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*456/2*
*MATHEMATICS*
*PAPER 2*
$2\frac{1}{2}$ *hours*

# MOCK EXAMINATIONS 2019
## *UGANDA CERTIFICATE OF EDUCATION*
## MATHEMATICS

**PAPER 2**
**DURATRION: 2HOURS 30 MINUTES**

**INSTRUCTIONS TO CANDIDATES:**

Answer all questions in section A and not more than five from section B

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

No paper should be given for rough work.

Graph papers shall be provided.

Silent non-programmable electronic calculators may be used.

State the degrees 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 (40 MARKS)**

*Attempt all questions in this Section.*

1. Without using tables or calculators evaluate $\dfrac{6^{\frac{1}{2}} \times 96^{\frac{1}{4}}}{216^{\frac{1}{4}}}$

2. Given $n(F) = 11$ , $n(B) = 5$, $n(F \cap B) = 3$ and $n(F \cup B)' = 2$
   Find

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i) $n(F \cup B)$

ii) . $n(\varepsilon)$

3. Make x the subject of the formula $d = \sqrt{\frac{p(x-a)}{r}}$

4. Vectors $\mathbf{a} = \begin{pmatrix} 3 \\ 5 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 4 \\ -6 \end{pmatrix}$ , find $\left| \left( 3\mathbf{a} - \frac{1}{2}\mathbf{b} \right) \right|$

5. Find the equation of a straight line passing through the midpoint of the line segment AB where $A(4.9)$ and $B(6.-5)$ and is parallel to the line $y = 3x - 4.$

6. Rationalize the denominator and simplify $\frac{2\sqrt{2} - \sqrt{3}}{\sqrt{2} + \sqrt{3}}$

7. Express 2.13737… as a fraction in the simplest form.

8. An industry buys machinery costing £12000. It decides to calculate the depreciation each year at 25% of its value at the beginning of each year. Determine the period it will take the machinery to depreciate in value to £3798.

9. $U = \{2,3,4,5,6,7,8,9\}, P = \{(x, y) : x \in U, y \in U \text{ and } x \text{ is } 3 \text{ less than } y\},$ .

   i) Find all elements of P.

   ii) Illustrate P on a papygram

10. The base of a right prism is a right angled triangle whose sides are 3 cm, 4 cm and 5 cm; the height of the prism is 10 cm. Draw the net of the prism and calculate its surface area area.

**SECTION B (60 MARKS)**

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

11. In a girls' A' level class, 19 girls were admitted for Physics (P), 18 for Biology (B) and 17 for Chemistry (C). 2 were admitted for all the three subjects, 9 for P only, 8 for C only and 7 for B only. x girls were admitted for P and B only, y girls were admitted for P and C only and z girls were admitted for B and C only. Only one girl was not admitted for any of the three subjects.

    a) Represent the information on a Venn diagram

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b) Find the values of x ,y and z.

c) If a girl is chosen at random from the class, what is the probability that she was admitted for at most 2 subjects?

12. Given that $f(x) = \frac{5x+7}{3x+2}$ $f(x) = \frac{5x+7}{3x+2}$

a) Find the value of :

i) $f(0)$

ii) k if $f(k) = \frac{5}{2}$

b) Determine:

i) $f^{-1}(x)$

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

13. (a) Given that $\log_{10} 2 = 0.301$ and $\log_{10} 3 = 0.477$, find, correct to 3 decimal places, the value of $2\log_{10} 21 - \log 98.$

(b) It is known that P varies inversely as the square of Q. corresponding pairs of values are shown in the following table:

| P | t | t+1 |
|---|---|---|
| Q | 5 | 4 |

Calculate the value of t and state the relationship between P and Q.

14. James sets of at 05:00 a.m. in the morning driving from his home town to a railway station at an average speed of $50\,\text{kmh}^{-1}$ for $1\frac{1}{4}$ hours, to catch a train. He waits for 15 minutes before the train sets off to his work place which is 240 km from his home. He spends 1hour 21 minutes on the train.

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His friend Savio stays 200 km away from James' home town. He sets off at 05:30 a.m. by another train travelling at $57\frac{1}{7}\text{kmh}^{-1}$ towards James' hometown.

