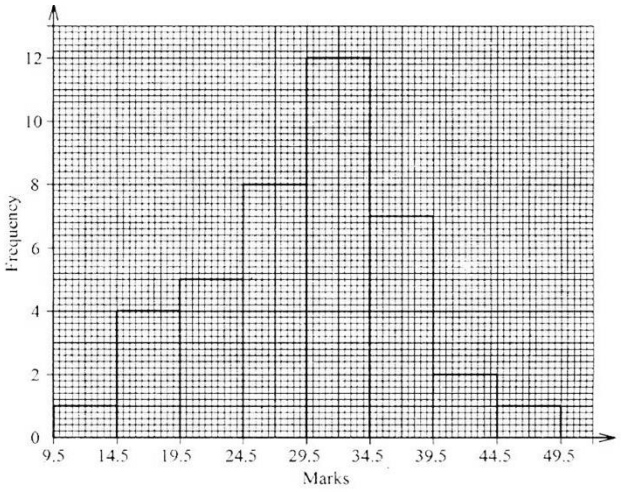
(a) (i) Construct a triangle PQR in which $PQ = 6.5$cm, angle $PQR = 30°$ and angle $QPR = 120°$. S is a point on the opposite side of RQ as P such that angle $RQS = 90°$ and $RS = 12$cm.

(ii) Measure the length of RQ and SQ.

(b) (i) Draw a circle that passes through the points P, Q and S.

(ii) Measure the radius of the circle

13. The histogram below shows the marks scored by 40 students in a test.



(a) Use the histogram to construct a grouped frequency distribution table.

(b) Calculate the mean mark.

14. (a) Factorise completely the following expressions

(i) $a^2 + b^2 - 4 + 2ab$,

(ii) $a^2 - 5a - 36 + am + 4m$

(b) Given that $x + y = 10$ and $xy = 5$, find the values of:

(i) $\frac{1}{x} + \frac{1}{y}$

(ii) $y \div \frac{1}{x}$

15.(a) The matrix $\begin{pmatrix} 0 & 4 \\ 3 & -1 \end{pmatrix}$ is pre-multiplied by the column matrix $\begin{pmatrix} x \\ y \end{pmatrix}$ to give $\begin{pmatrix} -8 \\ x \end{pmatrix}$. Find the values of x and y.

(b) Given that matrix $\boldsymbol{P} = \begin{pmatrix} 2 & 3 \\ 1 & 2 \end{pmatrix}$ and $Q = \begin{pmatrix} 2 & -3 \\ -1 & 2 \end{pmatrix}$, find

(i) $\boldsymbol{PQ}$

(ii) a 2×2 matrix R such that $\boldsymbol{QR = P}$

16. A rectangle $ABCD$ has vertices $A(1, 0)$, $B(3, 0)$, $C(3, 1)$ and $D(1, 1)$. Rectangle $ABCD$ is mapped onto rectangle $A'B'C'D'$ by the transformation matrix $\begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$.

(a) Find the coordinates of $A'B'C'D'$.

(b) Rectangle $A'B'C'D'$ is mapped onto $A''B''C''D''$ with vertices at $A''(2, 0)$, $B''(6, 0)$, $C''(10, 2)$ and $D''(6, 2)$. Find the matrix of transformation.

(c) Find a single transformation matrix which maps rectangle $ABCD$ onto $A''B''C''D''$.

17. A company wishes to transport at least 480 mattresses from its stores to one of its sales point. It has two types of trucks, A and B. Truck A can carry 40 mattresses at a cost of shs30,000 per trip. Track B can carry 60 mattresses at a cost of shs45,000 per trip. There is shs600,000 available for transport. The number of trips made by A should not exceed 12. Those made by B should not exceed twice the number of trips made by A.

(a) If x and y are the trips made by A and B respectively, write down **four** inequalities satisfying the given inequalities.

(b)(i) On the same axes, draw the graphs of the inequalities and shade the unwanted regions.

(ii) Find all the possible number of trips made by each truck so that the transport cost is minimised.

