456/2
MATHEMATICS
PAPER 2
July / August 2009
2 hours 30 minutes

WAKISSHA JOINT MOCK EXAMINATIONS

Uganda Certificate of Education

MATHEMATICS

Paper 2

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

*Answer **all** questions in section A and **five** questions from section **B**.*

All necessary calculating must be done on the same page as the rest of the answer.

Silent non programmable scientific calculators may be used.

Mathematical tables and squared papers are provided.

No paper should be given for rough work.

*State the degree of accuracy at the end of each answer attempted using a calculator or tables and indicate **Cal.** for calculator or **Tab** for mathematical tables.*

SECTION A

Compulsory: (40 marks)

Attempt all the questions in this section

1. Express 3375 as a product of prime factors. Hence find the cube root of 3375. *(04 marks)*

2. Given that $f(x) = x^2 + 1$ and $g(x) = x + 1$, find the value of **a** for which $gf(\mathbf{a}) = fg(\mathbf{a})$. *(4 marks)*

3. Without using tables or calculators evaluate; *(4 marks)*

$$\frac{\sqrt{1440} + \sqrt{160}}{\sqrt{360} - \sqrt{160}}$$

4. Given that Z varies directly as Y and inversely as the square of X and $Z = 2$ when $X = 3$ and $Y = 2$, Find the value of Z when $Y = 5$ and $X = 4$ *(4 marks)*

5. The line through the points A (1, m) and B (4 , 11) is parallel to the line whose equation is $4x = 2y-9$. Determine the value of m. *(4 marks)*

6. Express the recurring decimal 1.42727.... as a fraction in its simplest form. *(4 marks)*

7. Given that $305_m + 45_m = 353_m$ where m is a base, find m *(4 marks)*

8. A die labelled 1 to 6 and a tetrahedron labelled 1 to 4 are tossed once.
   (a) Write down the possibility space for the sum of scores of all possible out comes.
   (b) what is the probability that the sum exceeds seven.

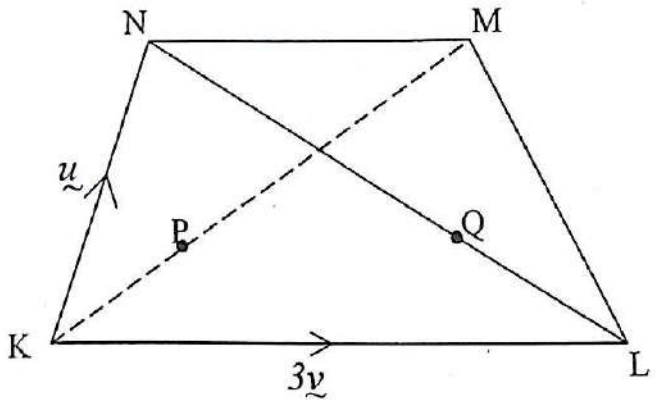
9. A forest covering an area of $172.8km^2$ is represented on a map by a green area of $10.8cm^2$. Determine the scale of the map.
(4marks)

10 Solve for the value of x in the equation

$$\frac{x+1}{2} = \frac{2}{3} + \frac{3}{x}$$

SECTION B

11. In the figure below, KLMN is a quadrilateral in which MN is parallel to KL and NM:KL = 2 : 3. KL = 3 $\underset{\sim}{v}$ and KN = $\underset{\sim}{u}$



a) Express in terms of $\underset{\sim}{u}$ and $\underset{\sim}{v}$ the vectors:
(i) **NM** (ii) **LM** (iii) **KM** (iv) **LN.**

(b) If P is a point on KM such that KP = xKM and Q is on LN such that LQ = yLN. Express in terms of , $\underset{\sim}{u}$, $\underset{\sim}{v}$, x and y the vectors;
(i) **KP** (ii) **KQ**
Hence find the scalars x and y if **KP = KQ** *(12 marks)*

In an opinion poll conducted by a food analyst in a certain suburb with a population of 115 people, 60 preferred matooke (M), 52 preferred yams(Y) and 50 preferred Cassava(C).

If 22 preferred Y and C, 20 preferred M and Y while 36 preferred M and C. Those who preferred all the three food staffs were half of those who preferred Y only. Those who preferred non were one more than those who preferred Y only.

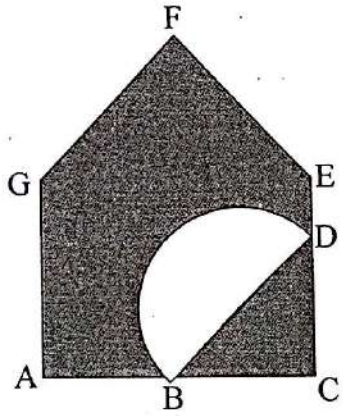
(a) Represent the above information on, a venn diagram

(b) What percentage of the people preferred yams only?

(c) How many people had no preference?

(d) What is the probability that a person chosen at random preferred at least two food stuffs?

13.



The figure shown above show a regular pentagonal uniform cross section of a solid prism ACEFG.

The length of a prism is 40m and the length of a side of the regular pentagonal cross-section is 10m. A semi-circular prism with diameter BD is cut from the pentagonal prism.

BC : AB = CD: DE = 4 : 1.Find the volume of the :

(i) pentagonal prism

(ii) semi - circular prism that is cut out ($\pi = \frac{22}{7}$)

(iii) prism that remains.

14. (a) Given that p = $\begin{pmatrix} 2 & 1 \\ 3 & 1 \end{pmatrix}$ and Q = $\begin{pmatrix} -1 & 1 \\ 2 & 0 \end{pmatrix}$. Show that det.(PQ) = det (P) x det (Q) *(4 marks)*

(b) A polygon with area of $6cm^2$ is mapped onto its image with area $36cm^2$ by the matrix of transformation represented by the matrix $\begin{pmatrix} 5t & 3 \\ 4t & 3 \end{pmatrix}$, find the value of t *(3 marks)*

(c) Solve for x and y in the simultaneous equations.

$$x + y = 2$$
$$2x^2 + y^2 = 3$$

(5 marks)

15. Three points P,Q and R are on the same level ground with point S vertically above Q. The angle of elevation of S from P is 60^0, PQ = 36 metres, QR = 24 meters and angle PQR = 150^0 Calculate.

(a) QS and PR

(b) the angle QPR

(c) A man walks from P towards R but stops at T, where QT is perpendicular to PR. Find the angle of elevation of S from T. *(12 marks)*

16. (a) Calculate the compound interest on Shs 5,000,000 at 12 % per annum in 5 years, the interest being added half yearly.

(b) REVAN MOTOR CYCLES UGANDA LIMITED. REVAN, REVAN, REVAN, PLEASE WAIT FOR ME; IS IT A DREAM? NO GET YOURSELF A DURABLE FUEL SAVING 90CC MOTOR CYCLE WHILE STOCK LASTS. CASH USHS 2,100,000/=

OR

DEPOSIT 50% OF THE MARKET PRICE, PAY SH 100,000 FOR THE FIRST FIVE WEEKS THEN SHS 80,000 FOR THE LAST EIGHT WEEKS

OR

Shs. 200,000 FOR NINE MONTHS.

DON'T MISS THIS CHANCE

(i) Calculate the percentage profit earned by the company on selling the motor cycle on weekly and monthly hire purchase?

(ii) How much will a customer save by buying a motor cycle on cash other than monthly hire purchase?

(iii) If one day 4 motor cycles were sold on weekly hire purchase and only 6 on monthly basis. Calculate the profit earned by the company if the cost price of each motor cycle is Shs 2 million

17. A port P is 3.6 km east of port Q .A navigator observes that the bearing of Q from his ship is 315^0 and that of P is 020^0 (use scale of 1 cm to represent 1 km)

(a) Determine the position of the ship from port P.

(b) Given that the ship begins to sail at a speed of $08kmh^{-1}$ on bearing 240^0. Calculate the position of the ship from port Q after 45 minutes.

