

SECTION A

[48 marks]

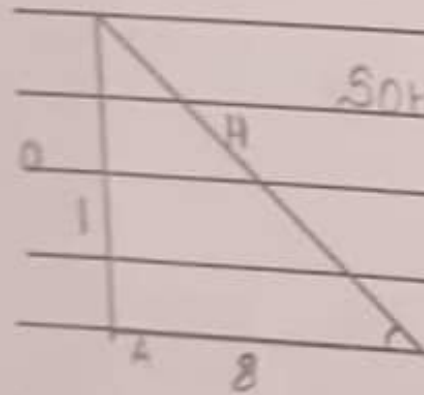
Answer all the questions in this section.

All questions carry equal marks.

1. If α and β are the roots of $5x^2 - 3x + 4 = 0$, find the equation whose roots are $\frac{1}{\alpha^2}$ and $\frac{1}{\beta^2}$.

2. Given that ${}^{(n-1)}P_4 : {}^nP_3 = 6 : 1$, find the value of n .

4. If $\tan x = \frac{1}{8}$ and $\tan(x+y) = 4$, find, correct to the nearest degree, the value of y , where $0^\circ \leq y \leq 360^\circ$.



SOH CAH TOA

1 2 3 4 5 6 35 f

12.12.

$$H^2 = 1^2 + 8^2$$

$$H^2 = 1^2 + 8^2$$

$$H^2 = 1 + 64$$

$$H^2 = 65$$

$$H = \sqrt{65}$$

$$H = 8.06$$

Candidate's Name: AMOS JOY AGUIARE

5. In a community, 60% of the graduates are unemployed. If a random sample of 4 graduates from the community is taken, find the probability that:
- (a) exactly half of them are unemployed;

- (b) at least three of them are unemployed.

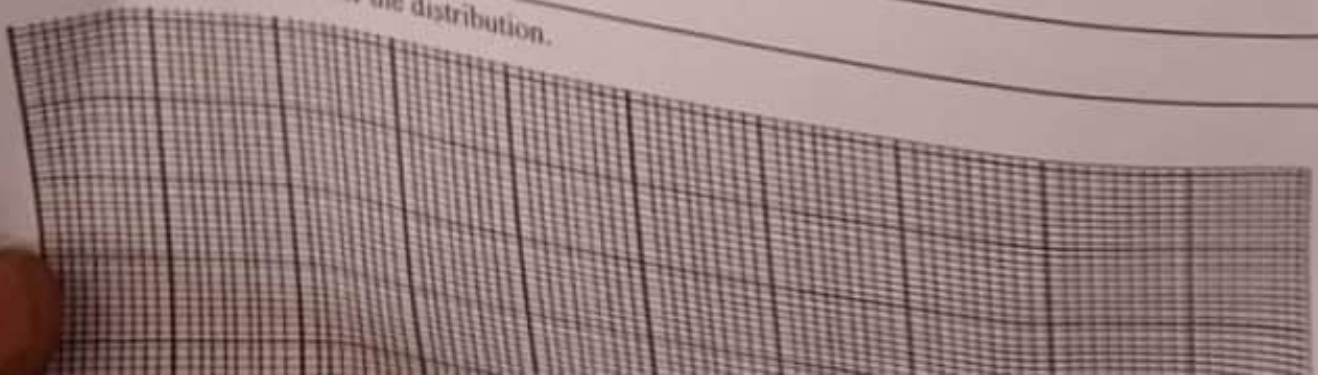
6. The table represents the distribution of the lifespan of some electric bulbs (in *hours*).

<i>Life span (in hours)</i>	37 - 46	47 - 64	65 - 76	77 - 84	85 - 98	99 - 118
<i>Frequency</i>			48	16		
<i>Frequency Density</i>	5	3			7	6

(a) Copy and complete the distribution table.

Handwritten area with horizontal lines for copying and completing the table.

(b) Draw a histogram for the distribution.