2011 PAPER TWO

SECTION A

1. Convert 5.272727… to a fraction.

2. Given that F = {all factors of 24} and G = {all factors of 30}, find $n(F' \cap G)$ where F' is the complement of F.

3. Find the equation of a line whose gradient is $-\frac{1}{2}$ and passes through the point (-4, 5).

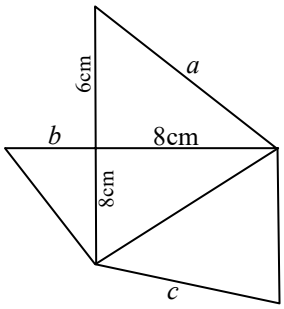
4. A sales woman earns a basic salary of shs120,000 and a commission of 8% of the month's total sales. If the month's total sales were shs1,350,000, find her income for that month.

5. Simplify: log 15 – 2 log 10 + log 60.

6. If m is directly proportional to the square of n and n = 2 when m = 1, find the value of m when n = -5.

7. Find the point of intersection of the lines $3x + 2y = 6$ and $x + y = 4$.

8. The diagram below shows the net of a right triangular pyramid.



Find the lengths marked a, b, and c.

9. Given that $S(-2, 6)$ and $T(3, 3)$ are two points, find the coordinates of R if $\boldsymbol{OR} = 4\boldsymbol{OS} + \frac{1}{3}\boldsymbol{OT}$ and O is the origin.

10. A cylinder has a radius of 3 cm and a height of 5 cm. Find the area of the curved surface.

SECTION B

11. (a) Hellen won shs42 million in a lottery. She shared the money with her parents in the ratio 5:2 respectively. Find how much money she gave her parents.

(b) Without using mathematical table or a calculator, simplify

$$\frac{64^{-1/3}}{27^{-1/3}}$$

(c) Given that $\sqrt{15} = 3.873$, $\sqrt{6} = 2.450$ and $\sqrt{10} = 3.162$, without using a calculator, evaluate to **two** significant figures

$$\frac{\sqrt{3}-\sqrt{2}}{\sqrt{5}-\sqrt{2}}.$$

12. A group of students was asked what game they play. It was found out that 20 play Rugby (R), 30 play Soccer (S) and 15 play Basketball (B). 6 play both Rugby and Soccer, 4 play both Soccer and Basketball and 5 play both Rugby and Basketball. The number of students who play Soccer only is equal to twice the number of students who play Rugby only. All the students play at least one of the games.

(a) Represent the above information on a Venn diagram.
(b) Find the number of students:
  (i) who play all the three games.
  (ii) in the group.
(c) If a student is chosen at random from the group, find the probability that the student plays at least two games.

13. (a) Given that $f(x) = 4x - 3$, find

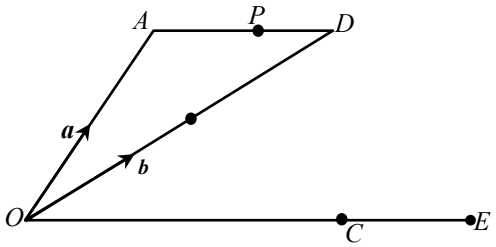
(i) $f(2)$,
(ii) $f^{-1}(x)$,
(iii) $f^{-1}(-1)$

(b) Given that $g(x) = x^2 + 1$ and $h(x) = x - 3$, find the value of x for which $gh(x) = hg(x)$.

14. Lugazi is 45 km from Kampala. Kintu set off at 0815 hours from Kampala riding a bicycle at 15 km/hr. Kintu's bicycle broke down at 0915 hours and he was delayed for 45 minutes. He then walked back to Kampala and reached at 1230 hours. Ojok set off at 0915 hours from Kampala, riding a bicycle and reached Lugazi at 1200 hours.

(a) On the same axes, draw the graphs showing the journeys of Kintu and Ojok.
(b) Use your graph in (a) to find:
  (i) How far from Kampala Kintu was when his bicycle broke down.
  (ii) The speed at which Kintu walked back to Kampala.
  (iii) Ojok's average speed.
  (iv) The time when the two men met.
  (v) The distance from Kampala where the two men met.

15. In the figure below, $\boldsymbol{OA} = \boldsymbol{a}$ and $\boldsymbol{OB} = \boldsymbol{b}$. $3\boldsymbol{OB} = 2\boldsymbol{BD}$. $\boldsymbol{P}$ is a point on $\overline{AD}$ such that. $\boldsymbol{OC} = 3\boldsymbol{CE} = 3\boldsymbol{AP}$.

