

# Class 8: Chapter 22- Linear Equations - Exercise 22B

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Q1. 17 less than four times a number is 11. Find the number.

$$\text{Let the number} = x$$

$$4x - 17 = 11$$

$$x = \frac{28}{4} = 7$$

Q2. If 10 be added to four times a certain number, the result is 5 less than five times the number. Find the number

$$\text{Let the number} = x$$

$$4x + 10 = 5x - 5$$

$$x = 15$$

Q3.  $\frac{2}{3}$  of a number is 20 less than the original number. Find the original number.

$$\text{Let the original number} = x$$

$$\frac{2}{3}x = x - 20$$

$$\frac{1}{3}x = 20$$

$$x = 60$$

Q.4 A number is 25 more than its  $\frac{5}{6}$  part. Find the number.

$$\text{Let the number} = x$$

$$x = 25 + \frac{5}{6}x$$

$$\frac{1}{6}x = 25$$

$$x = 150$$

Q.5 A number is as much greater than 21 as is less than 71. Find the number.

$$\text{Let the number} = x$$

$$x - 21 = 71 - x$$

$$2x = 92$$

$$x = 46$$

Q.6 6 more than one-fourth of the number is two-fifth of the number. Find the number.

$$\text{Let the number} = x$$

$$\frac{1}{4}x + 6 = \frac{2}{5}x$$

$$6 = \left(\frac{2}{5} - \frac{1}{4}\right)x = \frac{30}{20}x$$

$$x = 40$$

Q.7 One-third of a number exceeds one-fourth of the number by 15 . Find the number.

*Let the number = x*

$$\frac{1}{3}x - \frac{1}{4}x = 15$$

$$\frac{1}{12}x = 15 \text{ or } x = 180$$

Q.8 If one-fifth of a number decreased by 5 is 16, find the number.

*Let the number = x*

$$\frac{1}{5}x - 5 = 16$$

$$x = 105$$

Q.9 A number when divided by 6 is diminished by 40. Find the number.

*Let the number = x*

$$\frac{x}{6} = x - 40$$

$$\frac{5}{6}x = 40$$

$$x = 48$$

Q.10 Four-fifths of a number exceeds two-third of the number by 10. Find the number.

*Let the number = x*

$$\frac{4}{3}x = \frac{2}{3}x + 10$$

$$\text{or } \frac{2}{15}x = 10$$

$$\text{or } x = 75$$

Q.11 Two numbers are in the ratio 3:4 and their sum is 84. Find the number

*Let the two numbers be x and y*

Therefore

$$3x = 4y$$

$$x + y = 84$$

Solving

$$\frac{4}{3}y + y = 84$$

$$\frac{7y}{3} = 84$$

$$y = 3 \times 12 = 36$$

$$\text{Hence, } x = \frac{4}{3} \times 36 = 48$$

Q.12 Three numbers are in ratio 4:5:6 and their sum is 135. Find the numbers.

*Let the three numbers be x, y, z*

Therefore,

$$4x: 5x: 6x$$

$$4x + 5x + 6x = 135$$

Solving,

$$15x = 135$$

$$x = 9$$

Therefore

*The three numbers are 36, 45, 54*

Q.13 Two numbers are in the ratio 3:5. If each is increased by 10, then ratio between the new numbers so formed is 5:7, Find the original numbers.

*Let the two numbers be x and y*

*Given,*

$$\frac{x}{y} = \frac{3}{5} \dots \dots \dots i)$$

$$\frac{x + 10}{y + 10} = \frac{5}{7} \dots \dots \dots ii)$$

*solving,*

*From i)  $x = \frac{3}{5}y$*

*Substituting in ii)*

$$\frac{\frac{3}{5}y + 10}{y + 10} = \frac{5}{7}$$

$$\frac{21}{5}y + 70 = 5y + 50$$

$$20 = \frac{4}{5}y$$

$$\text{or } y = 25$$

$$x = \frac{3}{5} \times 25 = 15$$

*Two numbers are 15 and 25*

Q.14 The sum of three consecutive odd numbers is 75. Find the numbers.