Candidate's Name: AMOS JOY AGWIRE

7. The position vectors of x and y are $x = -2i + 5j$ and $y = i - 7j$ respectively. Find the:

(a) magnitude of $(y - 2x)$;

$$(y - 2x)$$

$$-2i + 5j - 2$$

$$(i - 7j) - 2(-2i + 5j)$$

$$(i - 7j) + 4i - 10j$$

$$i - 7j - (-4i + 5j)$$

$$i - 4i - 7j - i + 4i - 7j - 10j$$

$$5i - 17j$$

(b) angle between x and y , correct to the nearest degree.

8. A particle of mass 25 kg slides down a rough plane inclined at angle 30° to the horizontal. If the coefficient of friction is 0.2 , find, correct to 3 significant figures, the acceleration of the particle.

[Take $g = 10 \text{ ms}^{-2}$]

SECTION B

[52 marks]

*Answer four questions only from this section,
with at least one question from each part.
All questions carry equal marks.*

PART I

PURE MATHEMATICS

9. (a) Find the equation of a circle with centre $(-5, 6)$ and radius 7 units.
 (b) Find the equation of the normal to the curve $x^2 + y^2 - x + 2y = 0$ at $(1, -2)$.
10. (a) If $y = \frac{3}{1+e^x}$, find the value of $\frac{dy}{dx}$ at $x = 0$.
 (b) If $P = \begin{pmatrix} x+2 & 4 & -1 \\ 1 & 5 & -2 \\ -1 & 3 & x+5 \end{pmatrix}$ and $|P| = 84$, find the values of x .
11. (a) Given that $q: x \rightarrow 3x-1$ and $p: x \rightarrow x^2-1$, find the values of x for which:
 (i) $p(x) = q(2)$;
 (ii) $q(x) = p(x)$.
 (b) Evaluate: $\int_0^{\frac{4\pi}{3}} \sin\left(\frac{x}{4}\right) dx$.

PART II

STATISTICS AND PROBABILITY

12. (a) In a large consignment, 8% of the articles are defective. If a random sample of 50 articles are selected from the consignment, find the probability that at least 4 will be defective.
 [Take $e = 2.7183$]
- (b) A bag contains 5 blue and 6 green identical balls. If 5 balls are selected at random from the bag one after the other without replacement, find the probability that a green ball was picked at most two times.

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write in
this margin.

13. The table shows the distribution of the lengths of pipes, manufactured in a factory, measured to the nearest metre.

Lengths (m)	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80
Frequency	1	2	8	10	12	12	3	2

- (a) Construct a cumulative frequency distribution table for the distribution.
 (b) Draw a cumulative frequency curve (ogive) for the distribution.
 (c) Use the ogive to estimate the:
 (i) median length;
 (ii) semi-interquartile range;
 (iii) probability that a pipe selected at random has length between 41 m and 54 m.

PART III
VECTORS AND MECHANICS

14. (a) A vehicle which has broken down is pushed by three men with forces: 250 N in the direction 300° , 350 N in the direction 270° and 320 N in the direction 210° respectively. Calculate, correct to two decimal places, the resultant force.
 (i) magnitude;
 (ii) direction, of the resultant force.
 (b) A bus travelling from town X to town Y increases its speed from 36 kmh^{-1} to 144 kmh^{-1} in a distance of 120 metres, the acceleration being uniform. Calculate its acceleration.
15. (a) A tennis ball was hit with a racket and moved with a velocity of 12 ms^{-1} at an angle of 55° to the horizontal. Calculate, correct to the nearest metre, the maximum height reached by the tennis ball. [Take $g = 10 \text{ ms}^{-2}$]
 (b) A uniform beam PQ 12 m long weighs 20 N. It rests on two supports L and M where L is at a point 2 m from P and M is at a point 4 m from Q.
 (i) Calculate, correct to two decimal places, the reactions at L and M.
 (ii) If a mass 1 kg is placed at a distance x m from P, such that the reactions at L and M are equal, find the value of x . [Take $g = 10 \text{ ms}^{-2}$]

