

**Maharashtra State Board**  
**Class X Mathematics – Algebra – Paper I**  
**Board Paper 2019**

**Time: 2 hours**

**Maximum Marks: 40**

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- Note: - (i) All questions are compulsory.  
(ii) Use of calculator is not allowed.  
(iii) Figures to the right of questions indicate full marks.

**1. (A) Solve the following questions (Any four) :**

**4**

- (i) Find the median of :  
 $66, 98, 54, 92, 87, 63, 72.$
- (ii) Multiply and write the answer in the simplest form:  
 $5\sqrt{7} \times 2\sqrt{7}$
- (iii) If  $3x + 5y = 9$  and  $5x + 3y = 7$ , then find value of  $x + y$ .
- (iv) Write the ratio of second quantity to first quantity in the reduced form:  
5 dozen pens, 120 pens.
- (v) Write the following polynomial in coefficient form :  
 $2x^3 + x^2 - 3x + 4$
- (vi) For computation of income tax which is the assessment year of financial year  
01-04-2016 to 31-03-2017?

**(B) Solve the following questions (Any two):**

**4**

- (i) Find the value of the polynomial  $2x^3 + 2x$ , when  $x = -1$ .
- (ii) If  $A = \{11, 21, 31, 41\}$ ,  $B = \{12, 22, 31, 32\}$ , then find :  
(1)  $A \cup B$   
(2)  $A \cap B$ .
- (iii) Sangeeta's monthly income is Rs. 25,000. She spent 90% of her income and donated 3% for socially useful causes. How much money did she save?

**2. (A) Choose the correct alternative :**

**4**

- (i) In the A.P. 2, -2, -6, -10, ..... Common difference (d) is :  
(A) - 4  
(B) 2  
(C) -2  
(D) 4

(ii) For the quadratic equation  $x^2 + 10x - 7 = 0$ , the values of a,b,c are :

- (A)  $a = -1, b = 10, c = 7$
- (B)  $a = 1, b = -10, c = -7$
- (C)  $a = 1, b = 10, c = -7$
- (D)  $a = 1, b = 10, c = 7$

(iii) The tax levied by Central Government for trading within a state is :

- (A) IGST
- (B) CGST
- (C) SGST
- (D) UTGST

(iv) If a die is rolled, what is the probability that number appearing on upper face is less than 2?

- (A)  $\frac{1}{2}$
- (B)  $\frac{1}{2}$
- (C) 1
- (D)  $\frac{1}{6}$

**(B) Solve the following questions (Any two):**

**4**

- (i) First term and common difference of an A.P. are 12 and 4 respectively. If  $t_n = 96$ , find n.
- (ii) If  $\begin{vmatrix} 4 & 5 \\ m & 3 \end{vmatrix} = 22$ , then find the value of m.
- (iii) Solve the following quadratic equation :  
$$x^2 + 8x + 15 = 0.$$

**3. (A) Complete the following activities (Any two) :**

**4**

- (i) Smita has invested Rs. 12,000 to purchase shares of FV Rs. 10 at a premium of Rs. 2. Find the number of shares she purchased. Complete the given activity to get the answer.

**Activity:** FV = Rs. 10, Premium = Rs. 2

$$\therefore MV = FV + \boxed{\phantom{00}} = \boxed{\phantom{00}} + 2 = 12$$

$$\text{No. of shares} = \frac{\text{Total investment}}{MV}$$

$$= \frac{\boxed{\phantom{00}}}{12} = \boxed{\phantom{00}} \text{ shares}$$

- (ii) The following table shows the daily supply of electricity to different places in a town. To show the information by a pie diagram, measures of central angles of sectors are to be decided. Complete the following activity to find the measures:

Places	Supply of electricity (Thousand units)	Measure of central angle
Roads	4	$\frac{4}{30} \times 360 = 48^\circ$
Factories	12	$\frac{\square}{\square} \times 360 = 144^\circ$
Shops	6	$\frac{6}{30} \times 360 = \square$
Houses	8	$\frac{\square}{\square} \times 360 = \square$
Total $\Rightarrow$	30	

- (iii) Two coins are tossed simultaneously. Complete the following activity of writing the sample space (S) and expected outcomes of the events:

(i) Event A : to get at least one head.

