Linear Equations in One Variable: Exercise 2.2

Q.1 If you subtract $\frac{1}{2}$ from a number and multiply the result by $\frac{1}{2}$, you get $\frac{1}{8}$. What is the number?

Sol. Let x be the number.

According to question, $(x - \frac{1}{2}) \times \frac{1}{2} = \frac{1}{8}$

On dividing by $\frac{1}{2}$ on both the sides of the equation,

$(x - \frac{1}{2}) \times \frac{1}{2} \div \frac{1}{2} = \frac{1}{8} \div \frac{1}{2}$

$(x - \frac{1}{2}) \times \frac{1}{2} \times 2 = \frac{1}{8} \times 2$

$(x - \frac{1}{2}) = \frac{2}{8}$

$(x - \frac{1}{2}) = \frac{1}{4}$

Transposing $-\frac{1}{2}$ to RHS,

$x = \frac{1}{4} + \frac{1}{2}$

$x = \frac{1+2}{4}$

$x = \frac{3}{4}$

Q.2 The perimeter of a rectangular swimming pool is 154 m. Its length is 2 m more than twice its breadth. What are the length and the breadth of the pool?

Sol. Let x m be the breadth. So, the length = $(2x + 2)$ m.

And given perimeter of swimming pool,

2 (length + breadth) = 154 m.

$2 (2x + 2 + x) = 154$

$2 (3x + 2) = 154$

On dividing both the sides of the equation by 2,

$$\frac{2(3x+2)}{2} = \frac{154}{2}$$

$(3x + 2) = 77$

Now, transposing 2 from LHS to RHS,

$3x = 77 - 2$

$3x = 75$

On dividing by 3 on both the sides of the equation,

$$\frac{3x}{3} = \frac{75}{3}$$

$x = 25$

Therefore, breadth, $(2x + 2) = (2 \times 25 + 2) = 52$ m

Thus, breadth and length of the pool are 25 m and 52 m respectively.

Q.3 The base of an isosceles triangle is $\frac{4}{3}$ cm. The perimeter of the triangle is $4\frac{2}{15}$ cm. What is the length of either of the remaining equal sides?

Sol. Let x m be the length of equal sides.

So, perimeter of triangle will be:

$$x + x + \text{base} = 4\frac{2}{15}$$

$$2x + \frac{4}{3} = \frac{62}{15} \text{ (Since, base } = \frac{4}{3} \text{ cm)}$$

Now, transposing $\frac{4}{3}$ from LHS to RHS,

$$2x = \frac{62}{15} - \frac{4}{3}$$

$$2x = \frac{62 - 4 \times 5}{15}$$

$$2x = \frac{42}{15}$$

On dividing both the sides of the equation by 2,

$$\frac{2x}{2} = \frac{42}{15x2}$$

$$x = \frac{7}{5} = 1\frac{2}{5}$$

Thus, the length of equal sides = 125 cm

Q.4 Sum of two numbers is 95. If one exceeds the other by 15, find the numbers.

Sol. Let x be the one number. So, according to question, the other number = $x + 15$.

Since, given that sum of the both number is 95,

So, $x + x + 15 = 95$

$2x + 15 = 95$

Now, transposing 15 from LHS to RHS,

$2x = 95 - 15$

$2x = 80$

On dividing both the sides of the equation by 2,

$$\frac{2x}{2} = \frac{80}{2}$$

$x = 40$

So, other number $= x + 15$

$= 40 + 15 = 55$

Therefore, both the numbers are 40 and 55.

Q.5 Two numbers are in the ratio 5:3. If they differ by 18, what are the numbers?

Sol. **Given: T**he ratio of the two number = 5 : 3

Let 5x be the first number be and 3x be the second number.

Since they are differ by 18.

So, $5x - 3x = 18$

$2x = 18$

On dividing by 2 on both the sides of the equation,

$$\frac{2x}{2} = \frac{18}{2}$$

$x = 9$

Therefore, first number will be = $5x = 5 \times 9 = 45$

And second number will be = $3x = 3 \times 9 = 27$

Thus, both the numbers will be 45 and 27.

Q.6 Three consecutive integers add up to 51. What are these integers?

Sol. Let x, $x + 1$ and $x + 2$ be the three consecutive integers.

Since, three consecutive integers add up to 51

So, $x + x + 1 + x + 2 = 51$

$3x + 3 = 51$

Now, transposing 3 from LHS to RHS,

$3x = 51 - 3$

$3x = 48$

On dividing by 3 on both the sides of the equation,

$$\frac{3x}{3} = \frac{48}{3}$$

$x = 16$

Therefore, other consecutive integers are: $x + 1 = 17$ and $x + 2 = 18$.