END

456/2
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Paper 2
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$2^1/_2$ hours

WAKISSHA JOINT MOCK EXAMINATIONS

Uganda Certificate of Education

MATHEMATICS

Paper 2

2hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

- Answer **all** questions, in Section **A** and any **FIVE** from Section **B**.
- All necessary calculations **must** be done on the same page as the rest of the answers. Therefore, no paper should be given for rough work.
- Mathematical table with a list of formulae and squared paper are provided.
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SECTION A (40 MARKS) Turn Over

Answer All questions in this section.

1. Without using tables or calculator, find the value of $\log\left(\frac{81}{32}\right)$ given that $\text{Log}^2 = 0.3010$ and $\log^3 = 0.4771$ (04 Marks)

2. Three quantities A, B and C are given in the ratios A:B = 2:3 and B: C = 4:5
Determine the ratio A : C (04 Marks)

3. Given that $\begin{pmatrix} 4 & a & 3 \\ -2 & 2 & 0 \end{pmatrix}\begin{pmatrix} 1 & 5 \\ 3 & 0 \\ -6 & c \end{pmatrix} = \begin{pmatrix} -2 & 2 \\ 5 & -5 \end{pmatrix}$
Find the values of a and c (04 Marks)

4. Given that OA = $\begin{pmatrix} 4 \\ -7 \end{pmatrix}$ and OB = $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$, determine the
(i) $|\overrightarrow{AB}|$ the Modulus of $\overrightarrow{AB}$
(ii) Mid-point of AB (5Marks)

5. Factorise completely $2P^2 + 6P - 6q - 2pq$ (3Marks)

(04 Marks)

6. A number is chosen at random from the integers 1 up to 9.
Find the probability that the number is a triangle number or a prime number.(04 Marks)

7. The function g (x) = 3x + y and g (4) = 7.
Find the value of y and hence evaluate $g\left(-\frac{1}{2}\right)$ (04 Marks)

8. Given that P varies directly as fourth root of Q and P = 4 when Q = 16.
Find the value of Q when P = 2. (04 Marks)

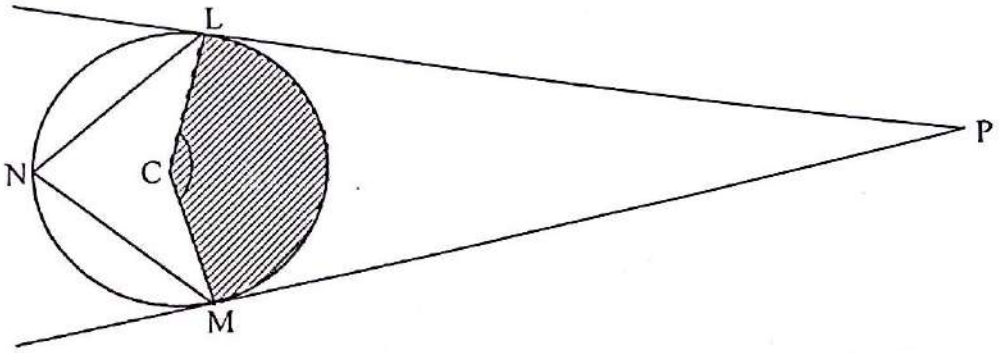
9. Find the equation of a straight line that is parallel to the line whose equation is 2x + 3y = 4 and Passes through the intersection of the lines whose equations are 3x – 2y = 0 and
3y + y = 81 (04 Marks)

10. Mr. Mukasa invested Sh. 50,000 at 8% compound interest per year.
Find the Interest earned after 2 years. (04 Marks)

SECTION B: (60 MARKS)

Answer any **FIVE** questions from this Section. All questions carry equal marks.

11.



PL and PM are tangents from point P to the Circle with centre C and radius 5cm.

a) Calculate angle LCM formed by minor arc LM.

b) Calculate, correct to 3 s.f., the area of the sector LCM which is shown shaded.

c) Also calculate the area of quadrilateral LCMN correct to the nearest cm^2.

12. a) The price of a house valued at 15 million shillings increased by 25% after the first year and decreased by 10% in the second year. Find the value of the house after a period of two years.

b) Mr. Okello earns a gross income of Sh. 8,160,000 per annum from a private school. He is entitled to a monthly personal allowance of Sh. 35,000 and an earned income allowance of 10% of his remaining income. Thereafter the first Sh. 200,000 of the remainder is taxed at 4% and the rest at 12% monthly.

(i) Calculate Mr. Okello's monthly income.

(ii) Express the income tax as a percentage of his monthly gross income

13. Three transport companies A, B and C operate between two towns. A owns 1 bus, 3 mini-buses and 6 taxis; B owns 3 buses, 2 mini-buses and 4 taxis; C owns 2 buses, 1 mini bus and 8 taxis. The carrying capacity of a bus is 52 passengers, a mini bus 20 and a taxi 4.

a) Represent this information as two suitable matrices and use matrix multiplication to find the number of passengers travelling by bus, by mini-bus and by taxi every day given that each vehicle makes one return journey daily and goes full.

b) Rearrange the above information into suitable matrices and find how many passengers each company transports daily.

14. Given three sets P, Q and R are such that
$n(P) = 16, n(Q) = n(R) = 19, n(P \cap Q) = 7, n(Q \cap R) = 6, n(P \cup Q \cup R)^{1} = 38$
and $2n(P \cap Q \cap R) = n(P \cap R) = n(PUQUR)^{1}$

a) Represent the above information in a venn diagram

b) Find (i) $n(P \cap Q \cap R)$ (ii) $n(P \cap Q \cap R^{1})$ (iii) $n(PUQ)^{1}$
(iv) $n(\varepsilon)$ where ε = universal set.

Turn Over

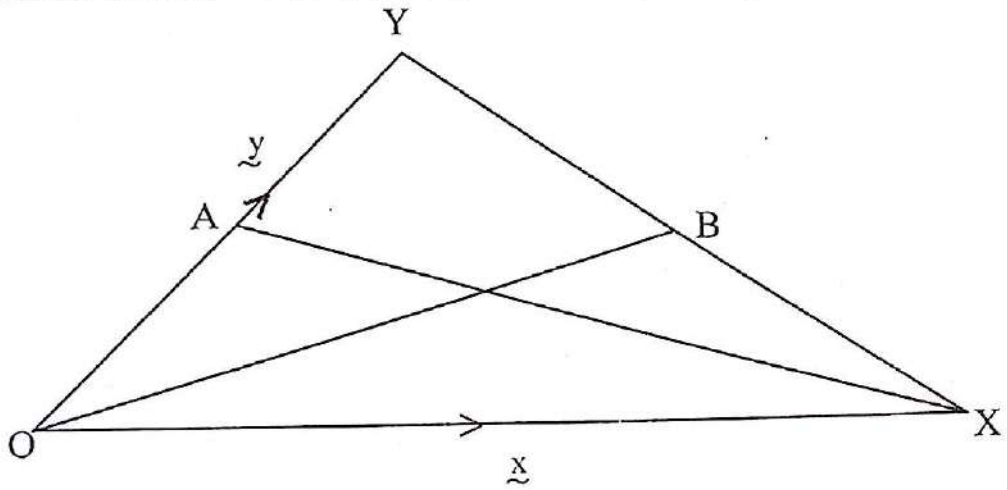
15. The distance between Kampala and Tororo is 180km. A bus leaves Kampala at and travels for $1\frac{1}{2}$ hours at a steady speed of 60km hr^{-1}, rests for 30 minutes then it continues at the same speed as before up to Tororo. At 0945hours a Prado car leaves Tororo and travels non-stop to Kampala at a steady speed of 90Kmh^{-1}.

a) On the same axes draw distance-time graph showing the journeys of each vehicle. Hence determine when and at what distance from Tororo the two vehicles meet.

b) Calculate the time at which the bus arrives in Tororo.

c) Determine the difference in times of arrival of the two vehicles.
(Hint: Use scale of 1cm to 10km on a vertical axis and 1cm : 15 minutes on horizontal axis).

16. In the triangle OXY below, OX = $\underset{\sim}{x}$ and OY = $\underset{\sim}{y}$. Points A and B lie in the lines OY and XY such that OA : AY = 1 : 3 and XB : BY = 2 : 3 respectively.



