

2023 MOCK 2 ELECTIVE MATHEMATICS

PAPER 1

OBJECTIVE TEST

1. Find the inverse of the matrix $A = \begin{pmatrix} 3 & 5 \\ 1 & 2 \end{pmatrix}$
 - a. $\begin{pmatrix} 5 & 1 \\ 2 & 3 \end{pmatrix}$
 - b. $\begin{pmatrix} -5 & 2 \\ -1 & 3 \end{pmatrix}$
 - c. $\begin{pmatrix} 2 & -5 \\ -1 & 3 \end{pmatrix}$
 - d. $\begin{pmatrix} 5 & -1 \\ -3 & 2 \end{pmatrix}$
2. Given that $x:R \rightarrow R$ is defined by $x = \frac{y+1}{5-y}$, $y \in R$, find the domain of x
 - a. $\{y: y \in R, y \neq 7\}$
 - b. $\{y: y \in R, y \neq 5\}$
 - c. $\{y: y \in R, y \neq 1\}$
 - d. $\{y: y \in R, y \neq 0\}$
3. If $\frac{6x+k}{2x^2+7x-15} \equiv \frac{4}{x+5} - \frac{2}{2x-3}$, find the value of k .
 - a. -25
 - b. -24
 - c. -22
 - d. -21
4. Differentiate $\frac{x}{x+1}$ with respect to x .
 - a. $\frac{1}{(x+1)^2}$
 - b. $\frac{1-x}{(x+1)^2}$
 - c. $\frac{-1}{x+1}$
 - d. $\frac{1}{x+1}$
5. Given that $2x+3y-10=0$ and $3x=2y-11$, calculate the value of $(x-y)$
 - a. -5
 - b. -3
 - c. 3
 - d. -5
6. Given that $f(x) = 2x$ and $g(x) = 3x^2$, find the value of x for which $f^1(x) = g(x)$
 - a. $X=1/6$ or $x=2/3$
 - b. $X=1/12$ or $x=2/3$
 - c. $X=0$ or $x=2/3$
 - d. $X=0$ or $x=1/6$
7. If $v = \log_x(M+N)$, express N in terms of X , P , M and V
 - a. $N = X^{p/v} + M$
 - b. $N = X^{v/p} + M$

c. $N = X^{p/v} - M$

d. $N = X^{v/p} - M$

8. Determine the coefficient of x^3 in the binomial expansion of $(1 + \frac{1}{2}x)^5$

a. $\frac{5}{2}$

b. $\frac{5}{4}$

c. $\frac{5}{6}$

d. $\frac{5}{8}$

9. If $\sin x = \frac{3}{5}$ and $\cos y = \frac{24}{25}$, where x and y are acute, find the value of $\cos(x+y)$.

a. $\frac{7}{25}$

b. $\frac{3}{5}$

c. $\frac{24}{25}$

d. $\frac{117}{125}$

10. If the determinant of a matrix $M = \begin{pmatrix} x & -1 \\ 6 & x \end{pmatrix}$ is equal to $5x$, find the values of x .

a. $x = 2, 3$

b. $x = 1, -6$

c. $x = -1, 6$

d. $x = -2, -3$

11. Which of the following matrices has no multiplicative inverse?

a. $\begin{pmatrix} 4 & -1 \\ 8 & 2 \end{pmatrix}$

b. $\begin{pmatrix} 2 & 3 \\ 4 & -6 \end{pmatrix}$

c. $\begin{pmatrix} 3 & 1 \\ 6 & 2 \end{pmatrix}$

d. $\begin{pmatrix} 2 & -2 \\ -5 & -5 \end{pmatrix}$

12. Find the equation of the line which makes an angle of 135° with the positive x-axis and passes through the point (0, 7)

