

**EDUZEDCO**  
**Form 1 Mathematics Paper 2 Examination**

*Subject: Mathematics | Class: Form 1 | Duration: 150 min | Total Marks: 100*

**INSTRUCTIONS TO CANDIDATES:**

1. Write your name and index number in the spaces provided.
2. This paper consists of TWO sections: Section I and Section II.
3. Answer ALL questions in Section I and any FIVE questions from Section II.
4. Show all the steps in your calculations, giving your answers at each stage.
5. Non-programmable silent electronic calculators and KNEC mathematical tables may be used.

**SECTION I (50 Marks)**

*Answer all questions in this section.*

1. A cylindrical water tank of radius  $1.4\text{ m}$  is being filled by a pipe of diameter  $7\text{ cm}$ . Water flows at  $2\text{ m/s}$ . Calculate the time taken to fill the tank to a height of  $5\text{ m}$ .

*(3 marks)*

2. The second term of a geometric progression is  $12$  and the fourth term is  $108$ . Find the common ratio and the first term.

*(3 marks)*

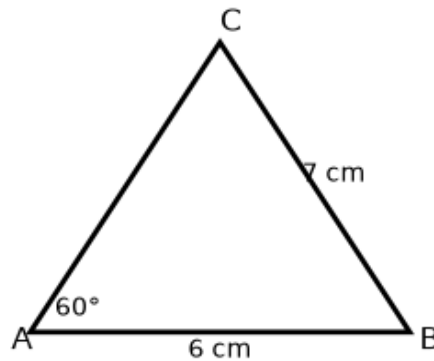
3. If  $x^2 + 8x + k$  is a perfect square, find the value of  $k$ .

*(2 marks)*

4. Make  $r$  the subject of the formula  $V = \frac{4}{3}\pi r^3$ .

*(3 marks)*

5. Construct a triangle  $ABC$  with  $AB = 6$  cm,  $BC = 7$  cm, and  $\angle ABC = 60^\circ$ . Draw the locus of points  $P$  such that  $\angle APB = 90^\circ$ .



(4 marks)

6.  $y$  varies partly as  $x$  and partly as the square of  $x$ . When  $x=1$ ,  $y=5$  and when  $x=2$ ,  $y=14$ . Find  $y$  when  $x=3$ .

(4 marks)

7. A rectangular block has dimensions  $5$  cm,  $4$  cm, and  $3$  cm. Find the angle between a diagonal of the block and the base.

(3 marks)

8. A TV is priced at  $\$600$  cash. Under hire purchase, a deposit of  $20\%$  is paid followed by  $\$12$  monthly installments of  $\$55$ . Calculate the total hire purchase price and the interest charged.

(4 marks)

9. The table below shows the distance  $s$  (m) traveled by a particle at time  $t$  (s):

| $t$ | 0 | 1 | 2  | 3  | 4  | 5  | 6  | 7   |
|-----|---|---|----|----|----|----|----|-----|
| $s$ | 0 | 3 | 10 | 21 | 36 | 55 | 78 | 105 |

Estimate the speed at  $t = 3.5$  s.

(4 marks)

10. A wave is modeled by  $y = 5 \sin(2\theta - 30^\circ)$ . State the amplitude, period, and phase shift.

(2 marks)

11. Two places A and B are on latitude  $40^\circ\text{N}$ . A is at longitude  $30^\circ\text{E}$  and B is at longitude  $60^\circ\text{E}$ . Find the distance between them along the parallel of latitude. (Earth radius  $= 6370$  km).

(3 marks)

12. A bag contains 3 red and 5 blue marbles. Two marbles are drawn without replacement. Find the probability that both are red.

(3 marks)

13. Describe the locus of a point P that moves such that its distance from a fixed point O is always 4 cm and its distance from a fixed line l is 3 cm.

(3 marks)

**14.** Given vectors  $\vec{a} = \begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix}$ ,  $\vec{b} = \begin{pmatrix} 3 \\ 0 \\ 2 \end{pmatrix}$ , and  $\vec{c} = \begin{pmatrix} 5 \\ 2 \\ 3 \end{pmatrix}$ , show that  $\vec{c}$  is a linear combination of  $\vec{a}$  and  $\vec{b}$ .

(3 marks)

**15.** A linear transformation  $T$  maps the unit square to a parallelogram with area 8 square units. Find the determinant of the matrix representing  $T$ .

(3 marks)

**16.** Evaluate  $\int_0^1 (3x^2 + 2x) \, dx$ .

(3 marks)

## SECTION II (50 Marks)

Answer any FIVE questions from this section.

17. Three taps \$A\$, \$B\$, and \$C\$ can fill a tank in 4, 6, and 8 hours respectively. All three taps are opened together for 1 hour, then \$C\$ is closed. How long will it take for the remaining two taps to fill the tank?

(10 marks)

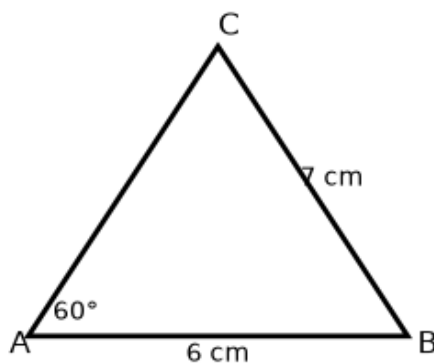


18. A farmer has 100 m of fencing to enclose a rectangular plot. One side of the plot is a river, so no fencing is needed there. Find the dimensions that maximize the area and the maximum area.

(10 marks)



19. In a circle, chords \$AB\$ and \$CD\$ intersect at \$E\$. \$AE = 4\$ cm, \$EB = 9\$ cm, \$CE = 6\$ cm. Find \$ED\$. If \$\angle AED = 70^\circ\$, find \$\angle ACB\$.



(10 marks)



20. In a certain country, income tax is charged as follows: - First \$10,000: 10% - Next \$20,000: 15% - Next \$30,000: 20% - Above \$60,000: 25% Calculate the tax for an income of \$80,000.

(10 marks)



21. A point  $P(2,3)$  is transformed by matrix  $M = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$  followed by  $N = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ . Find the image of  $P$  under the combined transformation.

(10 marks)



22. The heights (cm) of 50 students are given below: 

| Height  | Frequency |
|---------|-----------|
| 140-144 | 5         |
| 145-149 | 10        |
| 150-154 | 15        |
| 155-159 | 12        |
| 160-164 | 8         |

 Calculate the mean and variance.

(10 marks)



23. Sketch the graphs of  $y = 2\sin x$  and  $y = \cos 2x$  for  $0^\circ \leq x \leq 360^\circ$  on the same axes. Find the solutions to  $2\sin x = \cos 2x$  in that interval.

(10 marks)



24. A particle moves along a straight line with velocity  $v(t) = t^2 - 4t + 3$  m/s. Find the displacement after 4 seconds if initially at the origin. Also find the total distance traveled.

(10 marks)

