EXAMINATIONS COUNCIL OF ZAMBIA

Examination for School Certificate Ordinary Level

402/1

Mathematics

Paper 1

Wednesday 8 NOVEMBER 2023

Additional Materials
Geometrical Instruments

TIME 2 hours

Marks: 80

Instructions to Candidates

1. Write your centre number and your examination number on every page of this question paper.
2. There are twenty-three questions in this paper.
3. Answer all questions
4. Write your answers in the spaces provided in this question paper.
5. If working is needed for any question, it must be shown in the space below that question.
6. Electronic calculators and mathematical tables should not be used in this paper.

Information for candidates

1. No paper for rough work is to be provided
2. Ommision of essential working will result into loss of marks.
3. The number of marks is given in brackets [ ] at the end of each question or part question.
4. Cell phones are not allowed in the examination room.

For examiner's use		
Question	Mark obtained	Examiner's initials
1		
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Total		

1 Evaluate $\left(\frac{8}{27}\right)^{\frac{1}{3}}$

Answer: ..... [2]

2 Factorise completely $3x^3 - 27x$

Answer: ..... [2]

3 Simplify $2a - 5b(a - b) + ab$.

Answer: ..... [2]

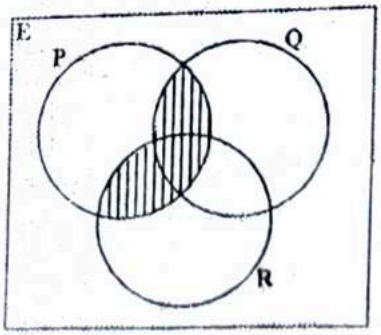
4 The point A(−5, 3) and the point B have a midpoint (4,−2). Find the coordinates of B.

Answer: ..... [2]

5 Given that $\overrightarrow{OP} = \begin{pmatrix} 4 \\ 13 \end{pmatrix}$ and the point Q is (16, 8), find $|\overrightarrow{PQ}|$.

Answer: ..... [2]

6 The Venn diagram shows three sets P, Q and R. Use set notation to describe the shaded part.



Answer:..... [2]

7 Given that A = (1 2 4) and B = $\begin{pmatrix} 3 \\ 0 \\ 4 \end{pmatrix}$, find

(a) A^T

(b) AB

Answer: (a) ..... [1]

(b) ..... [2]

8 Given that 25 and 13 are the first and third terms of an arithmetic progression respectively, find the

(a) second term,

(b) formula for the n^{th} term.

Answer: (a) ..... [1]

(b) ..... [2]

9 (a) A letter is chosen at random from the letters of the word "EXCELLENT". What is the probability that the letter "E" is chosen?

(b) The areas of two similar shapes are in the ratio 25: 36. If the length of the smaller shape is 2cm, find the length of the larger shape.

Answer: (a) ..... [1]

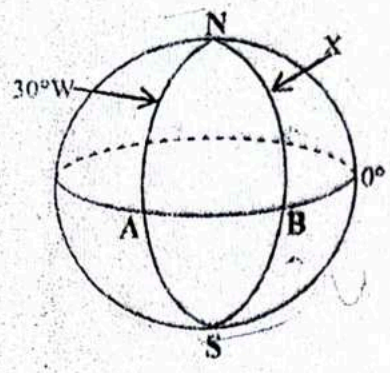
(b) ..... [2]

10 (a) Set A = {x: $1 < x \leq 15$, x is a prime number}and set B = {x: $0 \leq x < 10$, x is an odd number}. List the set A ∩ B.

(b) Solve the equation $2^{x+3} = \frac{1}{16}$

Answer: (a) ..... [1]
(b) ..... [2]

11 The diagram shows two towns A and B on the equator, A is on longitude 30°W and B is on longitude X.



(a) The time at B is 17 05 hours when it is 14 05 hours at A. Find the longitude X.

(b) A ship sailed due east from A to B at an average speed of 450 knots. Find the time it took the ship to travel from A to B.

Answer: (a) ..... [1]
(b) ..... [2]

12 The functions g and h are defined by $g(x) = 3x + 1$ and $h(x) = \frac{x-1}{2}$

Find

(a) $g^{-1}(x)$

(b) $gh(x)$.

(c) x if $gg(x) = 22$.

