A.P. SET CODE
C

MT - y

2017 ___ __ 1100 - MT - y - MATHEMATICS (71) ALGEBRA - SET - C (E)

Time : 2 Hours **Preliminary Model Answer Paper** **Max. Marks : 40**

A.1. Solve ANY FIVE of the following :

(i) $t_n = 2n - 5$

y $t_1 = 2(1) - 5 = 2 - 5 = -3$

y $t_2 = 2(2) - 5 = 4 - 5 = -1$

y $t_3 = 2(3) - 5 = 6 - 5 = 1$

y $t_4 = 2(4) - 5 = 8 - 5 = 3$

y $t_5 = 2(5) - 5 = 10 - 5 = 5$

y The first five terms of the sequence are – 3, – 1, 1, 3 and 5. **1**

(ii) $\frac{3}{y} - 4 = y$

Multiplying throughout by y, we get,

$3 - 4y = y^2$

y $-y^2 - 4y + 3 = 0$

Here a = –1, b = – 4, c = 3 are real numbers

where a ÷ 0

So it is a quadratic equation in variable y. **1**

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

Comparing with $ax^2 + bx + c = 0$ we have a = 1, b = – 6, c = 7

$a = b^2 - 4ac$

$= (-6)^2 - 4(1)(7)$

$= 36 - 28$

$= 8$

y $a = 8$ **1**

(iv) $5x = 10 - 2y$

y $5x + 2y = 10$

$y = 3x - 11$

y $-3x + y = -11$

$D_x = \begin{vmatrix} 10 & 2 \\ -11 & 1 \end{vmatrix}$ **1**

(v) S = {1, 2, 3, 5, 7, 9, 11, 13, 15}
n(S) = 9
A = {1, 3, 7, 11, 15}
n(A) = 5

y $P(A) = \frac{n(A)}{n(S)}$

y $\boxed{P(A) = \frac{5}{9}}$ **1**

(vi) Continuous classes
13.05 - 14.05, 14.05 - 15.05, 15.05 - 16.05 **1**

A.2. Solve ANY FOUR of the following :

(i) $S_n = n^2 (n + 1)$

y $S_1 = 1^2 (1 + 1) = 1 (2) = 2$
y $S_2 = 2^2 (2 + 1) = 4 (3) = 12$
y $S_3 = 3^2 (3 + 1) = 9 (4) = 36$ **1**

We know that,
$t_1 = S_1 = 2$
$t_2 = S_2 - S_1 = 12 - 2 = 10$
$t_3 = S_3 - S_2 = 36 - 12 = 24$

y The first three terms of the sequence are 2, 10 and 24. **1**

(ii) $3x^2 + kx - 2 = 0$
x = 4 is the solution of given quadratic equation.
Substituting x = 4 in given quadratic equation, it will get satisfied.

y $3 (4)^2 + k (4) - 2 = 0$ **1**
y $3 (16) + 4k - 2 = 0$
y $48 + 4k - 2 = 0$
y $4k + 46 = 0$
y $4k = -46$
y $k = \frac{-46}{4}$
y $\boxed{k = \frac{-23}{2}}$ **1**

(iii) (a) Nashima has won the election. **1**

(b) Minimum number of votes is 120 obtained by Suja. **½**

Name of the Candidate	Measure of central angle (¯)	Number of votes
Suja	60°	$\frac{60}{360} \times 720 = 120$

½

(iv) $3x + 5y = 16$

Comparing with $a_1x + b_1y = c_1$ we get, $a_1 = 3$, $b_1 = 5$, $c_1 = 16$ **½**

$4x - y = 6$

Comparing with $a_2x + b_2y = c_2$ we get, $a_2 = 4$, $b_2 = -1$, $c_2 = 6$ **½**

y $\frac{a_1}{a_2} = \frac{3}{4}$

y $\frac{b_1}{b_2} = \frac{5}{-1} = -5$

y $\frac{c_1}{c_2} = \frac{16}{6} = \frac{8}{3}$

$\because \frac{a_1}{a_2} \div \frac{b_1}{b_2}$ **½**

y The simultaneous equations $3x + 5y = 16$ and $4x - y = 6$ have unique solution. **½**