*Let the three consecutive numbers be*

$$x, x + 2, x + 4$$

*therefore,*

$$x + x + 2 + x + 4 = 75$$

$$3x + 6 = 75$$

$$3x = 69$$

$$x = 23$$

*Therefore the three numbers are 23, 25 and 27*

Q.15 Divide 25 into two parts such that 7 times the first part added to 5 times the second part makes 139.

*Let the two parts be x and y*

*Therefore*

$$x + y = 25$$

$$7x + 5y = 139$$

*Solving we get*

$$\begin{aligned}
 x &= 25 - y \\
 7(25 - y) + 5y &= 139 \\
 175 - 2y &= 139 \\
 2y &= 175 - 139 = 36 \\
 \text{or } y &= 18 \\
 \text{The other part} &= 7
 \end{aligned}$$

Q.16 Divide 180 into two parts such that the first part is 12 less than twice the second part.

Let the two parts be  $x$  and  $2y$

Therefore

$$x + y = 180$$

$$x + 12 = 2y$$

Solving

$$y = 180 - x$$

$$x + 12 = 2(180 - x)$$

$$3x = 360 - 12 = 348$$

$$x = 116$$

$$\text{Therefore } y = 180 - 116 = 64$$

Q.17 The denominator of the fraction is 4 more than its numerator. On subtracting 1 from each numerator and denominator the fraction becomes  $\frac{1}{2}$ . Find the original fraction.

Let the fraction be  $\frac{x}{y}$

Given

$$y = x + 4$$

$$\text{Therefore the fraction} = \frac{x}{x + 4}$$

Given,

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

$$2x - 2 = x + 3$$

$$x = 5 \text{ and } y = 9$$

$$\text{Therefore fraction} = \frac{5}{9}$$

Q.18 The denominator of the fraction is 1 more than the double the numerator. On adding 2 to the numerator and subtracting 3 from denominator, we obtain 1. Find the original fraction.

Let the fraction be  $\frac{x}{2x + 1}$

Given

$$\frac{x + 2}{2x + 1 - 3} = 1$$

$$x + 2 = 2x - 2$$

$$x = 4$$

$$\text{Fraction} = \frac{4}{9}$$

Q.19 The sum of the digits of a two-digit number is 5. On adding 27 to the number, its digits are reversed. Find the original number.

*Let the two digit number be  $xy$*

*Given*

$$x + y = 5 \dots\dots\dots i)$$

$$xy + 27 = yx$$

$$10x + y + 27 = 10y + x$$

$$9x + 27 = 9y$$

$$\text{or } x + 3 = y \dots\dots\dots ii)$$

*Solving i) and ii) together.*

$$x + 3 = (5 - x)$$

$$2x = 2$$

$$x = 1$$

$$y = 4$$

*Hence the number = 14*

Q.20 What same numbers should be added to each one of the number 15,23,29,44 to obtain numbers which are in proportion?

*Let the number added to each one of 15,23,29,44 be  $x$*

$$\frac{15 + x}{23 + x} = \frac{29 + x}{44 + x}$$

$$660 + 59x + x^2 = 667 + 52x + x^2$$

$$7x = 7$$

$$x = 1$$

Q.21 The sum of two numbers is 110. One-fifth of the larger number is 8 more than one-ninth of the smaller number. Find the numbers.

*Let the two numbers be  $x$  and  $y$*

*Given*

$$x + y = 110$$

$$\frac{1}{5}x = \frac{1}{9}y + 8$$

*Solving*

$$\frac{1}{5}x = \frac{1}{9}(110 - x) + 8$$

$$\left(\frac{1}{5} + \frac{1}{9}\right)x = \frac{110}{9} + 8 = \frac{182}{9}$$

$$x = \frac{182 \times 45}{9 \times 14} = 65$$

$$y = 110 - 65 = 45$$

*Two numbers are 45 and 65*

Q22 A number is subtracted from the numerator of the fraction  $\frac{12}{13}$  and six times that number is added to the denominator. If the new fraction is  $\frac{1}{11}$  then find the number.

