A.P. SET CODE
A

MT - w

2017 ___ __ 1100 - MT - w - MATHEMATICS (71) ALGEBRA - SET - A (E)

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

A.1. **Solve ANY FIVE of the following :**

(i)

$t_2 = \frac{192}{-2} = -96$

$t_3 = \frac{-96}{-2} = 48$

$t_4 = \frac{48}{-2} = -24$

$t_5 = \frac{-24}{-2} = 12$

$t_6 = \frac{12}{-2} = -6$

$t_7 = \frac{-6}{-2} = 3$

$t_8 = \frac{3}{-2} = -\frac{3}{2}$

∴ The next four terms of the sequence are 12, – 6, 3 and $-\frac{3}{2}$. **1**

(ii)

$(m + 4)(m - 10) = 0$

∴ $m(m - 10) + 4(m - 10) = 0$

∴ $m^2 - 10m + 4m - 40 = 0$

∴ $m^2 - 6m - 40 = 0$ **1**

(iii)

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

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

$a = b^2 - 4ac$

$= (-3)^2 - 4(1)(2)$

$= 9 - 8$

$= 1$

∴ $a = 1$ **1**

(iv) $\because$ $x = 5$ and $y = 3$ is the solution of $3x + ky = 3$,
it satisfies the equation.
$\therefore$ Substituting $x = 5$ and $y = 3$ in the equation we get,
$3(5) + k(3) = 3$
$\therefore 15 + 3k = 3$
$\therefore 3k = 3 - 15$
$\therefore 3k = -12$
$\therefore k = \frac{-12}{3}$
$\therefore \boxed{k = -4}$ **1**

(v) Two coins are tossed simultaneously
S = {HH, HT, TH, TT}
Event A of getting one head
A = {HT, TH} **1**

(vi) Mean = 54.6, Mode = 54 [Given]
We know,
Mean – Mode = 3 (Mean – Median)
$\therefore$ 54.6 – 54 = 3 (54.6 – Median)
$\therefore$ 0.6 = 3 (54.6 – Median)
$\therefore \frac{0.6}{3}$ = 54.6 – Median
$\therefore$ 0.2 = 54.6 – Median
$\therefore$ Median = 54.6 – 0.2
$\therefore \boxed{\text{Median} = 54.4}$ **1**

A.2. Solve ANY FOUR of the following :

(i) For the A.P. 4, 9, 14, ...
$a = 4, d = 5$
$t_n = a + (n - 1)\,d$ **1**
$\therefore t_{11} = 4 + (11 - 1)\,5$
$\therefore t_{11} = 4 + 50$
$\therefore \boxed{t_{11} = 54}$ **1**

(ii) The roots of the quadratic equation are -2 and $\frac{11}{2}$.

Let $\sim = -2$ and $= \frac{11}{2}$

$\therefore \quad \sim + = -2 + \frac{11}{2} = \frac{-4+11}{2} = \frac{7}{2}$ and $\sim . := -2 \times \frac{11}{2} = -11$ **1**

We know that,

$x^2 - (\sim +)x + \sim . = 0$

$\therefore \quad x^2 - \frac{7}{2}x + (-11) = 0$

$\therefore \quad x^2 - \frac{7}{2}x - 11 = 0$

Multiplying throughout by 2 we get,

$2x^2 - 7x - 22 = 0$

$\therefore$ The required quadratic equation is $2x^2 - 7x - 22 = 0$ **1**

(iii)

Blood group	**Percentage**	**Measure of central angle**	
O	45	$\frac{45}{100} \times 360^\circ = 162^\circ$	½
A	20	$\frac{20}{100} \times 360^\circ = 72^\circ$	½
B	30	$\frac{30}{100} \times 360^\circ = 108^\circ$	½
AB	5	$\frac{5}{100} \times 360^\circ = 18^\circ$	½
Total	**100**	**360°**	

(iv)

$12x + 13y = 29$ .....(i)

$13x + 12y = 21$ .....(ii)