(ii) Event B : to get no head

**Activity:** if two coins are tossed simultaneously

$$\therefore S = \{\square, HT, TH, \square\}$$

(i) Event A: at least getting one head.

$$\therefore A = \{HH, \square, TH\}.$$

(ii) Event B = to get no head.

$$\therefore B = \{\square\}.$$

**(B) Solve the following questions (Any two) :**

**4**

- (i) Find the 19<sup>th</sup> term of the A.P. 7, 13, 19, 25, ..... .
- (ii) Obtain a quadratic equation whose roots are -3 and -7.
- (iii) Two numbers differ by 3. The sum of the greater number and twice the smaller number is 15. Find the smaller number.

**4. Solve the following questions (Any three) :**

**9**

- (i) Amit saves certain amount every month in a specific way. In the first month he saves Rs. 200, in the second month Rs. 250, in the third month Rs. 300 and so on. How much will be his total savings in 17 months?
- (ii) A two digit number is to be formed using the digits 0,1,2,3. Repetition of the digits is allowed. Find the probability that a number so formed is a prime number.
- (iii) Smt. Malhotra purchased solar panels for the taxable value of Rs. 85,000. She sold them for Rs. 90,000. The rate of GST is 5%. Find the ITC of Smt. Malhotra. What is the amount of GST payable by her?

(iv) Solve the following simultaneous equations graphically :

$$x + y = 0; 2x - y = 9$$

**5. Solve the following questions (Any one) :**

**4**

(i) The following frequency distribution table shows marks obtained by 180 students in Mathematics examination :

Marks	Number of Students
0 – 10	25
10 – 20	x
20 – 30	30
30-40	2x
40-50	65

Find the value of x.

Also draw a histogram representing the above information.

(ii) Two taps together can fill a tank completely in  $3\frac{1}{13}$  minutes. The smaller tap takes 3 minutes more than the bigger tap to fill the tank. How much time does each tap take to fill the tank completely?

**6. Solve the following questions (Any one) :**

**3**

(i) The co-ordinates of the point of intersection of lines  $ax + by = 9$  and  $bx + ay = 5$  is (3,-1). Find the values of a and b.

(ii) The following frequency distribution table show the distances travelled by some rickshaws in a day. Observe the table and answer the following questions:

Class (Daily distance travelled in km)	Continuous Classes	Frequency (Number of rickshaws)	Cumulative Frequency less than type
60-64	59.5-64.5	10	10
65-69	64.5-69.5	34	$10 + 34 = 44$
70-74	69.5-74.5	58	$44 + 58 = 102$
75-79	74.5-79.5	82	$102 + 82 = 184$
80-84	79.5-84.5	10	$184 + 10 = 194$
85-89	84.5-89.5	6	$194 + 6 = 200$

(i) Which is the modal class? Why?

(ii) Which is the median class and why?

(iii) Write the cumulative frequency (C.F.) of the class preceding the median class.

(iv) What is the class interval (h) to calculate median?

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**Board Paper – 2019 Solution**

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**Solutions**

**1. (A)**

**(i)**

Data in ascending order:

54, 63, 66, 72, 87, 92, 98

Here n (number of observations) = 7 .... Odd

$\Rightarrow \left(\frac{n+1}{2}\right)^{\text{th}}$  observation is the median of the given data.

$\Rightarrow \left(\frac{7+1}{2}\right)^{\text{th}} = \left(\frac{8}{2}\right)^{\text{th}} = 4^{\text{th}}$  observation = 72

$\therefore$  72 is the median of the given data.