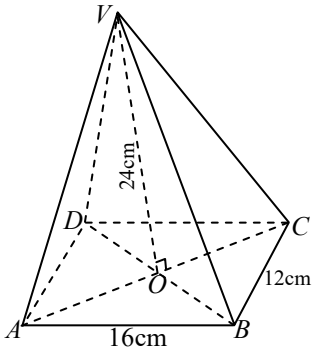


(a) Express the following vectors in terms of vectors $\boldsymbol{a}$ and $\boldsymbol{b}$:
  (i) $\boldsymbol{AD}$.
  (ii) $\boldsymbol{AP}$.
(b) Show that $\overline{AD} : \overline{OE} = 3 : 8$

16. Paul and Mary invested shs600,000 each in a savings society for 2 years. Paul opted for simple interest while Mary opted for compound interest. Both interests were at 12% per annum.

(a) Find the interest earned by each of them
(b) Who earned more interest and by how much?

17. The figure below shows a right pyramid on a rectangular base *ABCD*. $\overline{AB}$ = 16cm and $\overline{BC}$ = 12 cm. *V* is 24 cm vertically above the base *ABCD*.



Calculate the:

(a) volume of the pyramid.

(b) angle between $\overline{AV}$ and the base *ABCD*.

(c) angle between the planes *ADV* and *BCV*.

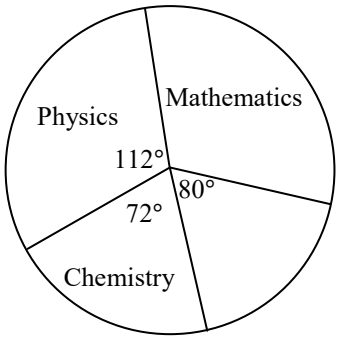
2015 PAPER ONE

SECTION A

1. Given that $a*b = a\sqrt{b}$, find the value of (2*4)*16.

2. Two towns *A* and *B* are such that the bearing of *B* from *A* is 085°. Find the bearing of *A* from *B*.

3. The pie chart below represents the subjects taught by 45 science teachers.



Determine the number of teachers who teach Mathematics.

4. Make *b* the subject of the equation $t = 20 + \sqrt{a - b^2}$

5. Given that $\begin{pmatrix} 2 & -2 \\ -3 & 4 \end{pmatrix}$, determine A^{-1}.

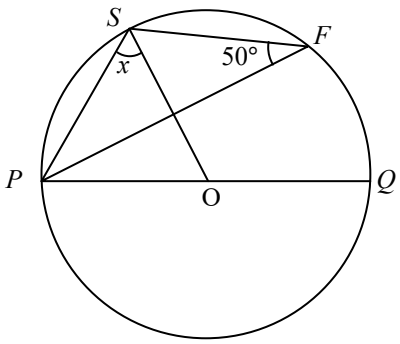
6. Determine an inequality which is represented by the unshaded region on the graph below:

7. (a) Plot the point *A* (4, 2) on a graph.

(b) Find the coordinates of the image of the point *A* after a rotation of + 90° about (l, -1)

8. Solve the equation: $\frac{3}{4}(2a+1) = \frac{5}{6}(a+5)$.

9. In the figure below, *PQ* is a diameter and O is the centre of the circle. Angle *PRS* = 23°.



Calculate the value of the angle marked *x*.

10. A coin and a regular tetrahedron with faces numbered from 1 to 4 are tossed.
    (a) Construct a table showing all the possible outcomes.
    (b) What is the probability of getting a tail and a number greater than 1?

SECTION B

11. (a) Copy and complete the following table for the curve $y = -2x^2 + x + 1$

x	-3	-2	-1	0	1	2	3
$-2x^2$	-18		-2			-8	
x	-3		-1			2	
1	1		1			1	
y	-20		-2			-5	

(b) Using the values in your completed table, draw the graph of $y = 2x^2 + x + 1$.

(c) Use your graph to solve the equation

$$6 - x - 2x^2 = O.$$

12. A motor cyclist travelled 8 km up a hill at a speed of x km/h. On the return journey down the hill, his speed was $(x + 4)$ km/h. The difference in time between the uphill and downhill journeys was 10 minutes.
(a) Write down an expression for the time taken for the
    (i) uphill journey.
    (ii) downhill journey.

(b) (i) Using expressions in (a), form a quadratic equation for the difference in time for the two journeys.

(ii) Solve the quadratic equation.

(c) What was his average speed for the uphill and downhill journeys?

13. (a) Matrix $A = \begin{pmatrix} x+7 & x \\ 3 & 0 \end{pmatrix}$ and $B \begin{pmatrix} x-1 & 0 \\ 2 & 2 \end{pmatrix}$.

