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

Answer: ................................................. [2]

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

Answer: ................................................. [2]

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

Answer: ................................................. [2]
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: $\vec{PQ} =$ .............................................. [2]
5. Shade $B' \cap (A \cap C)$ in the Venn diagram in the answer space.

**Answer:**

![Venn Diagram]

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 \( n^{th} \) term,
(b) sum of the first 20 terms.

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

9. Town L is on \((0^\circ, 30^\circ W)\) and town K is on \((0^\circ, 60^\circ E)\) 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? \([R = 6370\text{km}, \frac{\pi}{7}]\)

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°.

![Diagram of a sector with centre O and radius 7cm. Angle at O is 270°.]

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 \( x \).

Answer:

(a) ...........................................  [2]

(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]
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) \( k = \ldots \) \[1\]

(b) \( a = \ldots \) \[1\]

(c) \( b = \ldots \) or \( \ldots \) \[2\]
17 In the diagram below, A, B, C, D, E and F are points on the circumference of a circle. 
\[ \hat{FBD} = 70^\circ \] and \[ \hat{AEF} = 20^\circ \].

(a) Explain why AD is the diameter.

(b) Find 
(i) \[ \hat{ACF} \], 
(ii) \[ \hat{DEF} \].

Answer: 
(a) 

(b) (i) \[ \hat{ACF} \] 
(ii) \[ \hat{DEF} = \ldots \]
18 (a) It is given that $\triangle PQR$ below is right angled at $R$. $QR = 4\text{cm}$ and $\tan \angle QPR = \frac{4}{3}$.

Find $\sin \angle QPR$.

(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]

(b)  

- Begin
- 
- 
- Output $S$
- End
Write down the four inequalities that define the unshaded region $R$, on the diagram below.

Answer: 

................................................

................................................

................................................

................................................ [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) \( x = \ldots \) or \( \ldots \) [2]

(b) (i) \( \ldots \) [2]

(ii) \( \ldots \) [2]
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 825 m, find the value of T.
(c) Find the average speed for the whole journey.

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