Given that OC = h OB and A C = k A X, express in terms x, y, h and k the vectors;
(i) OB
(ii) AX
(iii) OC, Hence find the values of h and k

17. The bearing of N from A is 055^0. A point M is due East of A and the angle of depression of M from N is 32^0.

a) Draw an accurate diagram to represent the above information.

b) Find the bearing of N from M.

c) If the distance between A and N is 60KM, find how long a car can take to travel directly from M to N at a speed of 80km/h. (use 1cm : 50km).

END.

456/2
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MATHEMATICS

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SECTION A COMPULSORY (40 MARKS)

Answer All questions in this section.

1. Without using mathematical tables or a calculator, evaluate:

$$\frac{0.064 \times 50}{0.05 \times 4}$$

(04Marks)

2. A and B are two sets such that $n(A-B) = 14 + x$, $n(B - A) = 3x$ and $n(A \cap B) = x$. illustrate this information by a venn diagram. Calculate, given that $n(A) = n(B)$,

   (i) the numerical value of x

   (ii) $n(A \cup B)$ (04Marks)

3. If $\mathbf{OA} = \underset{\sim}{a} = \begin{pmatrix} 6 \\ -4 \end{pmatrix}$, $\mathbf{OB} = \underset{\sim}{b} = \begin{pmatrix} 9 \\ -6 \end{pmatrix}$ and $\mathbf{OC} = c = \frac{3}{2}\underset{\sim}{a} + \frac{1}{3}\underset{\sim}{b}$,

   Show that points A, B, and C are collinear. (04Marks)

4. Find the interest earned on Shs. 4,000,000 invested for two years at compound interest rate of 3% per annum. (04Marks)

5. If one pound sterling (£) = Ug Shs. 3000 and one Kenya shilling (KShs) = Ug Shs. 20.

   Find how many Kenya Shillings can fetch 600 (£) pound sterling.

   (04Marks)

6. The function h(x) is defined as $h(x) = \frac{4x-2}{x^2-9}$

   Find (i) h(2)

   (ii) values of x for which h(x) is meaningless. (04Marks)

7. The scale of a map is 1:80,000.

   Determine the actual distance in kilometer between two towns which are 12.5cm apart on the map. (04Marks)

8. Find the equation of a straight line parallel to $2y = 1 - 4x$ which passes through the point of intersection of the lines $x = -1$ and $y = 2$. (04Marks)

9. Without using tables or calculators, evaluate:

$$\frac{\sqrt{50}}{\sqrt{2}} + \frac{\sqrt{600}}{\sqrt{24}}$$

(04Marks)

10. Given that $\log_{10}^{x} = 2.852$ and $\log_{10}^{y} = \bar{2}.581$,

    Use tables to evaluate $x^{\frac{1}{2}}y$ correct to 3 significant figures (04Marks)

SECTION B: (60 MARKS)

Answer <u>ANY</u> five questions from this section. All questions carry equal marks.

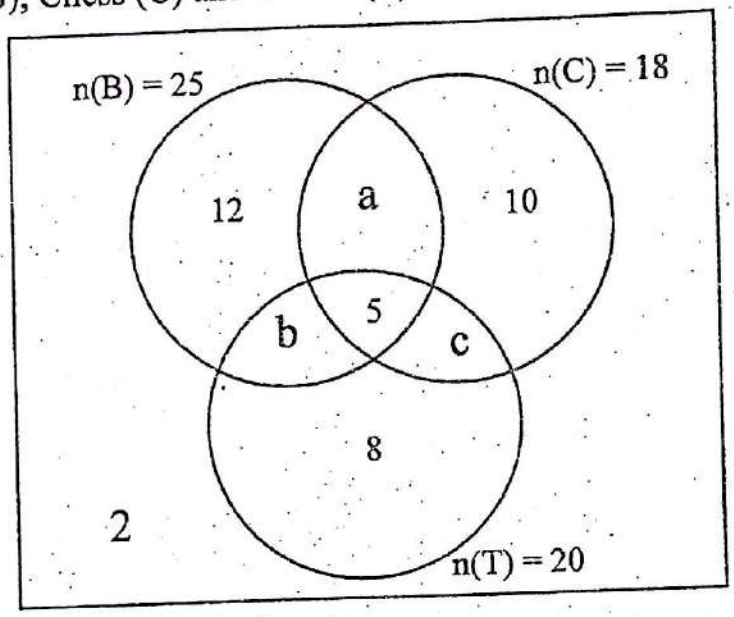
a) i) Draw a table for values of y and x for the curve $y = 10 - x^2$. Use values of x from $^-4$ to $^+4$. (06Marks)

ii) Use your table to draw a graph of $y = 10 - x^2$ (02Marks)

b) On the same axes, draw the graph of the line $y = 2x + 3$ (04Marks)

c) Use your graphs to solve the equation $x^2 + 2x - 7 = 0$

2. The diagram below represents members of a youth club who play different games; Badminton (B), Chess (C) and Tennis (T).



a) Determine the values of a, b and c (06Marks)

b) Find the total number of youth members who

(i) Make up the youth club

(ii) Belong to at least 2 clubs (04Marks)

c) A member is chosen at random from the youth club. Find the probability that the member belongs to B and T but not C. (02Marks)

13. The points A, B and C in a plane have position vectors $\underset{\sim}{a} = \begin{pmatrix}3\\4\end{pmatrix}$, $\underset{\sim}{b} = \begin{pmatrix}-1\\1\end{pmatrix}$ and $\underset{\sim}{c} = \begin{pmatrix}11\\-2\end{pmatrix}$ respectively, find the

a) i) length AB, BC and AC

ii) size of the angle BAC (08Marks)

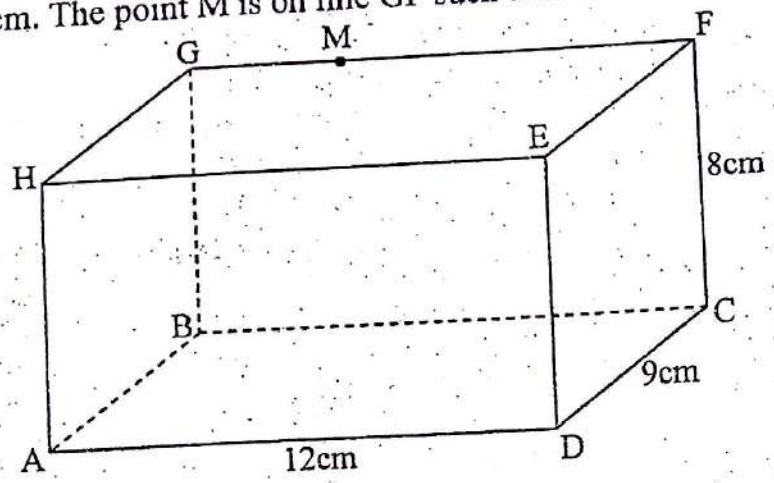
b) If point D is the mid-point of BC, find the equation of the line through point D which is parallel to the line AB. (04Marks)

14. a) Amega left Kampala at 9:00am and travelled to Jinja at an average speed of $60kmh^{-1}$. If Jinja is 30km from Kampala, at what time did he reach Jinja? (04Marks)

Turn Over

b) An aeroplane flew from airport A to airport B at 500Kmh^{-1}. Airport B is 1200km from airport A. The aeroplane flew back to airport A at 300kmh^{-1}. Calculate its average speed for the whole journey. (08Marks)

15. The diagram below ABCDEFGH is a cuboid in which AB = 9cm, AD = 12cm, and CF = 8cm. The point M is on line GF such that GM: MF = 1:3.



a) Calculate the length AF and MD (04Marks)

b) Find the angle between the
   i) Line AF and the base ABCD
   ii) Planes EFGH and AGFD (04Marks)

16. a) If h(x) = nx + 7 and h(5) = 22, find;
   i) the value of n.
   ii) h(4) (08Marks)

b) Given that f(x) = $8x^2 + 5$, find
   i) f(-3)
   ii) f(2)
   iii) the values of x for which f(x) = 293 (08Marks)

17. a) The cash price of a television set is Shs. 499,000. Through installment buying for seven months, Juliet paid an extra of Shs. 61,000. Find the amount of money she paid monthly. (02Marks)

b) The following is an advertisement of Dell computer by MAJA company limited.
"GET YOUR SELF A COMPUTER CHEAPLY WHILE STOCK LASTS"
Terms: Cash at Ug Shs. 1,150,000 or hire purchase; Deposit 20% of the cash price and pay either Shs. 95,000 weekly for 12weeks OR Ug. Shs. 260,000 monthly for 4 months. Calculate the
   i) Savings a customer would make by buying the computer on cash terms rather than weekly hire purchase. (04Marks)
   ii) Percentage profit made on monthly hire purchase if the wholesale cost of a computer is 16.5% below the cash price. (06Marks)

END.