(v) (a) Two coins are tossed

S = { HH, HT, TH, TT }

n (S) = 4

Let A be the event that head appears on both the coins

A = { HH }

n (A) = 1

$P(A) = \frac{n(A)}{n(S)}$

y $P(A) = \frac{1}{4}$ **1**

(b) Let B be the event that head does not appear

B = { TT }

n (B) = 1

$P(B) = \frac{n(B)}{n(S)}$

y $P(B) = \frac{1}{4}$ **1**

(vi)

$t_n = a + (n - 1) d$

$t_{11} = a + (11 - 1) d$

$16 = a + 10d$

y $a + 10d = 16$ ....(i) ½

$t_{21} = a + (21 - 1) d$

$29 = a + 20d$

y $a + 20d = 29$ ......(ii) ½

Subtracting (ii) from (i),

$a + 10d = 16$

$a + 20d = 29$

(–) (–) (–)

$- 10d = - 13$

y $10d = 13$

y $d = \frac{13}{10}$

y $d = 1.3$ ½

Substituting d = 1.3 in (i),

$a + 10 (1.3) = 16$

y $a + 13 = 16$

y $a = 16 - 13$

y $a = 3$

y **[The first term is 3 and the common difference is 1.3]** ½

A.3. **Solve ANY THREE of the following :**

(i) **Given :** For an A.P. $t_3 = 22$ and $t_{17} = - 20$

Find : t_n.

Sol. $t_n = a + (n - 1) d$

$t_3 = a + (3 - 1) d$

$22 = a + 2d$

y $a + 2d = 22$ ......(i) ½

$t_{17} = a + (17 - 1) d$

$- 20 = a + 16d$

y $a + 16d = - 20$ ......(ii) ½

Subtracting (ii) from (i),

$a + 2d = 22$

$a + 16d = - 20$

(–) (–) (+)

$- 14d = 42$

y $d = \frac{42}{-14}$

y $d = - 3$ ½

Substituting d = – 3 in (i),

	$a + 2(-3) = 22$	
	$a - 6 = 22$	
	y $a = 22 + 6$	½
	y $a = 28$	
	$t_n = a + (n-1)d$	
	y $t_n = 28 + (n-1)(-3)$	½
	y $t_n = 28 - 3n + 3$	
	y $\boxed{t_n = 31 - 3n}$	½
(ii)	$2x^2 + 5x - 2 = 0$	
	Comparing with $ax^2 + bx + c = 0$ we have $a = 2, b = 5, c = -2$	
	$b^2 - 4ac = (5)^2 - 4(2)(-2)$	
	$= 25 + 16$	
	$= 41$	1
	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	
	$= \frac{-5 \pm \sqrt{41}}{2(2)}$	½
	$= \frac{-5 \pm \sqrt{41}}{4}$	
	y $x = \frac{-5 + \sqrt{41}}{4}$ or $x = \frac{-5 - \sqrt{41}}{4}$	1
	y $\frac{-5 + \sqrt{41}}{4}$ and $\frac{-5 - \sqrt{41}}{4}$ are the roots of the given quadratic equation.	½
(iii)	There are 52 cards in a pack	
	y n (S) = 52	
	(a) Let A be the event of getting the jack of hearts	
	∵ There is one jack card in hearts	
	n (A) = 1	
	$P(A) = \frac{n(A)}{n(S)}$	
	y $\boxed{P(A) = \frac{1}{52}}$	1
	(b) Let B be the event of getting a spade card	
	∵ There are 13 spade cards	
	n (B) = 13	