Using a scale of 1cm for 15 minutes, on the horizontal and 1 cm for 10 km on the vertical,

a) Represent the information on the distance-time graph

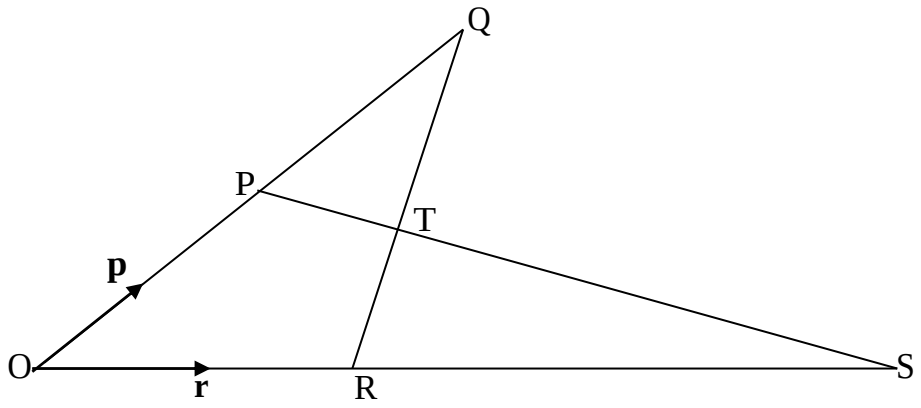
b) Using the graph, determine;

i) when and where the trains met from Savio's home?

ii) James' average speed

c) If Savio had driven his car at an average speed of 80 $kmh^{-1}$, how much time would he save?

15. In the figure below, $\mathbf{OR} = \text{r}$ , $\mathbf{OP} = \mathbf{p}$ $\overrightarrow{OS} = 2\boldsymbol{r}$ and $\overrightarrow{\text{OQ}} = \frac{3}{2}\mathbf{p}$. Given that $\overrightarrow{\text{QT}} = g\overrightarrow{\text{QR}}$ and $\overrightarrow{\text{PT}} = h\overrightarrow{\text{PS}}$,




a) Find

i) $\overrightarrow{\text{QR}}$

ii) $\overrightarrow{\text{PS}}$

b) (i) Find two distinct expressions, in terms of **r**, **p**, g and h for $\overrightarrow{\text{OT}}$.

(ii) by equating these expressions, find the values of g and h

(iii) Hence calculate the ratio PT: TS

16. a) Calculate the amount of tax paid on an article which is sold at shs. 920,000 if it includes a Value Added Tax of 18%.

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b) Under the tax structure below, Mr. Ouma pays a monthly income tax of shs. 221,000.

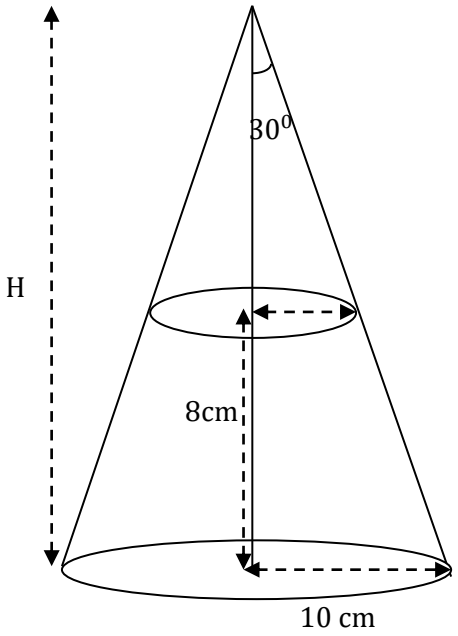
| Income (Shs) | Rate (%) |
|---|---|
| 130,000 | 0 |
| 130,001 – 300,000 | 15 |
| 300,001 – 500,000 | 20 |
| 500,001 – 750,000 | 35 |
| Above 750,000 | 40 |

Calculate:

i) Ouma's taxable income

ii) Ouma's monthly gross income if he receives 60% of the income tax as allowance.

17. The figure below shows a conical bottle of semi-vertical angle $30^0$, radius $10\ cm$, contains a fragrant fluid to a height of $8\ cm$.




a) Calculate the height, H, of the bottle

b) Calculate the volume of the fragrant fluid in litres.

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*END*

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