If $C = A + B$, find the value of x for which the determinant of matrix C is 2.

(b) Solve the following simultaneous equations using the matrix method.

$3x + 2y = 8$

$3y + 4x = 11$

14. The table below shows the ages of 50 people treated for tuberculosis (TB) at a health centre.

86	85	56	59	67	62	63	50	91	62
56	27	50	54	80	61	52	52	16	28
66	46	55	58	56	77	26	40	42	51
35	45	68	51	49	40	93	84	79	63
52	53	25	93	27	71	66	52	30	12

(a) Construct a frequency table starting with the class 10 19.
(b) Use the frequency table to calculate the;
(i) mean age of the people treated for TB.
(ii) median age of the people treated for TB.

15. A school hired a bus and a mini-bus to transport students to a study tour. Each trip of the bus cost Sh 40,000 and that of the mini-bus cost Sh25,000. The bus has a capacity of 42 students and the mini-bus 14 students. All the 126 students contributed a total of Sh 200,000 and had to go for the tour. The mini-bus had to make more trips than the bus. If x and y represent the number of trips made by the bus and the mini-bus respectively;
(a) write down **five** inequalities representing the given information
    (i) plot the inequalities on the same axes.
    (ii) by shading the unwanted region, show the region satisfying all the inequalities.
(c) Use the graph to find the number of trips each vehicle should make so as to spend the least amount of money.

16. Triangle ABC with vertices $A(1, 2)$, $B(2, 6)$ and $C(4, 2)$ is mapped onto triangle $A'B'C'$ by a reflection in the line $x + y = 0$. Triangle $A'B'C'$ is then mapped onto triangle $A''B''C''$ by a transformation whose matrix is $\begin{pmatrix} 2 & 5 \\ -4 & -5 \end{pmatrix}$.

(a) Use $I(1, 0)$ and $J(0, 1)$ to find the matrix of reflection in the line $y + x = 0$.

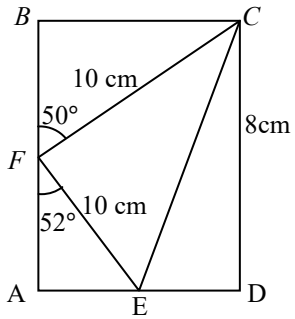
(b) Find the coordinates of

(i) A', B' and C'.

(ii) A'', B'' and C''.

(c) Determine a matrix for the single transformation which maps $A''B''C''$ back onto ABC.

17. In the diagram below, $ABCD$ is a rectangle with CF =10 cm, EF= 8 cm, angle BFC = 50° and angle EFA = 52°.



Calculate the:
(a) the length
    (i) BC
    (ii) AB
(b) the area of triangle CEF

2015 PAPER TWO

SECTION A

1. Simplify $\left(\frac{8}{27}\right)^{\frac{-2}{3}}$

2. Find the equation of the line through the point R(5, 9) and parallel to the line joining the point S(15, -2) to the point *T* (-3,4).

3. Amina bought a television set (TV) at a discount of 5%. The market price of the TV was Sh320,000. How much did she buy the TV?

4. Given that *P* (2, 3) and *Q* (5, 8) are two points in a plane, determine the;

   (a) vector *PQ*.

   (b) magnitude of *PQ*.

5. Solve: $\log_{10}(7x + 2) - \log_{10}(x - 1) = 1$

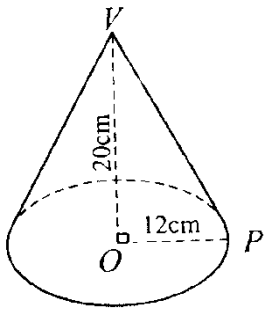
6. The function $h(x) = bx^2 + 4x$. If $h(-1) = 3$, find the value of *b*.

7. In a class of 15 students, 7 like Mathematics, 9 like English and 2 like neither Mathematics nor English. Find the number of students who like both Mathematics and English.

8. The capacity of a cylindrical tin is 2 litres. Its radius is 8 cm. Find its height.

9. A line has gradient $\frac{1}{2}$ and passes through the point (-4, 7). Find the coordinates of the point at which the line cuts the y-axis.

10. The figure below shows a cone whose base radius is 12 cm and perpendicular height *OV* is 20 cm. Determine the



   (i) slant height *PV*

   (ii) area of curved surface of the cone.