*Let the number subtracted from the numerator =  $x$*

$$\frac{12 - x}{13 + 6x} = \frac{1}{11}$$

$$132 - 11x = 13 + 6x$$

$$17x = 119$$

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

Q.23 A right angled triangle having perimeter 120cm has its two side perpendicular side in the ratio 5:12. Find the lengths of its sides.

*Perimeter of right angled triangle = 120*  
*Perpendicular sides = 5x and 12x*  
*Hypotenuse =  $\sqrt{(5x)^2 + (12x)^2} = 13x$*   
 Therefore  
 $5x + 12x + 13x = 120$   
 $30x = 120$   
 $x = 4$   
 Therefore length of side = 20, 48, 52

Q.24 The sum of the digits of a two-digit number is 9. If 9 is added to the number formed by reversing the digits, then the result is thrice the original number. Find the original number.

*Let the two digit number = xy*  
 $x + y = 9 \dots \dots \dots i)$   
 $yx + 9 = 3(xy)$   
 $10y + x + 9 = 3(10x + y)$   
 $10y + x + 9 = 30x + 3y$   
 $y + 9 = 29x \dots \dots \dots ii)$   
*Solving i) and ii)*  
 $7(9 - x) + 9 = 29x$   
 $63 - 7x + 9 = 29x$   
 $72x = 36$   
 $\text{Or } x = 2$   
 $y = 9 - 2 = 7$   
 Therefore the number = 27

Q.25 The lengths of a rectangle plot of land exceeds its breadth by 23 m. if the length is decreased by 15 m. and the breadth is increased by 7 m. the area is reduced by 360 m<sup>2</sup>

*Find the length and the breadth of the plot.*  
*Let the length = l and breadth = b*  
 $l = 23 + b$   
 Given  
 $(l - 15)(b + 7) = lb - 360$   
 $(23 + b - 15)(b + 7) = (23 + b)b - 360$   
 $(b + 8)(b + 7) = 23b + b^2 - 360$   
 $b^2 + 15b + 56 = 23b + b^2 - 360$   
 $416 = 8b$   
 $\text{or } b = 52\text{m}$   
 Therefore  
 $l = b + 23 = 52 + 23 = 75\text{m}$

Q.26 The length of the rectangular park is twice its breadth. If the perimeter of the park is 186 m, find its length and breadth.

*Let the length =  $l$  and breadth =  $b$*

$$l = 2b$$

$$2l + 2b = 186$$

$$4b + 2b = 186$$

$$6b = 186$$

$$\text{or } b = 31$$

$$l = 62$$

Q.27 The length of the rectangle is 7 cm more than its breadth. If the perimeter of the rectangle is 90cm, find its length and breadth.

*Let the length =  $l$  breadth =  $b$*

$$l = b + 7$$

*Given*

$$2l + 2b = 90$$

$$2(b + 7) + 2b = 90$$

$$4b = 76$$

$$\text{Or } b = 19 \text{ cm}$$

$$l = 19 + 7 = 26 \text{ cm}$$

Q.28 The length of a rectangle is 7 cm less than twice its breadth. If the length is decreased by 2cm and breadth increased by 3cm, the perimeter of the resulting rectangle is 66 cm. find the length and the breadth of the original rectangle

*Let the length =  $l$  and breadth =  $b$*

$$l + 7 = 2b$$

*Given,*

$$2(l - 2) + 2(b + 3) = 66$$

$$2l - 4 + 2b + 6 = 66$$

$$2l + 2b = 64$$

*Solving,*

$$2(2b - 7) + 2b = 64$$

$$6b = 78$$

$$b = 13,$$

$$l = 2 \times 13 - 7 = 19$$

$$\text{breadth} = 13 \text{ cm}$$

$$\text{length} = 19 \text{ cm}$$

Q.29 A man is five times as old as his son. In two years' time, he will be four times as old as his son. Find their present ages.

