

2023 SUPER MOCK ELECTIVE MATHS 1

PAPER 1

Elective Mathematics 1 (Objective)

1. A binary operation $*$ is defined on $\mathbb{R}$, the set of real numbers by $a * b = a + b - 3$. Find the identity element.
A. 3
B. 2
C. 0
D. -3
2. Find the sum of the sequence $4, -2, 1, -\frac{1}{2}, \dots$
A. $-\frac{3}{4}$
B. $\frac{3}{4}$
C. $\frac{8}{3}$
D. 8
3. Solve the equation $256^{(x+1)} = 8^{(1-x^2)}$
A. $-1, -\frac{5}{3}$
B. $-\frac{3}{8}, -\frac{5}{3}$
C. $\frac{8}{3}, \frac{3}{5}$
D. $\frac{8}{3}, \frac{5}{3}$
4. If α and β are the roots of $x^2 + 3x - 4 = 0$, find the value of $\alpha^2 + \beta^2 - 3\alpha\beta$.
A. -11
B. 20
C. 21
D. 29
5. Rationalize $\frac{1}{\sqrt{3}-\sqrt{2}}$
A. $\sqrt{3} - \sqrt{2}$
B. $\frac{\sqrt{3}+\sqrt{2}}{3}$
C. $\frac{\sqrt{3}+\sqrt{2}}{2}$
D. $\sqrt{3} + \sqrt{2}$
6. If $\log_5(6x + 7) - \log_5 6 = 2$, find x .

A. $23\frac{5}{6}$

B. $26\frac{1}{6}$

C. $30\frac{1}{6}$

D. $33\frac{1}{6}$

7. The polynomial $f(x) = x^3 - 4x^2 + x + 8$ is divided by $(x - 2)$. Find the remainder.

A. 0

B. 2

C. 4

D. 6

8. If $p = \frac{x+3}{2x-1}$, express $\frac{2p+1}{3p+1}$ in terms of x .

A. $\frac{4x-5}{5x-8}$

B. $\frac{4x-5}{5x+8}$

C. $\frac{4x+5}{5x+8}$

D. $\frac{4x-5}{5x-8}$

9. Find the radius of the circle $x^2 + y^2 + 6x - 4y - 12 = 0$.

A. 3

B. 5

C. 6

D. 12

10. If $\log_{10}(x^2) + \log_{10}(10x) = 1$, find the value of x .

A. -10

B. -1

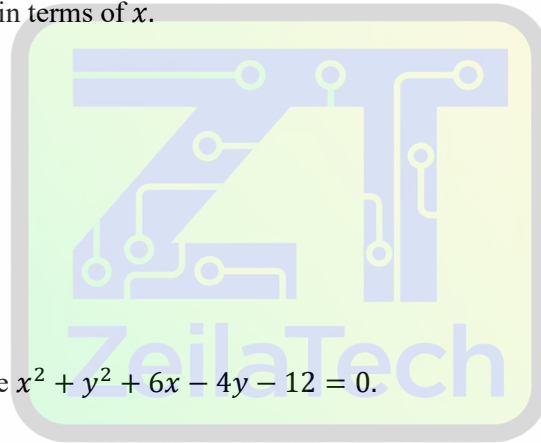
C. 1

D. 10

11. The remainder when the polynomial $f(x) = 5x^3 + px^2 - x + 10$ is divided by $(x + 1)$ is 8.

Find the value of p .

A. 1



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- B. 2
- C. 3
- D. 4

12. Evaluate $\int_0^2 \frac{3x^5 + 2x^4 - x^3}{x^3} dx$.

- A. 8.0
- B. 10.0
- C. 10.2
- D. 12.0

13. If $y = x^2 - 2x - 3$, calculate the minimum value of y .

- A. -4
- B. -1
- C. 1
- D. 4

Two functions f and g are defined on the set $\mathbb{R}$, of real numbers by $f(x) = \sqrt{x-1}$ and $g(x) = x^2 + 1$.

Use this information to answer questions 14 and 15.

14. Find the inverse of $f(x)$.

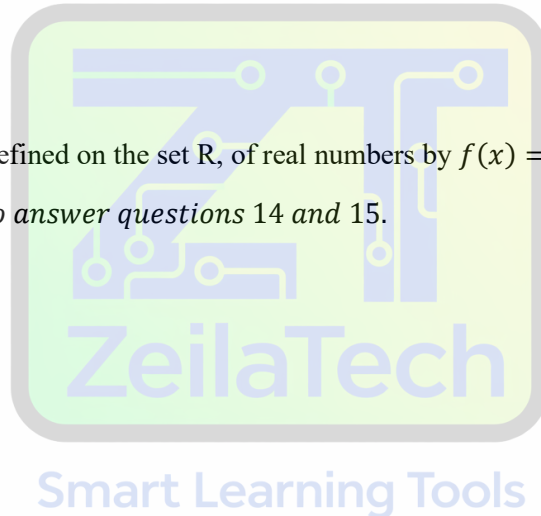
- A. $x - 1$
- B. $\sqrt{x+1}$
- C. $\sqrt{x^2+1}$
- D. $x^2 + 1$

