

SECTION A

[48 marks]

*Answer all the questions in this section.**All questions carry equal marks.*Do not
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this margin.

1. If $2x^2 + xy - 3y^2 = 9$, find $\frac{dy}{dx}$ at (1, 6).

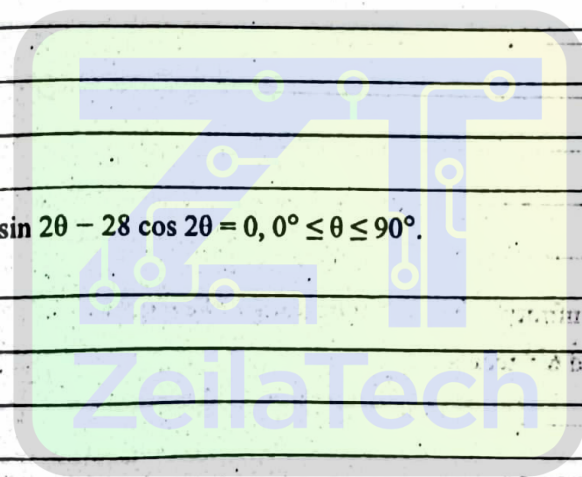
2. The first term and sum to infinity of an exponential sequence (G.P.) are 54 and 162 respectively. Find the sum of the 5th and 6th terms.

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3. If $\sqrt{q-3} + \sqrt{q+2} = 5$, find q .

4. (a) Solve: $9 \sin 2\theta - 28 \cos 2\theta = 0$, $0^\circ \leq \theta \leq 90^\circ$.



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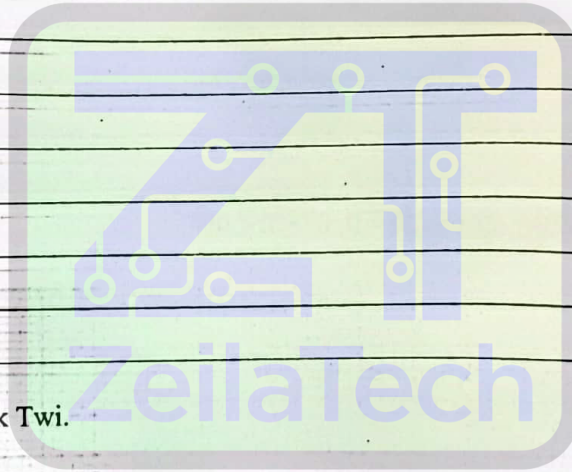
(b) Find the binomial expansion of $(3r - 2s)^4$.

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5. In a town, 15% of the people speak Twi. If four people are selected at random from the town, find the probability that:

(a) more than half speak Twi;

(b) at most 2 speak Twi.



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6. The table shows the distribution of heights (in *cm*) of students in a class.

Heights (in <i>cm</i>)	125 - 129	130 - 134	135 - 139	140 - 144	145 - 149
Number of students	5	21	23	7	4

- (a) Draw a histogram for the distribution.



(b) Use the histogram in 6(a) to estimate the mode of the distribution.

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this margin.

7. Three forces $F_1 = (2m + n)$, $F_2 = (-3m + 4n)$ and $F_3 = (4m - 6n)$ act on a body with mass 12 kg. Find the magnitude of the acceleration of the body.

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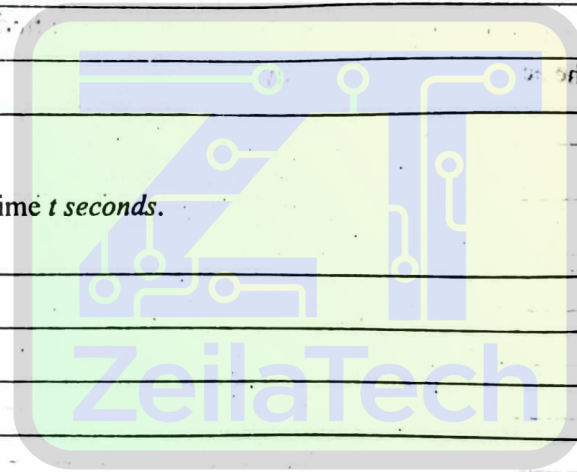
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8. The acceleration of a lorry at any time t seconds from rest is given by $a = \left(\frac{3}{2} - \frac{1}{10}t \right) \text{ms}^{-2}$.

Find its:

- (a) velocity after 10 seconds;

- (b) distance at time t seconds.



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SECTION B
[52 marks]

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this margin.

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 committee of five teachers is to be chosen from six French teachers and six Music teachers. In how many ways can this be done so that the committee will consist of:
- (a) four French teachers;
 - (b) at least one French teacher;
 - (c) at most two Music teachers?
10. (a) If the volume of a hemisphere is increasing at the rate of $21\pi \text{ cm}^3 \text{ s}^{-1}$, find the rate at which the radius is increasing when the radius is 5 cm.
- (b) Solve $3v - w = 4$
 $v^2 + 2vw - w^2 = -2$,
simultaneously.
11. (a) If the roots of $3x^2 + 4x - 5 = 0$ are α and β , find the equation whose roots are α^3 and β^3 .
- (b) Given that $5^x \times 5^{x+1} = 5^{3-x} \div (125^{-1} \times 5^{-x-1})$, find the value of x .

PART II

STATISTICS AND PROBABILITY

12. The probability that an ape will die when given a newly discovered drug is $\frac{1}{3}$. If 6 of such apes were selected for a trial, find the probabilities that:
- (a) half of them survived;
 - (b) more than two-third survived;
 - (c) less than one-third died.

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this margin.

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13. The table shows the length (in *cm*) of 45 pieces of wood in a factory.

Length	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74
Number of pieces of wood	2	2	$q - 1$	4	$3q - 5$	$q^2 - 3$	10	3	1

- (a) Find the value of q .
 (b) Using the value of q in 13 (a), draw a cumulative frequency curve for the distribution.
 (c) Using the curve in 13 (b), find the:
 (i) median length;
 (ii) 90th percentile of the distribution.

PART III

VECTORS AND MECHANICS

14. The vertices of a quadrilateral are $K(-1, 3)$, $L(2, 5)$, $Q(6, -3)$ and $R(m - 1, n - 2)$.

If $\overline{KL}$ is equal to $\overline{RQ}$, find:

- (a) the values of m and n ;
 (b) angle LKR , correct to the nearest degree.

15. (a) An object of mass 20 *kg* is suspended at a point G by two light inextensible strings $\overline{XG}$ and $\overline{YG}$. The strings are inclined at 55° and 35° respectively to the downward vertical. Find, correct to four significant figures, the tensions in the strings.

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

- (b) A bullet of mass 180 *g* is fired horizontally into a fixed wooden block with a speed of 24 ms^{-1} . If the bullet is brought to rest in 0.4 *sec* by a constant resistance, calculate the distance moved by the bullet in the wood.

END OF PAPER