

2024 WASSCE SUPER MOCK ELECTIVE MATHEMATICS 1

MATHEMATICS

PAPER 1

SECTION A

PAPER 1

1 ½ hours

Answer **all** the questions.

Each question is followed by **four** options lettered **A** to **D**. Find the **correct** option for **each** question. Shade in **pencil** on your answer sheet the answer space which bears the same letter as the option you have chosen. Give only **one** answer to **each** question.

Think carefully before you shade the answer spaces. Erase completely any answers you wish to change.

Answer all questions

1. Given that $\frac{\log(x-3)^{4x-1}}{\log(x-3)} = 9$, find x .

- A. -2
- B. 1
- C. 2
- D. 3

2. Simplify $\log_{10} \sqrt[3]{5^8}$

- A. $\frac{3}{8} \log_{10} 5$
- B. $\frac{3}{5} \log_{10} 5$
- C. $\frac{5}{8} \log_{10} 5$
- D. $\frac{8}{3} \log_{10} 5$

3. A bag contains 7 identical red and 6 identical green balls. If 2 balls are selected at random at the same time, what is the probability that they are of the same colour?

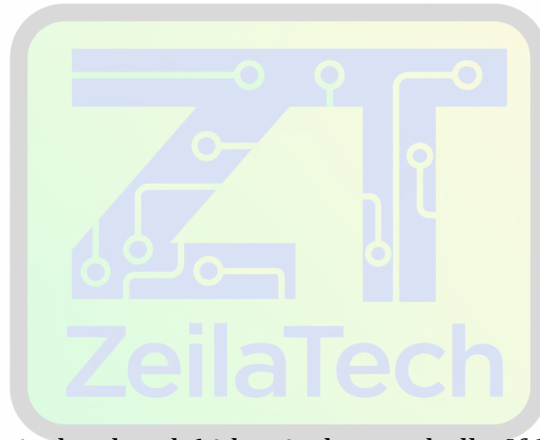
- A. $\frac{3}{13}$
- B. $\frac{5}{13}$
- C. $\frac{6}{13}$
- D. $\frac{7}{13}$

4. Given that $P(X) = 0.3$ and $P(Y/X) = 0.15$. Find $P(X \cap Y)$

- A. 0.045
- B. 0.15
- C. 0.20
- D. 0.18

5. Solve the equation $2\cos^2\theta - \cos\theta = 0$, where $0^\circ < \theta < 90^\circ$

- A. 20°
- B. 30°
- C. 60°
- D. 75°



6. Change 145° to radians.

- A. $\frac{\pi}{4}$
- B. $\frac{3\pi}{4}$
- C. $\frac{29\pi}{36}$
- D. $\frac{5\pi}{6}$

7. Simplify $\frac{\tan 60^\circ + \tan 45^\circ}{\tan 60^\circ - \tan 45^\circ}$ leaving your answer in surd form.

- A. $-2 - \sqrt{3}$
- B. $-2 + \sqrt{3}$
- C. $2 - \sqrt{3}$
- D. $2 + \sqrt{3}$

8. Express $\frac{5\pi}{6}$ radians in degrees

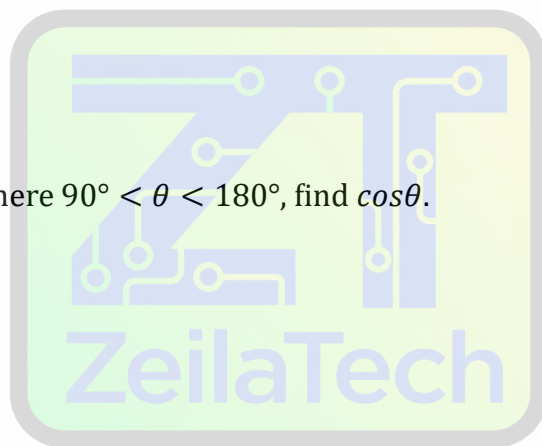
- A. 210°
- B. 170°
- C. 150°
- D. 105°

9. Given that $\sin \theta = \frac{1}{2}$ where $90^\circ < \theta < 180^\circ$, find $\cos \theta$.

- A. $\frac{-\sqrt{3}}{2}$
- B. $-\frac{1}{2}$
- C. $\frac{1}{2}$
- D. $\frac{\sqrt{3}}{2}$

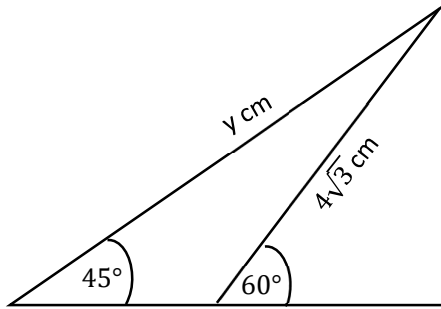
10. If $x = 3\cos \theta$ and $y = 2\sin \theta$, find $\frac{x^2}{9} + \frac{y^2}{4}$

- A. 1
- B. 9
- C. 13
- D. 36



Smart Learning Tools

11.