*Let the man's age =  $5x$*

*If son's age =  $x$*

*Two years later*

$$\text{Man's age} = 5x + 2$$

$$\text{Son's age} = x + 2$$

$$5x + 2 = 4(x + 2)$$

$$x + 6 \text{ years} = \text{son's age}$$

$$\text{Man's age} = 30 \text{ yrs.}$$

Q.30 A man is twice as old as his son. Twelve years ago, the man was thrice as old as his son. Find their present ages.

$$\text{Let the son's age} = x$$

$$\text{Man's age} = 2x$$

12 years ago

$$\text{Son's age} = x - 12$$

$$\text{Man's age} = 2x - 12$$

$$2x - 12 = 3(x - 12)$$

$$2x - 12 = 3x - 36$$

$$x = 24 = \text{son's age}$$

$$\text{Man's age} = 48 \text{ years}$$

Q.31 Seema is 10 years elder than Rekha. The ratio of their ages is 5:3. Find their ages.

$$\text{Let Rekha's age} = x$$

$$\text{Seema's age} = x + 10$$

given

$$\frac{x + 10}{x} = \frac{5}{3}$$

$$3x + 30 = 5x$$

$$2x = 30$$

or  $x = 15$

$$\text{Rekha's age} = 15 \text{ yrs.}$$

$$\text{Seema's age} = 25 \text{ yrs.}$$

Q.32 5 years ago, the age of Parvati was 4 times the age of her son. The sum of their present ages is 55 years. Find Parvati's age.

$$\text{Let the present age of Parvati} = x \text{ yrs}$$

$$\text{age of son} = y \text{ yrs.}$$

$$x + y = 55 \dots\dots\dots i)$$

Five years before

$$\text{parvati} = x - 5 \text{ yrs.}$$

$$\text{son} = y - 5 \text{ yrs.}$$

Given,

$$(x - 5) = 4(y - 5)$$

$$x - 4y = -15 \dots\dots\dots ii)$$

solving i) and ii)

$$x - 4(55 - x) = -15$$

$$5x = 205$$

or  $x = 44 = \text{parvati's age}$

$$\text{Son's age} = 55 - 44 = 22 \text{ years}$$

Q.33 A man is 56 years old and his son is 24 years old. In how many years, the father will be twice as old as his son at that time?

$$\text{Man's age} = 56 \text{ years}$$



*Son's age = 24 years*

*Let in x years, man would be twice the age of son*

$$56 + x = 2(24 + x)$$

$$56 + x = 48 + 2x$$

$$\text{or } x = 8 \text{ years}$$

Q.34 9 years hence, a girl will be 3 times as old as she was 9 years ago. How old is she now?

*Let the current age of the girl = x*

*Given,*

$$x + 9 = 3(x - 9)$$

$$x + 9 = 3x - 27$$

$$2x = 36$$

$$x = 18 \text{ years}$$

$$= \text{age of the girl}$$

Q.35 A man made a trip of 480km in 9 hours. Some part of trip was covered at 45 km/hr and the remaining at 60km/hr. find the part of the trip covered by him at 60km/hr.

*Let the distance covered at 45 km/hr = x*

*Let the distance covered at 60 km/hr = y*

*Total distance = 480 km.*

$$x + y = 480$$

$$\frac{x}{45} + \frac{y}{60} = 9$$

*Solving*

$$\frac{480 - y}{45} + \frac{y}{60} = 9$$

$$\text{or } y = 300 \text{ km and } x = 180 \text{ km}$$

Q.36 A motorist travelled from town A to town B at an average speed of 54km/hr. on his return journey, his average speed was 60km/hr. if the total time taken is 9 hours, find the distance between the two towns.