Thus, three consecutive integers are 16, 17 and 18.

Q.7 The sum of three consecutive multiples of 8 is 888. Find the multiples.

Sol. Let 8x, 8(x + 1) and 8(x + 2) be the three consecutive multiples of 8.

Since, sum of three consecutive multiples of 8 is 888.

So, $8a + 8(x + 1) + 8(x + 2) = 888$

$8(x + x + 1 + x + 2) = 888$

$8(3x + 3) = 888$

On dividing by 8 on both the sides of the equation,

$$\frac{8(3x+3)}{8} = \frac{888}{8}$$

$3x + 3 = 111$

Now, transposing 3 from LHS to RHS,

$3x = 111 - 3$

$3x = 108$

On dividing by 3 on both the sides of the equation,

$$\frac{3x}{3} = \frac{108}{3}$$

$x = 36$

So, first number, $8x = 8 \times 36 = 288$,

second number, $8(x + 1) = 8(36 + 1) = 8 \times 37 = 296$

Third number, $8(x + 2) = 8(36 + 2) = 8 \times 38 = 304$

Therefore, the required three consecutive multiples of 8 are 288, 296 and 304.

Q.8 Three consecutive integers are such that when they are taken in increasing order and multiplied by 2, 3 and 4 respectively, they add up to 74. Find these numbers.

Sol. Let x, (x + 1) and (x + 2) be the three consecutive integers.

Since, according to question when they are taken in increasing order and multiplied by 2, 3 and 4 respectively, they add up to 74.

So, $2x + 3(x + 1) + 4(x + 2) = 74$

$2x + 3x + 3 + 4x + 8 = 74$

$9x + 11 = 74$

Now, transposing 11 from LHS to RHS,

$9x = 74 - 11$

$9x = 63$

On dividing by 9 on both the sides of the equation,

$$\frac{9x}{9} = 7$$

$x = 7$

Therefore, second number, $x + 1 = 7 + 1 = 8$,

Third number, $x + 2 = 7 + 2 = 9$

Thus, the required consecutive integers are 7, 8 and 9.

Q.9 The ages of Rahul and Haroon are in the ratio 5:7. Four years later the sum of their ages will be 56 years. What are their present ages?

Sol. **Given:** The ratio of the ages of Rahul and Haroon = 5 : 7

Let 5x and 7x be the ages of Rahul and Haroon respectively.

Since, 4 years later, the age of Rahul will be $(5x + 4)$ and age of Haroon will be $(7x + 4)$.

So, $(5x + 4) + (7x + 4) = 56$

$12x + 8 = 56$

Now, transposing 8 from LHS to RHS,

$12x = 56 - 8$

$12x = 48$

On dividing by 12 on both the sides,

$$\frac{12x}{12} = 4$$

$x = 4$

Therefore, age of Rahul = $5x = 5 \times 4 = 20$ years

Age of Haroon = $7x = 7 \times 4 = 28$ years

Q.10 The number of boys and girls in a class are in the ratio 7:5. The number of boys is 8 more than the number of girls. What is the total class strength?

Sol. Given: The ratio of boys and girls in a class = 7 : 5

Let $7x$ and $5x$ be the number of boys and girls respectively.

Since, number of boys is 8 more than the number of girls

So, $7x = 5x + 8$

Now, transposing $5x$ from RHS to LHS,

$7x - 5x = 8$

$2x = 8$

On dividing both the sides of the equation by 2,

$$\frac{2x}{2} = \frac{8}{2}$$

$x = 4$

So, number of boys, $7x = 7 \times 4 = 28$

And number of boys, $5x = 5 \times 4 = 20$

Thus, total class strength = 28 + 20

= 48 students.

Q.11 Baichung's father is 26 years younger than Baichung's grandfather and 29 years older than Baichung. The sum of the ages of all the three is 135 years. What is the age of each one of them?

Sol. Let x year be the age of Baichung's father's.

Since, Baichung's father is 26 years younger than Baichung's grandfather and 29 years older than Baichung

So, age of Baichung's will be (x-29) and age of Baichung's grandfather will be (x + 26).

Since, given that sum of the ages of all the three is 135 years.

$$x + (x - 29) + (x + 26) = 135$$

$$3x - 3 = 135$$

Now, transposing 3 from LHS to RHS,

$$3x = 135 + 3$$

$$3x = 138$$

On dividing by 3 on both the sides of the equation,

$$\frac{3x}{3} = \frac{138}{3}$$

$$x = 46$$

Thus, age of Baichung's father = x years = 46 years

Age of Baichung = (x – 29) = (46 – 29) = 17 years

Age of Baichung's Grandfather = (x + 26) = (46 + 26) = 72 years.