y $P(B) = \frac{n(B)}{n(S)}$

y $P(B) = \frac{13}{52}$

y $\boxed{P(B) = \frac{1}{4}}$ **1**

(c) Let C be the event that the card drawn is queen of diamonds

∵ There is one queen card in diamond

$n(C) = 1$

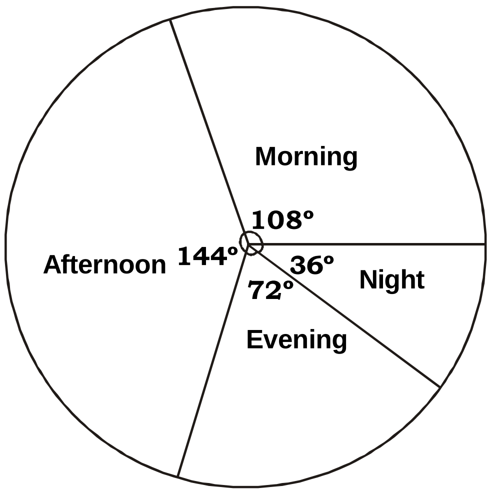
$P(C) = \frac{n(C)}{n(S)}$

y $\boxed{P(C) = \frac{1}{52}}$ **1**

(iv)

Part of day	**Percentage of electricity used**	**Measure of central angle**
Morning	30	$\frac{30}{100} \times 360^\circ = 108^\circ$
Afternoon	40	$\frac{40}{100} \times 360^\circ = 144^\circ$
Evening	20	$\frac{20}{100} \times 360^\circ = 72^\circ$
Night	10	$\frac{10}{100} \times 360^\circ = 36^\circ$
Total	**100**	**360°**

1



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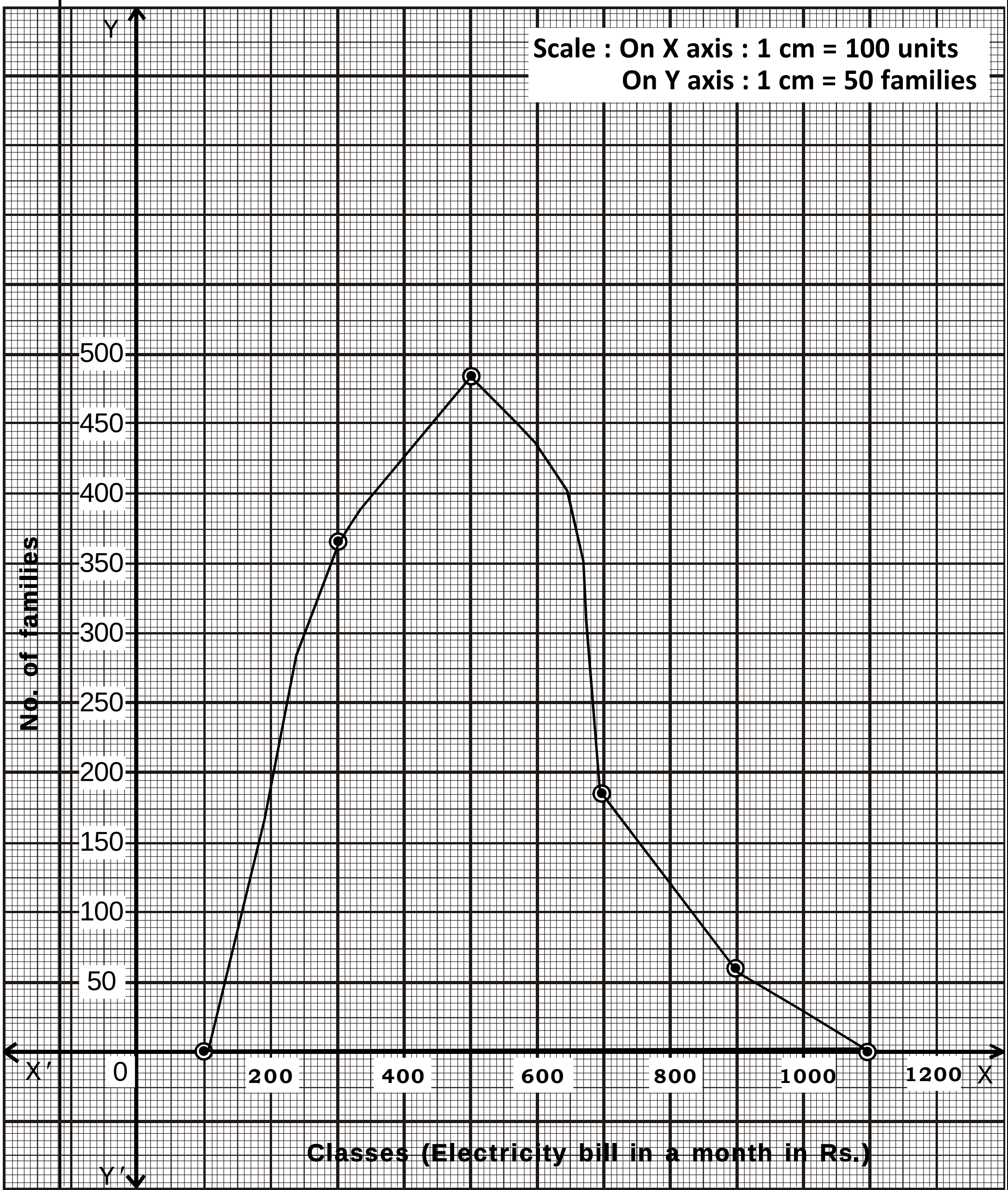
(v)

