**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 has a radius of 1.4 m and a height of 3.5 m. Water flows into the tank through a pipe of cross-sectional area 50 cm^2 at a speed of 2 m/s. Calculate the time taken to fill the tank, giving your answer in minutes.

(3 marks)

2. The third term of a geometric progression is 20 and the sixth term is 160. Find the first term and the common ratio.

(3 marks)

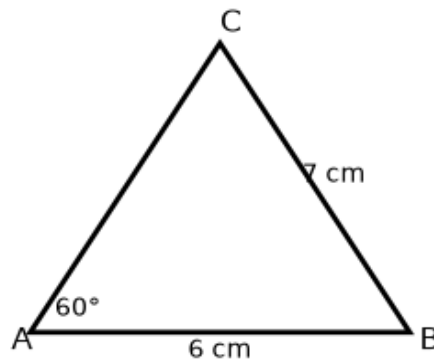
3. Find the value of k such that the expression $x^2 + 8x + k$ is a perfect square.

(2 marks)

4. Make r the subject of the formula $T = 2\pi \sqrt{\frac{r}{g}}$.

(3 marks)

5. Using a ruler and a pair of compasses only, construct a triangle ABC such that $AB = 6$ cm, $BC = 7$ cm, and angle $ABC = 60^\circ$. Construct the locus of point P such that P is equidistant from A and B, and also equidistant from AB and BC. Measure the distance of P from B.

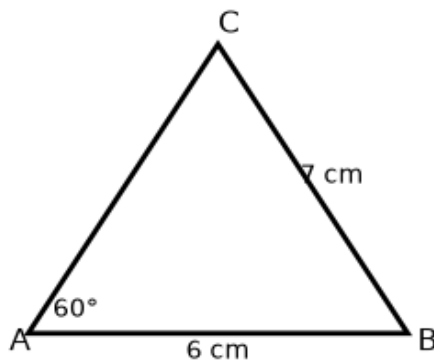


(4 marks)

6. y varies partly directly as x and partly inversely as the square of x . When $x=2$, $y=14$ and when $x=4$, $y=31$. Find the percentage change in y when x is increased by 50%.

(4 marks)

7. The diagram below shows a right pyramid with a rectangular base PQRS. $PQ = 8$ cm, $QR = 6$ cm, and the height of the pyramid is 10 cm. Calculate the angle between the slant edge VR and the base plane.



(3 marks)

8. A television set is priced at Ksh 50,000 cash. Under hire purchase, a deposit of 20% is required and the balance is to be paid in 12 equal monthly installments. The interest charged is 15% per annum compound interest on the outstanding balance. Calculate the monthly installment.

(4 marks)

9. The table below shows the velocity v (m/s) of a particle at time t (s):

t	0	1	2	3	4	5	6	7
v	0	2.5	4.8	6.9	8.8	10.5	12.0	13.3

Estimate the rate of change of velocity at $t=4$ s using a suitable method.

(4 marks)

10. A wave is represented by $y = 3\sin\left(\frac{\pi}{2}x - \frac{\pi}{3}\right)$. Determine the amplitude, period, and phase shift.

(2 marks)

11. Two points A and B on the Earth's surface have coordinates $(60^\circ\text{N}, 30^\circ\text{E})$ and $(60^\circ\text{N}, 60^\circ\text{W})$ respectively. Calculate the distance between A and B along the parallel of latitude, taking the Earth's

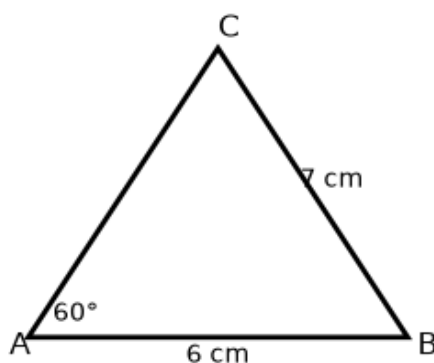
radius to be 6370 km.

(3 marks)

12. A bag contains 5 red balls, 3 blue balls, and 2 green balls. Two balls are drawn at random without replacement. Find the probability that both balls are of the same color.

(3 marks)

13. Describe the locus of a point P that moves such that its distance from a fixed point O is 3 cm and its distance from a fixed line L (3 cm from O) is less than or equal to 2 cm. Sketch the locus.



(3 marks)

14. Given vectors $\vec{a} = 2\hat{i} - 3\hat{j} + \hat{k}$, $\vec{b} = 4\hat{i} - 6\hat{j} + 2\hat{k}$, and $\vec{c} = -\hat{i} + 2\hat{j} - \hat{k}$. Show that $\vec{a}$, $\vec{b}$, and $\vec{c}$ are linearly dependent and find the relationship.

