

Candidate Name \_\_\_\_\_

Centre Number				Candidate Number										

# EXAMINATIONS COUNCIL OF ZAMBIA

Examination for School Certificate Ordinary Level

## Mathematics

4024/1

Paper 1

Wednesday

1 NOVEMBER 2017

Candidates answer on the question paper

**Additional materials:**  
Geometrical instruments

**Time: 2 hours**

### Instructions to Candidates

Write your **name**, **centre number** and **candidate number** in the spaces provided at the top of this page.

There are **twenty-three** questions in this paper.

Answer **all** questions.

Write your answers in the **spaces provided** on the question paper.

If working is needed for any question, it must be shown in the space below that question.

No paper for rough work is to be provided.

**Omission of essential working** will result in loss of marks.

**Electronic calculators and mathematical tables should not be used in this paper.**

**Cell phones are not allowed in the examination room.**

### Information for Candidates

The number of marks is given in brackets [ ] at the end of each question or part question.

The total number of marks for this paper is 80.

For Examiner's Use

1 Simplify  $3x - (y - 2x) - 3y$ .

Answer: ..... [2]

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2 Evaluate  $\left(\frac{81}{16}\right)^{-\frac{1}{4}} + \left(\frac{81}{16}\right)^0$ .

Answer: ..... [2]

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3 The gradient of the line joining the points  $(-2, k)$  and  $(k, -14)$  is 2. Calculate the value of  $k$ .

Answer: ..... [2]

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4 Factorise completely  $ax^2y - 4ay^3$ .

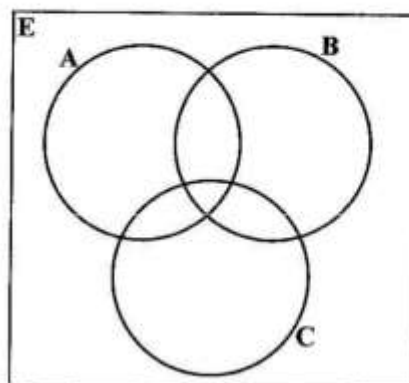
Answer: ..... [2]

5 The points P and Q have coordinates (2, 4) and (-3, 1) respectively.  
Express  $\vec{PQ}$  as a column vector.

Answer:  $\vec{PQ} = \dots\dots\dots$  [2]

- 6 Shade  $B' \cap (A \cap C)$  in the Venn diagram in the answer space.

Answer:



[2]

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

find

- (a)  $A^T$ ,  
(b)  $AB$  as a single matrix.

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

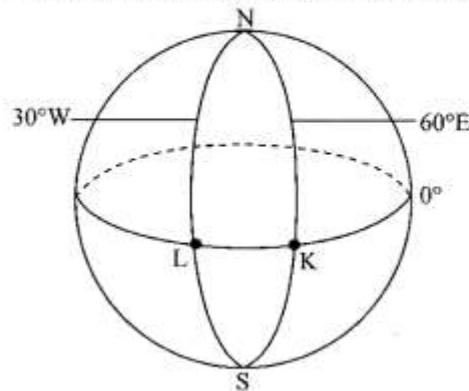
(b) ..... [2]

- 8 For the sequence 25, 22, 19, 16, ...,  
find the
- (a) formula for the  $n^{\text{th}}$  term,
  - (b) sum of the first 20 terms.

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

(b) ..... [2]

- 9 Town L is on  $(0^\circ, 30^\circ\text{W})$  and town K is on  $(0^\circ, 60^\circ\text{E})$  as shown in the diagram.



- (a) If a radio quiz is scheduled to start at 12 00 hours at L, find the time at which the people at K will be listening to the quiz.
- (b) What is the distance between L and K in kilometres?  $[R = 6370\text{km}, \pi = \frac{22}{7}]$

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

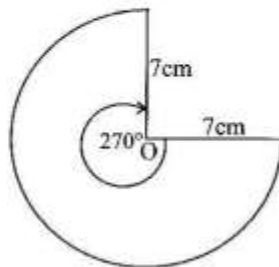
(b) ..... [2]

- 10 (a) The probability that Chakupaleza will go for remedial lessons on a particular day is  $\frac{7}{10}$ . What is the probability that she will **not** go for her remedial lessons on that particular day?
- (b) Solve the equation  $10^x = 0.0001$ .

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

(b) ..... [2]

- 11 (a) Given that  $E = \{2, 4, 6, 8, 10, 12\}$ ,  $A = \{4, 8, 12\}$  and  $B = \{2, 10, 12\}$ , list  $A' \cap B$ .
- (b) The diagram below is a sector with centre O and radius 7cm. Angle at O is  $270^\circ$ .



