

EDUZEDCO

Form 4 Mathematics Paper 2 Examination

Subject: Mathematics | Class: Form 4

Duration: 150 minutes | Total Marks: 100

INSTRUCTIONS:

- Answer ALL questions.
- Write neatly and clearly.
- Show all working where necessary.

SECTION A: Multiple Choice Questions

1. Water flows through a cylindrical pipe of radius 7 cm at a speed of 5 m/s. Calculate the time, in minutes, required to fill a tank measuring 2 m by 1.5 m by 1 m. (Take $\pi = \frac{22}{7}$)
2. The third term of a geometric progression is 18 and the sixth term is 486. Find the first term and the common ratio.
3. Find the value of k such that $x^2 + 8x + k$ is a perfect square.
4. Make x the subject of the formula: $y = \sqrt{\frac{ax + b}{cx - d}}$.
5. Using a ruler and a pair of compasses only, construct a triangle ABC with AB = 6 cm, BC = 7 cm, and angle ABC = 60° . Construct the locus of points equidistant from A and B, and the locus of points equidistant from B and C. Label the intersection of the two loci as P.
6. y varies partly as x and partly as the square of x . When $x = 2$, $y = 14$, and when $x = 3$, $y = 33$. Find y when $x = 4$.
7. A right pyramid has a square base of side 8 cm and a slant height of 10 cm. Calculate the angle between a slant edge and the base plane.
8. A refrigerator is priced at Sh 60,000 cash. On hire purchase, a deposit of 20% is paid followed by 12 monthly installments of Sh 5,000 each. Calculate the hire purchase price and the compound interest rate per annum charged, assuming monthly compounding.
9. The table below shows the distance s (m) covered by a particle at time t (s):

t	0	1	2	3	4	5	6	7
s	0	2.5	8	18	32	50	72	98

Estimate the velocity of the particle when $t = 3.5$ s using a suitable method.
10. A wave is modeled by $y = 5 \sin(3\theta - 60^\circ)$. Determine the amplitude, period, and phase shift.
11. Two points A and B lie on the equator with longitudes 30°E and 45°W respectively. Calculate the distance between them along the equator, taking the Earth's radius as 6370 km and $\pi = 3.142$.

12. A bag contains 4 red balls, 3 blue balls, and 5 green balls. Two balls are drawn without replacement. Find the probability that one is red and the other is blue.
13. A point P moves such that it is equidistant from points A(2,3) and B(6,1), and also at a distance of 5 units from the origin. Determine the coordinates of P.
14. Given vectors $\vec{a} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$, $\vec{b} = \begin{pmatrix} 3 \\ 0 \\ -1 \end{pmatrix}$, and $\vec{c} = \begin{pmatrix} 5 \\ 2 \\ 1 \end{pmatrix}$, show that the three vectors are linearly dependent.
15. A transformation T is represented by the matrix $\begin{pmatrix} 2 & 3 \\ 1 & 4 \end{pmatrix}$. Find the area of the image of a triangle with vertices (0,0), (1,0), and (0,1) under T.
16. Find the area enclosed by the curve $y = x^2 + 1$, the x-axis, and the lines $x = 1$ and $x = 3$.

SECTION B: Structured Questions

17. A tap can fill a tank in 6 hours, and a second tap can fill the same tank in 4 hours. An outlet pipe can empty the full tank in 8 hours. If all three are opened together, how long will it take to fill the tank?

[10 marks]

18. A rectangular field has a perimeter of 400 m. Find the maximum area that can be enclosed and the dimensions that give this maximum.

[10 marks]

19. In the diagram, O is the center of the circle. Points A, B, C, and D lie on the circle. Angle ABC = 70° and angle ADC = 110° . Find angle BAD and angle BCD.

[10 marks]

20. The tax brackets in a certain country are:

- First Sh 120,000: 10%
- Next Sh 120,000: 15%
- Next Sh 120,000: 20%
- Above that: 25%

A person earns a monthly salary of Sh 50,000 and is entitled to a personal relief of Sh 1,200 per month. Calculate the annual tax paid.

[10 marks]

21. A triangle with vertices A(1,2), B(3,4), and C(2,1) is transformed by matrix $M = \begin{pmatrix} 2 & 0 \\ 0 & 3 \end{pmatrix}$ followed by matrix $N = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$. Find the coordinates of the image of the triangle after the combined transformation.

[10 marks]

22. The table shows the ages of 50 people:

$\begin{array}{|c|c|}$

$\hline$

Age (years) & Frequency $\backslash\backslash$

$\hline$

10-19 & 6 $\backslash\backslash$

20-29 & 12 $\backslash\backslash$

30-39 & 15 $\backslash\backslash$

40-49 & 10 $\backslash\backslash$

50-59 & 7 $\backslash\backslash$

$\hline$

$\end{array}$

Calculate the mean, median, and standard deviation of the ages.

[10 marks]

23. On the same axes, sketch the graphs of $y = 2\sin(x - 30^\circ)$ and $y = \cos x$ for $0^\circ \leq x \leq 360^\circ$. Determine the number of solutions to $2\sin(x - 30^\circ) = \cos x$ in this interval.

[10 marks]

24. A particle moves along a straight line such that its acceleration $a = 6t - 4$ m/s². Initially, the particle is at rest at the origin. Find the velocity after 3 seconds and the distance traveled in the first 4 seconds.

[10 marks]