15. Find $f[g(2)]$.

- A. $1 - \sqrt{5}$
- B. $-1 + \sqrt{5}$
- C. ± 2
- D. ± 5

16. Find the coefficient of x^2 in the expansion of $(1 + \frac{x}{4})^6$

- A. $\frac{15}{16}$
- B. $\frac{15}{8}$



C. $\frac{15}{4}$

D. $\frac{15}{2}$

17. Consider the statements:

p : All tall men are model.

q : Dela is tall man.

Which of the following is a valid conclusion from these statements?

A. Dela may be a model.

B. Some models are tall.

C. All models are called Dela.

D. Dela is a model.

18. Evaluate $\frac{\tan 45^\circ + \tan 30^\circ}{1 - \tan 45^\circ \tan 30^\circ}$

A. $-2 - \sqrt{3}$

B. $2 - \sqrt{3}$

C. $-2 + \sqrt{3}$

D. $2 + \sqrt{3}$

19. An arc a circle of radius 10 cm subtends an angle of 4.4 radians at the centre.

Find the length of the arc.

A. 12cm

B. 22cm

C. 44cm

D. 55cm

20. Given that $M = \begin{pmatrix} 3 & 4 \\ 1 & 3 \end{pmatrix}$, $N = \begin{pmatrix} 8 & 5 \\ 5 & 1 \end{pmatrix}$ and $P = \begin{pmatrix} -1 & 7 \\ 3 & -2 \end{pmatrix}$, find $M + N - P$.

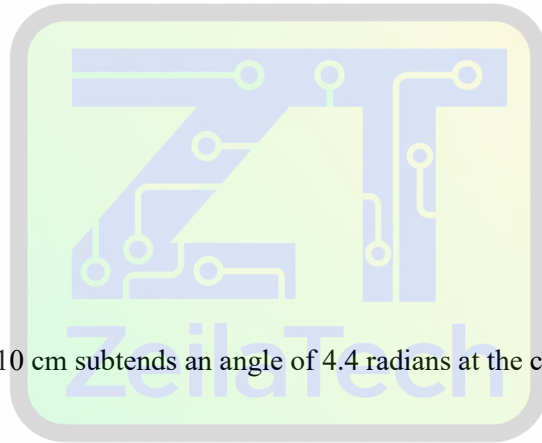
A. $\begin{pmatrix} 12 & 2 \\ 3 & 2 \end{pmatrix}$

B. $\begin{pmatrix} 12 & 2 \\ 3 & 6 \end{pmatrix}$

C. $\begin{pmatrix} 12 & 2 \\ 6 & 2 \end{pmatrix}$

D. $\begin{pmatrix} 12 & 2 \\ 6 & 6 \end{pmatrix}$

21. Find the gradient of the tangent of the curve $y = x^3 - 2x^2 - x - 2$ at the (0, -2).



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A. -2

B. -1

C. 1

D. 2

22. Simplify $\frac{{}^5n C_2}{{}^5n P_2}$.

A. $\frac{1}{5}$

B. $\frac{1}{2}$

C. 1

D. 5

23. In a village 40% of the men are farmers. If 5 men are randomly selected from the village, what is the probability that exactly 4 men are farmers?

A. $\frac{48}{625}$

B. $\frac{24}{625}$

C. $\frac{162}{625}$

D. $\frac{48}{3125}$

24. $3\binom{2}{x} - \binom{1-y}{4} = \binom{3-2y}{1-2x}$, find the value of x and y .

A. $x = -1, y = 2$

B. $x = 1, y = -\frac{2}{3}$

C. $x = \frac{5}{3}, y = \frac{2}{3}$

D. $x = 2, y = -1$

25. Find correct to **one** decimal place, the angle between the vectors $2\mathbf{j}$ and $(-5\mathbf{i} + 4\mathbf{j})$.