SECTION B

11. (a) A map has a scale of 1:250,000. The area of the swamp on the map is 12 cm^2. What is the actual area of the swamp in km?

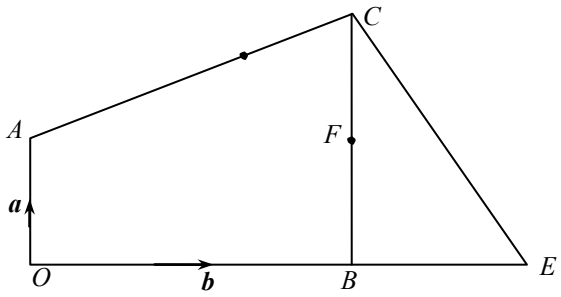
   (b) In a business John gets a fixed pay of Sh 80,000 and Daniel gets Sh 60,000 per month. The remainder is shared among John, Daniel and Tom in the ratio 2:3:5 respectively. At the end of a certain month the business made Sh 480,000. Determine the amount each got from the business.

12 (a) A mapping is defined by $f(x) = x^2 - x + 3$. Determine the range of the mapping whose domain is {-3, 0, 1, 2}.

   (b) Given that $h(x) = 3x - 5$ and $g(x) = x^2$, find $hg(-2)$.

   (c) If $f(x) = 2x + 5$, find the value of $f^1(11)$.

13. In the diagram below, $OA = a$, $OB = b$, $BC = 2OA$ and $3OB = 2OE$. *F* is a mid-point of *BC*. G divides *AC* in the ratio 2:1.



   (a) Express in terms of *a* and *b* the vectors:
   (i) *CB*
   (ii) *AC*
   (iii) *BE*

   (b) Show that G, *F* and *E* are collinear.

14. Two towns *A* and Bare 200 km apart. A Tata lorry left town *A* at noon and travelled at a speed of 50 km/hr for one hour. It stopped for 30 minutes then continued to *B* at a speed of 60 km/hr. An Isuzu lorry left town *B* at 12:30 p.m. and travelled for one hour at a speed of 40 km/hr. It then changed and travelled at a speed of *V* km/hr and arrived at town *A* at 4:30 p.m.

   (a) Using scales 2cm to represent 20km and 4cm to represent one hour, draw distance-time graphs showing the journeys for the two lorries on the same axes.

   (b) U se the graphs to estimate the;

   (i) distance from *A* to the point where the two vehicles met.

   (ii) time at which the two vehicles met.

   (iii) time of arrival for the Tata lorry at town *B*.

   (iv) speed (*V*) of the Isuzu lorry.

15. (a) A worker's gross salary is Sh 200,000 per month. If Sh 130,000 is tax-free and the rest is taxed at 10%, what is the worker's net pay per month?

   (b) Mr Odoi and Mrs Kaiso are money lenders. Mr. odoi lends money at a simple interest rate of 15% per annum. Mrs Kaiso lends money at a compound interest rate of 15% per annum. A trader wants to borrow Sh 500,000 for 2 years. Which of the two lenders would be cheaper and by how much?

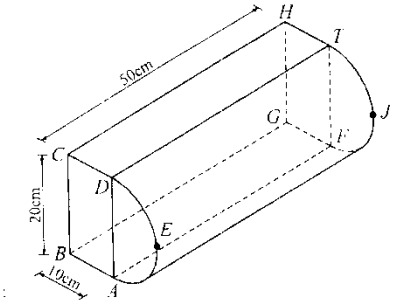
15. A restaurant supplies food to 129 factory workers. It found out that 72 workers like matooke (M), 50 like potatoes (P) and 32 like rice (R). 15 like matooke and rice. 18 like matooke and potatoes. 7 like potatoes and rice. 44 like matooke only. 10 dislike all the three types of food.

(a) Represent the given information on a Venn diagram.

(b) Find the number of workers who like all the three types of food.

(c) Find the probability that a worker chosen at random from the factory likes at most two types of food.

17. The diagram below shows a piece of wood of uniform cross-section *ABCD* in which *ABCD* is a rectangle and *ADE* is a semi-circle of diameter *AD*. $\overline{BC}$ = 20cm, $\overline{AB}$ = 10cm and $\overline{CH}$ = 50cm.



Calculate the:

(a) area of the cross section ABCDE.

(b) volume of the wood.

(c) total surface area of the piece of wood.