①

$$5x^2 - 3x + 4 = 0$$

$$a = 5, b = -3, c = 4$$

$$\alpha + \beta = -\frac{b}{a} = \frac{3}{5}$$

$$\alpha\beta = \frac{c}{a} = \frac{4}{5}$$

Sum of roots:

$$\frac{1}{\alpha^2} + \frac{1}{\beta^2} = \frac{\alpha^2 + \beta^2}{(\alpha\beta)^2}$$

$$= \frac{(\alpha + \beta)^2 - 2\alpha\beta}{(\alpha\beta)^2}$$

$$= \frac{\left(\frac{3}{5}\right)^2 - 2\left(\frac{4}{5}\right)}{\left(\frac{4}{5}\right)^2}$$

$$= \frac{\frac{9}{25} - \frac{8}{5}}{\frac{16}{25}} = \frac{9 - 40}{25}$$

$$= -\frac{31}{25} \times \frac{25}{16} = -\frac{31}{16}$$

Product of roots:

$$\frac{1}{\alpha^2} \times \frac{1}{\beta^2} = \frac{1}{(\alpha\beta)^2}$$

$$= \frac{1}{\left(\frac{4}{5}\right)^2} = \frac{25}{16}$$

Equation

$$x^2 - \text{Sum of roots} \times \text{Product of roots} = 0$$

$$x^2 - \left(-\frac{31}{16}\right)x + \frac{25}{16} = 0 \Rightarrow 16x^2 + 31x + 25 = 0$$

(2)

$${}^{n-1}P_4 : {}^nP_3 = 6 : 1$$

$$\frac{(n-1)!}{(n-1-4)!} = \frac{n!}{(n-3)!} = \frac{6}{1}$$

$$\frac{(n-1)!}{(n-5)!} \times \frac{(n-3)!}{n!} = 6$$

$$\frac{\cancel{(n-1)!}}{\cancel{(n-5)!}} \times \frac{(n-3)(n-4)\cancel{(n-5)!}}{n\cancel{(n-1)!}} = 6$$

$$(n-3)(n-4) = 6$$

$$n^2 - 4n - 3n + 12 = 6$$

$$n^2 - 7n + 12 = 6$$

$$n^2 - 7n + 6 = 0$$

$$n^2 - 6n - n + 6 = 0$$

$$n(n-6) - 1(n-6) = 0$$

$$(n-1)(n-6) = 0$$

$$n = 1 \text{ or } 6$$

$$n = 6$$

4 (3)

$$T_2 + T_{10} = 34$$

$$(a+d) + (a+9d) = 34$$

$$2a + 10d = 34 \quad \text{--- (1)}$$

$$S_{11} = \frac{n}{2} (2a + (n-1)d)$$

$$S_{11} = \frac{11}{2} (2a + (11-1)d)$$

$$S_{11} = \frac{11}{2} (2a + 10d)$$

$$S_{11} = \frac{11}{2} (34)$$

$$S_{11} = 11 \times 17$$

$$S_{11} = \underline{\underline{187}}$$

(4)

$$\tan x = \frac{1}{8}, \tan(x+y) = 4$$

and ~~$\tan y =$~~

$$\tan(x+y)$$

$$\frac{\tan x \tan y}{1 - \tan x \tan y} = 4$$

$$\frac{\frac{1}{8} \tan y}{1 - \frac{1}{8} \tan y} = 4$$

$$\frac{1}{8} \tan y = 4 - \frac{4}{8} \tan y$$

$$\frac{1}{8} \tan y + \frac{1}{2} \tan y = 4$$

$$\frac{\tan y + 4 \tan y}{8} = 4$$

$$5 \tan y = 32$$

$$\tan y = \frac{32}{5}$$

$$y = \tan^{-1}\left(\frac{32}{5}\right)$$

$$y = 81.1$$

$$y = 81^\circ$$

Example 25

$f: x \rightarrow 3x - 2$ and $g: x \rightarrow x + 1$ are two functions defined on the set of real numbers. Show that $[fg(x)]^{-1} = g^{-1}[f^{-1}(x)]$