A. 15.2°

B. 25.2°

C. 38.7°

D. 51.3°

26. Find with respect to x , the derivative of $(3 - 5x^2)^3$.

A. $-30x(3 - 10x^2)^2$

B. $-30x(3 - 5x^2)^2$

C. $30x(3 - 10x^2)^2$

D. $30x(3 - 5x^2)^2$

27. Find the equation of the normal to the curve $y = x^3 + 3x^2 - 4x + 1$ through the point (0, 1).

A. $4y + x - 4 = 0$

B. $4y - x - 4 = 0$

C. $y - 4x + 1 = 0$

D. $y - 4x - 1 = 0$

28. If $x = 3\cos\theta$ and $y = 2\sin\theta$, find $\frac{x^2}{9} + \frac{y^2}{4}$.

A. 1

B. 9

C. 13

D. 36

29. Which of the following vectors is parallel to the vector $\begin{pmatrix} 2 \\ -4 \end{pmatrix}$?

A. $\begin{pmatrix} 6 \\ -12 \end{pmatrix}$

B. $\begin{pmatrix} -8 \\ 6 \end{pmatrix}$

C. $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$

D. $\begin{pmatrix} 6 \\ 8 \end{pmatrix}$

30. Two fair coins are tossed together once. Find the probability that no tail shows up.

A. $\frac{3}{4}$

B. $\frac{2}{3}$

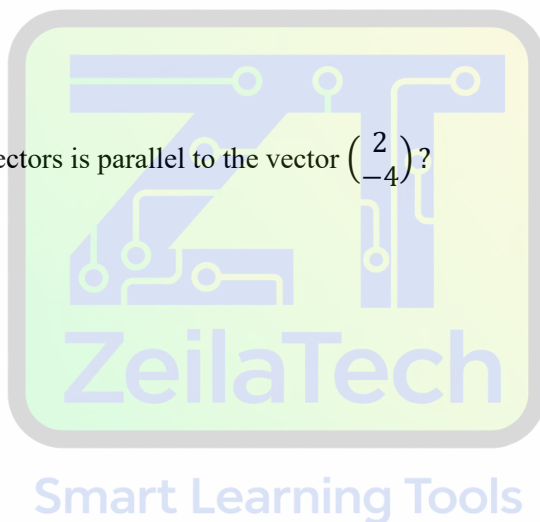
C. $\frac{1}{2}$

D. $\frac{1}{4}$

31. For what values of x is $\frac{2x-1}{3x^2+5x-2}$ **not** defined?

A. $-\frac{1}{3}, -2$

B. $-\frac{1}{3}, 2$



C. $\frac{1}{3}, -2$

D. $\frac{1}{2}, -2$

32. In a family of 12 children, 8 play football, 7 play volleyball and 5 play both football and volleyball. Find the probability that a child selected at random does **not** play either of the two games.

A. $\frac{1}{6}$

B. $\frac{1}{4}$

C. $\frac{5}{12}$

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

33. Forces $(2\mathbf{i} + 4\mathbf{j})$ N, $(3\mathbf{i} - 3\mathbf{j})$ N and $\mathbf{R}$ N act on a body. If the body remains in equilibrium,

find $\mathbf{R}$.

A. $(-5\mathbf{i} - \mathbf{j})$

B. $(-5\mathbf{i} + \mathbf{j})$

C. $(5\mathbf{i} - \mathbf{j})$

D. $(5\mathbf{i} + \mathbf{j})$

34. A committee consisting of 2 girls and 3 boys is to be formed from 6 girls and 9 boys. In how many ways can this be done, if one particular boy must be on the committee?

A. 71

B. 420

C. 840

D. 2002

A body starts from rest and accelerates at $(2t + 5) \text{ ms}^{-2}$, where t is the time in seconds.

Use this information to answer questions 35 and 36.

35. Find the velocity of the body at $t = 3\text{s}$.

A. 2 ms^{-1}

B. 6 ms^{-1}

C. 11 ms^{-1}

D. 24 ms^{-1}

36. Find the distance covered by the body in 3 seconds.

A. 27.5m

B. 31.5m



C. 45.0m

D. 72.0m

37. Given that $\mathbf{a} = i - j$ and $\mathbf{b} = 2i + 3j$, find the unit vector along $\mathbf{b} - \mathbf{a}$.

A. $\frac{1}{\sqrt{13}}(i + 4j)$

B. $\frac{1}{\sqrt{13}}(4i - j)$

C. $\frac{1}{\sqrt{17}}(4i + j)$

D. $\frac{1}{\sqrt{17}}(i + 4j)$

The table below shows the distribution of marks obtained in a test by 25 candidates.

Use it to answer question 38 to 40.

Marks	20-39	40-59	60-79	80-99
Frequency	2	8	10	5

38. What is the class mark of the modal class of the distribution?

A. 60.5

B. 64.5

C. 69.5

D. 79.5

39. If a student is selected at random, what is the probability that she obtained at **most** 79 marks?

A. $\frac{2}{3}$

B. $\frac{1}{2}$

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

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

40. Find the mean the distribution.

A. 63.3

B. 63.9

C. 69.3

D. 79.9