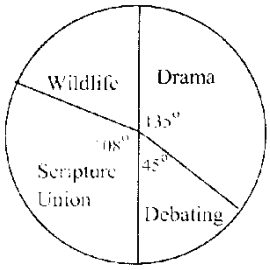
[Take $\pi = 3.14$]

2016 PAPER ONE

SECTION A

1. Make a the subject of the expression $c = \dfrac{a^2}{(a-b)(a+b)}$

2. The pie chart below shows the various clubs that 40 students belong to:



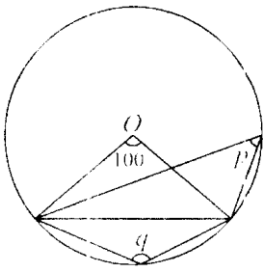
Determine the number of students in the wildlife club.

3. Given that $a*b = a + b + ab$,

(a) evaluate 3 * 5.

(b) find the value of n, when $7 * n = 23$.

4. The circle below has its centre at O.



Calculate angles p and q.

5. An object at (0, 0) undergoes a translation $A = \begin{pmatrix} 5 \\ -12 \end{pmatrix}$ then allowed by translation $B = \begin{pmatrix} 3 \\ 6 \end{pmatrix}$.

(a) Find a single translation equivalent to the two translations *A* and ***B.***

(b) How far is the object from (0, 0)?

6. Solve the equation; $\dfrac{5x+2}{3} - \dfrac{7x+2}{5} = 3$

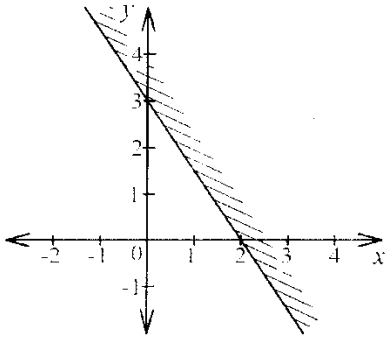
7. Two fair coins are tossed.

(a) Construct a table showing all the possible outcomes.

(b) What is the probability of getting at least a tail?

8. Find the inverse of the matrix $A = \begin{pmatrix} 5 & 7 \\ -3 & -2 \end{pmatrix}$.

9. Determine the inequality which is represented by the unshaded region on the graph below.



10. A pilot in a plane at an altitude of 500 m above the horizontal ground sees a camp at an angle of depression of 15°. Find the horizontal distance the pilot would have to fly so that the plane is directly above the camp.

SECTION **B**

11. A manager of a restaurant spent Shs29,000 to purchase 4 kg of rice and 7 kg of irish potatoes. Later he increased each of the above quantities by 1 kg thus increasing his expenditure by Shs5,000.

(a) Writ down two equations that represent the manager's purchases.

(b) Use your equations to find the cost of rice and irish potatoes per kilogramme.

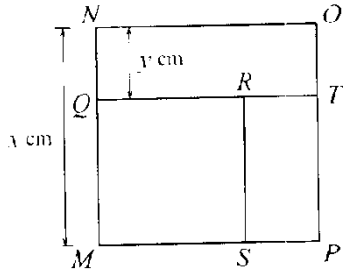
(c) How much would the manager pay for 10 kg of rice and 15 kg of irish potatoes?

12. (a) Solve the equation $3\begin{pmatrix} 1+x \\ y \end{pmatrix} - \begin{pmatrix} x \\ 1-2y \end{pmatrix} = \begin{pmatrix} 5 \\ 9 \end{pmatrix}$

(b) Given that $M = \begin{pmatrix} 0 & 1 \\ 3 & 0 \end{pmatrix}$ and $N = \begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}$

(i) calculate N^2 and MN.
(ii) find the value of the scalar k if $N^2 + kN = MN$.

13. In the figure below, $MNOP$ and $MQRS$ are squares. $MN = x$ cm and $QN = y$ cm.



(a) If the area of the rectangle $QNOT$ is 1 cm^2 less than area of $MQRS$, show that $y^2 - 3xy + x^2 = 1$.
(b) Given that $y = 3$ cm, find the appropriate value of x.
(c) Calculate the area of rectangle $PTRS$.

14. The following table shows the marks scored by 36 students in a Mathematics test.

Marks	Frequency
30 -39	4
40-49	6
50- 59	3
60-69	12
70-79	2
80- 89	5
90-99	4

(a) Calculate to 2 decimal places the
(i) mean mark.
(ii) median mark.
(b) Find the probability that a student picked at random scored below 50.

