

Maharashtra Board

Class IX Mathematics - Algebra

Sample Paper – 1

Solution

Time: 2 hours

Total Marks: 40

Note: - (1) All questions are compulsory.
(2) Use of calculator is not allowed.

1.

i. For the linear equation is $kx - \frac{3}{5}y = 8$

Given values: $y = -\frac{1}{2}, x = 1$

Substituting the value of x and y in the equation we get

$$k - \frac{3}{10} = 8$$

$$k = 8 + \frac{3}{10} = 8.3$$

ii. Because 70 occurs the maximum number of times, i.e. four times, the mode of the given data is 70.

iii. We have,

$$n(P \cup Q) = n(P) + n(Q) - n(P \cap Q)$$

$$\Rightarrow n(P \cap Q) = n(P) + n(Q) - n(P \cup Q) = 5 + 12 - 14 = 3$$

iv. The given expression can be rearranged as shown below :

$$2pq + 4p + 5q + 10$$

$$= 2p(q + 2) + 5(q + 2)$$

$$= (2p + 5)(q + 2)$$

v. $A = \{x : x \text{ is the cube of a natural number}\}$

vi. $\sqrt[4]{1250} = \sqrt[4]{625 \times 2} = 5\sqrt[4]{2}$

2.

- i. Let the present age of the mother be $7x$ years
Present age of the daughter = $3x$ years
Let us say that the mother was 26 years old, k years ago.
 $7x = 26 + k$ (1)
 $3x = 6 + k$ (2)
Subtracting (2) from (1), we get
 $4x = 20$
 $x = 5$
So, the present age of the mother = $7x$ years = 35 years
Present age of the daughter = $3x$ years = 15 years

- ii. Let the numbers be $6x$ and $13x$.
Their LCM = $78x$
 $78x = 312$ (given)
 $x = 4$.
The numbers are 24 and 52.

- iii. Here, $A = \{3, 6, 9, 12, 15\}$.
 $B = \{3, 5, 7, 9\}$
 $A \cup B = \{3, 5, 6, 7, 9, 12, 15\}$

iv.

- (a) Additive inverse of $\frac{2}{8}$ is $-\frac{2}{8}$
(b) Additive inverse of $-\frac{5}{8}$ is $\frac{5}{8}$
(c) Additive inverse of $\frac{-6}{-5} = \frac{6}{5}$ is $-\frac{6}{5}$
(d) Additive inverse of $\frac{2}{9}$ is $-\frac{2}{9}$

v. We have

$$\begin{aligned} & 12xy - 15x \\ &= 2 \times 2 \times 3 \times x \times y - 3 \times 5 \times x \\ &= 3 \times x(2 \times 2 \times y - 5) \\ &= 3x(4y - 5) \end{aligned}$$

- vi. (a) Secondary
(b) Primary

3.

- i. To get the equivalent ratio we have to either multiply or divide the numerator and denominator of given ratio by same number (except 0).

Multiplying with 2,

$$\text{Ratio } 18 : 12 = \frac{18 \times 2}{12 \times 2} = \frac{36}{24}$$

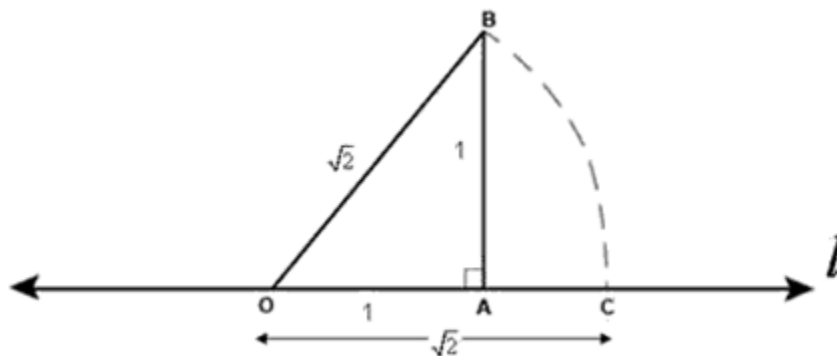
$\therefore 36 : 24$ is an equivalent ratio if $18 : 12$.

Dividing by 2,

$$\text{Ratio } 18 : 12 = \frac{18 \div 2}{12 \div 2} = \frac{9}{6}$$

$\therefore 9 : 6$ is an equivalent ratio if $18 : 12$.

