Maharashtra State Board
Class X Maths Algebra
Answers Set-1

Time : 2 Hours **Marks 40**

Q 1. (A) 4

(1) $A' = \{1,11,9,17\}$

(2) $2\sqrt{12} \times \sqrt{3} = 2\sqrt{36} = 12$

(3) $x^2 = 4 \times 25 = 100$ $\therefore x = 10$

(4)

$$\begin{array}{r} x + y = 5 \\ x - y = 7 \\ \hline 2x = 12 \\ x = 6 \end{array}$$

(5) $8000 \times \frac{3}{100} = \text{Rs. } 240$

(6) $\text{Class mark} = \frac{\text{Lower class limit} + \text{Upper class limit}}{2}$

$= \frac{80 + 90}{2} = 85$

(B) 4

(1) $m^2 + 5m + 6$

$= m^2 + 3m + 2m + 6$

$= m\ (m\ +3)+2(m+3)$

$= (m + 2)\ (m\ +3)$

(2) Let the numbers be x and y,

$\therefore$ from the given conditions,

$$\begin{array}{r} x + y = 20 \\ + \\ x - y = 4 \\ \hline 2x = 24 \\ x = 12 \end{array}$$

$\therefore$ 12 + y = 20 $\quad\quad$ $\therefore$ y = 8

The numbers are 12 and 8

(3) $\angle$Q and $\angle$ R is a pair of adjacent angles of parallelogram PQRS.

$\therefore$ $\angle$Q and $\angle$ R = 180°

$\therefore$ $\angle$Q = 180 - 60 = 120

$\therefore$ $\angle$ R : $\angle$Q = 60 : 120 = 1 : 2

Q 2. (A) 4

(1) (D) 5

(2) (B) $x^2 \left(\frac{1}{x} - 2\right) = \frac{7}{2}$

(3) (D) 40

(4) (B) 9%

(B) 4

(1) s = {HH, HT, TH, TT}

n (s) = 4

A = {HH, HT, TH}

n(A) = 3

$p(A) = \frac{n(A)}{n(S)} = \frac{3}{4}$

(2) The roots of the quadratic equation are real and equal.

$\therefore$ $b^2 - 4ac = 0$

$(-6)^2 - 4 \times 2 \times k = 0$

$-8k = -36$

$k = \frac{9}{2}$

(3) $101x + 99y = 501$ .....(I)

$99x + 101y = 499$ .....(II)

Adding equations (I) and (II) and dividing by 200

$x + y = 5$ .....(III)

Subtracting (II) from (I) and dividing by 2

$x - y = 1$ .....(IV)

Solving equations (III) and (IV),

$x = 3$

$y = 2$

Q 3. (A)

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

$s_{12} = \frac{12}{2}[10 + 11 \times 4]$

$= \frac{12}{2}[10 + 44]$

$= 6 \times 54$

$s_n = 324$

(ii) $D = 8, \quad x = \frac{Dx}{D} = \frac{0}{8} = 0 = 24 - 24 = 0, \quad D_y = 36 - 12 = 24$

$x = \frac{Dx}{D} = \frac{0}{8} = 0$

$y = \frac{Dy}{D} = \frac{24}{8} = 3$

(iii) $s = \{A, B, C, D, E, O\}$

$n(s) = 6$

$M = \{A, E, O\}$

$n(M) = 3$

$P(M) = \frac{n(M)}{n(S)} = \frac{3}{6} = \frac{1}{2}$

(B)

(1)

Types of vehicle	Measure of central angle
Bicycle	36°
Two wheeler	108°
Car	72°
Bus	72°
Rickshaw	72°

(2) Amount spent to purchase 100 shares = 45 × 100 = ₹. 4500

Brokerage = $4500 \times \frac{2}{100}$ = ₹. 90

GST on brokerage = $90 \times \frac{18}{100}$ = ₹. 16.20

∴ Total amount = 4500 + 90 + 16.20 = ₹. 4606.20

(3) The arrangement of chairs is 20, 22, 24, 26, ...

Which is an A. P.

Here, a = 20, d = 2. We want to find t_{21}.