456/2
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Paper2
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$2^1/_2$hours

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MATHEMATICS

Paper 2

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Turn Over

SECTION A (40 MARKS)

*Answer **All** questions in this section.*

1. Express 216 as a product of its prime factors, hence find the cube root of 216. *(04 marks)*

2. A trader invested Shs. 80,000 at 15% simple interest per year in a certain bank. After t years his account accumulated to Shs. 128,000, find t.

3. A parallelogram ABCD has vertices at A(-6, -1), B(-2, -1) and C (6, -5). Find the coordinates of point D.

4. In a class, 52 students like Coca cola (C), 26 like Mirinda (M) and 8 like both C and M. If 3 do not like any of the two soft drinks, find the total number of students in the class.

5. Without using tables or calculators simplify as far as possible;
$\frac{1}{2}log_{10}64 - 3log_{10}\left(\frac{a}{5}\right) + log_{10}a^3$.

6. Find the equation of a line which is the perpendicular bisector of the line passing through the points (3, 4) and (-1, 6). *(04 marks)*

7. A student spent $\frac{1}{4}$ of his pocket money on pens, $\frac{1}{3}$ on books and $\frac{2}{7}$ on soft drinks. If his balance after shopping amounted to shs. 3,300, how much money did he have before shopping? *(04 marks)*

8. Express $0.2\overline{45}$ as a rational number in the form $\frac{p}{q}$ where $q \neq 0$ in its simplest form. *(04 marks)*

9. A pyramid VABCD on a square base has each of it's eight edges of length 10cm. Calculate the angle between edges VA and VC. *(04 marks)*

10. Given the vectors **PQ** = $\begin{pmatrix}2\\0\end{pmatrix}$, **RS** = $\begin{pmatrix}-1\\6\end{pmatrix}$ and **RQ** = $\begin{pmatrix}-3\\3\end{pmatrix}$, find the modulus of the vector **PS.** *(04 marks)*

SECTION B: (60 MARKS)

*Answer **<u>any five</u>** questions from this section. All questions carry equal marks.*

11. In a triangle OPQ, **OP** = **p**, **OQ** = **q**, a point K is on the side of PQ and L on the side of OQ such that $\overline{PL}$ and $\overline{OK}$ meet at a point M. Given that $\overline{OL} = x\overline{OQ}$, $\overline{PK} = y\overline{PQ}$, $\overline{PM} = \overline{ML}$ and $3\overline{OM} = 2\overline{OK}$,
Express the vectors.

a) **PL** and **OM** in terms of **p**, **q** and x. *(03marks)*

b) **OK** and **OM** in terms of **p, q** and y. *(04 marks)*

Hence find the values of x and y. *(05 marks)*

12. a) Copy and complete the table below for the curve $y = 4x-x^2$ and the line $2y = x+3$ in the interval $-1 \leq x \leq 5$.

x	-1	0	1	2	3	4	5
$4x$		0				16	
$-x^2$		0				-16	
$y = 4x-x^2$		0				0	
$y = \frac{1}{2}(x+3)$		1.5				3.5	

b) Using the table above in (a) draw the graphs $y = 4x - x^2$ and $2y = x + 3$ for values of x. $-1 \leq x \leq 5$.

c) Use your graph to solve the equation $2x^2 - 7x + 3 = 0$.

13. A total of 100 vehicles were inspected and 60 passed the road worthy test. The remainder had faults in; Brakes (B) Lights (L) and Steering (S) as follows;
$n(B \cap S' \cap L') = 12$, $n(B \cap S) = 5$, $n(B \cap L) = 8$
$n(S \cap L \cap B') = 2$, $n(B \cap L \cap S) = 3$ and $n(S \cap L' \cap B') = n(L \cap B' \cap S')$

a) Represent the given information on a venn diagram. *(06 marks)*

b) How many vehicles had
   i) Faulty lights? *(03 marks)*
   ii) One fault only? *(01 mark)*

c) If a vehicle is chosen at random, find the probability that it had at least two faults. *(02 marks)*

14. Two taxis A and B move off from rest in the same direction on a straight road. The speed of taxi A increases at a uniform rate of $2ms^{-1}$ while taxi B moves as shown in the table below;

Time (s)	0	1	2	3	4	5	6	7	8
speed (ms^{-1})	0	0.5	1.5	4	10	15	18	19.5	20

a) Draw on the same axes the speed - time graphs of taxis A and B using the scale; **1cm to represent 1 second and 1cm to represent $2ms^{-1}$.**

b) Using the graphs in (a) above find the;
   i) time and speed when taxi B over took taxi A.
   ii) difference in the speed of the vehicles after 6 seconds.
   iii) distance covered by taxi A.

Turn Over

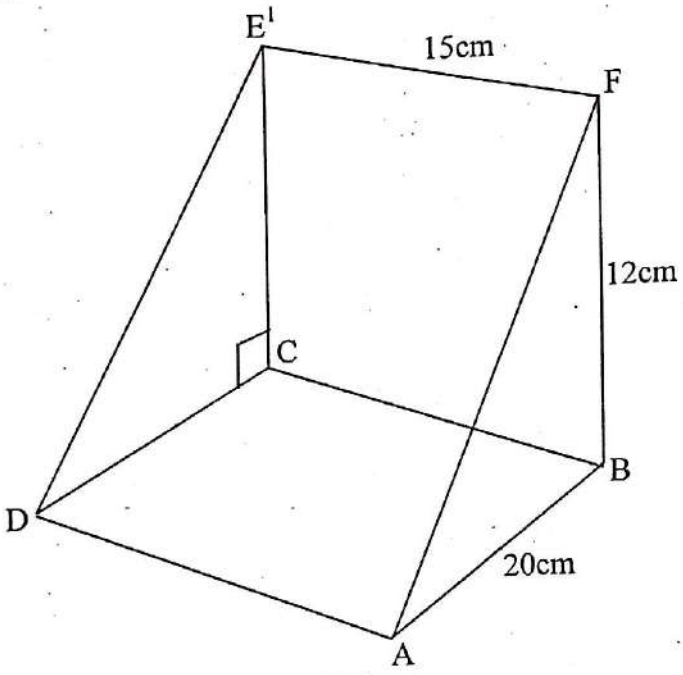
15. a) The inverse function of a function f(x) is defined by $f^{-1}(x) = \frac{2x+5}{3}$, find , *(02 marks)*

i) $f^{-1}\left(\frac{1}{2}\right)$ *(04 marks)*

ii) $f(^{-}3)$

b) A function g is defined by g(x, y) where g(x, y) = ax + by with a and b as constants.
If g(7,4) =2 and g(3,-1) = 9, find the values of a and b. Hence find g (1,-2) *(06 marks)*

16. The figure below shows a prism ABCDEF with right angled triangular cross – section such that $\overline{AB}$ = 20cm, $\overline{BF}$ =12cm and $\overline{FE}$ =15 cm.



a) Calculate the length $\overline{DE}$ and $\overline{DF}$

b) Find the angle between the

i) Line $\overline{DF}$ and the base ABCD.

ii) Planes ADEF and BCEF.

c) Volume of the prism ABCDEF.

17. a) An amount of shs.4million was deposited in a bank at 10% compound interest per annum. Find the number of years it will take to accumulate to shs.5,324,000. *(04 marks)*

b) A gas cooker can be bought by cash at shs.450,000. The shop keeper offers it on hire purchase for a monthly deposit of 12.5% and 10 monthly installment payments of Shs.43,000 per month. Calculate the;

i) total hire purchase cost

ii) extra cost to buy the cooker on hire purchase

iii) extra cost as a percentage of the cash price.

