456/2

MATHEMATICS

Paper 2

JULY/AUG 2022

2 ½ hours

MBARARA 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 answer booklet(s) provided. 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: (40MARKS)

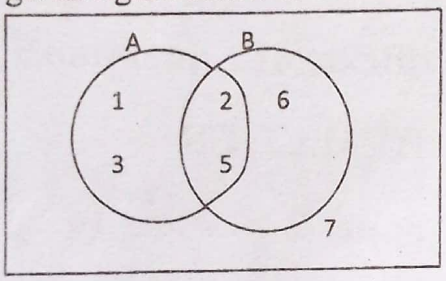
Answer all questions in this section.

1. Simplify $27^{2/3} \div \left(8^{-2/3} \times 8^{4/3}\right)$ *(4marks)*

2. M is the point (4, -8). If OM = a – 3b and $a = \begin{pmatrix} 2 \\ 0 \end{pmatrix}$, find the column vector for b, where O is the origin. *(4marks)*

3. The price of a newspaper is sh 2000. A newspaper vendor receives a commission of 5% on the first 80 copies he sells and 2½% on extra copies sold. How much commission does he receive for selling 200 copies. *(4marks)*

4. Use the given figure below to answer the questions.



Find;

(i) n(AnB′) *(2marks)*

(ii) A′UB *(2marks)*

5. It is given that $f(x) = \frac{a}{x+2}$ and that f(6) = 6. Find the

(i) value of a *(2marks)*

(ii) f(-8) *(2marks)*

6. At a speed of 18kmh^{-1} a cyclist takes 3hours to complete a journey. How long would he take to complete the journey at 15kmh^{-1}? *(4marks)*

7. The line 3x + 2y = 8 cuts the y-axis at p(0,k). Find

(i) the gradient of the line

(ii) the value of K *(4marks)*

8. An open cone is made from a sector of a circle of radius 5cm. if the angle of the sector is 216^0, find the area of the curved surface of a cone *(4marks)*

9. A map is drawn to a scale of 1 : 300,000. Find the actual area, in km^2, of a road represented by $4.2cm^2$ on the map *(4marks)*

10. Solve the equation $\frac{-3x-7}{5} + \frac{x}{3} = \frac{x-2}{6}$ *(4marks)*

SECTION B (60MARKS)

Answer any five questions from this section. All questions carry equal marks.

11. In a group of 30boys in form 4 of a certain school, 19 play football (F), 17 play volleyball (V) and 10 play both. Three of the 10 also play basketball (B), 5play volley ball and basket ball and 9 play football and basketball. All the boys play at least one of these games. By means of a Venn diagram, find:
    (i) the number of boys who play basket ball only. *(8marks)*
    (ii) the number of boys playing atleast 2 games *(2marks)*
    (iii) the probability that a boy picked at random is playing only one game. *(2marks)*

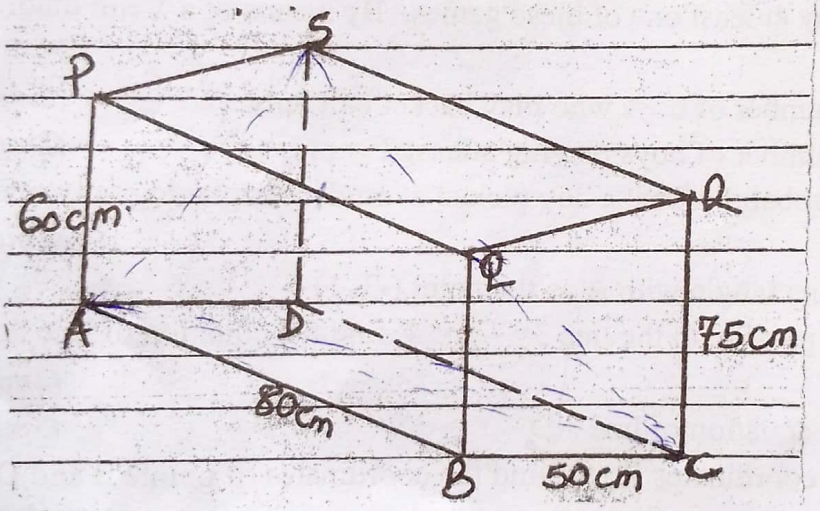
12. ABCD is a rectangle with A as the point (-3, 1).
    (a) If AB is parallel to the line $3y - x = 4$, find the equation of line AB. *(3marks)*
    (b) Find the equation of line AD *(3marks)*
    (c) If C has coordinates (2, 6), find the coordinates of points B and D. *(6marks)*

13. (a) Given $f(x) = \frac{2x}{x-3}$, find;
    (i) F(-1)
    (ii) f(0)
    (iii) $f^{-1}(x)$
    (iv) $f^{-1}(1)$ *(8marks)*
    (b) Given $g(x) = 2x - 5$ and $h(x) = 3x^2$, find the value of
    (i) gh(x)

(ii) x if $gh(x) = 0$. *(4marks)*

14. At 8:00am, a bus A leaves town P travelling to town Q, 150km away, at an average speed of $60kmh^{-1}$. After a 30 minutes stop over at Q, due to poor state of the road, the bus travels another 70km to town R at $35kmh^{-1}$. At 9:00am, an express bus B leaves town R for town P, and travels at a speed of $55kmh^{-1}$.
(a) Draw the distance time graph to show both journeys.
(b) From the graph, find where and when the two buses meet.
(c) What time did bus A and B reach their respective destination?
(d) Calculate the average speed of bus A for the whole journey. *(12marks)*

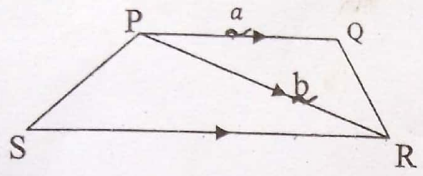
15. The figure below shows a cage in which base ABCD and roof PQRS are both rectangular. AP, Bq, CR and DS are perpendicular to the base.



Calculate:
(a) QR
(b) ∠QRC
(c) the angle between planes ABCD and PQRS
(d) the inclination of PR to the horizontal. *(12marks)*

16.(a) If $\underset{\sim}{OA} = 6\underset{\sim}{P} - 4\underset{\sim}{q}$, $OB = 2\underset{\sim}{p} + 4\underset{\sim}{q}$ and $\underset{\sim}{AB} = 4m\underset{\sim}{p} + (2m - n)\underset{\sim}{q}$, find the value of the scalars m and n. *(6marks)*

(b) $\underset{\sim}{PQ} = \underset{\sim}{a}$, $\underset{\sim}{PR} = \underset{\sim}{b}$ and $\underset{\sim}{SR} = 2\underset{\sim}{PQ}$.



Express in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$ the vectors $\underset{\sim}{SP}$ and $\underset{\sim}{SQ}$ *(3marks)*

(c) A(2, -1) and C(6, 7). B is a point on $\underset{\sim}{AC}$ such that $\underset{\sim}{AB} = \frac{3}{4}\underset{\sim}{AC}$. Find the coordinates of B. *(3marks)*

17 (d) A man earned a monthly salary of shillings 72,000. He was entitled to a tax waiver of shillings 18,000 per month. If he worked in a country whose tax rates for that year was given as in the table below.

Income in shillings p.a	Tax rates %
1 – 90240	10
90241 – 180480	15
180481 – 270720	20
270721 – 360960	25
360961 – 451200	30
Above 451200	32.5

Calculate;

(a) His annual taxable income

(b) Annual tax payable

(c) His annual net income *(12marks)*

END