**(ii)**

$$\begin{aligned} & 5\sqrt{7} \times 2\sqrt{7} \\ &= (5 \times 2)(\sqrt{7} \times \sqrt{7}) \\ &= 10 \times 7 \\ &= 70 \end{aligned}$$

**(iii)**

$$3x + 5y = 9 \quad \dots (1)$$

$$5x + 3y = 7 \quad \dots (2)$$

Adding (1) and (2), we get

$$8x + 8y = 16$$

$$\Rightarrow 8(x + y) = 16$$

$$\Rightarrow x + y = 2$$

**(iv)**

1<sup>st</sup> Quantity = 120 pens

2<sup>nd</sup> Quantity = 5 dozen pens =  $5 \times 12 = 60$  pens .... since 1 dozen = 12

$\therefore$  Ratio of 2<sup>nd</sup> quantity to 1<sup>st</sup> quantity =  $60 : 120 = \frac{60}{120} = \frac{1}{2} = 1 : 2$

**(v)**

$$2x^3 + x^2 - 3x + 4$$

Coefficient of  $x^3 = 2$

Coefficient of  $x^2 = 1$

Coefficient of  $x = -3$

$\Rightarrow$  Coefficient form of  $2x^3 + x^2 - 3x + 4$  is (2, 1, -3, 4)

**(vi)**

Assessment year of financial year 01 - 04 - 2016 to 31 - 03 - 2017 is 01 - 04 - 2017 to 31 - 03 - 2018

**1.(B)**

**(i)**

$$2x^3 + 2x$$

The value of the polynomial  $2x^3 + 2x$ , when  $x = -1$  is given by

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

**(ii)**

$A = \{11, 21, 31, 41\}$ ,  $B = \{12, 22, 31, 32\}$ , then find:

(1)  $A \cup B = \{11, 12, 21, 22, 31, 32, 41\}$

(2)  $A \cap B = \{31\}$

**(iii)**

Sangeeta's monthly income is Rs. 25, 000.

$$90\% \text{ of income} = \frac{90}{100} \times 25000 = 90 \times 250 = \text{Rs. } 22500$$

$$3\% \text{ of income} = \frac{3}{100} \times 25000 = 3 \times 250 = \text{Rs. } 750$$

$$\text{Total spent money} = 22500 + 750 = \text{Rs. } 23250$$

$$\text{Savings} = 25000 - 23250 = \text{Rs. } 1750$$

$\therefore$  Sangeeta saves Rs. 1750.

**2.(A)**

**(i)**

Correct Option: A

Explanation:

The given A.P is 2, -2, -6, -10,...

$$\text{Common difference (d)} = -2 - (2) = -6 - (-2) = -4$$

**(ii)**

Correct Option: C

Explanation:

$$x^2 + 10x - 7 = 0$$

General form of a Quadratic Equation is  $ax^2 + bx + c = 0$ .

Comparing the given Quadratic Equation with the General form of a Quadratic Equation, we get

$$a = 1, b = 10 \text{ and } c = -7$$

**(iii)**

Correct Option: B

Explanation:

The tax levied by Central Government for trading within a state is CGST.

**(iv)**

Correct Option: D

Explanation:

If a die is rolled, the sample space is given by

$$S = \{1, 2, 3, 4, 5, 6\}$$

$$n(S) = 6$$

Let A be the event of getting the number appearing on upper face is less than 2.

$$A = \{1\}$$

$$\Rightarrow n(A) = 1$$

$$\Rightarrow P(A) = \frac{n(A)}{n(S)} = \frac{1}{6}$$

**2.(B)**

**(i)**

First term (a) = 12, common difference (d) = 4

We know that,

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

$$\Rightarrow t_n = 12 + (n - 1) \times 4 = 12 + 4n - 4 = 8 + 4n \quad \dots (1)$$