(08 marks)

END

456/2
MATHEMATICS
Paper2
July/August 2014
$2^1/_2$hours

WAKISSHA JOINT MOCK EXAMINATIONS

Uganda Certificate of Education

MATHEMATICS

Paper 2

2hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

- *Answer* **all** questions in Section **A** and any **five** questions from Section **B**.
- Any additional question(s) answered will **not** be marked.
- **All** necessary calculations **must** be done on the same page as the rest of the answers. Therefore, no paper should be given for rough work.
- Mathematical table with a list of formulae and squared paper may be provided.
- Silent, non-programmable scientific calculators may be used.
- State the degree of accuracy at the end of each question attempted using a calculator or mathematical tables; and indicate **cal** for calculator, or **Tab** for mathematical tables.

Turn Over

SECTION A (40 Marks)

Answer **all** *questions from this section*

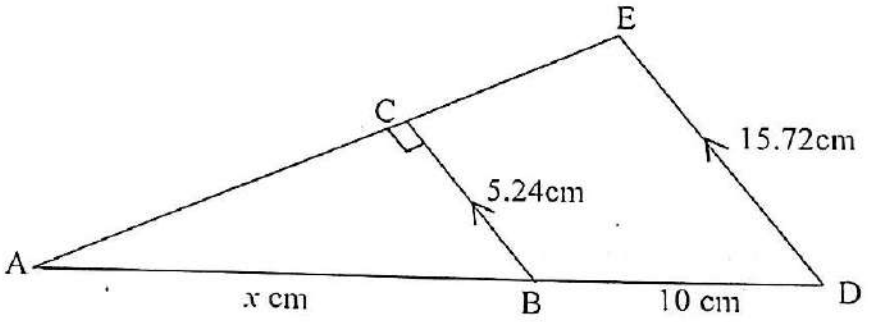
1. Without using mathematical tables or a calculator, simplify: $6 + \frac{2\frac{1}{2} - \frac{1}{4}}{\frac{3}{4}}$ (04 marks)

2. Given that $x : y = 4:5$ find the value of x when $y = 120$. (04 marks)

3. Given that P = {All prime numbers less than 10} and
   T = {All triangle numbers less than 20}
   (a) List the members of sets P and T
   (b) Find n(P∪T) (04 marks)

4. A shop keeper made a profit of 5% after selling a television. If the profit made was Shs 15,000, what was its cost price? (04 marks)

5. In the figure below line BC is parallel to line DE, AB = $x$cm, BD = 10cm, BC = 5.24 cm and DE = 15.72 cm. Find the value of x. (04 marks)



6. The points D and E are (7, 9) and (2,-3) respectively. Find the
   (i) Vector ED
   (ii) Magnitude of ED

(04 marks)

7. Convert 204_{six} to base four. (04 marks)

8. Find the equation of a line passing through point (3,-4) and is parallel to the line $2x - 3y = 6$. (04 marks)

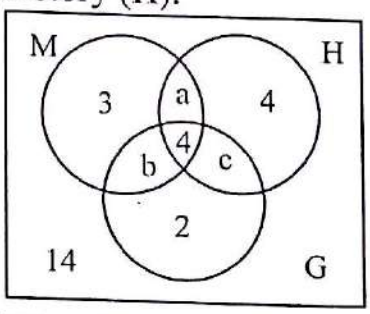
9. Solve for y in $\sqrt{175} - 2\sqrt{28} + \sqrt{63} = y\sqrt{7}$ (04 marks)

10. Express $0.8\overline{7272}$ as a rational number in the form $\frac{a}{b}$ where $b \neq 0$ in its simplest form. (04 marks)

SECTION B (60marks)

Answer **five** *questions from this section.*

11. The venn diagram below shows representation of students of senior four of Katikitiki secondary school to three different clubs of mathematics (M), Geography (G) and History (H).



(a) If n(M).= 18, n(H) = 19 and n (G) = 20 determine the values of a, b and c. (07 marks)

(b) Find (i) the size of the class.
(ii) $n(M^{l} \cap G \cap H)$ (03 marks)

(c) If a student is chosen at random from the class, what is the probability that she/he belongs to only two clubs? (02 marks)

12. a) Without using logarithm tables or calculator simplify $\left(\frac{27}{125}\right)^{-1/3} \div (0.25)^{3/2}$ in its simplest form. (06 marks)

b) Use logarithm to evaluate $\frac{342.0 \times 0.0017}{0.35}$. Give your answer in standard form. (06 marks)

13. a) Given that $g(x) = \frac{3x}{x+4}$ and $h(x) = x^2 - 2$

Find; (i) $g(-5)$
(ii) $gh(2)$

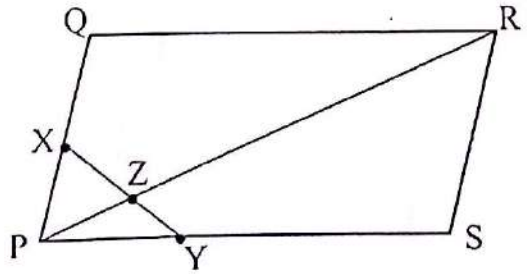
(06 marks)

b) A function f is defined by $f(x) = \frac{x+4}{3x+2}$ find;

(i) $f^{-1}(x)$
(ii) the value of x for which $f^{-1}(x)$ is meaningless

(06 marks)

14. In a parallelogram PQRS, point X lies on line PQ such that PX = XQ and point Y lies along line PS such that PY = 2YS. Given that; PQ = 2$\underset{\sim}{a}$ and PS = 3$\underset{\sim}{b}$.

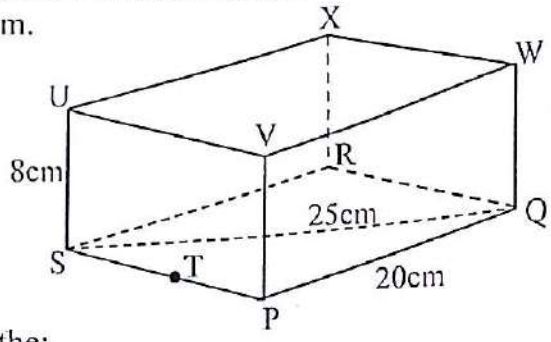


(a) Find in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$ the vectors
(i) PR (ii) YX (04 marks)

(b) If PR meets XY at Z such that PZ = mPR and YZ = nYX, find PZ and YZ in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$ and hence find the values of m and n. (08 marks)

Turn Over

15. The figure PQRSUVWX is a cuboid with ST = TP, SU = 8cm, PQ = 20cm and SQ = 25 cm.



Calculate the;

(a) Length PX. (4 marks)

(b) (i) Surface area of the cuboid. (3 marks)

(ii) Volume of the cuboid. (2 marks)

(c) Angle between the planes TWX and RQWX. (3 marks)

16. The distance d(m) travelled by a particle after time t (s) is given by the table below;

Distance (m)	0	25	50	60	60	50	25	0
Time (s)	0	1	2	3	4	5	6	7

(a) Draw a distance - time graph to represent the information above using a scale of 1cm : 5m on vertical axis and 1 cm: 1 second on horizontal axis. (6 marks)

(b) From your graph;

(i) Find the time when the particle had travelled 30m. (2 marks)

(ii) Estimate the average speed between 1second and 5 seconds. (3 marks)

(c) Determine the maximum distance travelled. (1 marks)

17. In a certain school a teacher's gross income has certain allowances deducted before it is taxed.

The allowances include;

Marriage	$^1/_{20}{}^{th}$ of the gross income
Housing	shs. 30,000 per month
Medical and insurance	shs. 180,000 per annum
Head of department	shs. 20,000 per month
Lunch and breakfast	shs. 1500 per day

Family allowance for three children only. Children aged below 10 shs. 20,000, ages from 10 to 15 years shs. 15,000 and children aged from 16 to 20, shs. 10,000 per child. Mr. John is married with three children one aged 8, the elder is 22years and the other 14years. If his gross monthly income is shs. 720,000,