Calculate the area of the sector. [ $\pi = \frac{22}{7}$ ]

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

(b) ..... [2]

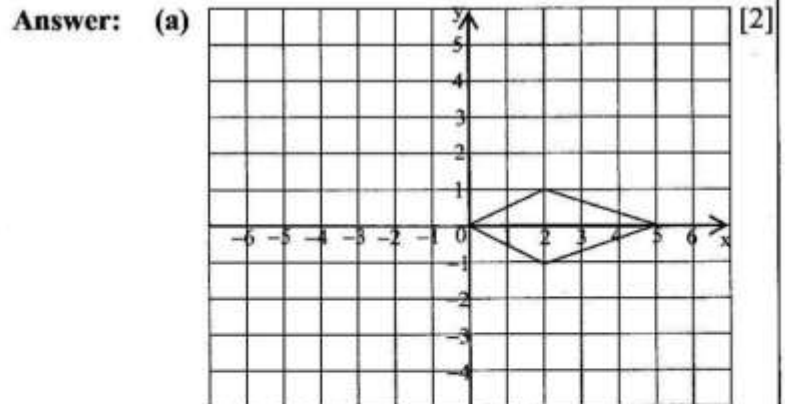
12 The functions  $f$  and  $g$  are defined by  $f(x) = 2x + 1$  and  $g(x) = 5x - 1$ .

Find

- (a)  $g^{-1}(x)$ ,
- (b)  $fg(x)$ ,
- (c)  $fg(-3)$ .

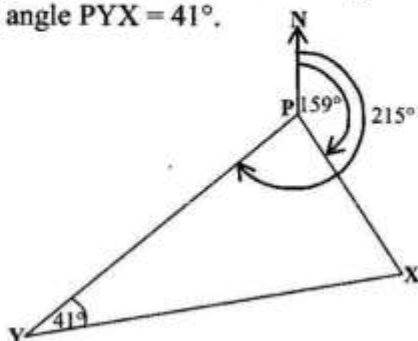
**Answer:** (a) ..... [1]  
 (b) ..... [2]  
 (c) ..... [1]

- 13 (a) The kite in the diagram in the answer space has coordinates  $(0, 0)$ ,  $(2, 1)$ ,  $(5, 0)$  and  $(2, -1)$ . Draw the image of the kite after a reflection in the line  $y = x$ .
- (b) Differentiate  $y = \frac{1}{3}x^3 - 5x^2 - 2x$  with respect to  $x$ .



(b)..... [2]

- 14 Two boats X and Y leave port P at the same time. X travels on a bearing of  $159^\circ$  and Y travels on a bearing of  $215^\circ$  as shown in the diagram below. After sometime, X and Y are at points such that angle  $PYX = 41^\circ$ .



Find the

- (a) bearing of X from Y,  
(b) bearing of P from X.

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

(b) ..... [2]

- 15 Misozi and Filamba estimated the length of a line to be 9cm and 10cm respectively. If the true length of the line was 9.6cm, find

- (a) Misozi's absolute error,  
(b) Filamba's percentage error.

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

(b) ..... [2]

- 16 It is given that  $t = kv^2$ , where  $k$  is the constant of variation.

$v$	1	$b$	5
$t$	4	36	$a$

Use the information given in the table to find the

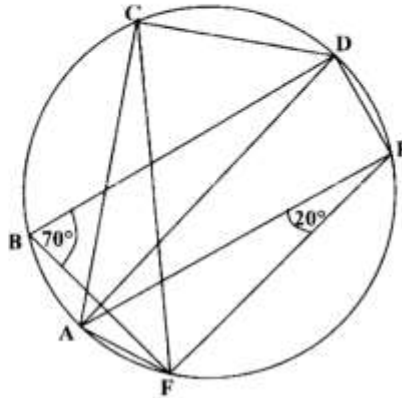
- (a) value of  $k$ ,
- (b) value of  $a$ ,
- (c) values of  $b$ .

**Answer:** (a)  $k = \dots\dots\dots$  [1]

(b)  $a = \dots\dots\dots$  [1]

(c)  $b = \dots\dots\dots$  or  $\dots\dots\dots$  [2]

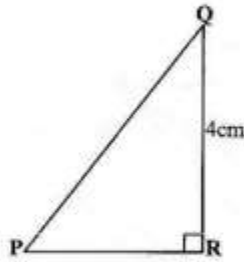
- 17 In the diagram below, A, B, C, D, E and F are points on the circumference of a circle.  
 $\widehat{FBD} = 70^\circ$  and  $\widehat{AEF} = 20^\circ$ .