Electricity bill in a month in Rs.	Class mark	No. of families
200 - 400	300	362
400 - 600	500	490
600 - 800	700	185
800 - 1000	900	63

½



2½

A.4. Solve ANY TWO of the following :

(i) Total money repaid by Babubhai in 10 instalments = (S_{10})
= 4000 + 500
= Rs. 4500 ½

No. of instalments (n) = 10

Difference between two consecutive instalments (d) = – 10 ½

First instalment = (a) = ?

Last instalment (t_{10}) = ?

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

y $S_{10} = \frac{10}{2}[2a + (10-1)d]$ ½

y $4500 = 5[2a + 9(-10)]$

y $\frac{4500}{5} = 2a - 90$

y $900 = 2a - 90$

y $900 + 90 = 2a$

y $990 = 2a$

y $\frac{990}{2} = a$

y $a = 495$ **1**

$t_n = a + (n-1)d$

$t_{10} = a + (10-1)d$

y $t_{10} = 495 + 9(-10)$

y $t_{10} = 495 - 90$

y $t_{10} = 405$ **1**

y First instalment is Rs. 495 and last instalment is Rs.405. ½

(ii) $3x + 4y + 5 = 0$ $y = x + 4$

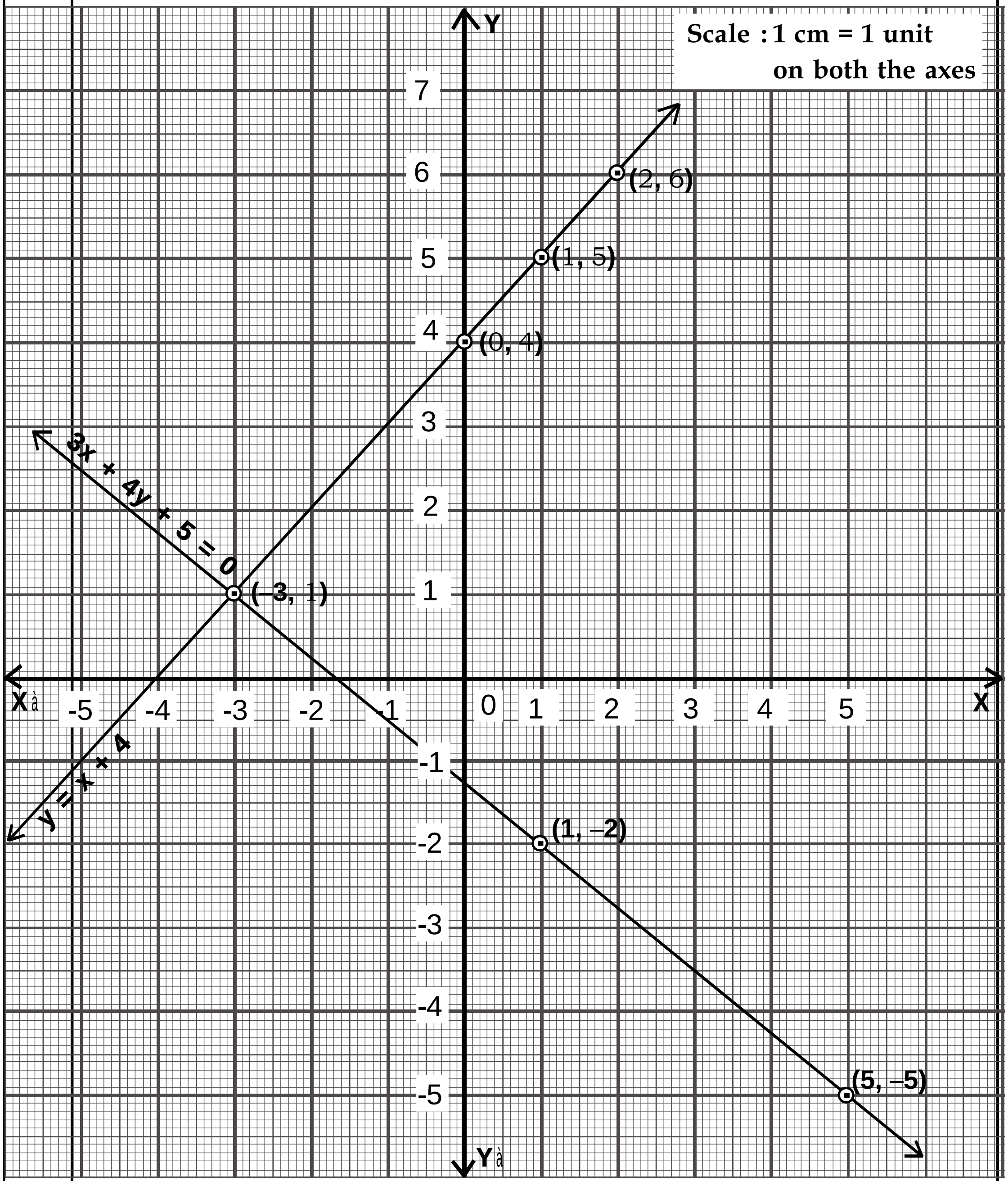
y $3x = -5 - 4y$

y $x = \frac{-5-4y}{3}$

x	–3	1	5
y	1	–2	–5
(x, y)	(–3, 1)	(1, –2)	(5, –5)

x	0	1	2
y	4	5	6
(x, y)	(0, 4)	(1, 5)	(2, 6)

1



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x = – 3 and y = 1 is the solution of given equations. 1

(iii) Let three men be denoted M_1, M_2 and M_3 and two women be denoted as W_1 and W_2.

A committee of two is formed in the following ways.

S = { M_1M_2, M_1M_3, M_1W_1, M_1W_2, M_2M_3, M_2W_1, M_2W_2, M_3W_1, M_3W_2, W_1W_2 }

n (S) = 10

P is the event that the committee should contain atleast one woman