a. $y+x+7=0$

b. $y+x-7=0$

c. $y+x-4=0$

d. $y+x+4=0$

13. If $(3+4\sqrt{3})(2 - a\sqrt{3}) = -18+2\sqrt{3}$, find the value of a.

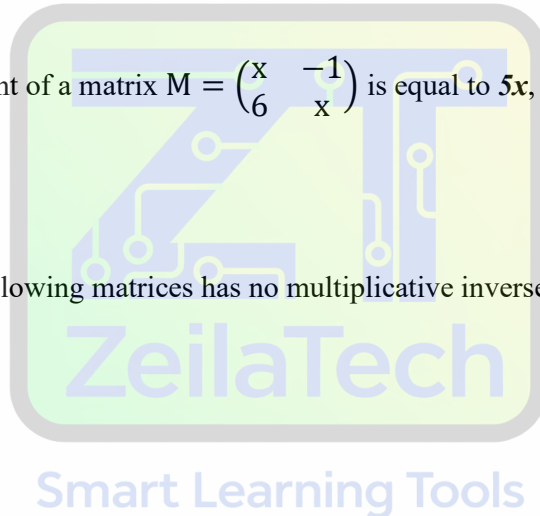
a. 3

b. 2

c. -2

d. -4

14. If $S = \sin \theta$, find $\frac{s}{\sqrt{1-s^2}}$



- a. $\sin \theta$
 b. $\tan \theta$
 c. $\cot \theta$
 d. $\sec \theta$
15. If α and β are the roots of the equation $2x^2 - x - 2 = 0$, evaluate $(\alpha^2 + \beta^2)$
 a. $-3\frac{3}{4}$
 b. $-1\frac{3}{4}$
 c. $2\frac{1}{4}$
 d. $4\frac{1}{4}$
16. The linear equation $3x + 2y = 6$ is expressed in the form $\frac{x}{a} + \frac{y}{b} = 1$. Find the value of a and b .
 a. $A=3, b=2$
 b. $A=2, b=3$
 c. $A=2, b=\frac{1}{3}$
 d. $A=\frac{1}{2}, b=\frac{1}{3}$
17. The radius of a sphere is 6cm and it is increasing at a rate of 0.25cm^{-1} . At what rate in terms of π is the volume of the sphere increasing?
 a. $36\pi\text{cm}^3/s$
 b. $12\pi\text{cm}^3/s$
 c. $3\pi\text{cm}^3/s$
 d. $\pi\text{cm}^3/s$
18. Given that $y = (2x^3 + 2x^2 + 1)^5$, find $\frac{dy}{dx}$.
 a. $5(2x^2 + 4x)(2x^3 + 2x^2 + 1)^4$
 b. $5(6x^2 + 4x)(2x^3 + 2x^2 + 1)^4$
 c. $(x^2 + 4x)(2x^3 + 2x^2 + 1)^4$
 d. $5(6x^2 + 2x)(2x^3 + 2x^2 + 1)^4$
19. Find the gradient of the tangent to the point curve $y = x^3 - 2x + 1$ at the point $(-1, 2)$.
 a. -1
 b. 1
 c. 5
 d. 10
20. If $\log_3 x = 2$, find $\log_x 81$
 a. 6
 b. 4
 c. 3
 d. 2
21. If the binomial expansion of $(1 + 3x)^6$ is used to evaluate $(0.97)^6$, find the value of x .
 a. -0.03
 b. -0.01