Answer: (a) ..... [1]

(b) ..... [1]

(c) ..... [2]

13 (a) In a practical examination, Nellie recorded the volume, V, of water as 6.4 litres correct to one decimal place. Complete the statement in the answer space below,

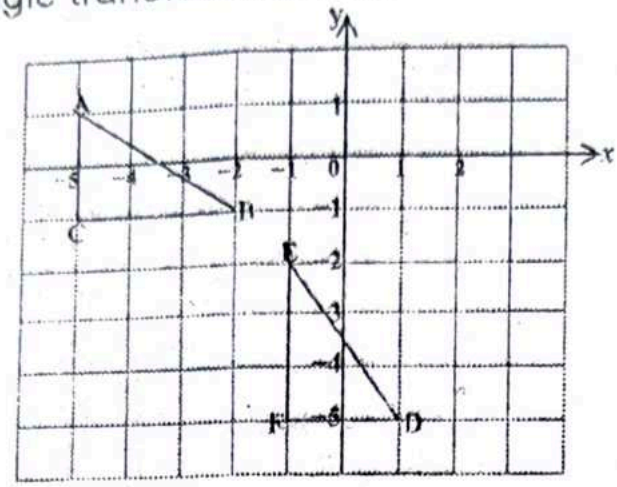
(b) The actual length of the longest side of a rectangular playing field is 102m. A boy measured the same side as 99.8m. Calculate the relative error.

Answer: (a) $\leq p \leq$ [2]

(b) ..... [2]

14 (a) Find $\int (x^3 + 2x + 3)\, dx$

(b) In the following diagram, triangle ABC is mapped onto triangle DEF by a single transformation M.

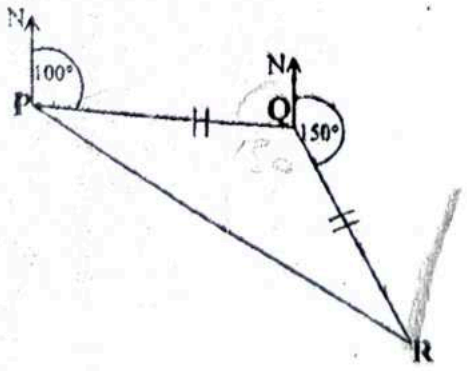


Describe fully the transformation **M**.

Answer: (a) ..... [2]

(b) ..... [2]

15 The diagram shows three points P, Q and R on level ground. The bearing of Q from P is 100°, the bearing of R from Q is 150° and PQ = QR.



Find

(a) angle QPR,

(b) the bearing of P from R.

Answer: (a) ..... [2]

(b) ..... [2]

18 (a) A sugar company paid K362 400.00 as dividend for 1 200 shares. A man had 20 shares in the company. Calculate the amount paid to him.

(b) Find the equation of a line parallel to the line $2x + y = 4$ passing through $(-5, 3)$.

Answer: (a) ..... [2]
(b) ..... [2]

19 If a varies jointly as b and the square root of c and $a = 21$ when $b = 5$ and $c = 36$, find the value off
(a) k, the constant of variation,
(b) a when $b = 9$ and c = 100,
(c) c when $a = 70$ and $b = 25$.

Answer: (a) ..... [1]
(b) ..... [1]
(c) ..... [2]

20 (a) In the answer space below is an incomplete simple program in pseudocode for calculating and outputting the volume, V, of a cone given the base radius r and height h. Complete the program by filling in the blank spaces with appropriate statements

(b) Shade two more sections of the diagram in the answer space so that it has rotational symmetry of order 2.

Answer: (a) Begin

Enter.....

V=.....

Output V

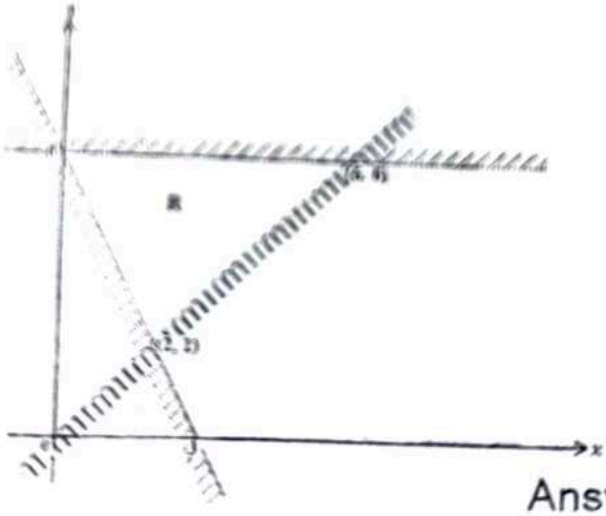
End

[2]

