UNIT 2 QUANTITATIVE ABILITY IV

T5: Simple Equations

Simple Quadratic Equation: Algebraic Expression

A combination of constants and variables connected by a sign of fundamental operations of addition, subtraction, multiplication, and division is called an algebraic expression.

Question 1: Solve the following equation:

x + 2 = 1/14

Solution:

We have $x + 2 = 1/14$

$\Rightarrow x = 1/14 - 2$

$\Rightarrow x = -27/14$

Question 2: Solve the following equation:

2/x + 13 = 21

Solution:

We have $2/x + 13 = 21$

$\Rightarrow 2 + 13x = 21x$

$\Rightarrow 21x - 13x = 2$

$\Rightarrow 8x = 2$

$\Rightarrow x = \frac{1}{4}$

Question 3: Find five solutions of the following equation: 2/x + 3/y = 2; x ≠ 1.

Solution:

We have 2/x + 3/y = 2

⇒ 2y + 3x = 2xy

⇒ 2y(1 − x) = −3

⇒ y = 3/[2(x − 1)]; x ≠ 1

Now we get that x is the independent variable and y is the dependent. By putting different values for x we can find five different solutions to the given equation.

Value for x	0	2	−1	½	− ½
Value for y	−3/2	3/2	−¾	3	− 1

Solve the equation 2x + 5y = 4 such that sum of x and y is 7.
Solution:
We have to solve the equation $2x + 5y = 4$, with constraint that
$x + y = 7 \Rightarrow x = 7 - y$

Substituting this value of x in the given equation, we get
$2(7 - y) + 5y = 4$
$\Rightarrow 14 - 2y + 5y = 4$
$\Rightarrow 3y = -10$
$\Rightarrow y = -10/3$
Then $x = 7 - (-10/3) = (21 + 10)/3 = 31/3$.
∴ the value of $x = 31/3$ and $y = -10/3$.

Question 5: Solve the following system of equations:
5/x + 4/y = 22
3/x + 2/y = 12

Solution:
Let $1/x = u$ and $1/y = v$, then the given equations transform into
$5u + 4v = 22$ ….(i)
$3u + 2v = 11$ ….(ii)

Multiply equation (ii) by 2 on both sides then subtract from (i), we get
$(5u - 6u) + (4v - 4v) = 22 - 24$

$\Rightarrow -u = -2$
$\Rightarrow u = 2$ and so $x = 1/u = \frac{1}{2}$

Now with value of u, we get $v = 3 \Rightarrow y = \frac{1}{3}$

Thus the solution of the given system of equations is $(\frac{1}{2}, \frac{1}{3})$.

The present age of a father is three times the present age of his son. After 10 years, the age of the father will be five more than twice the age of his son. Find the present ages of father and son.

Solution:
Let the present age of the son be x and the age of the father be y.
Given y = 3x ….(i)

After 10 years,
y + 10 = 2(x + 10) + 5 ….(ii)

Solving equation (ii) by substituting the value of y from (i),
3x + 10 = 2(x + 10) + 5
⇒ x = 25 − 10 = 15
∴ the present age of son is 15 years and the present age of the father is 3 × 15 = 30 years.

A train is running at a speed of 48 km/hr crosses a pole in half minute. Find the length of the train.

Solution:
Let the length of the train be l. Then the distance covered by the train in 0.5 is equal to the length of the train.

Speed of train = 48 km/hr = (48 × 1000)/60 m/min = 800 m/min

But, x/0.5 = 800

⇒ x = 800 × 0.5 = 400 m

∴ the length of the train is 400 m.

Aman has ₹ 1, ₹ 2 and ₹ 5 coins in the ratio 1 : 2 : 3, respectively, such that the total amount he has is ₹ 200. Find the number of coins of each denomination he has?

Solution:
Let the number of ₹ 1, ₹ 2 and ₹ 5 coins be x, 2x and 3x, respectively.
Now x + 2.2x + 5.3x = 200
⇒ x + 4x + 15x = 200
⇒ 20x = 200
⇒ x = 10
Number of ₹ 1 coins = 10
Number of ₹ 2 coins = 20
Number of ₹ 5 coins = 30.

Find the number which will come in the place of the question mark in the given series 14, 25, 47, 91, 179, ?.
a) 255
b) 321
c) 355
d) 211
Answer : (c) 355

Explanation:-
 observing the pattern we get that the difference between consecutive terms is being doubled every time.
25 – 14 = 11
47 – 25 = 22
91 – 47 = 44
179 – 91 = 88
So, if 88 is doubled, we get 176.
Hence, 179 + 176 = 355
Hence the missing term is 355.

Solve the following equations for x:

(i) $2 + 3x = x - 4$

(ii) $3/(5 - x) = 1/(5x + 8)$

(iii) $12x + 4 = 2x$

(iv) $1/(\sqrt{2}x + 1) = \sqrt{3}$