

Mathematics I

009

15 Nov.2012

08.30am-11.30am

**YEAR
2012**

ORDINARY LEVEL NATIONAL EXAMINATIONS 2012

SUBJECT : MATHEMATICS 1

DURATION : 3 HOURS

INSTRUCTIONS :

- This paper has **TWO** sections **A** and **B**.

SECTION A: Answer **ALL** questions.

(55 marks)

SECTION B: Answer any **THREE** questions.

(45 marks)

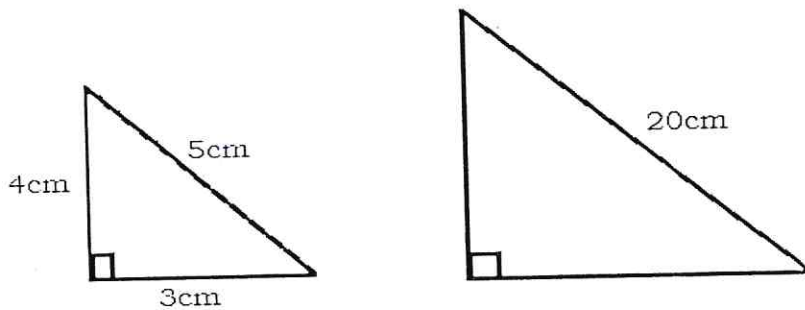
- You may use mathematical instruments and calculators **where necessary**.
- **USE A BLUE INK PEN ONLY**
- **USE A PENCIL TO DRAW DIAGRAMS.**
- **SHOW CLEARLY ALL THE WORKING. Marks will not be awarded for answers without all working steps.**

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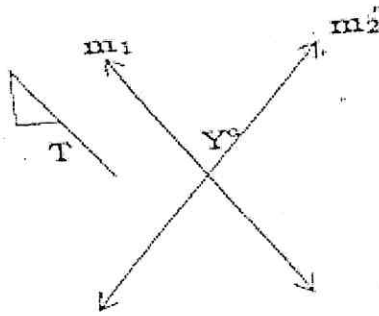
SECTION A: Attempt all questions.

(55 marks)

1. Express 900 as a product of its prime factors. Hence find the square root of 900. (3 marks)
2. (a) Calculate without using a calculator: $3.45^2 - 1.55^2$. (2 marks)
 (b) Divide without using a calculator: $0.9 \div 30$. (1 mark)
3. In a school food store, there is enough food to feed 300 students for 17 days. For how long will the food last if 40 more students join the group? (3 marks)
4. Solve the equation: $5x^2 + 21x - 20 = 0$ (3 marks)
5. The right angled triangles below are similar. Find the area of the larger triangle. (3 marks)

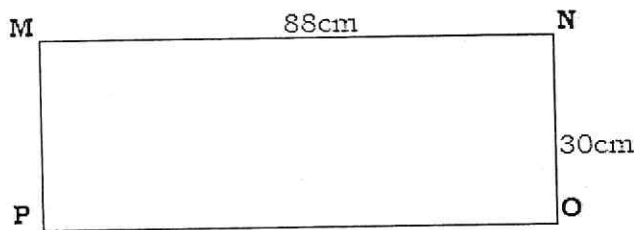


6. Solve the simultaneously: $x + 2y = 40$
 $3x = 60 - y$ (4 marks)
4. Find the equation of the line which passes through the points $(-3, 3)$ and $(4, 2)$. (4 marks)
5. Given that $f(x) = ax^2 - 7$ and $f(2) = 13$, find the value of $f(-1)$. (4 marks)
6. In a class of 40 students, 24 like Mathematics and 30 like Kinyarwanda. All students like at least one of the subjects. Draw a Venn diagram to represent this information. How many students like both mathematics and Kinyarwanda? (4 marks)
10. Solve the equation: $\frac{3x}{2} \geq \frac{x}{4} - 10$. Illustrate the answer on a number line. (4 marks)
11. A point **m** divides a line segment AB, 10cm long into two parts such that one part is 4cm longer than the other. Find the length of the two parts. (4 marks)
12. The diagrams below show a flag **T** and two mirrors **m₁** and **M₂ M₁ (T)** in intersecting at an angle **Y°**. Copy the diagram and show images **M₁(T)** in **m₁** and **M₂ M₁ (T)** in **m₂**. (4 marks)



13. Given $152n = 68ten$, find n . (4 marks)

14. Find the mid - point M of the line joining the points $A(1, 0)$ and $B(9, 6)$. Find length \overline{MB} . (4 marks)



If it is curved in such a way that MP and NO meet to form a hollow cylindrical figure, find the volume of the cylindrical figure formed. $\pi = \frac{22}{7}$. (4 marks)

SECTION B: Attempt ONLY three questions.

(45 marks)

16. (a) Solve for x : $\frac{1}{x^2-1} + \frac{1}{x^2-4x+3} + \frac{1}{x-3} = 0$ (8 marks)

(b) Factorize completely: $f(x) = 2x^3 + 5x^2 + x - 2$. Hence find the values of x when $f(x) = 0$ (7 marks)

17. The table below shows the ages of 73 students.

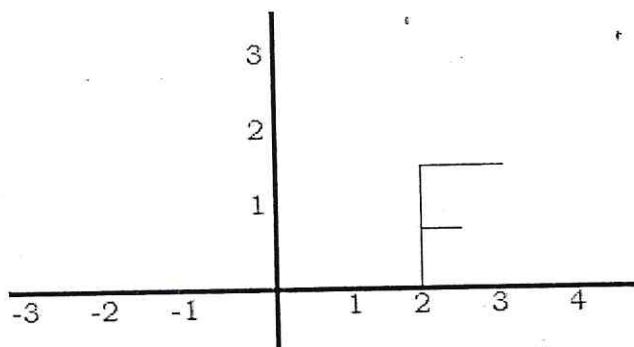
Age in years	14	15	16	17	18	19	20
Frequency	5	9	13	11	12	15	8

Make the frequency table using the above data.