- ii. Let 'l' be the number line with the zero point O as origin. On this line cut off $OA = 1$ unit. At 'A' draw perpendicular to number line 'l' and on it cut off $AB = 1$ unit. Then $\triangle OAB$ is a right angled at A.



By Pythagoras theorem, we have:

$$OB^2 = OA^2 + AB^2 = 1^2 + 1^2 = 2$$

$$OB = \sqrt{2}$$

With O as center and radius OB, draw an arc of the circle meeting the line 'l' at C.

Then $OC = OB$ (Radii of circle)

$$OC = \sqrt{2}$$

Hence the point 'C' in the number corresponds to the irrational number $\sqrt{2}$ i.e. $OC = \sqrt{2}$.

- iii. 1. Let $P = \{x, y, z\}$. $n(P) = 3$.

Hence, the number of subsets of Set $P = 2^3 = 8$.

2. Set of letters in the word 'DELHI'

Let $Q =$ Set of letters in the word 'DELHI'.

$Q = \{D, E, L, H, I\}$, so $n(Q) = 5$

Hence, the number of subsets of Set $Q = 2^5 = 32$.

3. Let $R = \{0, 3, 6, 9\}$, $n(R) = 4$.

Hence, the number of subsets of Set $R = 2^4 = 16$.

iv. Let the number of boys and girls be $3x$ and x respectively.

$$3x + x = 36$$

$$x = 9$$

Number of boys = 27

And number of girls = 9

Let 'a' more girls be added, then

$$\frac{27}{9+a} = \frac{9}{5}$$

$$\Rightarrow 135 = 81 + 9a$$

$$\Rightarrow 9a = 54$$

$$\Rightarrow a = 6$$

So, 6 girls should be added to the council.

v. $99x + 101y = 499$... (1)

$$101x + 99y = 501 \quad \dots (2)$$

Adding equations (1) and (2), we get.

$$200x + 200y = 1000$$

$$\text{Or, } x + y = 5 \quad \dots (3)$$

Subtracting (1) from (2), we get,

$$2x - 2y = 2$$

$$\text{Or, } x - y = 1 \quad \dots (4)$$

Adding (3) and (4), we get,

$$2x = 6 \Rightarrow x = 3$$

Putting the value of x in (3), we get,

$$y = 2$$

4.

i.

$$x = \frac{4\sqrt{6}}{\sqrt{2} + \sqrt{3}}$$

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

$$\frac{x + 2\sqrt{2}}{x - 2\sqrt{2}} = \frac{3\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}} \quad \dots(1) \text{ (By componendo and dividendo)}$$

Also,

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

$$\frac{x + 2\sqrt{3}}{x - 2\sqrt{3}} = \frac{3\sqrt{2} + \sqrt{3}}{\sqrt{2} - \sqrt{3}} \quad \dots(2) \text{ (By componendo and dividendo)}$$

Adding (1) and (2), we get

$$\frac{x + 2\sqrt{2}}{x - 2\sqrt{2}} + \frac{x + 2\sqrt{3}}{x - 2\sqrt{3}} = \frac{3\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}} + \frac{3\sqrt{2} + \sqrt{3}}{\sqrt{2} - \sqrt{3}}$$

$$= \frac{3\sqrt{3} + \sqrt{2} - 3\sqrt{2} - \sqrt{3}}{\sqrt{3} - \sqrt{2}}$$

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

$$= \frac{2(\sqrt{3} - \sqrt{2})}{\sqrt{3} - \sqrt{2}}$$

$$= 2$$

ii. (a) Our class intervals will be 0-5, 5-10, 10-15

The grouped frequency distribution table can be constructed as follows:

Distance	Tally Marks	Number of children
0-5		9
5-10		12
10-15		6
15-20		3
	Total	30

(b) The number of children living at a distance of more than 15 km from school (i.e. in the interval 15-20) is 3.

iii. Given system of equations is

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

$$5x - \frac{3}{2}y - 2 = 0$$

Simplifying we get $2x + 3y - 2 = 0$ (1)

$10x - 3y - 4 = 0$ (2)