Find the value of y in the diagram above.

- A. $\frac{3}{\sqrt{6}}$
- B. $6\sqrt{2}$
- C. $2\sqrt{3}$
- D. $4\frac{1}{2}$

12. Given that $\sin(A + B) = \sin A \cos B + \cos A \sin B$. Find the value of $\sin 105^\circ$

- A. $\frac{\sqrt{2}}{4}(\sqrt{3} + 1)$
- B. $\frac{\sqrt{2}}{4}(\sqrt{3} - 1)$
- C. $\frac{\sqrt{3}}{6}(1 + \sqrt{3})$
- D. $2 + \sqrt{3}$

13. Evaluate $\int_0^1 (x^3 + 1)^2 dx$.

- A. $\frac{9}{14}$
- B. $\frac{11}{14}$
- C. $\frac{23}{14}$
- D. $\frac{31}{14}$

14. Evaluate $\int_1^2 \frac{x^2 + x - 2}{x - 1} dx$.

- A. 0
- B. $\frac{3}{2}$
- C. $\frac{5}{2}$
- D. $\frac{7}{2}$

15. If $\mathbf{a} = 4\mathbf{i} + 7\mathbf{j}$ and $\mathbf{b} = 3\mathbf{i} - 5\mathbf{j}$, find $\mathbf{a} \cdot \mathbf{b}$

- A. -23
- B. -20
- C. 20
- D. 23

16. $\mathbf{p} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ and $\mathbf{q} = \begin{pmatrix} 8 \\ -6 \end{pmatrix}$. Find the angle between $\mathbf{p}$ and $\mathbf{q}$.

- A. 0°
- B. 30°
- C. 60°
- D. 90°

17. The ages (in years) of five girls are 6, 8, 6, 5 and 10. Calculate the standard deviation of their ages.

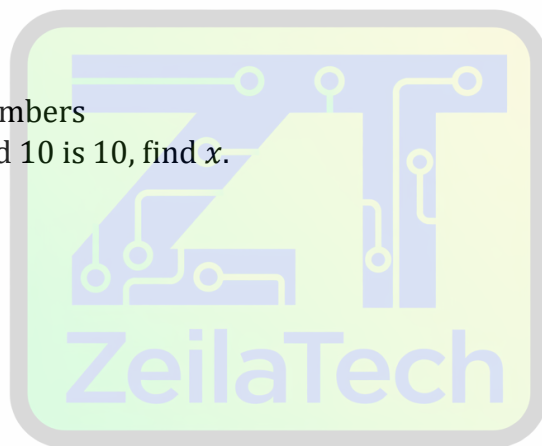
- A. 1.8
- B. 1.9
- C. 2.6
- D. 3.2

18. The mean of the eight numbers 4, 6, 4, 7, x , $x + 1$, 8 and 2 is 5. Find x .

- A. 2
- B. 3
- C. 4
- D. 5

19. If the mean of the numbers 5, 8, x , 12, $(x + 5)$ and 10 is 10, find x .

- A. 6
- B. 8
- C. 10
- D. 60



Use this information to answer Questions 20 and 21

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

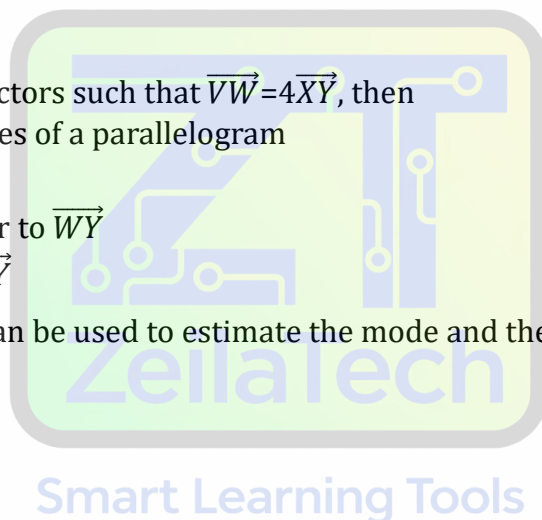
20. What is the upper-class boundary of the class containing the 40th percentile?