(a) Find the median age. (4 marks)

(b) Calculate the mean age. (11 marks)

18. Use the diagram to answer (a) and (b) below.



(a) Copy the diagram and sketch the image under

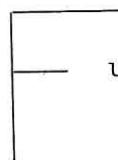
(i) a $+ 90^\circ$ rotation about origin.

(3 marks)

(ii) a $- 180^\circ$ rotation about origin.

(2 marks)

(b) Copy the diagram again and sketch the image of



under a translation.

(3 marks)

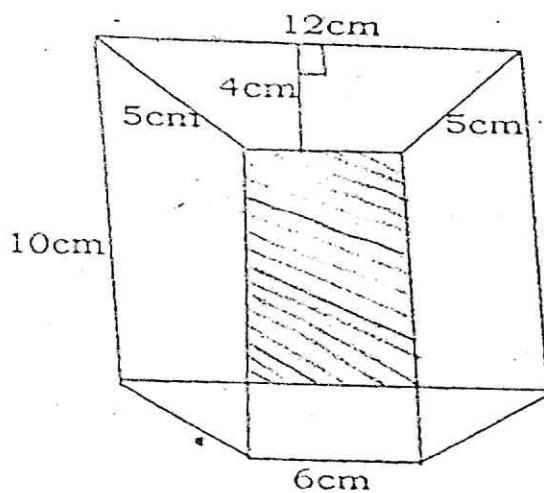
(i) $T = \begin{pmatrix} -2 \\ 1 \end{pmatrix}$.

(2 marks)

(ii) $T = \begin{pmatrix} 4 \\ 0 \end{pmatrix}$.

(5 marks)

19. The figure below is a right trapezoidal prism.



Calculate its (a) lateral area.

(5 mark

(b) total surface area.

(7 mark

(c) volume.

(3 mark

20. (a) Rationalize the denominator: $\frac{\sqrt{2}}{2\sqrt{5} + \sqrt{3}}$ (4 marks)

(b) Simplify: $\sqrt{12} \times 3\sqrt{60} \times \sqrt{45}$. (4 marks)

(c) Simplify: $\sqrt{8} \times \sqrt{50} + \sqrt{121}$. (4 marks)

(d) Simplify: $\frac{5\sqrt{7}}{\sqrt{45}} \times \frac{2\sqrt{3}}{\sqrt{21}}$ (3 marks)

END.

ANSWER KEY FOR 2012

MATHEMATICS 009

SECTION A

<p>1. $\begin{array}{l} 2 \mid 900 \\ 2 \mid 450 \\ 3 \mid 225 \\ 3 \mid 75 \\ 5 \mid 25 \\ 5 \mid 5 \\ 5 \mid 1 \end{array}$</p> <p>So $900 = 2^2 \times 3^2 \times 5^2$</p> <p>$\sqrt{900} = \sqrt{2^2 \times 3^2 \times 5^2}$</p> <p>$= 2 \times 3 \times 5 = 30$</p>	<p>2. a) $45^2 - 1.55^2$</p> <p>$= (3.45+1.55)(3.45-1.55)$</p> <p>$= (5.00)(1.90)$</p> <p>$= 9.5$</p> <p>b) $0.9 \div 30 = \frac{9}{10} \times \frac{1}{30}$</p> <p>$= \frac{3}{100 \times 10} = 0.003$</p>	<p>3.</p> <p>300 students \Rightarrow 17 days</p> <p>1 student $\Rightarrow 17 \times 300$</p> <p>340 students $\Rightarrow \frac{17 \text{ days} \times 300}{340}$</p> <p>$= 15$ days.</p>
<p>4. $5x^2 + 21x - 20 = 0$</p> <p>$= 5x^2 + 25x - 4x - 20 = 0$</p> <p>$= 5x(x+5) - 4(x+5) = 0$</p> <p>$= (x+5)(5x-4) = 0$</p> <p>$\therefore x + 5 = 0$ or $5x - 4 = 0$</p> <p>$x = -5$ or $x = \frac{4}{5}$</p>	<p>5. Area of the small triangle</p> <p>$= \frac{1}{2} \times 4 \times 3 = 6\text{cm}^2$</p> <p>Linear scale factor $= \frac{20}{5} = 4$</p> <p>Area scale factor $= 4^2 = 16$</p> <p>Area of larger triangle</p> <p>$= 16 \times 6 = 96\text{cm}^2$</p>	<p>6. $\begin{array}{l} \times 3 \mid x + 2y = 40 \\ \quad \quad \quad \mid 3x + y = 60 \\ \quad \quad \quad \mid = 3x + 6y = 120 \\ \quad \quad \quad \mid - 3x + y = 60 \\ \quad \quad \quad \mid \quad \quad \quad 5y = 60 \\ \quad \quad \quad \mid \quad \quad \quad y = 12 \\ \quad \quad \quad \mid x + 24 = 40 \\ \quad \quad \quad \mid \quad \quad \quad x = 16. \end{array}$</p>