15. (a) Copy and complete the table below for $y = (3x + 1)(2x - 5)$.

X	-1	0	I	2	3	4
$3x+1$	-2		4		10	
$2x - 5$	-7		-3		1	
Y	14		-12		10	

(a) Use your completed table to draw a graph of $y = (3x + 1)(2x - 5)$ with a scale of 2 cm for 1 unit on the x-axis and 2 cm for 5 units on the y-axis.
(b) Draw on the same axes the line $y = 5$.
(c) Use the two graphs in (b) and (c) to solve the equation $6x^2 - 13x - 10 = 0$

16. (a) The image of $P(6, 3)$ after a reflection is $P'(3, 6)$.
(i) Plot the points P and P' on a graph paper.
(ii) Construct the line of reflection. Hence find the equation of the line of reflection.
(b) The image of $ABCD$ under a matrix of transformation $\begin{pmatrix} 1 & 0 \\ -2 & 1 \end{pmatrix}$ is $A'B'C'D'$. The coordinates of the image are $A'(1, 0)$, $B'(4, -6)$, $C'(4, -4)$ and $D'(1, 2)$. Determine the coordinates of A, B, C and D.

17. The manager of a cinema hall wishes to divide the seats available into two classes executive and ordinary. There are not more than 120 seats available. There must be at least twice as many ordinary seats as there are executive seats. Executive seats are priced at Shs 15,000 each. Ordinary seats are priced at Shs10,000 each. At least Shs 1,000,000 should be collected at each show to meet the expenses.
(a) Taking x as the number of executive seats and y as the number of ordinary seats, write down five inequalities from the given information.
(b) Represent the inequalities on a graph.
(c) From your graph, find the number of seats of each kind which must be sold to give the maximum profit.

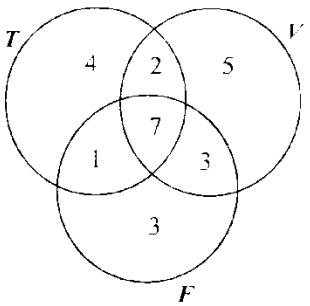
2016 PAPER TWO

SECTION A

1. Given that $h(x) = 3x - 2$, find the value of
(i) $h(-2)$.
(ii) x when $h(x) = 7$

2. Josephine obtained 95% in a test which was marked out of 80 marks. How many marks did she score out of 80?

3. The Venn diagram below shows the number of students who play tennis (T) volleyball (V) and football (F).



Find:
(a) the number of students who play only one game.
(b) $n(V \cup F \cap T')$

4. A straight line passes through the points (-2, 5) and (2, -3). Determine the equation of the line.

5. The volume of a sphere is 2000 cm^3. Calculate the volume of a similar sphere whose radius is half of that of the given sphere.

6. Given that $\dfrac{a+b\sqrt{2}}{c} = \dfrac{4+\sqrt{2}}{4-\sqrt{2}}$, find the values of a, b and c.

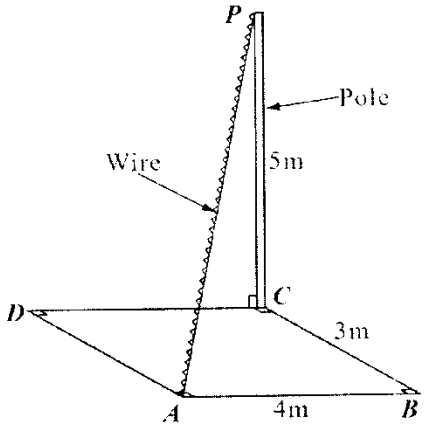
7. The coordinates of points A and B are (-4, -5) and (x,y) respectively. The coordinates of the midpoint of AB are (-3, 1). Determine the values of x and y.

8. The position vectors of A and B are $\boldsymbol{a}$ and $\boldsymbol{b}$ respectively. A point X is on $\overline{AB}$ such that $4\overline{AX} = 3\overline{AB}$. Find the position vector of X, in terms of $\boldsymbol{a}$ and $\boldsymbol{b}$.

9. An examination body pays its setters Shs100,000 as basic fee and Shs8,000 for each question set. A

withholding tax of 6% is deducted from a setter's gross pay. Okot set ten questions. How much was his net pay?