$$t_n = 96 \quad \dots \text{given}$$

$$\Rightarrow 8 + 4n = 96 \quad \dots \text{from (1)}$$

$$\Rightarrow 4n = 88$$

$$\Rightarrow n = 22$$



**(ii)**

$$\begin{vmatrix} 4 & 5 \\ m & 3 \end{vmatrix} = 22$$

$$\Rightarrow 4 \times 3 - 5m = 22$$

$$\Rightarrow 12 - 5m = 22$$

$$\Rightarrow 5m = -10$$

$$\Rightarrow m = -2$$

**(iii)**

$$x^2 + 8x + 15 = 0$$

$$\Rightarrow x^2 + 5x + 3x + 15 = 0$$

$$\Rightarrow x(x + 5) + 3(x + 5) = 0$$

$$\Rightarrow (x + 5)(x + 3) = 0$$

$$\Rightarrow (x + 5) = 0 \text{ or } (x + 3) = 0$$

$$\Rightarrow x = -5 \text{ or } x = -3$$

**3. (A)**

**(i)**

Activity: FV = Rs. 10, Premium = Rs. 2

$$\therefore MV = FV + \text{Premium} = 10 + 2 = \text{Rs. } 12$$

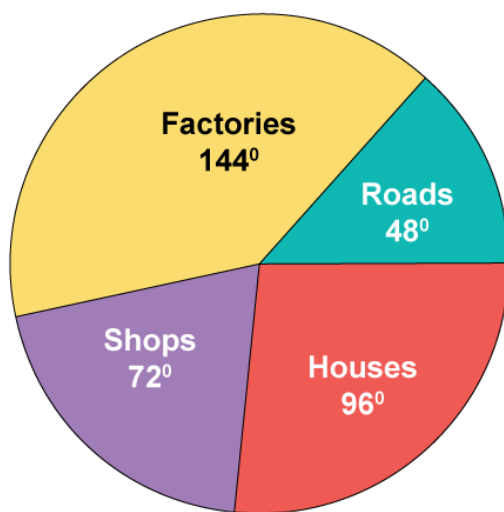
$$\begin{aligned} \therefore \text{No. of shares} &= \frac{\text{Total investment}}{MV} \\ &= \frac{12000}{12} \\ &= 1000 \text{ shares} \end{aligned}$$

$\therefore$  the number of shares Smita purchased is 1000.

(ii)

Places	Supply of electricity (Thousand units)	Measure of central angle
Roads	4	$\frac{4}{30} \times 360 = 48^\circ$
Factories	12	$\frac{12}{30} \times 360 = 144^\circ$
Shops	6	$\frac{6}{30} \times 360 = 72^\circ$
Houses	8	$\frac{8}{30} \times 360 = 96^\circ$
Total	30	

The following pie chart shows the daily supply of electricity to different places in a town:



(iii)

Activity: If two coins are tossed simultaneously

$$\therefore S = \{\overline{HH}, HT, TH, \overline{TT}\}$$

(i) Event A: at least getting one head.

$$\therefore A = \{HH, \overline{HT}, TH\}$$

(ii) Event B: to get no head.

$$\therefore B = \{ \boxed{11} \}$$

### 3.(B)

(i)

The given A. P is 7, 13, 19, 25,.....

Here  $a = 7$  and  $d = 13 - 7 = 6$

We know that  $n^{\text{th}}$  term of an A.P is given by

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

$$\Rightarrow t_{19} = 7 + (19 - 1)6$$

$$= 7 + 108$$

$$= 115$$

(ii)

We know that,

If  $\alpha$  and  $\beta$  are the roots of a quadratic equation in variable  $x$ , then quadratic equation can be obtained as  $x^2 - (\alpha + \beta)x + \alpha\beta = 0$

Here  $\alpha = -3$  and  $\beta = -7$

$\therefore$  The required quadratic equation is given by

$$x^2 - [(-3) + (-7)]x + (-3)(-7) = 0$$

$$\Rightarrow x^2 - (-3 - 7)x + (-3)(-7) = 0$$

$$\Rightarrow x^2 - (-10)x + (-21) = 0$$

$$\Rightarrow x^2 + 10x - 21 = 0$$

(iii)

Let the smaller number be  $y$  and the greater number be  $x$ .