- (a) Explain why AD is the diameter.  
 (b) Find  
 (i)  $\widehat{ACF}$ ,  
 (ii)  $\widehat{DEF}$ .

**Answer:** (a) ..... [1]  
 ..... [1]  
 (b) (i)  $\widehat{ACF} = \dots\dots\dots$  [1]  
 (ii)  $\widehat{DEF} = \dots\dots\dots$  [2]

- 18 (a) It is given that  $\triangle PQR$  below is right angled at R.  $QR = 4\text{cm}$  and  $\tan \hat{QPR} = \frac{4}{3}$ .



Find  $\sin \hat{PQR}$ .

- (b) The ratio of the surface areas of two cubes is 16:25. What is the volume of the smaller cube, if the volume of the bigger cube is  $500\text{ cm}^3$ ?

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

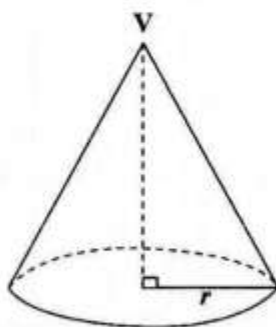
(b) ..... [2]

- 19 (a) A businessman bought 300 company shares at K60.00. The nominal price was K30.00. How much does he pay for the shares?
- (b) The equation of a straight line L is given by  $2y = 4x - 5$ . Find the equation of the line passing through  $(-2, 3)$  and perpendicular to line L.

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

(b) ..... [2]

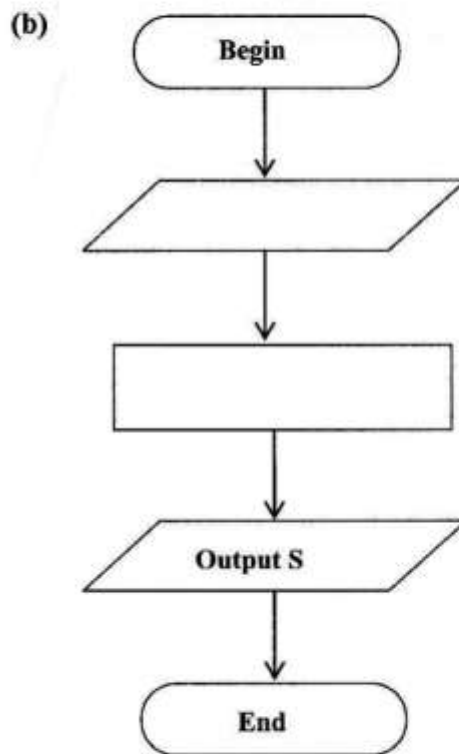
- 20 (a) The diagram below shows a cone with apex  $V$  and radius  $r$ .



How many planes of symmetry has the cone?

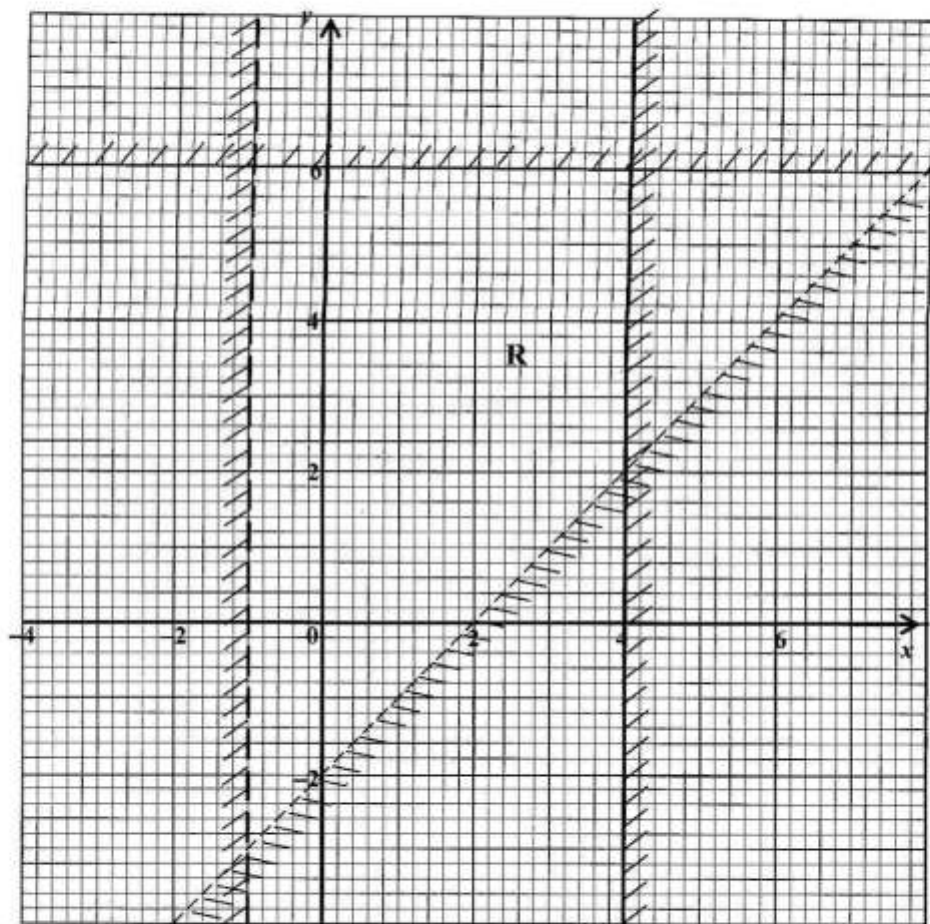
- (b) The diagram below is an incomplete program flow chart to calculate the curved surface area,  $S$ , of a cone with base radius  $r$  and slant height  $l$ . Complete the flow chart below by writing appropriate statements in the blank symbols.