P = { M_1W_1, M_1W_2, M_2W_1, M_1W_2, M_3W_1, M_3W_2, W_1W_2 }

y n (P) = 7 **1**

Q is the event that the committee should contain one man and one woman

Q = { M_1W_1, M_1W_2, M_2W_1, M_2W_2, M_3W_1, M_2W_2 }

y n (Q) = 6 **1**

R is the event that there is no woman in the committee

R = { M_1M_2, M_1M_3, M_2M_3 }

y n (R) = 3 **1**

Q ą R = ¤ **½**

y Q and R are mutually exclusive events

P ą R = ¤ and P Ć R = S **½**

y P and R are complementary events.

A.5. Solve ANY TWO of the following :

(i) Let the four consecutive positive integers be x, x + 1, x + 2 and x + 3 **½**

As per the given condition,

$x \times (x + 1) \times (x + 2) \times (x + 3) = 840$

y $x (x + 3) \times (x + 1) (x + 2) = 840$

y $(x^2 + 3x) \times (x^2 + 2x + x + 2) = 840$

y $(x^2 + 3x) (x^2 + 3x + 2) = 840$ **½**

Substituting $x^2 + 3x = m$ we get,

$m (m + 2) = 840$ **½**

y $m^2 + 2m - 840 = 0$

y $m^2 + 30m - 28m - 840 = 0$

y $m (m + 30) - 28 (m + 30) = 0$

y $(m + 30) (m - 28) = 0$

y $m + 30 = 0$ or $m - 28 = 0$

y $m = -30$ or $m = 28$ **½**

Resubstituting $m = x^2 + 3x$ we get,

$x^2 + 3x = -30$ ......(i) or $x^2 + 3x = 28$ ......(ii) **½**

From (i), $x^2 + 3x = -30$

y $x^2 + 3x + 30 = 0$

Comparing with $ax^2 + bx + c = 0$ we have a = 1, b = 3, c = 30

$$b^2 - 4ac = (3)^2 - 4\ (1)\ (30)$$
$$= 9 - 120$$
$$= -111$$

$\because$ $b^2 - 4ac < 0$

y The roots of the above quadratic equation are not real. **1**

Hence not considered.