10. The figure below shows a vertical pole, *CP* of height 5 m standing on a rectangular horizontal slab *ABCD*. $\overline{AB}$ = 4 m and $\overline{BC}$ = 3 m. *PA* is a wire that supports the pole.



Calculate the angle between the wire *PA* and the slab *ABCD*.

SECTION B

11. A group of 84 tourists were asked whether they had ever visited Gulu, Mbarara or Soroti. The number of tourists who had visited Gulu was equal to the number of tourists who had visited Mbarara. 54 had visited Soroti. 14 had visited Soroti and Gulu only. 12 had visited Soroti and Mbarara only. 16 had visited Gulu and Mbarara only. 13 had visited all the three towns. 8 had not visited any of the towns.

(a) Represent the given information on a Venn diagram.

(b) How many tourists had
(i) visited Mbarara?
(ii) not visited Gulu?

(c) Given that a tourist is selected at random, what is the probability that the tourist had visited two towns only?

12. Towns *P* and Q are 100 km apart. A pick-up starts from town *P* at 5.00 am at a steady speed of 30 krn/h for 1 hour. It increases its speed to 100 km/h until it reaches town Q. At 5.30 am, a taxi starts from town Q towards *P* at a steady speed of 60 krn/h until it breaks down 1½ hours later.

(a) On the same axes, draw distance-time graphs for the pick-up and the taxi. (Use scale 2cm: 30 minutes on the horizontal axis and 2cm : 10 km on the vertical axis)

(b) Use your graphs to find
(i) the time the taxi and the pick-up passed each other and how far they were from *P*.
(ii) how far the taxi was from town Q when it broke down.
(iii) the time the pick-up reached town Q.

13. (a) Evaluate $\dfrac{2\frac{1}{2}+\left(\frac{3}{5}+1\frac{1}{4}\right)}{1\frac{1}{8}-\frac{3}{4}}$

(b) A lake occupies an area of 43.75 km^2. What would be its area in cm, on a map whose scale is 1: 250,000?

14. (a) Given that T= {2,5,6,8,9, 10, 12, 13} illustrate on papygrams the relations:
(i) "**Greater than by 3.**"
(ii) "**Factor of.**"

(b) If $f(x) = x + 13$ and $g(x) = \log_{10}(x + 2)$, find
(i) the value of x when (x) = O.
(ii) $gf(85)$.

15. (a) A bank in a certain country buys and sells foreign currency as follows:

Currency	Buying (Shs)	Selling (Shs)
1 US. Dollar (S)	2,900	3,000
1 Pound Sterling(£)	4,650	4,700

A tourist arrived in that country with S4500. She converted all the dollars to shillings at the bank. During her stay she spent Shs 9,900,000 and then converted the remaining shillings to Pound Sterling. Calculate the amount she received in Pound Sterlings.

(b) A generator is being sold in cash or on hire purchase. Its cash value is Shs894,000. On hire purchase, a deposit of 50% of the cash value is made and followed by equal monthly instalments of Shs65,000 for 8 months. Calculate the money saved when one buys the generator in cash rather than on hire purchase.

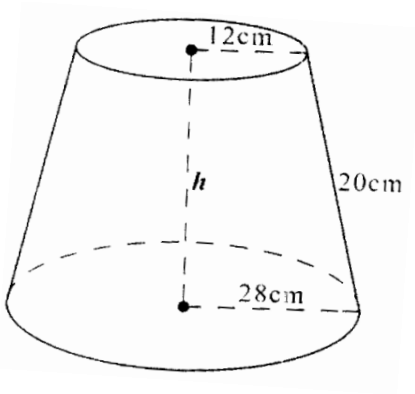
16. Given that $\boldsymbol{OP} = \begin{pmatrix}3\\4\end{pmatrix}$, $\boldsymbol{PQ} = \begin{pmatrix}4\\-8\end{pmatrix}$, $\boldsymbol{OR} = \frac{1}{2}\boldsymbol{OQ}$ and S is a point on $\overline{PQ}$ such that , find

(a) $\boldsymbol{OR}$

(b) (i) $\boldsymbol{PR}$
(ii) $|\boldsymbol{PR}|$

(c) $\boldsymbol{OS}$

17. The diagram below shows a lampshade made out of the lower part of a cone. The base radius is 28cm, the top radius is 12 cm and the slant height is 20 cm.



Calculate the;

(a) height *h,* of the lamp shade.

(b) surface area of the lampshade. (Use $\pi = 3.14$)