(a) Calculate the taxable income and income tax he pays under the tax structure below;

Income (shs)	Rate %
0 – 120,000	Tax free
120,001 – 250,000	13.0
250,001 – 430,000	24.0
430,001 – 630,000	30.0
Above 630,000	40.5

N.B. (One month = 30 days)

(b) Determine the percentage of this gross monthly income paid in taxes. (12 marks)

END

456/2
MATHEMATICS
Paper2
July/August 2015
$2^1/_2$hours

WAKISSHA JOINT MOCK EXAMINATIONS

Uganda Certificate of Education

MATHEMATICS

Paper 2

2hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

- Answer **all** questions in Section **A** and any **five** questions from Section **B.**
- Any additional question(s) answered will **not** be marked.
- **All** necessary calculations **must** be done on the same page as the rest of the answers. Therefore, no paper should be given for rough work.
- Graph paper is provided.
- Silent, non-programmable scientific calculators and mathematical table with a list of formulae may be used.
- State the degree of accuracy at the end of each question attempted using a calculator or mathematical tables; and indicate **cal** for calculator, or **Tab** for mathematical tables.

Turn Over

SECTION A (40 MARKS)

Attempt **all** questions in this section.

1. Express 18 and 42 each as a product of its prime factors and hence find their highest common factor (HCF). (04 marks)

2. Express 2.10303....in the form $2\frac{a}{b}$, where a and b are integers. (04 marks)

3. Given that $f(x) = 2\sqrt{x} + 6$, find the value of x for which $f(x) = 16$. (04 marks)

4. Find the equation of a line passing through the point (0, -5) and is perpendicular to the line $y + 3x = 1$ (04 marks)

5. Simplify the following as far as possible,
   $\log_2 4 - \frac{1}{2}\log_3 81 + \log_2 8$ (04 marks)

6. Given that position vectors **OP** = $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$ and **OQ** = $\begin{pmatrix} 4 \\ -1 \end{pmatrix}$.
   Find the coordinates of the mid-point of vector **PQ.** (04 marks)

7. Two similar conical flasks have heights of 32.4cm and 97.2cm.
   If the volume of the small flask is 3016cm^3, find the volume of the big flask.
   (04 marks)

8. A tourist has US$ 1,200 which he changes to Uganda shillings (Ug. Shs) at a rate of $1 = Ug. Shs 3,000. If he has a balance of Ug. Shs 900,000 after all expenses find;
   (a) the amount of money spent in Ug. Shs.
   (b) his balance in US dollars. (04 marks)

9. The number of people who play football (F) or basket ball (B) is twice the number of people who play F and B. If n(F) = 9 and n(B) = 6, how many play both games? (04 marks)

10. The quantity V varies directly as H and inversely as the square of W. Given that when W = 50, H = 100 and V = 80, find W, when H = 320 and V = 100. (04 marks)

SECTION B (60 MARKS)

Attempt any **five** questions in this section. All questions carry equal marks.

11. A quantity R varies partly as the square of V and partly as the cube of V. When V = 20, R = 416 and when V = 40, R = 3264.
    (a) Form an equation relating R and V.
    (b) Determine the value of R when V = 30. (12 marks)

12. The functions f and g are defined by $f(x) = \frac{x}{x-5}$ and $g(x) = x + 4$.

    Find;
    (a) $g(^{-}10)$ (02 marks)
    (b) $f^{-1}(x)$ and hence $f^{-1}(6)$ (04 marks)
    (c) the value of x for which $gf(x) + fg(x) = 0$ (06 marks)

13. In a mathematics class the teacher told students to bring a pen(P), a graph book (G) and a ruler (R) for use. During the next lesson it was found out that only 16 students brought all the items. 5 students did not have any of the items. 13 did not have a pen, 14 students did not have a graph book and 20 did not have a ruler. One student only had a pen, 2 students had only a graph book and no student had only a ruler.
    (a) Represent the above information a venn diagram. (05 marks)

    (b) How many students
        (i) were in the class?
        (ii) had a pen and a ruler only? (03marks)

    (c) If a student is selected from this class at random find the probability that he had
        (i) at least 2 items.
        (ii) only one item. (04 marks)

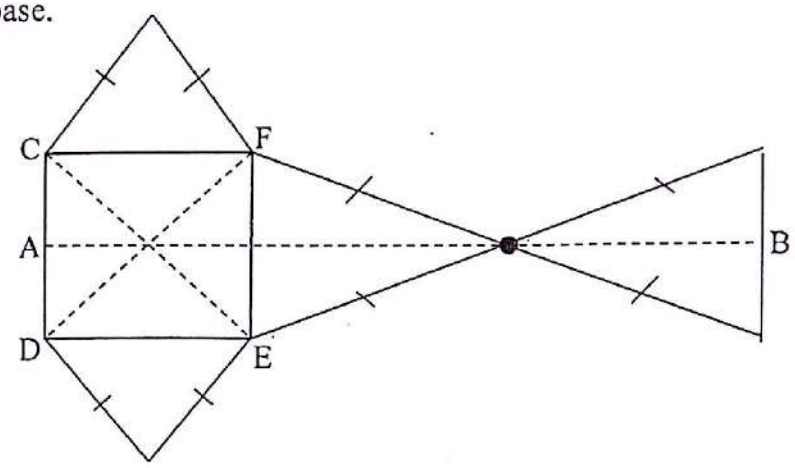
14. A lorry set off from Tororo at 0730 hours at a steady speed of 40km/hr to Kampala, a distance of 180km away. After travelling for 2 hours it stopped and rested for $1\frac{1}{2}$hrs, then continued at a steady speed of 50km/hr for the rest of its journey. A car also set off from Kampala to Tororo at the same time as the lorry at a steady speed of 60km/hr but suddenly reduced its speed after 2 hours to 15km/hr due to some mechanical fault for the remaining journey.
    Using scales of 1cm to 10km and 1cm to 30 minutes on the vertical and horizontal axes respectively:

    (a) Draw distance time graphs showing the routes of the two vehicles. (08 marks)

    (b) Using your graphs determine the
        (i) distance between the two vehicles after 2 hours.
        (ii) difference in time of arrival at respective towns. (04 marks)

Turn Over

15. The diagram below shows a square CDEF with diagonals CE and DF each = $\sqrt{200}$ cm and four congruent isosceles triangles representing the net of a pyramid on a square base.



Given that AB = 46cm,

(a) Draw a sketch of the pyramid. (02 marks)

(b) Calculate the

(i) height of the vertex of the pyramid above the base.

(ii) angle between two opposite slanting planes.

(iii) volume of the pyramid. (10 marks)

16. (a) Calculate the simple interest on Shs. 990,000 for 8 months at a rate of $5\frac{1}{2}$ % per annum. (03 marks)

(b) The income tax rates of a certain country are shown in the table below;

Taxable Income (Shs)	Rate (%)
01 - 200,000	6
200,001- 500,000	13
500,001 - 900,000	20
900,000 and above	30

(i) Calculate the Income tax an employee pays if the employee's taxable income is Ug.Shs 1,170,000. (05marks)

(ii) Given that the employees' untaxed allowances is Shs 140,750/=. Find the employee's net income. (04marks)

17. In a triangle OPQ, point R lies on line PQ such that **3PR = PQ**. Point S lies on line **OQ** and **OS** = $\frac{1}{4}$**OQ**, while T lies on line **OR** such that **OT = TR.**

If OQ = **q** and OP = **p** express in terms of **p** and **q** the vectors.

(a) (i) **PQ**

(ii) **OR**

(iii) **PT** (08marks)

(b) Show that **PT : TS** = 2:1. (04marks)

- END-

456/2
MATHEMATICS
Paper2
July/August 2017
$2^1/_2$hours

WAKISSHA JOINT MOCK EXAMINATIONS

Uganda Certificate of Education

MATHEMATICS

Paper 2

2hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

- Answer **all** questions in Section **A** and any **five** questions from Section **B**.
- Any additional question(s) answered will **not** be marked.
- **All** necessary calculations **must** be done in the same answer booklet/sheets provided with the rest of the answers. Therefore, no paper should be given for rough work.
- Graph paper is provided.
- Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

SECTION A (40 MARKS)

Attempt **all** questions in this section.

