Maharashtra Board
Class IX Mathematics - Algebra
Sample Paper – 2 Solution

Time: 2 hours **Total Marks: 40**

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

1.

i. Mode is the value that occurs most often.
Here, 18 is the mode.

ii. Product of extremes = product of means
$3 \times 10 = 6 \times x$
$x = 5$

iii. The set of integers is an infinite set as there are infinite numbers of integers.

iv. To prove: a + (b + c) = (a + b) + c

LHS = a + (b + c) = $\frac{2}{3}+\left(\frac{4}{3}+\frac{1}{3}\right)=\frac{2}{3}+\frac{5}{3}=\frac{7}{3}$

RHS = (a + b) + c = $\left(\frac{2}{3}+\frac{4}{3}\right)+\frac{1}{3}=\frac{6}{3}+\frac{1}{3}=\frac{7}{3}$

Thus LHS = RHS, verified.

v. First four even numbers are 2, 4, 6, 8.

Their mean = $\frac{2+4+6+8}{4}=\frac{20}{4}=5$

vi. We have to find:
$(4x + 6) + (3x - 7)$
$=4x + 6 + 3x - 7$
$=(4x + 3x) + (6 - 7)$
$=7x - 1$

2.

i. Middle term = Sum of 15 observations − (Sum of first 7 observations + Sum of last 7 observations)=$15 \times 14 - (7 \times 12 + 7 \times 16) = 14$

ii. Let x be the number of goats and y be the number of hens
Number of legs = $4x + 2y$
Number of heads = $x + y$
According to the given condition
$\Rightarrow 4x + 2y = 2(x + y) + 24$
$\Rightarrow 2x = 24$
$\Rightarrow x = 12$
So there are 12 goats in the group.

iii. Let the required number of hours be y.
Then, less the men, more the hours (Indirect Proportion)
$\Rightarrow 16 : 24 :: 28 : y$
$(16 \times y) = (24 \times 28)$
$y = \frac{24 \times 28}{16} = 42$ Hours
Hence, 16 men will do it in 42 hours.

iv. $A \cup B = \{1, 2, 3, 6, 8\}$

v. Let C receives Rs. x.
B receives twice as much as C = Rs. 2x
A receives twice as much as B = Rs. 6x

The total of amount received by A, B and C together is Rs. 8100.

$\Rightarrow 6x+2x+x = 8100$
$\Rightarrow 9x = 8100$
$\Rightarrow x = 900$

The amount received by C = Rs. x = Rs.900.
The amount received by B = Rs. 2x = Rs. 1800.
The amount received by B = Rs. 6x = Rs. 5400.

vi. Mean= $\dfrac{\text{Sum of all observation}}{\text{Total number of observation}}$

$$= \frac{23+45+46+12+34+87+78+12+65+33+19+34+55+67+81+12+56+98+11+49}{20}$$

$$= \frac{917}{20} = 45.85$$

3.

i. The removed number could be obtained by difference between the sum of original 6 numbers and the sum of remaining 5 numbers i.e. = sum of original 6 numbers - sum of remaining 5 numbers

Using the formula-

Sum of terms = mean × number of terms

Sum of original 6 numbers = 20 × 6 = 120

Sum of remaining 5 numbers = 15 × 5 = 75

Number removed = sum of original 6 numbers - sum of remaining 5 numbers

= 120 - 75 = 45

The number removed is 45.

ii. Any point (x, y) will be on the line if it satisfies the equation of the line 3y = 6- 2x

1. Now for point (3, 0)
   LHS = 3y = 3(0)=0
   RHS= 6- 2(3)=0
   Since LHS =RHS, the point (3, 0) lies 3y = 6 – 2x.
2. For point (2, 2)
   LHS = 3y = 3(2) = 6
   RHS= 6- 2(2)=2
   Since LHS ≠RHS, the point (2, 2) does not lie on the line 3y = 6 – 2x.
3. For (0, 2)
   LHS = 3y = 3(2)=6
   RHS= 6- 2(0)=0 = 6
   Since LHS =RHS, the point (0, 2) lies 3y = 6 – 2x.

iii. Let us assume that Laxmi purchased x bananas and y oranges.

Since each banana costs Rs. 2, x bananas cost Rs. 2x.

Similarly, each orange cost Rs. 3y

Thus the total amount paid by Laxmi is Rs. (2x + 3y), which equals. Rs. 30.

Thus, we can express the given situation in the form of a linear equations as 2x+ 3y = 30

Now, we know that Laxmi purchased 6 oranges i.e. the value of y is 6.

Substitute this value of y in them equation 2x + 3y = 30, thereby reducing it to a linear equation in one variable.

We can then solve the equation to obtain the value.

$2x + 3 \times 6 = 30$
$2x + 18 = 30$
This is a linear equation in one variable.
$2x = 30 - 18$
$2x = 12$
$x = 6$
Laxmi purchased 6 bananas.

iv.

(a) $A' = \{1, 2, 3, 4, 8\}$
(b) $B' = \{2, 3, 5, 6, 7\}$
(c) $C' = \{2, 4, 6, 8\}$

v.

a. Number of boys who liked the white colour = 25
Number of girls who liked the white colour = 45 - 25 = 20

b. Number of boys and girls checked for their favourite colour
= 30 + 20 + 32 + 45 = 127

c. Since the blue section is the longest for the white colour, the boys liked the white colour the most.