- c. 0.01
d. 0.03
22. Find the n^{th} term of the linear sequence (A.P) $(5y+1), (2y+1), (1-y), \dots$
a. $8y-3n+1$
b. $(8-3n)y+1$
c. $8y+3n+1$
d. $(8+3n)y+1$
23. Which of the following is not an equation of a circle?
a. $3x^2 + 3y^2 + 5x + 7y = 5$
b. $x^3 + y^2 - 5x + 4y = 0$
c. $5x^3 + 5y^2 - 16 = 0$
d. $x^3 - y^2 + 3x - 5y = 2$
24. Calculate the variance of $\sqrt{2}, (1 + \sqrt{2})$ and $(2 + \sqrt{2})$.
a. 2
b. $\frac{2}{3}$
c. $\sqrt{\frac{2}{3}}$
d. 0
25. $P(3,4)$ and $Q(-3,-4)$ are two points in a plane. Find the gradient of the line that is normal to line PQ.
a. $-\frac{4}{3}$
b. $-\frac{3}{4}$
c. $\frac{3}{4}$
d. $\frac{4}{3}$
26. Find the unit vector in the direction opposite to the resultant of forces $F_1 = (-2i - 3j)$ and $F_2 = (5i - j)$.
a. $\frac{1}{5}(3i + 4j)$
b. $\frac{1}{5}(3i - 4j)$
c. $\frac{1}{5}(-3i + 4j)$
d. $\frac{1}{5}(-3i - 4j)$
27. If $\log_5\left(\frac{125x^3}{\sqrt[3]{y}}\right)$ is expressed in the form $p \log_5 x + q \log_5 y + k$, find the value of p, q and k respectively.
a. $3, -\frac{1}{3}, 3$
b. $3, \frac{1}{3}, 3$
c. $-\frac{1}{3}, 3, 5$
d. $3, -\frac{1}{3}, 5$
28. The first and second terms of a linear sequence are 15 and 12 respectively. Find the n^{th} term.
a. $18 - 3n$

- b. $12 + 3n$
 c. $12n + 3$
 d. $12 - 2n$
29. Evaluate $\sum_{n=0}^6 2(n - 3)$
 a. -12
 b. -6
 c. 0
 d. 1225
30. The 2^{nd} and 4^{th} terms of an exponential sequence are $\frac{2}{9}$ and $\frac{8}{81}$ respectively. find the 6^{th} term of the sequence.
 a. $\frac{81}{32}$
 b. $\frac{27}{24}$
 c. $\frac{81}{324}$
 d. $\frac{32}{729}$
31. Given that $2x^2 - x - 3 = A(x + B)^2 + C$, find the minimum value of $2x^2 - x - 3$.
 a. $\frac{25}{8}$
 b. $\frac{8}{25}$
 c. $-\frac{8}{25}$
 d. $-\frac{25}{8}$
32. If $\begin{pmatrix} p+q \\ 0 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ p-q \end{pmatrix} = \begin{pmatrix} 2 \\ 0 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 8 \end{pmatrix}$, find the values of p and q.
 a. $p = -5, q = 3$
 b. $p = -5, q = -3$
 c. $p = 5, q = -3$
 d. $p = 5, q = 3$
33. Find the angle between $i + 5j$ and $5i - j$.
 a. 90°
 b. 60°
 c. 25°
 d. 0°
- The ages, x (in years), of a group of 18 students in Mr. POBORSKY's class have the following statistics:**

$$\sum x = 745 \text{ and } \sum x^2 = 33951.$$

Use the given data to answer questions 34 and 35.

34. Calculate the mean age in 2 decimal places
 a. 39.41 years
 b. 43.91 years
 c. 41.39 years
 d. 34.91 years

35. Calculate the standard deviation in 2 decimal places.
- 16.13
 - 16.31
 - 13.16
 - 13.61
36. The deviations of a six numbers from 12 are: -4,3,2,0,1 and -3. Calculate correct to three significant figures, the mean of the distribution.
- 1.18
 - 11.8
 - 3.18
 - 31.8
37. If $2^x = 5$, find the value of x .
- 2.23
 - 2.32
 - 4.23
 - 4.32
38. When the polynomial $f(x)=x^2 + 6x + k$ is divided by $x-a$, the remainder is the same as when it is divided by $x-2a$. find the possible values of a .
- $a = 0$, or $a = 2$
 - $a = 0$ or $a = -2$
 - $a = 0$ or $a = 4$
 - $a = 0$ or $a = -4$
39. Evaluate $\sum_{k=1}^7 (5k - 3)$
- 911
 - 191
 - 119
 - 199
40. Find, *correct to two decimal places*, the mean deviation of the following numbers. 6,12,10,4,8,1,18 and 12.
- 4.33
 - 3.34
 - 3.43
 - 4.32

END OF PAPER 1