

2023 MOCK 2 MATHEMATICS (ELECTIVE) 1

PAPER ONE

Answer all questions in this section

- If $\frac{1}{x^2-2x-3} \equiv \frac{P}{x+1} + \frac{Q}{x-3}$, find the value of $(P + 2Q)$
 A. $-\frac{1}{2}$ B. $-\frac{1}{4}$ C. 0 D. $\frac{1}{4}$
- The 3^{rd} , 4^{th} and 5^{th} terms of an exponential sequence are x, y and z respectively. Which of the following statements is true?
 A. $3x = 20yz$ B. $x^2 = yz$ C. $y^2 = xz$ D. $z^2 = xy$
- If $\cos\theta = x$, $0^\circ < \theta < 90^\circ$, find the value of $\tan^2\theta$.
 A. $\frac{\sqrt{1-x^2}}{x}$ B. $\sqrt{1-x^2}$ C. $\frac{1}{x^2} - 1$ D. $\frac{1-x^2}{x}$
- Solve for x : $3^{5x-\frac{1}{2}} - 1 = 0$
 A. -0.5 B. 0.1 C. 0.5 D. 2.5
- Given that $M = \begin{bmatrix} 0 & 2 \\ 2 & 1 \end{bmatrix}$ and $N = \begin{bmatrix} 0 & 2 \\ 2 & -1 \end{bmatrix}$, find $(2M - N)$
 A. $\begin{bmatrix} 0 & 2 \\ 2 & -3 \end{bmatrix}$ B. $\begin{bmatrix} 0 & 2 \\ 2 & -1 \end{bmatrix}$ C. $\begin{bmatrix} 0 & 2 \\ 2 & 1 \end{bmatrix}$ D. $\begin{bmatrix} 0 & 2 \\ 2 & -3 \end{bmatrix}$
- If $f: x \rightarrow x^2 - 1$ and $g: x \rightarrow 3x + 1$, find $fog(x)$ when $x = 2$
 A. 3 B. 6 C. 10 D. 48
- If α and β are the roots of $2x^2 - x - 2 = 0$, find the value of $\left(\frac{1}{2\alpha} + \frac{1}{2\beta}\right)$
 A. -1 B. $-\frac{1}{2}$ C. $-\frac{1}{3}$ D. $-\frac{1}{4}$
- If the coefficient of x^2 in the expansion of $(1 + 3x)^n$ is 324, find the value of n .
 A. 6 B. 7 C. 8 D. 9
- If the mean of the numbers 5, 8, x , 12, $(x + 5)$ and 10 is 1, find x .
 A. 6 B. 8 C. 10 D. 60

The table shows the marks obtained by 100 pupils in a test.

Marks	1-5	6-10	11-15	16-20	21-25	26-30
Frequency	5	12	8	48	17	10

Use this information to answer Questions 10 and 11

- What is the upper-class boundary of the class containing the 40^{th} percentile?
 A. 13 B. 15.5 C. 18 D. 20.5
- Find the probability that a pupil selected at random had a mark of at most 15.
 A. 0.08 B. 0.17 C. 0.25 D. 0.75
- The position vectors of P and Q are $\begin{pmatrix} 1 \\ 5 \end{pmatrix}$ and $\begin{pmatrix} 4 \\ 8 \end{pmatrix}$ respectively. If R is the midpoint of $\overline{OQ}$ where O is the origin, find $\overline{PR}$
 A. $\begin{pmatrix} 4 \\ 8 \end{pmatrix}$ B. $\begin{pmatrix} 3 \\ 5 \end{pmatrix}$ C. $\begin{pmatrix} 1 \\ -1 \end{pmatrix}$ D. $\begin{pmatrix} -1 \\ -1 \end{pmatrix}$
- Two forces, $(10N, 150^\circ)$ and $(8N, 330^\circ)$, act at a point. Find the magnitude of the resultant of their horizontal component.
 A. 1N B. 3N C. 4N D. 5N
- If $\overline{VW}$ and $\overline{XY}$ are two vectors such that $\overline{VW} = 4\overline{XY}$, then
 A. V, W, X, Y are vertices of a parallelogram B. $\overline{VW} = 4\overline{YX}$
 C. $\overline{VW}$ is perpendicular to $\overline{WY}$ D. $\overline{VW}$ is parallel to $\overline{XY}$
- If $\begin{bmatrix} 2 & 4 \\ 3 & z \end{bmatrix} + \begin{bmatrix} x & y \\ 3 & 0 \end{bmatrix} = \begin{bmatrix} 4 & -4 \\ w & 0 \end{bmatrix}$, find (w, x, y, z)
 A. $(6, -2, -8, -4)$ B. $(6, 2, -8, -4)$ C. $(6, 2, -8, 4)$ D. $(6, 4, -4, 0)$
- Evaluate $\int_0^1 \frac{3-3x^2}{x+1} dx$
 A. $1\frac{1}{3}$ B. $1\frac{1}{2}$ C. 3 D. $4\frac{1}{2}$
- Given that $\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \cos\alpha\sin\beta$, evaluate $\sin(30^\circ + \theta) + \sin(30^\circ - \theta)$
 A. $\sin\theta$ B. $\cos\theta$ C. $\sqrt{3}\sin\theta$ D. $\sqrt{3}\cos\theta$
- In a class of 25 students, 6 study Mathematics, 14 study Biology and 3 study both subjects. What is the probability that a student selected at random does not study any of the subject?
 A. $\frac{14}{25}$ B. $\frac{8}{25}$ C. $\frac{1}{5}$ D. $\frac{3}{25}$