From equation (1), we get

$$y = \frac{2-2x}{3}$$

Substituting this value of y in (2),

$$10x - 3 \left(\frac{2-2x}{3} \right) - 4 = 0$$

$$\Rightarrow 10x - 2 + 2x - 4 = 0$$

$$\Rightarrow 12x = 6$$

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

Substituting this value of x in equation (1) we get,

$$2 \left[\frac{1}{2} \right] + 3y - 2 = 0$$

$$3y - 1 = 0$$

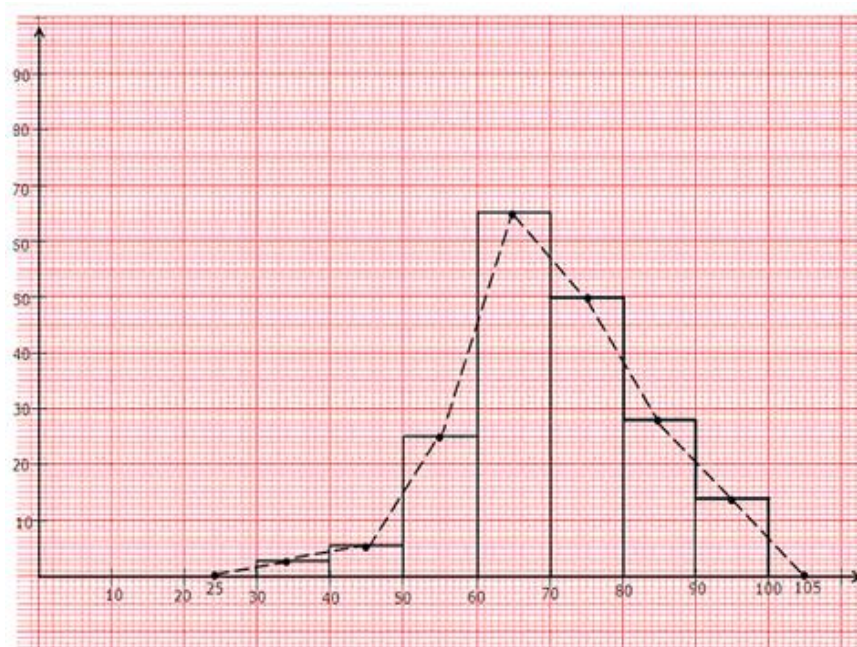
$$y = \frac{1}{3}$$

Hence $x = \frac{1}{2}$ and $y = \frac{1}{3}$ are the required solution.

5.

i.

Class Interval	Class Marks	Frequency
30-40	35	3
40-50	45	6
50-60	55	25
60-70	65	65
70-80	75	50
80-90	85	28
90-100	95	14



ii. Let the monthly pocket money of Ravi and Sanjeev be $5x$ and $7x$ respectively.

Let their expenditure be $3y$ and $5y$ respectively.

Ravi's Savings = $5x - 3y$

Sanjeev's savings = $7x - 5y$

By the given information,

$$5x - 3y = 80 \quad \dots(1)$$

$$7x - 5y = 80 \quad \dots(2)$$

From (1) and (2), we have :

$$5x - 3y = 7x - 5y$$

$$\Rightarrow x = y$$

From equation (1),

$$5x - 3x = 80$$

$$\Rightarrow 2x = 80$$

$$\Rightarrow x = 40$$

Hence, Monthly Pocket money of Ravi = $5 \times 40 = \text{Rs. } 200$

Monthly pocket money of Sanjeev = $7 \times 40 = \text{Rs. } 280$

iii. Let the digit at units place be x and the digit at ten's place be y .
Then the number will be $= 10y + x$ and the number obtained by reversing the digit
be $= 10x + y$.

Now according to the given condition, we get

$$(10y + x) + (10x + y) = 121$$

$$x + y = 11$$

$$\text{also } x - y = \pm 3$$

[\because It is that difference of the digits is 3.]

$$x + y = 11 \quad \dots(1)$$

$$x - y = 3 \quad \dots(2)$$

Adding (1) and (2), we get

$$2x = 14 \text{ or } x = 7$$

Using $x = 7$ in equation (1), we have

$$7 + y = 11$$

$$\Rightarrow y = 11 - 7 = 4$$

Therefore the number is 47.

Next,

$$x + y = 11 \quad \dots(3)$$

$$x - y = -3 \quad \dots(4)$$

Adding (3) and (4) we get,

$$2x = 8$$

$$\Rightarrow x = 4$$

$$y = 11 - 4 = 7$$

So number is 74.

Hence, the number is either 47 or 74.