Adding (i) and (ii),

$12x + 13y = 29$

$13x + 12y = 21$

$25x + 25y = 50$ **1**

Dividing throughout by 25 we get,

$x + y = \frac{50}{25}$

y $x + y = 2$ **1**

(v)	Two coins are tossed	
	y S = { HH, HT, TH, TT }	
	y n (S) = 4	1
	A is the event of getting at the most one head	
	y A = { HT, TH, TT }	
	y n (A) = 3	1
(vi)	$S_n = 3n + n^2$	
	$S_1 = 3(1) + (1)^2$	
	y $S_1 = 3 + 1$	
	y $S_1 = 4$	
	y $\boxed{t_1 = S_1 = 4}$	½
	$S_2 = 3(2) + (2)^2$	
	y $S_2 = 6 + 4$	
	$\boxed{S_2 = 10}$	½
	$t_2 = S_2 - S_1$	
	y $t_2 = 10 - 4$	
	y $\boxed{t_2 = 6}$	1
A.3.	**Solve ANY THREE of the following :**	
(i)	The three digit natural numbers that are divisible by 4 are as follows 100, 104, 108, ... 996.	
	These numbers form an A.P. with $a = t_1 = 100$,	
	$d = t_2 - t_1 = 104 - 100 = 4$.	1
	Let, $t_n = 996$	
	We know that for an A.P.	
	$t_n = a + (n - 1) d$	
	y $996 = 100 + (n - 1) 4$	1
	y $996 = 100 + 4n - 4$	
	y $996 = 96 + 4n$	
	y $4n = 996 - 96$	
	y $4n = 900$	
	y $n = \frac{900}{4}$	
	y $n = 225$	
	y There are 225 three digit natural numbers that are divisible by 4	1

(ii)

$(2y + 3)^2 = 81$

y $(2y + 3)^2 - 81 = 0$

y $(2y + 3)^2 - (9)^2 = 0$

y $(2y + 3 + 9)(2y + 3 - 9) = 0$ **1**

y $(2y + 12)(2y - 6) = 0$

y $2y + 12 = 0$ or $2y - 6 = 0$

y $2y = -12$ or $2y = 6$ **1**

y $y = \frac{-12}{2}$ or $y = \frac{6}{2}$

y $\boxed{y = -6 \text{ or } y = 3}$ **1**

(iii) There are 52 cards in a pack

y n (S) = 52

(a) Let A be event that the card drawn is a black card

Total no. of black cards = 26

y n (A) = 26

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

y $P(A) = \frac{26}{52}$

y $\boxed{P(A) = \frac{1}{2}}$ **1**

(b) Let B be the event that the card drawn is not a black card

Total no. of red cards = 26

y n (B) = 26

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

y $P(B) = \frac{26}{52}$

y $\boxed{P(B) = \frac{1}{2}}$ **1**

(c) Let C be the event that card drawn bears number between 2 to 5 including 2 and 5

No. of cards between 2 to 5 including 2 and 5 is 4.

$\therefore$ There are 4 types of cards

y The total no. of cards between 2 to 5 including 2 and 5 is

$4 \times 4 = 16$

$n(C) = 16$

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

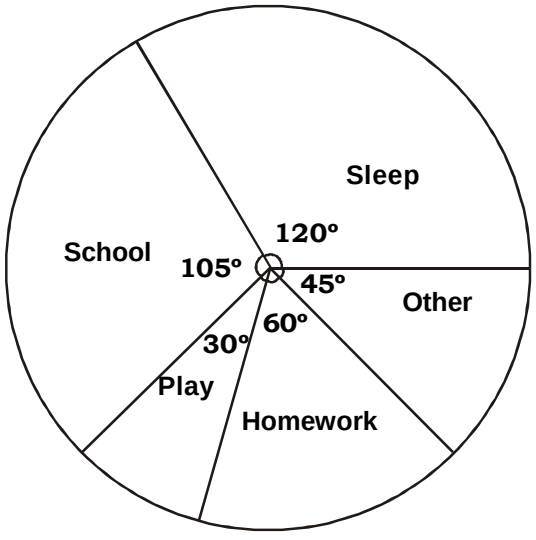
y $P(C) = \frac{16}{52}$

y $\boxed{P(C) = \frac{4}{13}}$ **1**

(iv)