19. Find the equation of the line which passes through the midpoint of the line joining the points (1, 2) and (2, -3) and perpendicular to the line $3x + 2y - 5 = 0$
 A. $4x - 6y - 12 = 0$ B. $4x - 6y - 9 = 0$ C. $4x + 6y - 12 = 0$ D. $4x + 6y - 9 = 0$
20. Which of the following can be used to estimate the mode and the median of a distribution?
 A. Ogive B. Bar chart C. Histogram D. Pie chart
21. If ${}^{10}C_4 = {}^{10}C_{n-1}$, find the value of n.
 A. 6 B. 7 C. 8 D. 9
22. Find the minimum value of $x^2 + 2x - 6$
 A. -7 B. -6 C. -5 D. -4
23. Find the coordinate of the point on the curve $y = 3x^2 - 2x - 5$, where the tangent is parallel to the line $y - 5 = 8x$
 A. $(0, \frac{5}{3})$ B. $(\frac{5}{3}, 0)$ C. $(\frac{5}{3}, 0)$ D. $(0, -\frac{5}{3})$
24. Calculate the mean deviation of 5, 8, 2, 9 and 6.
 A. 4 B. 2 C. 5 D. 3
25. Find the constant term in the binomial expansion of $(2x^2 + \frac{1}{x^2})^4$
 A. 12 B. 42 C. 10 D. 24
26. Find the coordinate of the centre of the circle $3x^2 + 3y^2 - 6x + 9y - 5 = 0$
 A. $(1, -\frac{3}{2})$ B. $(3, -\frac{9}{2})$ C. $(-3, \frac{9}{2})$ D. $(-1, \frac{3}{2})$
27. Evaluate $\int_0^9 (\sqrt[3]{x}) dx$
 A. 9 B. 3 C. 27 D. 18
28. Which of the following vector is perpendicular to $(\begin{smallmatrix} -1 \\ 3 \end{smallmatrix})$?
 A. $(\begin{smallmatrix} 1 \\ 3 \end{smallmatrix})$ B. $(\begin{smallmatrix} 3 \\ 1 \end{smallmatrix})$ C. $(\begin{smallmatrix} -3 \\ 1 \end{smallmatrix})$ D. $(\begin{smallmatrix} 1 \\ -3 \end{smallmatrix})$
29. Find, correct to the nearest degree, the angle between $p = 12i - 5j$ and $q = 4i + 3j$
 A. 75° B. 59° C. 76° D. 60°
30. Evaluate $\lim_{x \rightarrow 1} \left(\frac{1-x}{x^2-3x+2} \right)$
 A. $\frac{1}{2}$ B. -1 C. 1 D. $-\frac{1}{2}$
31. Simplify $\frac{2\sqrt{3}-5\sqrt{2}}{\sqrt{3}}$
 A. $2 - 5\sqrt{2}$ B. $5 + 5\sqrt{2}$ C. $2 - \frac{5}{3}\sqrt{6}$ D. $2 + \frac{5}{3}\sqrt{6}$
32. Express 0.029646, correct to three decimal places.
 A. 0.02 B. 0.029 C. 0.03 D. 0.030
33. Simplify, leaving your answer in standard form, $\frac{0.15 \times 0.063}{0.0013}$
 A. 7.269×10^{-2} B. 7.269×10^{-1} C. 7.269×10^1 D. 7.269×10^2
34. If y varies inversely as x and $x = \frac{1}{2}$, when $y = 6$, find y when $x = \frac{1}{3}$.
 A. $\frac{1}{36}$ B. 9 C. 12 D. 18
35. Okon won a 200m race in 25seconds. If he run at the same rate, how long in minutes, would it take him to complete 800m.
 A. $2\frac{1}{2}$ B. 2 C. $1\frac{2}{3}$ D. 1
36. Evaluate $\frac{\log 27}{\log \frac{1}{2}} + \frac{\log 4}{\log \sqrt{2}}$
 A. -2 B. -1 C. 1 D. 7
37. Expand $(5x - y)(x - 3y)$
 A. $5x^2 + 16xy + 3y^2$ B. $5x^2 - 16xy + 3y^2$ C. $5x^2 + 14xy - 3y^2$ D. $5x^2 + 16xy - 3y^2$
38. If $\frac{2(x-1)}{3} - \frac{3(2x-1)}{4} = \frac{1}{2}$, find x.
 A. $\frac{1}{2}$ B. $-\frac{3}{5}$ C. -2 D. $-\frac{23}{10}$
39. Given that $\cos 2x - \sin x = 0$ and $0^\circ \leq x \leq 90^\circ$, find the value of x
 A. 90° B. 60° C. 45° D. 30°
40. Town X is 6km away and on a bearing of 030° from town Y. Town Z is 8km away from Town X and on a bearing of 120° . Calculate, correct to the nearest whole number, the bearing of Z from Y.
 A. 067° B. 071° C. 079° D. 083°