Two number differ by 3.

$$\Rightarrow x - y = 3 \quad \dots (i)$$

The sum of the greater number and twice the smaller number is 15.

$$\Rightarrow x + 2y = 15 \dots (ii)$$

Multiply equation (i) by 2, we get

$$2x - 2y = 6 \dots (iii)$$

Adding (ii) and (iii), we get

$$3x = 21$$

$$\Rightarrow x = 7$$

Substituting  $x = 7$  in equation (i), we get

$$7 - y = 3$$

$$\Rightarrow y = 4$$

$\therefore$  the smaller number is 4.

4.

(i)

According to the question, Amit saving's is given by

200, 250, 300, 350.....

$$\text{Here } d = 250 - 200 = 300 - 250 = 50$$

The consecutive terms are having same difference i.e 50

So, Amit saving patten forms an A.P.

$$\text{Here } a = 200 \text{ and } d = 50$$

$$\text{To find: Total saving in 17 month} = S_{17}$$

We know that sum of 17 terms of an A.P is given by  $S_n = \frac{n}{2}(2a + (n - 1)d)$

$$\Rightarrow S_{17} = \frac{17}{2}(2(200) + (17 - 1) \times 50)$$

$$= \frac{17}{2}(400 + 800)$$

$$= 17 \times 600$$

$$= \text{Rs. } 10,200$$

$\therefore$  Amit's total savings in 17 months is Rs. 10,200.

**(ii)**

Here, we have to form two – digit numbers, zero cannot be at tens place (as it will not form a two – digit number).

$$\therefore S = \{10, 11, 12, 13, 20, 21, 22, 23, 30, 31, 32, 33\}$$

$$\Rightarrow n(S) = 12$$

Let A be the event of getting a number formed is a prime number.

$$\therefore A = \{11, 13, 23, 31\}$$

$$\Rightarrow n(A) = 4$$

$$\therefore P(A) = \frac{n(A)}{n(S)} = \frac{4}{12} = \frac{1}{3}$$

**(iii)**

According to the information given in the question, we get

$$\text{Tax collected at the sale (Output sale)} = 5\% \text{ of } 90,000 = \frac{5}{100} \times 90,000 = \text{Rs. } 4500$$

$$\begin{aligned} \text{Tax paid at the time of purchase (Input tax)} &= 5\% \text{ of } 85,000 \\ &= \frac{5}{100} \times 85,000 = \text{Rs. } 4250 \end{aligned}$$

$$\text{Input Tax Credit (ITC)} = \text{Rs. } 4250$$

$$\therefore \text{GST payable} = \text{Output tax} - \text{ITC} = 4500 - 4250 = \text{Rs. } 250$$

$\Rightarrow$  The GST payable by Smt. Malhotra is Rs. 250 and ITC is Rs. 4250.

**(iv)**

$$x + y = 0$$

Put  $x = 0 \Rightarrow y = 0$ , so the point is  $(0, 0)$

$$\text{Put } x = 1$$

$$\Rightarrow 1 + y = 0$$

$\Rightarrow y = -1$ , so the point is  $(1, -1)$

Put  $x = -1$

$\Rightarrow -1 + y = 0$

$\Rightarrow y = 1$ , so the point is  $(-1, 1)$

x	y	(x, y)
0	0	(0, 0)
1	-1	(1, -1)
-1	1	(-1, 1)