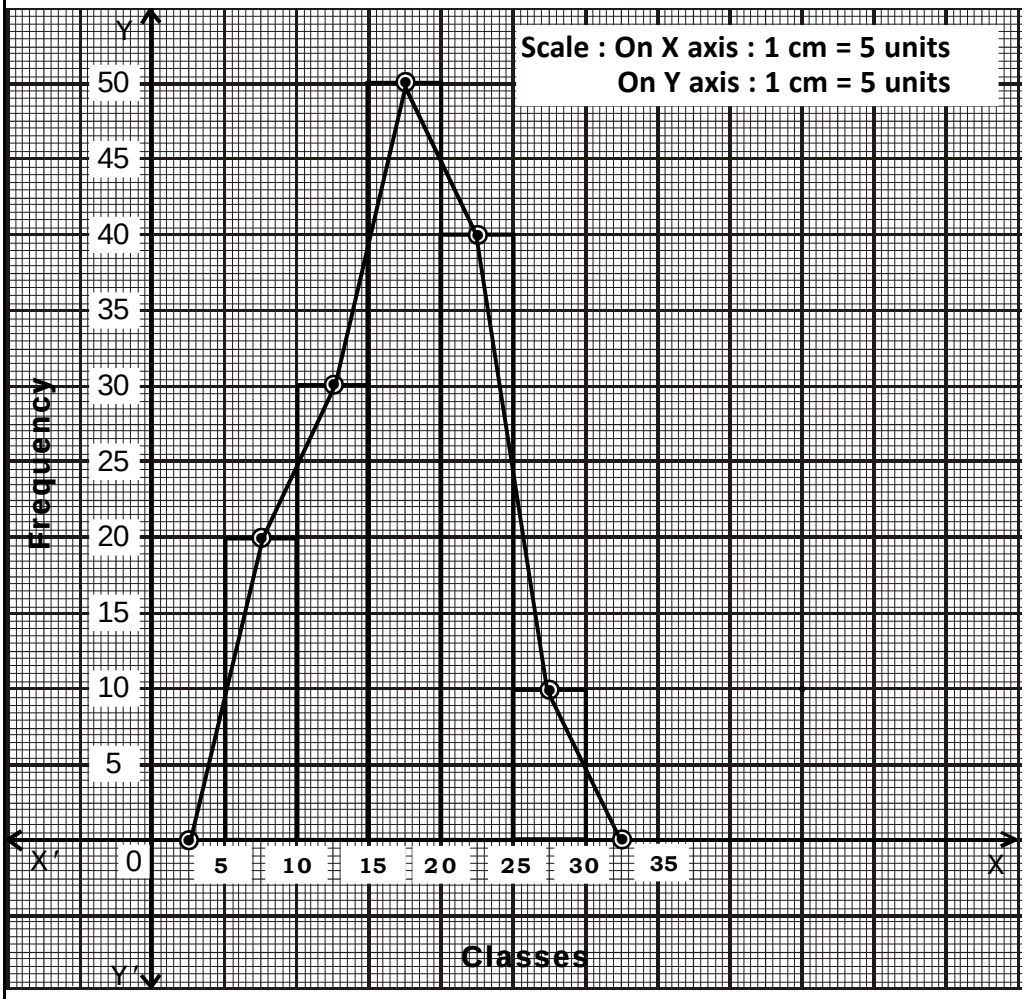
Activity	**No. of hrs.**	**Measure of central angle (¯)**
Sleep	8	$\frac{8}{24} \times 360^\circ = 120^\circ$
School	7	$\frac{7}{24} \times 360^\circ = 105^\circ$
Play	2	$\frac{2}{24} \times 360^\circ = 30^\circ$
Home work	4	$\frac{4}{24} \times 360^\circ = 60^\circ$
Other	3	$\frac{3}{24} \times 360^\circ = 45^\circ$
Total	**24**	**360°**

1



2

(v)



3

A.4. Solve ANY TWO of the following :

(i) The odd natural numbers from 1 to 150 are as follows

1, 3, 5, 7, 9, ..., 149.

These numbers form an A.P. with a = 1, d = 2 **1**

Let, 149 be n^{th} term of an A.P.

$t_n = 149$

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

$149 = 1 + (n - 1) 2$

$149 = 1 + 2n - 2$

$149 = 2n - 1$

$149 + 1 = 2n$

$2n = 150$

$n = 75$ **1**

149 is 75^{th} term of A.P.

We have to find sum of 75 terms i.e. S_{75}

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

y $S_{75} = \frac{75}{2}[2(1) + (75-1)2]$

y $S_{75} = \frac{75}{2}[2 + 74(2)]$ **1**

$= \frac{75}{2}[2 + 148]$

$= \frac{75}{2}(150)$

$= 75(75)$

y $S_{75} = 5625$

y Sum of all odd natural numbers from 1 to 150 is 5625. **1**

(ii) $\frac{1}{3x} + \frac{1}{5y} = \frac{1}{15}$

Multiplying throught by 15 we get,

$15\left(\frac{1}{3x}\right) + 15\left(\frac{1}{5y}\right) = 15\left(\frac{1}{15}\right)$

y $\frac{5}{x} + \frac{3}{y} = 1$ .....(i)

$\frac{1}{2x} + \frac{1}{3y} = \frac{1}{12}$

Multipying throught by 12,

$12\left(\frac{1}{2x}\right) + 12\left(\frac{1}{3y}\right) = 12\left(\frac{1}{12}\right)$

y $\frac{6}{x} + \frac{4}{y} = 1$ .....(ii) **1**

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

$5a + 3b = 1$ .....(iii)

$6a + 4b = 1$ .....(iv)

Multiplying (iii) by 4,

$20a + 12b = 4$ .....(v)

Multiplying (iv) by 3

$18a + 12b = 3$ .....(vi)

Subtracting (vi) from (v)

$20a + 12b = 4$

$18a + 12b = 3$

(–) (–) (–)