Solution

$$f(x) = 3x - 2$$

$$\text{Let } y_1 = 3x - 2$$

$$\text{then } x = \frac{y_1 + 2}{3}$$

$$\therefore f^{-1}(y_1) = \frac{y_1 + 2}{3}$$

$$\therefore f^{-1}(x) = \frac{x + 2}{3}$$

$$g(x) = x + 1$$

Let $y_2 = x + 1$

then $x = y_2 - 1$

$$\therefore g^{-1}(y_2) = y_2 - 1$$

$$\therefore g^{-1}(x) = x - 1$$

$$g^{-1}[f^{-1}(x)] = g^{-1}\left[\frac{x+2}{3}\right]$$

$$= \frac{x+2}{3} - 1$$

$$= \frac{x+2-3}{3}$$

$$= \frac{x-1}{3}$$

$$fg(x) = f(x+1)$$

$$= 3(x+1) - 2$$

$$= 3x + 3 - 2$$

$$= 3x + 1.$$

Let $y_3 = 3x + 1$

then $x = \frac{y_3 - 1}{3}$

$$\therefore [fg(y_3)]^{-1} = \frac{y_3 - 1}{3}$$

$$\therefore [fg(x)]^{-1} = \frac{x - 1}{3}$$

$$\text{Hence } [fg(x)]^{-1} = g^{-1}[f^{-1}(x)]$$

frequency density

66

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GOOD BETTER BEST WJEC STANDARD GRAPH ©

59-

46

64

76

54

98

118

life span (hours)

7

$$x = -2\hat{i} + 5\hat{j}$$

$$y = \hat{i} - 7\hat{j}$$

$$y - 2x = (\hat{i} - 7\hat{j}) - 2(-2\hat{i} + 5\hat{j})$$

$$= \hat{i} - 7\hat{j} - 4\hat{i} - 10\hat{j}$$

$$= -3\hat{i} - 17\hat{j}$$

$$a) |x - 2y| = \sqrt{(-3)^2 + (-17)^2}$$

$$= \sqrt{9 + 289}$$

$$= 17.03$$

(7b)

$$\cos \theta = \frac{x \cdot y}{|x| |y|}$$

$$= \frac{(-2\hat{i} + 5\hat{j}) \cdot (\hat{i} - 7\hat{j})}{(\sqrt{1^2 + 7^2})(\sqrt{(-2)^2 + 5^2})}$$

$$= \frac{-2 - 35}{\sqrt{50} \times \sqrt{29}}$$

$$= \frac{-37}{38.07}$$

$$\cos \theta = \frac{-37}{38.07}$$

$$\theta = \cos^{-1}\left(\frac{-37}{38.07}\right)$$

$$\theta = 103.6$$

ly. Find the:

le 30° to the horizon
acceleration of the
[Take g =

for the equation of the circle with centers $(-5, 6)$ and radius 7 units

General equation of a circle is

$$x^2 + y^2 + 2gx + 2fy + c = 0$$

$$\text{and } c = a^2 + b^2 - r^2$$

with $a = -5$ and $b = 6$.

$$\therefore g = -5 \text{ and } f = 6$$

the equation can be transformed thus

$$x^2 + y^2 + 2(5)x + 2(-6)y + (-5^2 + 6^2 - 7^2) = 0$$

$$x^2 + y^2 + 10x - 12y + (25 + 36 - 49) = 0$$

$$x^2 + y^2 + 10x - 12y + 12 = 0 \text{ which is the required equation}$$

to find the equation of normal to the curve

$$x^2 + y^2 + x + 2y = 0 \text{ at } (1, -2)$$

$$\therefore 2g = 1 \therefore g = \frac{1}{2}, \quad 2f = 2 \therefore f = 1$$

$$\text{and } g = -a \therefore a = -\frac{1}{2}, \quad b = -f \therefore b = -1$$

$$\therefore m_1 = \frac{y_2 - y_1}{x_2 - x_1} = \frac{(-2 - -1)}{(1 - -\frac{1}{2})} = \frac{-1}{\frac{3}{2}} = -\frac{2}{3}$$