**$2x - y = 9$**

Put  $x = 0$

$\Rightarrow 2(0) - y = 9$

$\Rightarrow y = -9$

Put  $x = 1$

$\Rightarrow 2(1) - y = 9$

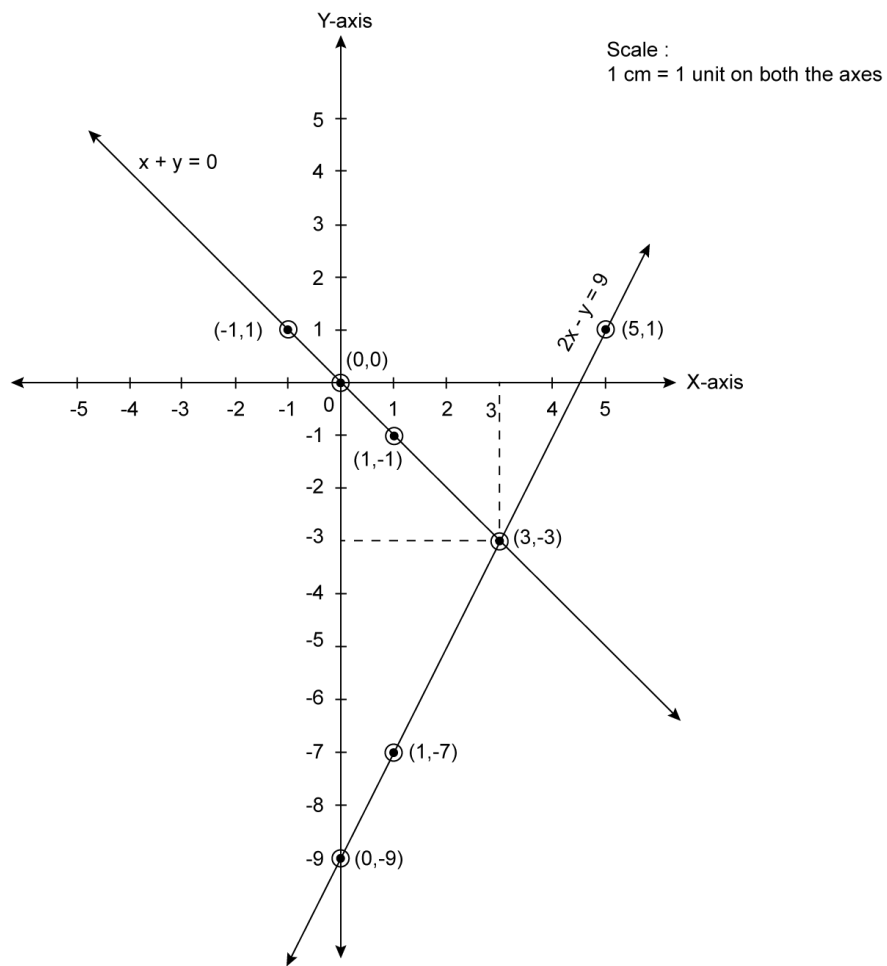
$\Rightarrow y = -7$

Put  $x = 5$

$\Rightarrow 2(5) - y = 9$

$\Rightarrow y = 1$

x	y	(x, y)
0	-9	(0, -9)
1	-7	(1, -7)
5	1	(5, 1)



In the graph the point of intersection of given two lines is  $(3, -3)$ .

So, the solution is  $(3, -3)$

5.

(i)

Since the total number of students are 180.