(3 marks)

15. The transformation matrix $T = \begin{pmatrix} 2 & 3 \\ 1 & 2 \end{pmatrix}$ maps a square of area 4 square units onto a parallelogram. Find the area of the image.

(3 marks)

16. Find the area enclosed by the curve $y = x^2 - 4x + 3$ and the x -axis.

(3 marks)

SECTION II (50 Marks)

Answer any FIVE questions from this section.

17. A pump can empty a tank in 6 hours. A second pump can empty the same tank in 4 hours. The first pump is started alone for 2 hours then the second pump is also opened. How many more hours will it take to empty the tank?

- (a) Write an expression for the fraction of the tank emptied by the first pump in 1 hour.
- (b) Find the fraction emptied by both pumps together in 1 hour.
- (c) Calculate the total time taken to empty the tank when both pumps operate together after the first 2 hours.

(10 marks)



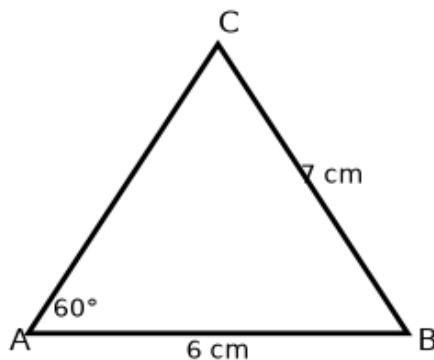
18. A rectangular field is to be fenced on three sides (one length is not fenced) using 200 m of fencing. Find the dimensions that give the maximum area and the maximum area.

- (a) Express the area in terms of the width.
- (b) Differentiate and find the critical point.
- (c) Determine the maximum area.

(10 marks)



19. In the circle O is the centre. Chords AB and CD intersect at E inside the circle. Given that AE = 4 cm, EB = 6 cm, CE = 3 cm, and angle AED = 70° , find the length of ED and the radius of the circle if the chord AB is 8 cm from the centre.



- (a) Use the intersecting chords theorem to find ED.
 (b) Find the radius using perpendicular distance from centre to chord.

(10 marks)



20. In a certain country, income tax is charged at the following rates: \begin{center}

\begin{tabular}{|c|c|} \hline Taxable Income (Ksh per annum) & Tax Rate \\ \hline First 120,000 & 10% \\ Next 100,000 & 15% \\ Next 200,000 & 20% \\ Above 420,000 & 25% \\ \hline \end{tabular}

\end{center} A person earns a gross salary of Ksh 80,000 per month and is entitled to a personal relief of Ksh 1,200 per month. Calculate: (a) The annual taxable income. (b) The annual tax payable. (c) The net monthly income.

(10 marks)



21. Triangle ABC has vertices A(1,2), B(3,5), and C(5,1). It is transformed by matrix $M = \begin{pmatrix} 1 & 2 \\ 3 & 1 \end{pmatrix}$ followed by matrix $N = \begin{pmatrix} 2 & 0 \\ 0 & -1 \end{pmatrix}$. Find the coordinates of the image of triangle ABC after the combined transformation. Describe the single transformation equivalent to $N \circ M$.

- (a) Find the image after M.
- (b) Find the final image after N.
- (c) Determine the matrix product NM and describe the transformation.

(10 marks)



22. The marks of 50 students in a test are as follows:

Marks	Frequency
10-19	4
20-29	8
30-39	12
40-49	14
50-59	7
60-69	5

 Calculate the mean and standard deviation of the marks.

- (a) Find the mid-points and product with frequency.
- (b) Compute the mean.
- (c) Compute the variance and standard deviation.

(10 marks)



23. A particle moves along a straight line such that its velocity v (m/s) after time t seconds is given by $v = 3t^2 - 12t + 9$. Find: (a) The initial velocity. (b) The time when the particle is momentarily at rest. (c) The displacement between $t=0$ and $t=4$ seconds. (d) The total distance traveled between $t=0$ and $t=4$ seconds.

(10 marks)

Age Group	Percentage
18-24	28%
25-34	22%
35-44	18%
45-54	15%
55-64	12%
65-74	8%
75-84	5%
85+	2%

24. The acceleration of a particle is given by $a = 6t - 4$ (m/s²). Initially, the particle is at the origin with velocity 2 m/s. Find: (a) The velocity at time t . (b) The displacement at time t . (c) The displacement when $t=3$ seconds.

- Integrate acceleration to get velocity.
- Integrate velocity to get displacement.
- Evaluate at $t=3$.

(10 marks)