for the perpendicular

$$m = -\frac{1}{m_1}$$

$$m_2 = \frac{3}{2}$$

Hence the equation of the tangent is

$$y - y_1 = m(x - x_1)$$

$$\therefore 2y + 4 = 3x - 3$$

$$y - -2 = \frac{3}{2}(x - 1)$$

$$2y + 4 = 3x - 3$$

$$y + 2 = \frac{3x - 3}{2}$$

with equation of tangent

for normal

$$m_3 = -\frac{1}{m_2} = -\frac{2}{3}$$

$$y - (-2) = -\frac{2}{3}(x - 1)$$

$$y + 2 = -\frac{2}{3}x + \frac{2}{3}$$

$$3y + 6 = -2x + 2$$

$$3y + 2x + 4 = 0$$

with equation of normal

(11) a

$$q: x \rightarrow 3x - 1$$

$$p: x \rightarrow x^2 - 1$$

(i) $p(x) = q(x)$

$$x^2 - 1 = 3(x) - 1$$

$$x^2 - 1 = 6 - 1$$

$$x^2 - 1 = 5$$

$$x^2 = 6$$

$$x = \sqrt{6}$$

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(ii) $q(x) = p(x)$

$$3x - 1 = x^2 - 1$$

~~$$3x - 1 - x^2 + 1 = 0$$~~

$$x^2 - 1 - 3x + 1 = 0$$

$$x^2 - 3x = 0$$

$$x(x - 3) = 0$$

$$x = 0 \text{ or } x = 3$$

$$x = \underline{\underline{3}}$$

(11b)

$$\int_0^{\frac{4\pi}{3}} \sin\left(\frac{x}{4}\right) dx.$$

$$\frac{1}{4} \int_0^{\frac{4\pi}{3}} \sin x dx.$$

$$\frac{1}{4} \left[-\cos x \right]_0^{\frac{4\pi}{3}}$$

$$\frac{1}{4} \left(-\cos 240 - [-\cos 0] \right)$$

$$\frac{1}{4} \left[-\cos 240 + 1 \right]$$

$$\frac{1}{4} \left[0.5 + 1 \right]$$

$$\frac{1}{4} \left[\frac{3}{2} \right] = \underline{\underline{\frac{3}{8}}}$$

(15)

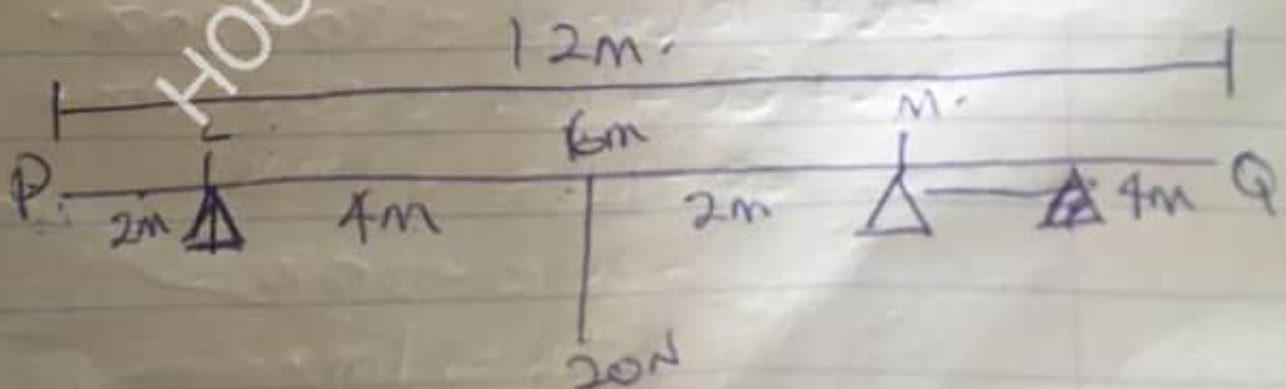
$$H = \frac{u^2 \sin^2 \theta}{2g}$$

$$H = \frac{12^2 (\sin 85^\circ)^2}{2(10)}$$

$$= \frac{144 \times 0.6710}{20}$$

$$H = \frac{96.63}{20}$$

$$H = 4.83 \text{ m}$$



$$L + M = 20 \text{ N}$$

taking moment about L.

$$M \times 6 = 20 \times 4$$

15 contd.

$$6m = 80$$

$$m = \frac{80}{6}$$

$$M = 13.3 \text{ N}$$

taking moment about m.