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



[2]

- 21 Write down the four inequalities that define the unshaded region R, on the diagram below.



Answer: .....

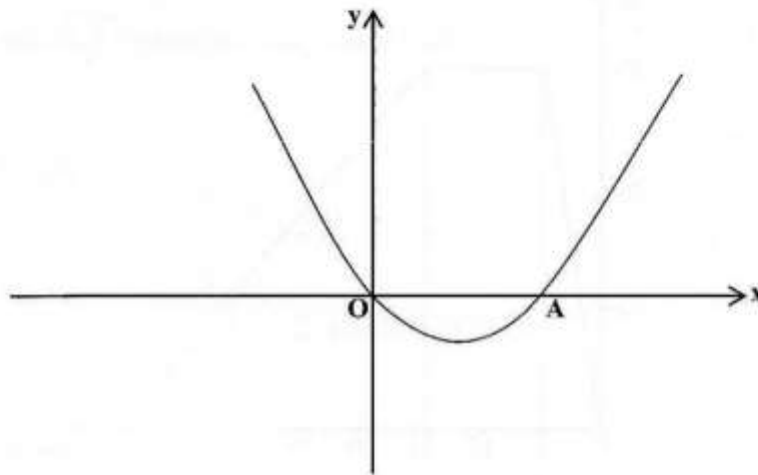
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[5]

- 22 (a) If  $y = (1 - 2x)(1 + x) - 2$ , find the values of  $x$  for which  $y = -2$ .
- (b) The sketch shown below represents a section of the curve  $y = x(x - 2)$ .



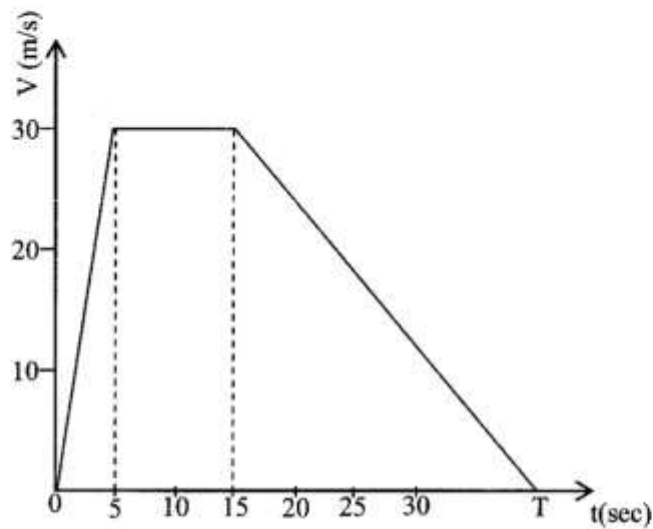
- (i) Find the coordinates of the points where the curve cuts the x-axis.
- (ii) What is the minimum value of the function?

**Answer:** (a)  $x = \dots\dots\dots$  or  $\dots\dots\dots$  [2]

(b) (i)  $\dots\dots\dots$  [2]

(ii)  $\dots\dots\dots$  [2]

- 23 The diagram below shows a speed-time graph of a car journey.



- (a) Find the acceleration during the first 5 seconds.  
 (b) If the total distance travelled was 825m, find the value of T.  
 (c) Find the average speed for the whole journey.

**Answer:** (a) ..... [1]  
 (b) ..... [3]  
 (c) ..... [2]