4.

i.

1) Range of marks
Highest observation= 71
Lowest observation = 7
Range = 71 – 7 = 64
Let the width of the class should be divided such that the highest and the lowest observation are included in the end classes.

Cumulative Frequency Table

Marks	Tally Marks	Frequency	Cumulative Frequency
5 - 15	||	2	2
15 - 25	~~||||~~	5	(2 + 5) = 7
25 - 35	~~||||~~ ||	7	(7 + 7) = 14
35 - 45	~~||||~~ ~~||||~~ ~~||||~~ ||||	19	(14 + 19) = 33
45 - 55	~~||||~~ ~~||||~~	10	(33 + 10) = 43
55 - 65	~~||||~~	5	(43 + 5) = 48
65 - 75	||	2	(48 + 2) = 50
Total		**50**	

2) From cumulative frequency, we find that 14 students scored less than 35.
Thus, 50 - 14 = 36 students, i.e. 72% students scored more than 35 marks.

ii. Let the age of father be x years and his son' s age be y years.
Two years ago their ages were (x - 2)years and (y - 2)years.
Two years later their ages were (x + 2)years and (y + 2)years.
Then according to the condition given,
$x - 2 = 5(y - 2)$
$x - 5y = -8$ (1)

$x + 2 = 3(y + 2) + 8$
$x - 3y = 12$ (2)

Eliminating x by subtracting equation 2 from 1 we get
$-5y + 3y = -8 - 12$
$-2y = -20$
$y = 10$
Put this value in (1), we get
$x = -8 + 50 = 42$
Hence the father's present age 42 years.
And the son's present age is 10 years.

iii. Simplifying the equation $\sqrt{x^2} + \sqrt{y^2} = \sqrt{5}$ we get
$\sqrt{x^2} + \sqrt{y^2} = \sqrt{5}$
$\sqrt{x \times x} + \sqrt{y \times y} = \sqrt{5}$
$x + y = \sqrt{5}$
Thus $x + y = \sqrt{5}$ is a linear equation

Substituting x= $\frac{\sqrt{5}}{\sqrt{5}+1}$ in the linear equation we get $x + y = \sqrt{5}$

$$\frac{\sqrt{5}}{\sqrt{5}+1}+y=\sqrt{5}$$

$$y=\sqrt{5}-\frac{\sqrt{5}}{\sqrt{5}+1}$$

$$y=\frac{\sqrt{5}\left(\sqrt{5}+1\right)-\sqrt{5}}{\sqrt{5}+1}$$

$$y=\frac{5+\sqrt{5}-\sqrt{5}}{\sqrt{5}+1}$$

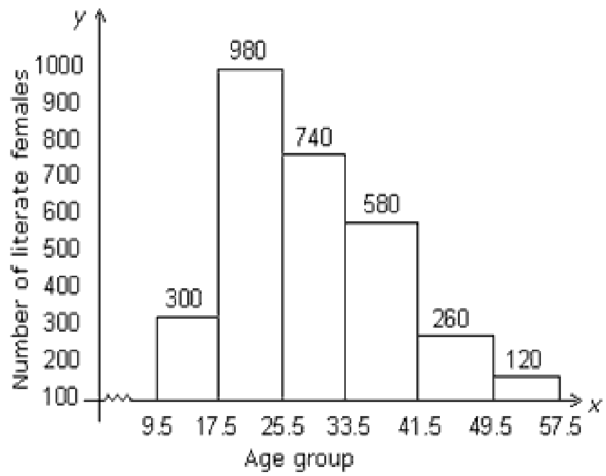
$$y=\frac{5}{\sqrt{5}+1}$$

$$y=\frac{5\left(\sqrt{5}-1\right)}{4}$$

5.

i. Since the given frequency distribution table is not continuous, we have to convert it into a continuous one.

Age group	**Number of literate females**
9.5-17.5	300
17.5-25.5	980
25.5-33.5	740
33.5-41.5	580
41.5-49.5	260
49.5-57.5	120
Total	2980



ii.

(i) Abscissa of P is 2
(ii) Ordinate of Q is – 5
(iii) V (-2,2)
(iv) S (4,0)
(v) T (0,4)
(vi) P (2,3)
(vii) U (-4,3)
(viii) V (-2,2)
(ix) Q (3,-5)

iii. Let the cost of 1 chair be x and 1 table be y.

According to the given condition

$3x + 2y = 700$ ...(1)

$5x + 3y = 1100$ ...(2)

Multiply equation (1) by 5 and (2) by 3.

$15x + 10y = 3500$ ………….(3)

$15x + 9y = 3300$ ………….(4)

Subtract equation (4) from equation (3).

$15x + 10y = 3500$

$\underline{15x + 9y = 3300}$

$y = 200$

Putting this value of y = 200 in (1) we get

$3x + 2y = 700$ ...(1)

$3x + 400 = 700$

$x = 100$

Hence, cost of 2 chairs and 2 tables is $2(x + y) = 200 + 400 =$ Rs. 600.