$$L \times 6 = 20 \times 2.$$

$$6L = 40$$

$$L = 6.6 \text{ N}$$

$P = M = 10 \text{ N}$ as 1 kg mass hangs

at $x \text{ m}$ from p.

$$1 \text{ kg} \times 10 = 10 \text{ N}.$$

$$(10 \times x) + M(6-x) = 20(4-x)$$

$$10x + 10(6-x) = 80 - 20x.$$

$$10x + 60 - 10x = 80 - 20x.$$

$$60 - 80 = -20x$$

$$-20 = -20x$$

$$x = 1 \text{ m}.$$

Each question is followed by four options in pencil, on your answer sheet, the answer space which bears the Give only one answer to each question. An example is given below.

The ages, in years, of four boys are 10, 12, 14 and 16. What is the average age of the boys?

- A. 12 years
- B. $12\frac{1}{2}$ years
- C. 13 years
- D. $13\frac{1}{2}$ years

The correct answer is 13 years which is lettered C, and therefore answer space C would be shaded.

[A]

[B]



[D]

Think carefully before you shade the answer spaces; erase completely any answer(s) you wish to change.
Do all rough work on this question paper.
Now answer the following questions.

1. Express $\frac{3\sqrt{2}-5}{1-2\sqrt{2}}$ in the form $p+q\sqrt{2}$, where p and q are constants.

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

$$\frac{3\sqrt{2}-5}{1-2\sqrt{2}} \times \frac{1+2\sqrt{2}}{1+2\sqrt{2}} = \frac{3\sqrt{2}-5}{1-2\sqrt{2}}$$

$$\frac{3\sqrt{2}-5}{1-2\sqrt{2}} \times \frac{1+2\sqrt{2}}{1+2\sqrt{2}} = \frac{3\sqrt{2}-5}{1-2\sqrt{2}}$$

$$\frac{3\sqrt{2}-5}{1-2\sqrt{2}} \times \frac{1+2\sqrt{2}}{1+2\sqrt{2}} = \frac{3\sqrt{2}-5}{1-2\sqrt{2}}$$

2. If $2^{3x^2} \times 8 = 32^{2x}$, find the values of x .

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

3. Evaluate: $\lim_{x \rightarrow 2} \frac{4x-3}{x^2+2x+5}$

- A. $-\frac{11}{5}$
- B. $-\frac{9}{13}$
- C. $\frac{5}{13}$
- D. $\frac{11}{13}$

4. If $y = 24x^3$, evaluate $\int_0^1 \left(\frac{dy}{dx} \right) dx$.

- A. 6
- B. 24
- C. 36
- D. 48

5. Determine the turning point of the curve $y = x^2 - 4x + 1$.

A. $(2, -5)$
 B. $(2, -3)$
 C. $(2, 3)$
 D. $(2, 5)$

6. If $\frac{n!}{4!} = {}^nC_3 = 30$, find the value of n .

A. 10
 B. 8
 C. 6
 D. 5

7. Given that $\sin \theta = \frac{3}{4}$, where $0^\circ < \theta < \frac{\pi}{2}$, find the value of $\sin 2\theta$.

A. $\frac{3\sqrt{7}}{8}$
 B. $\frac{7\sqrt{7}}{8}$
 C. $\frac{8\sqrt{7}}{7}$
 D. $\frac{8\sqrt{7}}{3}$

8. Find the coordinates of the centre of the circle $x^2 + y^2 - 2y + 4x = 4$.

A. $(-2, -1)$
 B. $(-2, 1)$
 C. $(2, -1)$
 D. $(2, 1)$

9. Solve $\begin{pmatrix} 2 & 1 \\ 2 & -3 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 7 \\ 3 \end{pmatrix}$.

A. $x = 3, y = 1$
 B. $x = 3, y = -1$
 C. $x = -3, y = 1$
 D. $x = -3, y = -1$

10. The functions $f: x \rightarrow 7x + 5$ and $g: x \rightarrow 3p + x$ are defined on the set of real numbers, R . If $(f \circ g) = (g \circ f)$, find the value of p .