$2a = 1$ **1**

y $a = \frac{1}{2}$

Substituting $a = \frac{1}{2}$ in (iv),

$6\left(\frac{1}{2}\right) + 4b = 1$

y $3 + 4b = 1$

y $4b = 1 - 3$

y $4b = -2$

y $b = \frac{-2}{4}$

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

Resubstituting the values of a and b,

$a = \frac{1}{x}$

$\frac{1}{2} = \frac{1}{x}$

y $x = 2$

$b = \frac{1}{y}$

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

y $y = -2$

y x = 2 and y = –2 is the solution of given simultaneous equations. **1**

(iii) When two dice are thrown

S = { (1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6),
(2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6),
(3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6),
(4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6),
(5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6),
(6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6) }

y n (S) = 36 **1**

	P is the event that sum of scores on the uppermost faces is a multiple of 6	
	P = { (1, 5), (2, 4), (3, 3), (4, 2), (5, 1), (6, 6) }	
y	n (P) = 6	1
	Q is the event that sum of scores on the uppermost faces is atleast 10.	
	Q = { (4, 6), (5, 5), (5, 6), (6, 4), (6, 5), (6, 6) }	
y	n (Q) = 6	1
	R is the event that same score on both the dice	
	R = { (1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6) }	
y	n (R) = 6	1
A.5.	**Solve ANY TWO of the following :**	
(i)	$(x^2 + 2x)(x^2 + 2x - 11) + 24 = 0$	
	Substituting $x^2 + 2x = m$ we get,	½
	$m(m - 11) + 24 = 0$	
y	$m^2 - 11m + 24 = 0$	
y	$m^2 - 8m - 3m + 24 = 0$	½
y	$m(m - 8) - 3(m - 8) = 0$	
y	$(m - 8)(m - 3) = 0$	
y	$m - 8 = 0$ or $m - 3 = 0$	1
y	$m = 8$ or $m = 3$	
	Resubstituting $m = x^2 + 2x$ we get,	
	$x^2 + 2x = 8$ or $x^2 + 2x = 3$	
y	$x^2 + 2x - 8 = 0$..... (i) or $x^2 + 2x - 3 = 0$ .....(ii)	½
	From (i), $x^2 + 2x - 8 = 0$	
y	$x^2 + 4x - 2x - 8 = 0$	
y	$x(x + 4) - 2(x + 4) = 0$	
y	$(x + 4)(x - 2) = 0$	
y	$x + 4 = 0$ or $x - 2 = 0$	
∴	$x = -4$ or $x = 2$	1
	From (ii), $x^2 + 2x - 3 = 0$	
y	$x^2 + 3x - x - 3 = 0$	
y	$x(x + 3) - 1(x + 3) = 0$	
y	$(x + 3)(x - 1) = 0$	
y	$x + 3 = 0$ or $x - 1 = 0$	1
y	$x = -3$ or $x = 1$	
y	$x = -4$ or $x = 2$ or $x = -3$ or $x = 1$.	½

(ii) Let the no. of Rs. 10 notes given to Durga be x and the no. of Rs.5 notes given to her be y.

As per the first condition,

$10x + 5y = 190$ .....(i) ½

As per the second condition,

$5x + 10y = 185$ .....(ii) ½

Adding (i) and (ii),

$15x + 15y = 375$

Dividing throughout by 15 we get,

$x + y = \frac{375}{15}$

y $x + y = 25$ .....(iii) **1**

Subtracting (ii) from (i),

$5x - 5y = 5$

Dividing throughout by 5 we get,

$x - y = 1$ .....(iv) **1**

Adding (iii) and (iv),

$x + y = 25$

$x - y = 1$

y $2x = 26$

y $x = 13$ **1**

Substituting x = 13 in (iii),

$13 + y = 25$

y $y = 25 - 13$

y $y = 12$ ½

y Durga had 13 notes of Rs. 10 rupee and 12 notes of Rs. 5. ½

(iii) Class width (h) = 4, Assumed mean (A) = 25

Age in years	**Class Mark (x_i)**	**$d_i = x_i - A$**	**$u_i = \frac{d_i}{h}$**	**No. of people (f_i)**	**$f_i u_i$**
7 - 11	9	– 16	– 4	5	– 20
11 - 15	13	– 12	– 3	9	– 27
15 - 19	17	– 8	– 2	13	– 26
19 - 23	21	– 4	– 1	21	– 21
23 - 27	25 ← A	0	0	16	0
27 - 31	29	4	1	15	15
31 - 35	33	8	2	12	24
35 - 39	37	12	3	9	27
Total				**100**	**– 28**

2

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

y $\bar{u} = \frac{-28}{100}$

y $\bar{u} = -0.28$ **1**

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

$= 25 + 4 (-0.28)$

$= 25 - 1.12$ **1**

$= 23.88$ years

y Mean of age is 23.88 years. **1**

❖❖❖❖