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

∴ $t_{21} = 20 + (21-1) \times 2$

$= 20 + 40$

$= 60$

∴ There are 60 chairs in the 21st row.

Q 4. 9

(1) $7y = -3y^2 - 4$

∴ $3y^2 + 7y + 4 = 0$

Here a = 3, b = 7, c = 4

∴ $y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{-7 \pm \sqrt{49 - 48}}{6}$

$= \frac{-7 \pm \sqrt{1}}{6}$

Alternate Method

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

∴ $3y(y + 1) + 4(y + 1) = 0$

∴ $(3y + 4)(y + 1) = 0$

∴ $y = -1$ or $y = -\frac{4}{3}$

$\therefore\ y = \frac{-7+1}{6}$ or $y = \frac{-7-1}{6}$

$\therefore\ y = -1$ or $y = -\frac{8}{6} = -\frac{4}{3}$

(2) $s = \{1, 2, 3, 4, 5, 6, 7, 8\}$

$\therefore\ n(s) = 8$

$A = \{1, 3, 5, 7\}$

$\therefore\ n(A) = 4$

$\therefore\ p(A) = \frac{n(A)}{n(S)} = \frac{4}{8} = \frac{1}{2}$

$B = \{2, 3, 5, 7\}$

$\therefore\ n(B) = 4$

$\therefore\ p(B) = \frac{n(B)}{n(S)} = \frac{4}{8} = \frac{1}{2}$

$C = \{2, 4, 6, 8\}$

$\therefore\ n(C) = 4$

$P(C) = \frac{n(c)}{n(s)} = \frac{4}{8} = \frac{1}{2}$

(3) The numbers divisible by 4 between 1 and 145 are 4, 8, 12, 16, ...144 ; which is an A. P.

Here, a = 4, d = 4, t_n = 144 we have to find n.

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

$\therefore t_n = 4 + (n - 1) \times 4$

$\therefore\ 144 = 4n$

$\therefore\ \ n = 36$

Now, $s_n = \frac{n}{2}\left[t_1 + t_n\right]$

$\therefore\ S_{36} = \frac{36}{2}\left[4+144\right]$

$= 18 \times 148 = 2664$

Alternate Method

$4 + 8 + 12 + ... + 144$

$= 4(1 + 2 + 3 + ... + 36)$

$= \frac{4 \times 36 \times 37}{2}$

$= 12 \times 6 \times 37$

$= 444 \times 6$

$= 2664$

This is also possible.

$\therefore$ The sum of numbers between 1 and 145 divisible by 4 is 2664.

(4) $\Sigma fi = N = 250 \therefore \frac{N}{2} = 125 \quad \therefore f = 90$

Also, c. f. = 63 and h = 50 and L = 150

$$\text{Median} = L + \left[\frac{\frac{N}{2} - \text{C.F.}}{f}\right] \times h$$

$$= 150 + \left[\frac{125 - 63}{90}\right] \times 50$$

$$= 150 + 34.4 = 184.4$$

Q 5. 4

(1) Suppose, the age of the son six year before was x

$\therefore$ mother's age six year before was x^2

$\therefore$ present age of the son is $(x + 6)$ and

present age of the mother is $(x^2 + 6)$

Three years hence, son's age will be $(x + 9)$ and mother's age will be $(x^2 + 9)$