A. -6
 B. -5
 C. 0
 D. 4

11. If α and β are the roots of $2x^2 - 9x + 4 = 0$, find the value of $\alpha\beta + \left(\frac{1}{\alpha} + \frac{1}{\beta}\right)$.

A. $\frac{17}{4}$
 B. $\frac{4}{17}$
 C. $-\frac{9}{2}$
 D. $-\frac{1}{2}$

12. Evaluate: $\int_0^1 x(x^2 - 1)^2 dx$.

A. 6
 B. 4
 C. $\frac{1}{4}$
 D. $\frac{1}{6}$

13. There are 12 women in an association. A committee of 3 is to be formed such that 2 particular women must not be included. Find the number of ways of forming the committee.

A. 180
B. 160
C. 150
D. 120

14. Find the acute angle between lines $2x = 4 - y$ and $2y - 6x + 15 = 0$.

A. 90°
B. 60°
C. 45°
D. 30°

15. A binary operation $*$ defined on the set of real numbers, R , by $p * q = p + q + 2pq$. Find the identity element.

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

17. Calculate the mean mark.

A. 40.6
B. 40.7
C. 41.6
D. 41.7

18. If $\{x : 4 \leq x \leq 15\}$, where x is an integer, find probability that x is a multiple of 4 or 5.

A. $\frac{1}{4}$
B. $\frac{1}{3}$
C. $\frac{5}{12}$
D. $\frac{1}{2}$

19. Express $F = (8N, 150^\circ)$ in the form $(pi + qj)$, where p and q are constants.

A. $(4\sqrt{3}i - 4j)N$
B. $(4i - 4\sqrt{3}j)N$
C. $(4i + 4\sqrt{3}j)N$
D. $(-4\sqrt{3}i + 4j)N$

The table shows the distribution of marks scored by students in a Mathematics examination.

Marks	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69
Number of Students	5	11	8	7	12	7

Use the table to answer questions 16 and 17.

16. In which group is the upper quartile?

A. 30 - 39
B. 40 - 49
C. 50 - 59
D. 60 - 69

20. Given that $P = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$ and $Q = \begin{pmatrix} -5 \\ -1 \end{pmatrix}$
find $|P - Q|$.

A. $\sqrt{13}$
B. $2\sqrt{13}$
C. $4\sqrt{13}$
D. $13\sqrt{2}$

21. A force F N, moves a body of mass 7 kg from rest until it attains a velocity of 6 ms^{-1} after 5 seconds. Calculate the value of F .

A. 10.0
B. 9.6
C. 8.4
D. 6.0

22. A body, X of mass 2 kg moving with a velocity of 5 ms^{-1} , collides with another body, Y of mass 1 kg moving in the opposite direction with a velocity of 2 ms^{-1} . After the collision, X moves with a velocity of 2 ms^{-1} in the same direction as Y. Find the velocity of Y.

A. 2 ms^{-1}
B. 4 ms^{-1}
C. 8 ms^{-1}
D. 12 ms^{-1}

23. The first and last terms of an Arithmetic Progression (A. P.) are 7 and 70 respectively. If the common difference is 9 , find its number of terms.

A. 7
B. 8
C. 9
D. 10

24. Given that
$$\frac{25-11x}{(x+1)(x-2)(x-3)} = \frac{P}{(x+1)} + \frac{Q}{(x-2)} + \frac{R}{(x-3)},$$
 find the values of P and Q .

A. $P = 3, Q = -1$
B. $P = 3, Q = -2$
C. $P = -1, Q = 3$
D. $P = -2, Q = -1$

25. If $\begin{vmatrix} 3 & 4 \\ -5 & 2x \end{vmatrix} = -22$, find the value of x .

A. 7
B. 6
C. -6
D. -7

26. Solve $12x^2 + x - 35 \geq 0$.

A. $-\frac{7}{4} \leq x \leq \frac{5}{3}$
B. $-\frac{5}{3} \leq x \leq \frac{7}{4}$
C. $x \leq -\frac{5}{3}, x \geq \frac{7}{4}$
D. $x \leq -\frac{7}{4}, x \geq \frac{5}{3}$