1. Without using a scientific calculator evaluate; $\dfrac{3-2\frac{3}{4}}{1\frac{3}{4}}$ *(04 marks)*

2. The distance between the end points of A (2, 2) and B (6, y) of a line is 5 units. Calculate the possible values of y. *(04 marks)*

3. Given that $U = 4\underset{\sim}{a}+3\underset{\sim}{b}$, $V = 5\underset{\sim}{a} - \underset{\sim}{b}$ and $W = h\underset{\sim}{a} + (h + k)\underset{\sim}{b}$ where h and k are constants. Calculate the value of h and k when $W = 3U - 2V$. *(04 marks)*

4. Given that $\log_{10}3 = 0.4771$, without using tables or calculator evaluate $\log_{10}8.1$ *(04 marks)*

5. Given that M and N are two sets such that $n(\varepsilon) = 39$, $n(M \cap N) = 12$, $n(M) = 26$ and $n(M' \cap N') = 5$, find
   (i) $n(M' \cap N)$ *(03 marks)*
   (ii) $n(N')$ *(01 mark)*

6. A function $f(x) = x - m$ and $f^{-1}(x) = 2xk - 7$ where m and k are constants. Calculate the values of m and k. *(04 marks)*

7. The force (F) which acts between two magnetic poles is inversely proportional to the square of the distance (d) between them. If F = 18 when d = 4, Find F when d = 3. *(04 marks)*

8. An employee's gross salary is Shs. 6.72 million per annum. He pays an income tax of 15% of his gross monthly income. Find his net income per month. *(04 marks)*

9. The total surface area of a cuboid measuring 4cm by 0.05m by x cm is $76cm^2$. Calculate the value of x. *(04 marks)*

10. Express $\dfrac{\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ in the form $p + \sqrt{q}$ where p and q are integers. Hence state the values of p and q. *(04 marks)*

SECTION B (60 MARKS)

Attempt any **five** questions from this section. All questions carry equal marks.

11. In a certain school there are students who play football (F), Tennis (T) or Volleyball (V). 24 play Football, 25 play Tennis and 29 play Volley ball. 11 play both F and T, 10 play both T and V while 13 play both F and V.
The number of students who play tennis or volley ball but not footbali is equal to twice those who play neither of the three games.
If those who play neither of the games are 12;

(c) Represent the above information on a venn diagram. *(07 marks)*

(d) Find the;

(i) total number of students in the school.

(ii) number of students who play only two games. *(03 marks)*

(e) Find the probability that a student chosen at random plays not more than one game. *(02 marks)*

12. (a) Given that $g(x) = px^2 - qx + 1$, $g(2) = 11$, and $g(1) = 2$. Find the values of p and q. *(05 marks)*

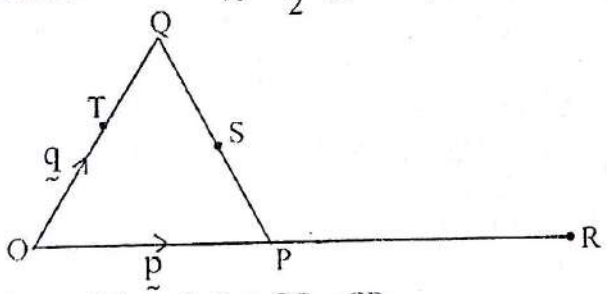
(b) Given that $f(x) = \frac{x+5}{6}$ and $fg(x) = \frac{7-x}{2}$

Find:

(i) $f(-17)$

(ii) an expression for $g(x)$ and hence evaluate $g(4)$. *(07 marks)*

13. In the diagram below $\underset{\sim}{p}$ and $\underset{\sim}{q}$ are position vectors of P and Q respectively. Point R lies on QP produced such that $\underset{\sim}{QP} = \frac{1}{2}\underset{\sim}{QR}$ and point T lies on QQ such that $\underset{\sim}{QT} = 2\underset{\sim}{TQ}$.



If point S lies on $\underset{\sim}{PQ}$ such that $\underset{\sim}{QS} = \underset{\sim}{SP}$

(a) Express in terms of $\underset{\sim}{p}$ and $\underset{\sim}{q}$ the vectors. *(09 marks)*

(i) $\underset{\sim}{QP}$

(ii) $\underset{\sim}{TS}$

(iii) $\underset{\sim}{TR}$

(iv) $\underset{\sim}{SR}$

(b) Show that the points T, S and R are collinear. *(03 marks)*

14. The time (T-hours) taken to dig a spring well partly varies as the depth (D-metres) of the well and partly varies as the square of the depth.
If T = 80, D = 20 and when T = 150, D = 30.

(a) Write down an expression connecting T and D. *(08 marks)*

(b) Find T when D = 40. *(04 marks)*

15. A worker is entitled to the following allowances:

- Insurance Shs. 1,524,000 per annum
- Housing Shs. 120,000 per month.
- Fuel of 5 litres per day.
- Electricity Shs. 60,000 per month.
- Medical Shs. 972,000 per year.

Turn Over

His income is further subjected to the tax structure below;

Taxable income (Shs)	Rate (%)
1 – 150,000	8
150,001 – 330,000	10
330,001 – 530,000	12
530,001 – 750,000	15
750,001 – 1,030,000	20
1,030,001 and above	25

N.B: 1 month = 30days.

If the worker paid an income tax of Shs. 173,000 and the price per litre of fuel is Shs. 3,800.

Calculate his;

(a) taxable income. *(10 marks)*

(b) monthly net income. *(02 marks)*

16. A bus sets off from town A, at 7:30am at a steady speed of 60 km/hr to town B, 240km away. After travelling for 90 minutes it stopped at a service centre for 30 minutes after which it increased its speed by 15 km/hr until its final destination. 30 minutes later after the departure of the bus, a taxi sets off from town B towards town A at a steady speed and arrives 15 minutes before the bus.

(a) Using scales of 2cm to represent 30 minutes and 2cm to represent 30km, draw on the same axes distance- time graphs showing the journeys for the two vehicles. *(06 marks)*

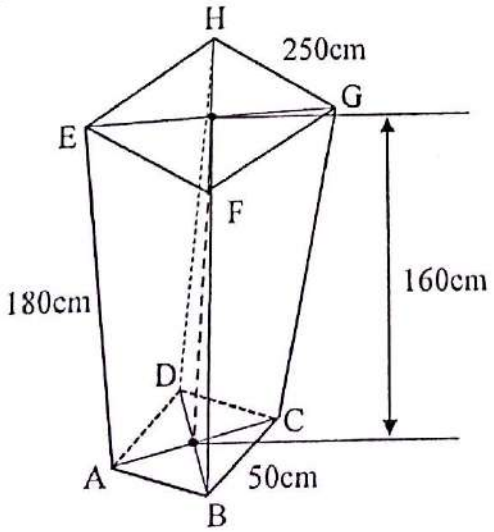
(b) Using your graph(s) in (a) above, find the time;

(i) when the vehicles by pass each other.

(ii) taken by the taxi to cover the journey. *(04 marks)*

(c) Calculate the average speed of the taxi. *(02 marks)*

17. The diagram below shows an open water tank made out of a lower part of a pyramid with height 160cm. The upper top EFGH and lower base ABCD are squares of dimensions 250cm and 50cm respectively. The slant edge is 180cm.



