

456/2
MATHEMATICS
Paper 2
July 2019
2¹/₂ hours

INTERNAL MOCK EXAMINATIONS 2019

Uganda Certificate of Education

MATHEMATICS

Paper 2

2 hours 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.

SECTION A (40 MARKS)

Turn Over

Attempt **all** questions in this section.

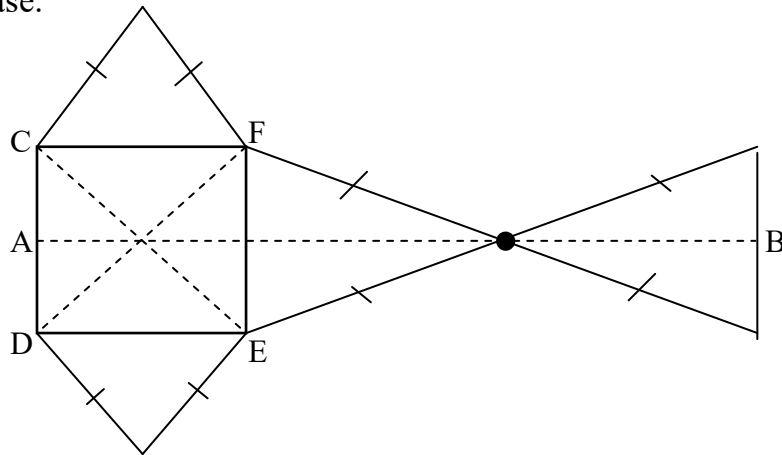
1. Express 18 and 42 each as a product of its prime factors and hence find their highest common factor (HCF). (04 marks)
2. Express $2.10303\dots$ in the form $2\frac{a}{b}$, where a and b are integers. (04 marks)
3. Given that $f(x) = 2\sqrt{x} + 6$, find the value of x for which $f(x) = 16$. (04 marks)
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 $\mathbf{OP} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ and $\mathbf{OQ} = \begin{pmatrix} 4 \\ -1 \end{pmatrix}$.
Find the coordinates of the mid-point of vector $\mathbf{PQ}$. (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)

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 $AB = 46$ cm,

- (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 $OQ = \mathbf{q}$ and $OP = \mathbf{p}$ express in terms of $\mathbf{p}$ and $\mathbf{q}$ the vectors.
- (a) (i) $\mathbf{PQ}$
- (ii) $\mathbf{OR}$
- (iii) $\mathbf{PT}$ (08marks)
- (b) Show that $\mathbf{PT} : \mathbf{TS} = 2:1$. (04marks)

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