(b)

[2]

21 Write the three inequalities that define the unshaded region R.



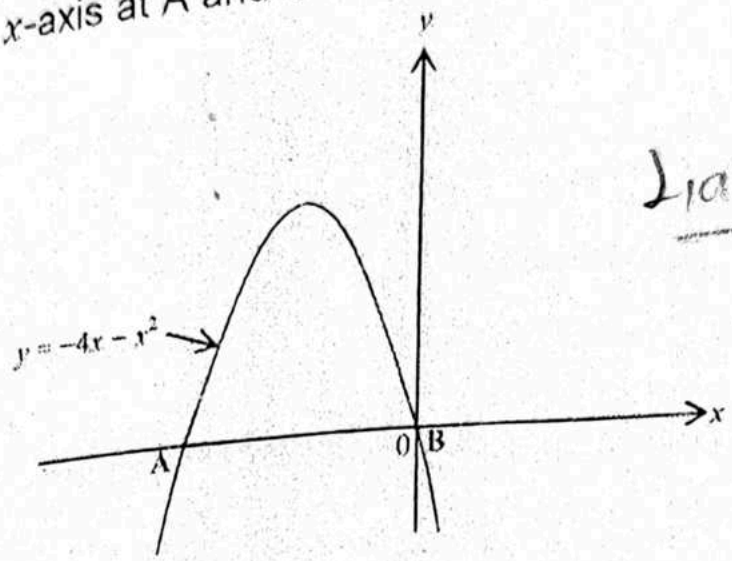
Answer:

.....

.....[5]

22 (a) Solve the equation $x^2 = 4(x - 3)^2$

(b) The diagram shows the sketch of the graph of $y = -4x - x^2$ cutting the x-axis at A and B.



Find the coordinates of

(i) A,

(ii) the turning point of the graph.

$\frac{4ac - b^2}{2a}$

$y = -x^2 - 4x$

$y = 2^2 - 4(x) - 2$

$x = \frac{-b}{2a}$

$y = 4 + 8$

$y = 12$

$x = \frac{4}{2(-1)}$ $x = \frac{4}{-2}$

$x = -2$

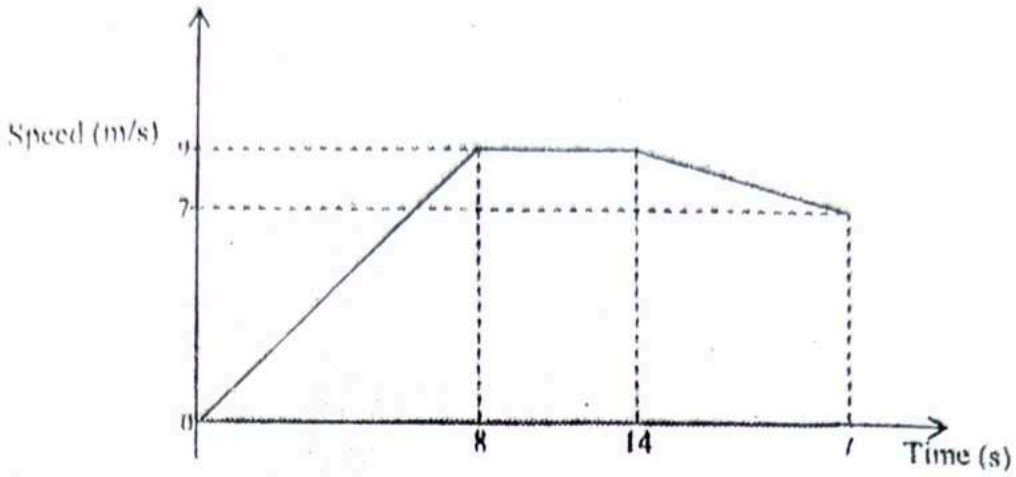
$\therefore TP(-2, 12)$

Answer: (a) x =.....or..... [2]

(b) (i)..... [2]

(ii) ..... [2]

23 The diagram shows the speed-time graph of a car during a period of t seconds.



Find the

(a) acceleration of the car during the first 8 seconds,

(b) distance covered in the first 14 seconds,

(c) value of t if the average speed of the car is 7m/s.

Answer: (a) .....[1]

(b) .....[2]

(c) .....[3]