Calculate the;

(a) volume of water required to fill the tank in litres. *(08 marks)*

(b) surface area of the material required to cover the outer part of the tank. *(04 marks)*

END

456/2
MATHEMATICS
PAPER 2
July/August 2018
2½ hours

WAKISSHA JOINT MOCK EXAMINATIONS

Uganda Certificate of Education

MATHEMATICS

Paper 2

2hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

- *Answer all questions in section A and any five questions from section B.*
- *Any additional question(s) answered will not be marked.*
- *All necessary calculations must be done in the same answer booklet/sheets provided, with the rest of the answers. Therefore no paper should be given for rough work.*
- *Graph paper is provided.*
- *Silent non-programmable scientific calculators and mathematical tables with a list of formulae may be used.*

SECTION A (40 marks)

Answer **all** *questions in this section*

1. Without using tables or scientific calculator, evaluate $\left(\frac{1}{27}\right)^{\frac{-2}{3}} + (81)^{\frac{3}{4}}$ *(04 marks)*

2. If set P = {All factors of 30} and set T = {All triangle numbers less than 20}. Represent P and T on a venn diagram and hence find $n(P' \cap T)$ *(04 marks)*

3. A straight line passes through the points (-3, 2), (0, 2) and (4, n) Determine the value of n. *(04 marks)*

4. The surface area of two similar spheres are in the ratio of 4: 9. Find the volume of the smaller sphere if the volume of the larger one is $135cm^3$. *(04 marks)*

5. Solve for y if: $3\log_{10}y + \log_{10}\left(\frac{1}{16}\right) - \log_{10}4 = 0$ *(04 marks)*

6. Express 0.12_{six} as a fraction in its simplest form in base ten. *(04 marks)*

7. A forest covering an area of $172.8km^2$ is represented on a map by an area of $10.8cm^2$. Determine the scale of this map. *(04 marks)*

8. The quantities p and q are such that p is inversely proportional to the square root of q and q = 4 when p = 10. Find the value of q when p = 0.05. *(04 marks)*

9. Given that $h^{-1}(x) = \frac{3}{5x-2}$, find an expression for $h(x)$. Hence find $h(2)$ *(04 marks)*

10. If U$ 420 (United states dollars) is equivalent to Ug. shs. 1,659,000, find the;
    (i) exchange rate
    (ii) equivalent of Ug. shs. 750,500 in dollars. *(04 marks)*

SECTION B (60 marks)

Attempt any **five** *questions from this section.*

11. (a) A mapping is described by $x \xrightarrow{f} 1 - x^2$
    (i) Determine the range corresponding to the domain $\{3, 2, 1, -1\}$ of this mapping. *(04 marks)*
    (ii) Represent the mapping in (a) (i) above on an arrow diagram. Hence state the type of mapping. *(02 marks)*

    (b) Given that $f(x) = 3x - 1$ and $g(x) = 2x^2$, find the value of x for which $fg(x) = gf(x)$ *(06 marks)*

15. (a) A radio is offered for sale at shs.80,000/= cash or a deposit of 12% of cash price plus nine monthly payments of shs.9,400. Calculate the

(i) cost of the radio under hire purchase.

(ii) amount of money saved if the radio is bought for cash rather than hire purchase. *(06 marks)*

(b) A man deposits shs.50,000 in a bank which offers a compound interest rate of 12% per annum. How long will it take him to accumulate interest of Shs. 12,720? *(06 marks)*

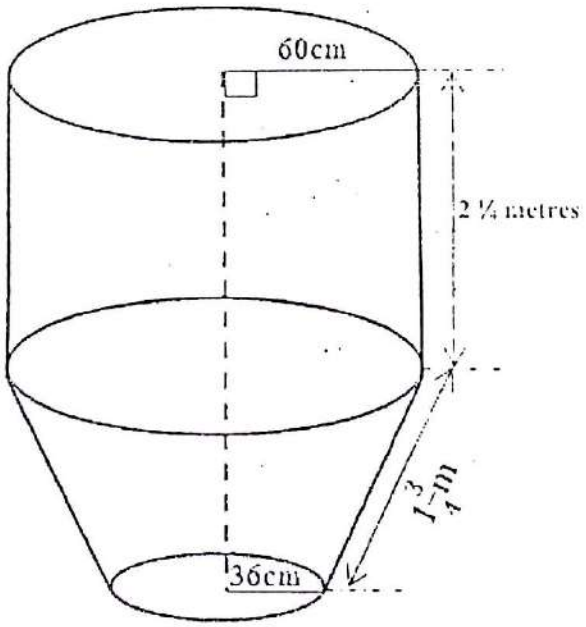
16. A cyclist (C_1) leaves town T and takes 2 hours to reach town Q, 10km away. At Q, he rests for 30minutes and later returns to T at a steady speed of 8kmh^{-1}. Another cyclist (C_2) leaves town Q at the same time as C_1 towards town T, travelling at $2\frac{1}{2}$ kmh^{-1} but midway he decides to return to Q at a steady speed of 4 kmh^{-1}.
Using a scale of 1cm to represent 15 minutes on the horizontal and 1cm to represent 0.5km on the vertical axes respectively,

(a) draw distance time graphs to represent the two different journeys of the cyclists. *(07 marks)*

(c) how far from town Q did the cyclists by pass each other on the return journey? *(01 mark)*

(c) determine the average speed of C_2 for his whole journey if he travels nonstop. *(04 marks)*

17. The diagram below shows an open water tank made up of a cylinder with radius 60cm and height of 2¼ metres and a frustrum with sl height of 1¾ metres.



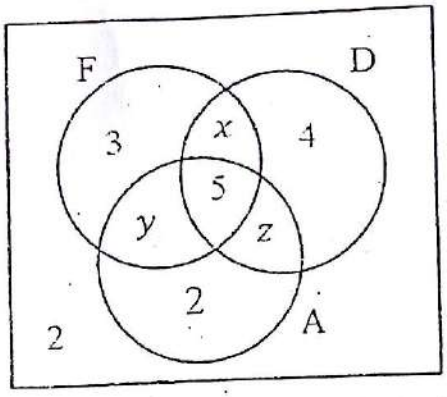
If the tank is seated on a circular base with radius 36cm, calculate the;

(a) capacity of the water tank when full of water. *(06 marks)*

(b) total surface area of the water tank. *(06 marks)*
(Use $\pi = 3.14$).

END

12. The diagram below shows representatives of members of the Board of Governors of a certain schools to different committees of: Academics (A), Development and Planning (D) and Finance (F)



(a) If $n(F) = 12$ and $n(D) = n(A) = 15$ determine the values of x, y and z. *(06 marks)*

(b) What is the total number of members of the board of governors? *(02 marks)*

(c) Find the probability that a member of the board chosen at random from the group belongs to;

(i) at least two committees. *(02 marks)*

(ii) only two committees. *(02 marks)*

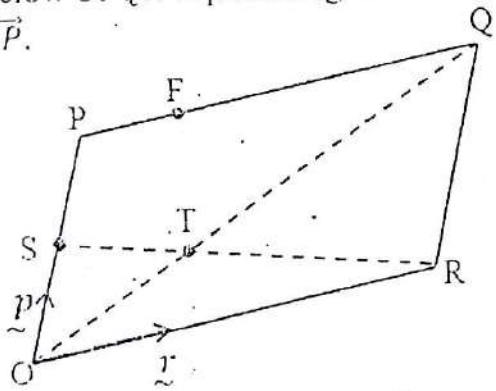
13. (a) Three people Paul, Mary and Simon contribute towards a saving fund. If Paul contributes $\frac{3}{5}$ of the total, Mary contributes $\frac{2}{3}$ of the remainder and Simon contributes Shs.8000, find the

(i) total amount of the savings fund.

(ii) contribution made by Paul and Mary independently. *(08 marks)*

(b) Use logarithm tables to evaluate: $\sqrt[3]{0.7196}$ *(04 marks)*

14. In the diagram below $OPQR$ is parallelogram in which $OP = \underset{\sim}{p}$, $OR = \underset{\sim}{r}$ and S is a mid-point of $\overrightarrow{OP}$.



Given that $5\overrightarrow{PF} = \overrightarrow{FQ}$ and $\overrightarrow{OT} = \frac{1}{2}\overrightarrow{TQ}$,

(a) express in terms of $\underset{\sim}{p}$ *and* $\underset{\sim}{r}$ the vectors

(i) $\overrightarrow{OF}$

(ii) $\overrightarrow{FR}$

(iii) $\overrightarrow{FT}$ *(07 marks)*

(b) determine the ratio $\overrightarrow{ST} : \overrightarrow{TR}$ *(05 marks)*

Turn ove