Q.12 A rational number is such that when you multiply it by $\frac{5}{2}$ and add $\frac{2}{3}$ to the product, you get $-\frac{7}{12}$. What is the number?

Sol. Let x be the number.

Since, when we multiply x by $\frac{5}{2}$ and add $\frac{2}{3}$ to the product, then we get $-\frac{7}{12}$

So, $\frac{5}{2}x + \frac{2}{3} = -\frac{7}{12}$

Now, transposing $\frac{2}{3}$ from LHS to RHS,

$$\frac{5}{2}x = -\frac{7}{12} - \frac{2}{3}$$

$$\frac{5}{2}x = \frac{-7-8}{12}$$

$$\frac{5}{2}x = \frac{-15}{12}$$

Now, Multiplying by $\frac{2}{5}$ on both the sides,

$$x = \frac{-15}{12} \times \frac{2}{5}$$

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

Therefore, the required rational number $= -\frac{1}{2}$.

Q.13 Lakshmi is a cashier in a bank. She has currency notes of denominations Rs 100, Rs 50 and Rs 10, respectively. The ratio of the number of these notes is 2:3:5. The total cash with Lakshmi is Rs 4,00,000. How many notes of each denomination does she have?

Sol. Given: The ratio of the number of Rs 100, Rs 50 and Rs 10 notes = 2 : 3 : 5
Let 2x, 3x, and 5x be the number of Rs 100 notes, Rs 50 notes and Rs 10 notes respectively.
So, amount of Rs 100 notes = Rs (100 × 2x) = Rs 200x
Amount of Rs 100 notes = Rs (50 × 3x) = Rs 150x
Amount of Rs 100 notes = Rs (10 × 5x) = Rs 50x
Since, The total cash = Rs 4,00,000
So, 200x + 150x + 50x = 400000
400x = 400000
On dividing by 400 on both the sides of equation,
x = 1000
Therefore, number of Rs 100 notes = 2x = 2 × 1000 = 2000
Number of Rs 50 notes = 3x = 3 × 1000 = 3000
Number of Rs 10 notes = 5x = 5 × 1000 = 5000

Q.14 I have a total of Rs 300 in coins of denomination Re 1, Rs 2 and Rs 5. The number of Rs 2 coins is 3 times the number of Rs 5 coins. The total number of coins is 160. How many coins of each denomination are with me?

Sol. Given: Total rupees of coins = Rs. 300
Let x be the number of Rs 5 coins.
Since, the number of Rs 2 coins is 3 times the number of Rs 5 coins.
So, Number of Rs 2 coins = 3 X number of Rs 5 coins
$= 3x$
And Number of Rs 1 coins = 160 – (number of coins of Rs 5 and of Rs 2)
$= 160 - (3x + x)$
$= 160 - 4x$
Now, amount of Rs 1 coins = Rs [1 x $(160 - 4x)$]
= Rs $(160 - 4x)$
Amount of Rs 2 coins = Rs $(2 \times 3x) =$ Rs $6x$
Amount of Rs 5 coins = Rs $(5 \times x) =$ Rs $5x$
Since, Total rupees of coins = Rs. 300
Given, $160 - 4x + 6x + 5x = 300$
$160 + 7x = 300$
Now, transposing 160 from LHS to RHS,
$7x = 300 - 160$
$7x = 140$
On dividing by 7 on both the sides of the equation,

$$\frac{7x}{7} = \frac{140}{7}$$

$x = 20$
Therefore, number of Rs 5 coins = $x = 20$
Number of Rs 2 coins = $3x = 3 \times 20 = 60$
Number of Rs 1 coins = $160 - 4x = 160 - 4 \times 20 = 160 - 80 = 80$

Q.15 The organizers of an essay competition decide that a winner in the competition gets a prize of Rs 100 and a participant who does not win gets a prize of Rs 25. The total prize money distributed is Rs 3,000. Find the number of winners, if the total number of participants is 63.

Sol. Let x be the number of winners.

Since, the total number of participants is 63.

So, the number of participants who did not win = $(63 - x)$

Amount given to the winners is = Rs $100x$

Amount given to the participants who did not win = Rs $[25\ (63 - x)]$ or Rs $(1575 - 25x)$

Since, The total prize money distributed = Rs 3,000

So, $100x + 1575 - 25x = 3000$

Now, transposing 1575 from LHS to RHS,

$$75x = 3000 - 1575$$

$$75x = 1425$$

On dividing by 75 on both the sides of equation,

$$\frac{75x}{75} = \frac{1425}{75}$$

$$x = 19$$

So, number of winners = 19