27. Find the coefficient of x^5 in the binomial expansion of $\left(1 + \frac{x}{4}\right)^7$.

A. $\frac{7}{1024}$
B. $\frac{7}{1110}$
C. $\frac{21}{1024}$
D. $\frac{21}{1110}$

28. Solve $\sin 2x = \cos x$, where $0^\circ < x \leq 180^\circ$.

- A. $\{30^\circ, 90^\circ, 150^\circ\}$
- B. $\{30^\circ, 90^\circ, 180^\circ\}$
- C. $\{60^\circ, 90^\circ, 150^\circ\}$
- D. $\{60^\circ, 90^\circ, 180^\circ\}$

29. Find the fourth term in the binomial expansion of $(x^3 + 2y)^8$.

- A. $22x^6y^3$
- B. $140x^3y^8$
- C. $348x^4y^8$
- D. $448x^{15}y^3$

30. Find, in terms of π , the rate at which the area of a circle is changing with respect to its radius, when the radius is 5 cm.

- A. $\pi \text{ cm}$
- B. $5\pi \text{ cm}$
- C. $10\pi \text{ cm}$
- D. $25\pi \text{ cm}$

31. Given that $\log_x a = m + n$ and $\log_x b = m - n$,

express $\log_x (a^{1/3})$ in terms of m and n .

- A. $6m$
- B. $6n$
- C. $3(m + n)$
- D. $3(m - n)$

32. Given that $g: x \rightarrow 4x^2 + px + p$, find the range of values of p for which $g(x) = 3$ has real roots.

- A. $4 \leq p \leq 12$
- B. $4 < p < 12$
- C. $p \leq 4$ or $p \geq 12$
- D. $p < 4$ or $p > 12$

33. Consider the statements:

p : It is hot

q : It is raining

Which of the following symbols correctly represents the statement: *It is raining if and only if it is cold?*

- A. $p \leftrightarrow \neg q$
- B. $q \leftrightarrow p$
- C. $\neg p \leftrightarrow \neg q$
- D. $q \leftrightarrow \neg p$

34.



Forces 50 N and 80 N act on a body as shown in the diagram. Find, correct to the nearest whole number, the horizontal component of the resultant force.

- A. 95 N
- B. 57 N
- C. 43 N
- D. 13 N

35. Two fair dice are tossed once. What is the probability of obtaining a sum divisible by 5?

- A. $\frac{1}{3}$
- B. $\frac{7}{36}$
- C. $\frac{5}{36}$
- D. $\frac{1}{9}$

36. If $f(x) = 1 - \frac{1}{x}$, $x \neq 0$, $x \in \mathbb{R}$, find $f^{-1}(4)$.

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

37. The n^{th} term of an exponential sequence (G, P) is $2\left(\frac{1}{2}\right)^{n-1}$. If the sum of the terms is $\frac{127}{32}$, find the number of terms.

- A. 5
- B. 6
- C. 7
- D. 8

38. The gradient of a curve is $3x^2 - 4x + 7$. If the curve passes through $P(1, -2)$, find its equation.

- A. $y = x^3 - 2x^2 + 7x - 3$
- B. $y = x^3 - 2x^2 + 3x + 3$
- C. $y = x^3 + 2x^2 + 2x + 3$
- D. $y = x^3 + 2x^2 + 2x - 3$

39. Three coplanar forces of magnitude 6 N , 9 N and 4.5 N maintain a particle in equilibrium. If the angle between the 6 N and the 9 N forces is 30° , find the angle between the 4.5 N and the 6 N forces.

- A. 30°
- B. 45°
- C. 60°
- D. 90°

40. M and N are two subsets of the universal set μ . If $n(\mu) = 48$, $n(M) = 20$, $n(N) = 30$ and $n(M \cup N) = 40$, find $n(M \cap N)$.

- A. 18
- B. 20
- C. 30
- D. 38

C	11 A	21 C
B	12 D	22 B
C	13 D	23 B
B	14	24
D	15 A	25 D
B	16 C	26
A	17 B	27 C
A	18 D	28 A
A	19 C	29 D
C	20	30 C

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