$$\Rightarrow 25 + x + 30 + 2x + 65 = 180$$

$$\Rightarrow 3x + 120 = 180$$

$$\Rightarrow 3x = 60$$

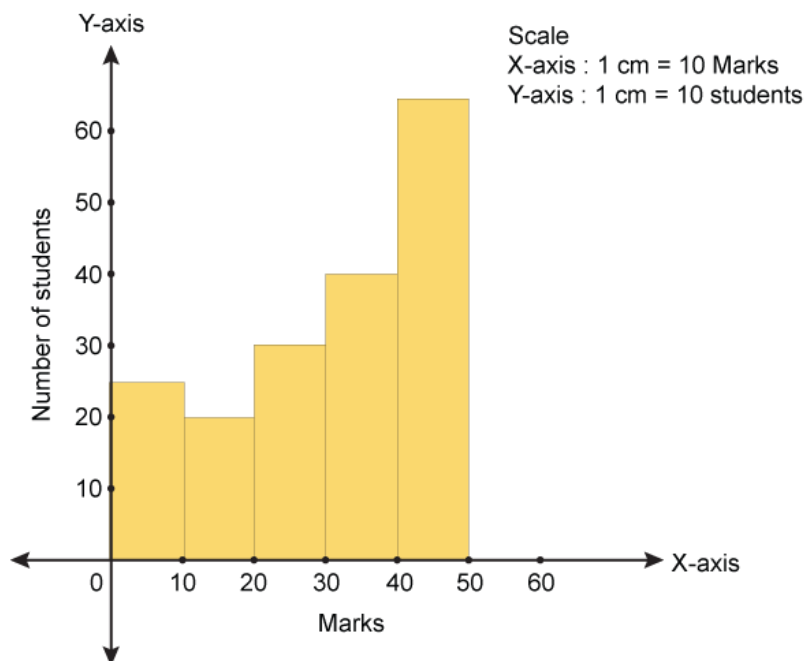
$$\Rightarrow x = 20$$

The frequency distribution table is given as follows:

Marks	Number of Students
0 - 10	25
10 - 20	20
20 - 30	30
30 - 40	$2(20) = 40$
40 - 50	65
<b>Total</b>	180

### Steps of drawing a Histogram:

1. Draw X – axis and Y – axis on the graph paper.
2. Show the Marks on X – axis and Number of students on Y – axis.
3. On X – axis, take the scale as 1 cm = 10 Marks and on Y – axis take the scale as 1cm = 10 students.
4. Taking each class as the base (Marks), draw rectangles with heights proportional to the frequencies (Number of students).





**(ii)**

Let x (smaller) and y(bigger) be the time of each tap to fill the tank completely.

According to the condition in the question, we get

$$x + y = 3 \frac{1}{13} = \frac{40}{3} \dots (i)$$

$$x = y + 3$$

$$\Rightarrow x - y = 3 \dots (ii)$$

Adding (i) and (ii), we get

$$2x = \frac{40}{3} + 3$$

$$\Rightarrow x = \frac{40+9}{3}$$

$$\Rightarrow x = \frac{49}{3 \times 2} = \frac{49}{6}$$

Put  $x = \frac{49}{6}$  in (ii), we get

$$\frac{49}{6} - y = 3$$

$$\Rightarrow y = \frac{49}{6} - 3 = \frac{49 - 18}{6} = \frac{31}{6}$$

$\therefore$  The smaller and bigger taps takes  $\frac{49}{6}$  mins and  $\frac{31}{6}$  mins to fill the tank completely.

**6.**

**(i)**

$$ax + by = 9 \dots (i)$$

$$bx + ay = 5 \dots (ii)$$

The co-ordinates of the point of intersection of given lines is (3, -1).

So, it will satisfy both the equation (3, -1)

$$\text{From (i), } a(3) + b(-1) = 9 \Rightarrow 3a - b = 9 \dots (iii)$$

$$\text{From (i), } b(3) + a(-1) = 5 \Rightarrow 3b - a = 5 \dots (iv)$$

Multiply equation (iv) by 3, we get

$$9b - 3a = 15 \quad \dots (v)$$

Adding (iii) and (v), we get

$$8b = 24$$

$$\Rightarrow b = 3$$

Put  $b = 3$  in equation (iv), we get

$$3(3) - a = 5$$

$$\Rightarrow 9 - a = 5$$

$$\Rightarrow a = 4$$

$\therefore$  the values of  $a$  and  $b$  is 4 and 3 respectively.

**(ii)**

(i) The modal class is 74.5 – 79.5 because it has the highest frequency i.e 82.

(ii) Here the total number of frequency i.e  $N = 200$

$$\text{So, } \frac{N}{2} = \frac{200}{2} = 100$$

Cumulative frequency which is just greater than 100 is 102.

$\therefore$  the corresponding class 69.5 – 74.5 is the median class.

(iii) Since the median class is 69.5 – 74.5, then the cumulative frequency of the class preceding the median class 44.

(iv) Class interval  $(h) = 64.5 - 59.5 = 5$