by given condition,

$x^2 + 9 = 3(x + 9)$

$\therefore x^2 - 3x + 9 - 27 = 0$

$\therefore x^2 - 3x - 18 = 0$

$\therefore (x - 6)(x + 3) = 0$

$\therefore x = 6$ or $x = -3$

But age cannot be negative $\therefore x \neq -3$

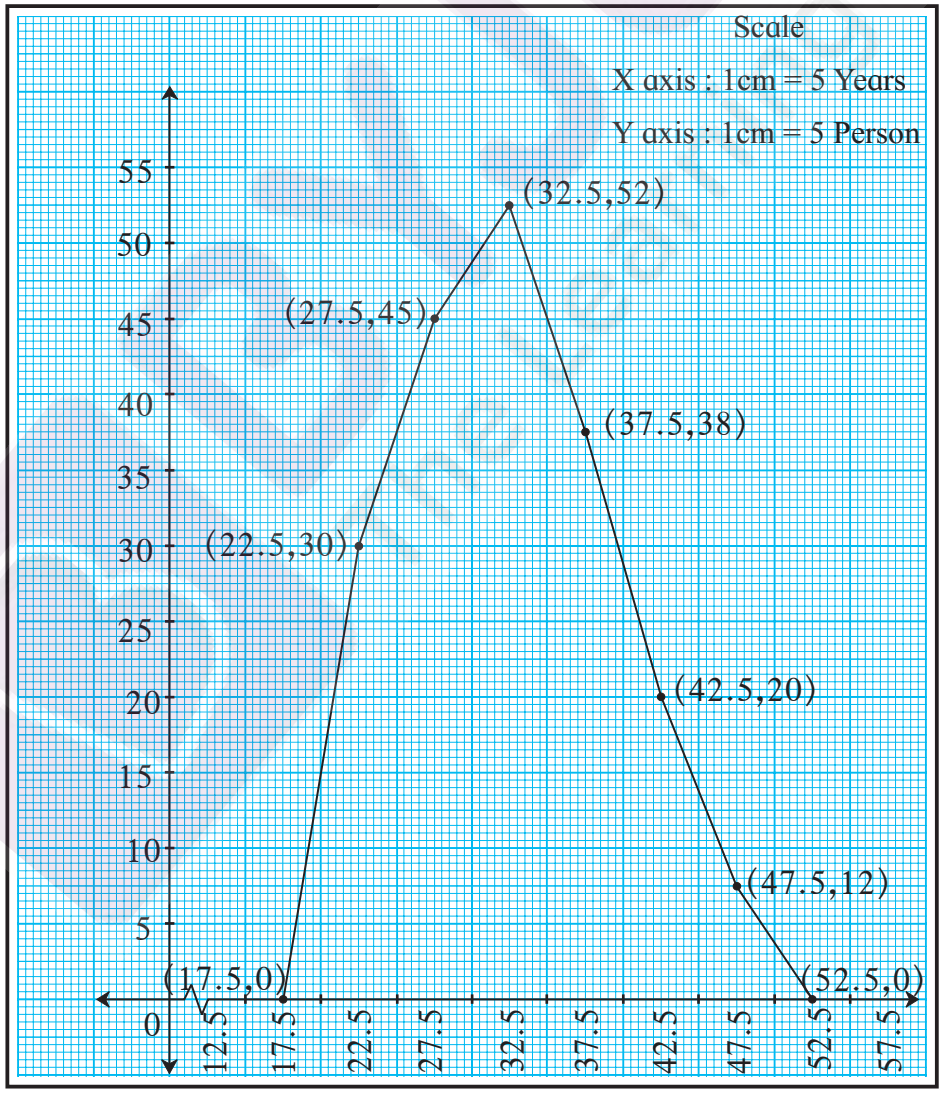
$\therefore$ son's present age $= x + 6 = 6 + 6 = 12$ years.

mother's present age $= x^2 + 6 = 36 + 6 = 42$ years.

(2)

Class (Age of blood donor)	Class mark	Frequency (No. of donors)	co-ordinates
15-20	17.5	0	(17.5, 0)
20-25	22.5	30	(22.5, 30)
25-30	27.5	45	(27.5, 45)
30-35	32.5	52	(32.5, 52)
35-40	37.5	35	(37.5, 38)
40-45	42.5	20	(42.5, 20)
45-50	47.5	12	(47.5, 12)
50-55	52.5	0	(52.5, 0)

Draw the axes. Plot points choosing a proper scale. Draw the frequency polygon.