- A. 13
- B. 15.5
- C. 18
- D. 20.5

21. 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

22. A five-member committee is to be formed from 6 boys and 4 girls. If the committee must include exactly two girls, find the number of ways in which the committee could be formed.
- A. 84
 - B. 98
 - C. 104
 - D. 120
23. How many different arrangements of the letters of the word **COMMISSION** are possible?
- A. 5040
 - B. 226800
 - C. 604800
 - D. 3628800
24. 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
25. If $\overrightarrow{VW}$ and $\overrightarrow{XY}$ are two vectors such that $\overrightarrow{VW} = 4\overrightarrow{XY}$, then
- A. V, W, X, Y are vertices of a parallelogram
 - B. $\overrightarrow{VW} = 4\overrightarrow{YX}$
 - C. $\overrightarrow{VW}$ is perpendicular to $\overrightarrow{WY}$
 - D. $\overrightarrow{VW}$ is parallel to $\overrightarrow{XY}$
26. 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
27. 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. $4x + 6y - 9 = 0$
28. 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°



29. A linear transformation is defined by $T(x, y) \rightarrow (-x + y, -4y)$, find the image Q^1 of $Q(-3, 2)$ under T
- $Q^1(5, -3)$
 - $Q^1(-5, -8)$
 - $Q^1(5, -8)$
 - $Q^1(-8, -5)$

30. Find the minimum value of $x^2 + 2x - 6$
- 7
 - 6
 - 5
 - 4

31. Given that $M = \begin{bmatrix} 0 & 2 \\ 2 & 1 \end{bmatrix}$ and $N = \begin{bmatrix} 0 & 2 \\ 2 & -1 \end{bmatrix}$, find $(2M - N)$
- $\begin{bmatrix} 0 & 2 \\ 2 & -3 \end{bmatrix}$
 - $\begin{bmatrix} 0 & 2 \\ 2 & -1 \end{bmatrix}$
 - $\begin{bmatrix} 0 & 2 \\ 2 & 1 \end{bmatrix}$
 - $\begin{bmatrix} 0 & 2 \\ 2 & -3 \end{bmatrix}$

32. If $f: x \rightarrow x^2 - 1$ and $g: x \rightarrow 3x + 1$, find $f \circ g(x)$ when $x = 2$
- 3
 - 6
 - 10
 - 48

33. If α and β are the roots of $2x^2 - x - 2 = 0$, find the value of $\left(\frac{1}{2\alpha} + \frac{1}{2\beta}\right)$
- 1
 - $-\frac{1}{2}$
 - $-\frac{1}{3}$
 - $-\frac{1}{4}$

34. If $\frac{1}{x^2 - 2x - 3} \equiv \frac{P}{x+1} + \frac{Q}{x-3}$, find the value of $(P + 2Q)$
- $-\frac{1}{2}$
 - $-\frac{1}{4}$
 - 0
 - $\frac{1}{4}$

35. The 3rd, 4th and 5th terms of an exponential sequence are x, y and z respectively. Which of the following statements is true?
- $3x = 20yz$
 - $x^2 = yz$
 - $y^2 = xz$
 - $z^2 = xy$

36. If $(x + 1)$ is a factor of the polynomial $f(x) = x^3 - px^2 + x + 6$, find the value of p .

- A. -8
- B. -4
- C. 4
- D. 8

37. Given that $\frac{2x}{(x+6)(x+3)} \equiv \frac{P}{x+6} + \frac{Q}{x+3}$, find (P, Q) .

- A. $(4, 2)$
- B. $(2, 4)$
- C. $(4, -2)$
- D. $(-2, 4)$

Use the information below to answer Questions 38 and 40

The binary operation $*$ is defined on the set of rational numbers by $a * b = 2ab$.

38. Find the identity element.

- A. $\frac{1}{4}$
- B. $\frac{1}{2}$
- C. 2
- D. 4

39. Find the rational number that has no inverse under $*$

- A. 3
- B. 2
- C. 1
- D. 0

40. A binary operation $\otimes$ is defined on the set of real numbers by $a \otimes b = a + b\sqrt{2}$. Find $(2 \otimes -3) \otimes 5$

- A. $2 + 5\sqrt{2}$
- B. $2 + 2\sqrt{2}$
- C. $2 - 3\sqrt{2}$
- D. $-3 + 5\sqrt{2}$

END OF PAPER