From (ii), $x^2 + 3x = 28$

y $x^2 + 3x - 28 = 0$

y $x^2 + 7x - 4x - 28 = 0$

y $x\ (x + 7) - 4\ (x + 7) = 0$

y $(x + 7)\ (x - 4) = 0$

y $x + 7 = 0$ or $x - 4 = 0$

y $x = -7$ or $x = 4$ **1**

$\because$ x is positive integer

y $x \div -7$

Hence $x = 4$

y $x + 3 = 4 + 3 = 7$

y The largest required number is 7. **½**

(ii) $\frac{16}{x+y} + \frac{2}{x-y} = 1$ ....(i)

$\frac{8}{x+y} - \frac{12}{x-y} = 7$ ....(ii)

Substituting $\frac{1}{x+y} = a$ and $\frac{1}{x-y} = b$ in (i) and (ii),

$16a + 2b = 1$ ....(iii)

$8a - 12b = 7$ ....(iv) **1**

Multiplying (iv) by 2,

$16a - 24b = 14$ ....(v)

Subtracting (v) from (iii),

$16a + 2b = 1$

$16a - 24b = 14$

(–) (+) (–)

$26b = -13$

y $b = \frac{-13}{26}$

y $b = \frac{-1}{2}$ **1**

	Substituting $b = \frac{-1}{2}$ in (iii),	
	$16a + 2\left(\frac{-1}{2}\right) = 1$	
y	$16a - 1 = 1$	
y	$16a = 1 + 1$	
y	$16a = 2$	
y	$a = \frac{2}{16}$	
y	$a = \frac{1}{8}$	½
	Resubstituting the values of a and b,	
	$a = \frac{1}{x+y}$	
	$\frac{1}{8} = \frac{1}{x+y}$	
y	$x + y = 8$ ....(vi)	½
	$b = \frac{1}{x-y}$	
	$\frac{-1}{2} = \frac{1}{x-y}$	
y	$x - y = -2$ .....(vii)	½
	Adding (vi) and (vii),	
	$x + y = 8$	
	$x - y = -2$	
	$2x = 6$	
	$x = \frac{6}{2}$	
y	$x = 3$	½
	Substituting x = 3 in (vi) we get,	
	$3 + y = 8$	
y	$y = 8 - 3$	½
y	$y = 5$	
y	x = 3 and y = 5 is the solution of given simultaneous equations.	½

(iii) Class width (h) = 10, Assumed mean (A) = 44.5

Dividend (in %)	**Class Mark (x_i)**	**$d_i = x_i - A$**	**$u_i = \frac{d_i}{h}$**	**No. of companies (f_i)**	**$f_i u_i$**
10 - 19	14.5	– 30	– 3	5	– 15
20 - 29	24.5	– 20	– 2	15	– 30
30 - 39	34.5	– 10	– 1	28	– 28
40 - 49	44.5 ← A	0	0	42	0
50 - 59	54.5	10	1	15	15
60 - 69	64.5	20	2	12	24
70 - 79	74.5	30	3	3	9
Total				**120**	**– 25**

2

$$\bar{u} = \frac{\Sigma f_i u_i}{\Sigma f_i}$$

$$\therefore \bar{u} = \frac{-25}{120}$$

$$\therefore \bar{u} = -0.208$$ **1**

$$\text{Mean } (\bar{x}) = A + h\bar{u}$$

$$= 44.5 + 10(-0.208)$$ **1**

$$= 44.5 - 2.08$$

$$= 42.42$$

∴ Mean of dividend is 42.42%. **1**

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