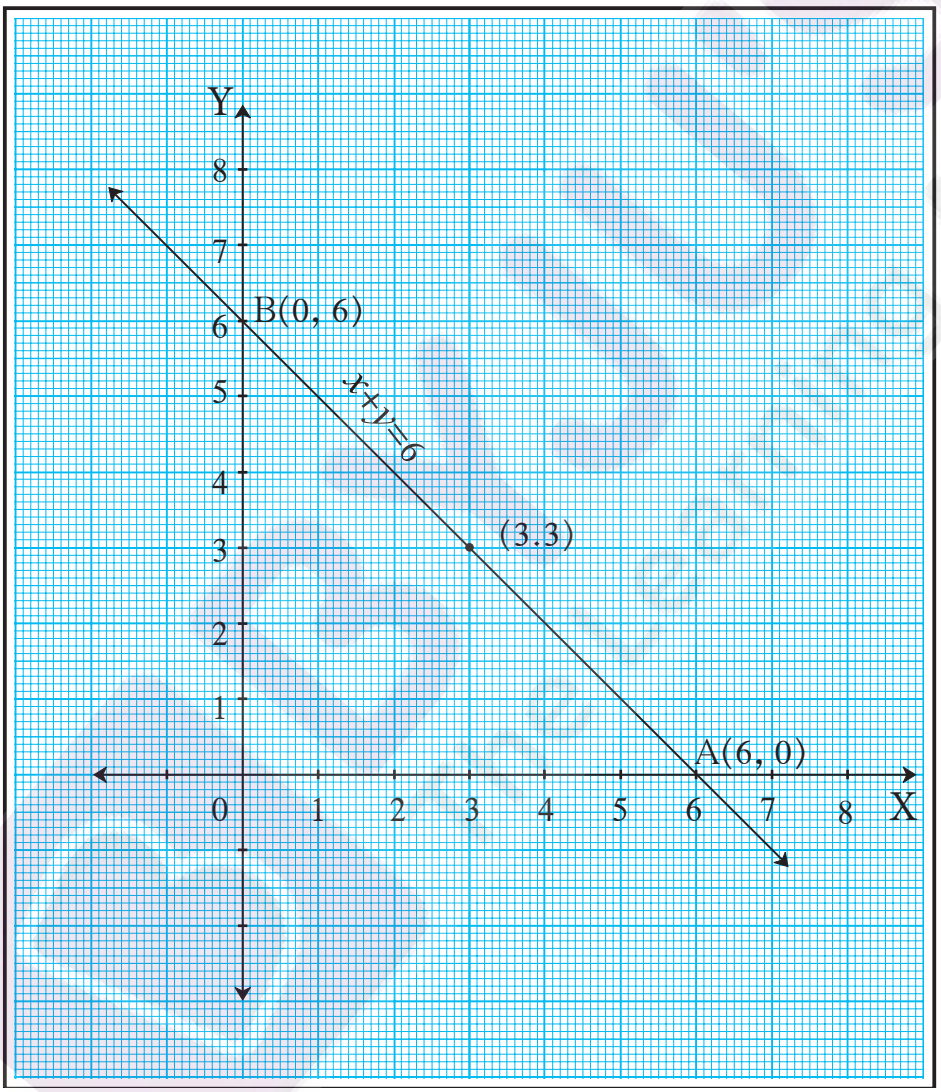


Q 6. 3

(1)

(a) Draw the graph of $x + y = 6$

$x + y = 6$			
x	6	3	0
y	0	3	6
(x, y)	(6, 0)	(3, 3)	(0, 6)



(b) In Δ AOB, by Pythagoras theorem,

$AB^2 = OB^2 + OA^2 = 6^2 + 6^2 = 2 \times 36$

$\therefore$ AB $= 6\sqrt{2}$

OR, A(6, 0) and B(0, 6)

$\therefore$ d(A, B) $= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(0-6)^2 + (6-0)^2} = \sqrt{36+36} = \sqrt{72} = 6\sqrt{2}$

A(Δ AOB) $= \frac{1}{2} \times$ product of sides making right angle

$= \frac{1}{2} \times 6 \times 6 = 18$ sq. unit

(2) The price of one unit $= \frac{400 \text{ crore}}{8 \text{ crore}} =$ ₹. 50

(a) No. of units by investing ₹. 10,000 $= \frac{10{,}000}{50} = 200$

(b) If the market value is increased by 10% by selling one unit, the profit will be

$50 \times \frac{10}{100} =$ ₹. 5

$\therefore$ By selling 200 units, the profit will be $200 \times 5 =$ ₹. 1000.