*Let the distance between town A and B = x*

$$\text{Therefore } \frac{x}{54} + \frac{x}{60} = 9.5$$

$$\text{or } x = 270 \text{ km.}$$

Q.37 The distance between two stations is 300km. two motor-cyclist start simultaneously from these stations and move towards each other. The speed of one of them is 7km/hr faster than that of other. If the distance between them after 2 hours is 34km, find the speed of each motor-cycle

*Distance = 300 km*

*Let the speed of 1st cyclist = x*

*Then speed of 2nd cyclist = x + 7*

*Distance covered by 1s cyclist in 2hr = 2x*

*Distance covered by 2nd cyclist in 2 hr = 2(x + 7)*

*Therefore*

$$2x + 34 + 2(x + 7) = 300$$

$$4x + 48 = 300$$

$$x = \frac{252}{4} = 63 \text{ km/hr}$$

Speed of 1st cyclist = 63 km/hr

Speed of 2nd cyclist = 63 + 7 = 70 km/hr

Q.38 A boat travels 30km upstream in river in the same period of time as it travels 50km downstream. If the ratio of stream be 5 km/hr, find the speed of the boat in still water.

Let the speed of boat =  $x$  km/hr

Speed of stream = 5 km/hr

Speed of boat upstream =  $x - 5$  km/hr

Speed of the boat downstream =  $x + 5$  km/hr

$$\text{Therefore } \frac{30}{x - 5} = \frac{50}{x + 5}$$

$$30x + 150 = 50x - 250$$

$$400 = 20x$$

$$\text{Or } x = 20 \text{ km/hr}$$

Q.39 The length of each of the equal sides of an isosceles triangle is 4cm longer than the base. If the perimeter of the triangle is 62cm, find the lengths of the sides of the triangle.

Let the base =  $x$  cm

Sides =  $(x + 4)$

Perimeter = 62 cm

Therefore

$$(x + 4) + (x) + (x + 4) = 62$$

$$3x + 8 = 62$$

$$3x = 54$$

$$\text{or } x = 18$$

Base = 18 cm, Sides = 22cm

Q.40 A certain number of candidates appeared for an examination in which one-fifth of the whole plus 16 secured first division, one-fourth plus 15 secured second division and one-fourth minus 25 secured third division, if the remaining 60 candidates failed, find the total number of candidates appeared.

Let the number of candidates =  $x$

$$\left(\frac{1}{5}x + 6\right) + \left(\frac{1}{4}x + 15\right) + \left(\frac{1}{4}x - 25\right) + 60 = x$$

$$6 + 60 = x - \left(\frac{1}{5} + \frac{1}{4} + \frac{1}{4}\right)x$$

$$x \left(1 - \frac{14}{20}\right) = 66$$

$$x = \frac{20 \times 66}{6} = 220$$

No. of candidates = 220

Q.41 Raman has 3 times as much money as Kamal. If Raman gives Rs. 750 to Kamal, then Kamal will have twice as much as left with Raman. How much had each originally?

Let money with Kamal =  $x$

Then money with Raman =  $3x$   
 $2(3x - 750) = (x + 750)$   
 Or  $x = 450$  Rs.  
 Kamal has 450 Rs. And Raman 1350 Rs.

Q.42 The angles of triangle are in ratio 2:3:4. Find the angles.

Ratio of angle = 2 : 3 : 4  
 Therefore  
 $2x + 3x + 4x = 180$   
 $9x = 180$   
 $x = 20$   
 Therefore angle are 40, 60, 80degrees.

Q.43 A certain number man can finish a piece of work in 50 days. If there are 7 more men, the work can be completed 10 days earlier. How many men were originally there?

Let  $x$  men finish work in 50 days  
 Total work =  $50x$  man days  
 $x + 7$  men finish work in 40 days  
 Total work =  $(x + 7) \times 40$   
 Therefore  
 $50x = 40(x + 7)$   
 $5x = 4x + 28$   
 $x = 28$   
 Original no of men = 28

Q.44 Divide 600 in two parts such that 495 of one exceeds 60 of the other by 120.

Let the two parts =  $x$  and  $y$   
 $x + y = 600$   
 $0.4x - 0.6y = 120$   
 Solving we get  
 $x = 480$   
 $y = 120$

Q.45 A workman is paid Rs. 150 for each day he works and is fined Rs. 50 for each day he is absent. In a month of 30 days he earned Rs. 2100. For how many days did he remain absent?

Salary = 150 Rs./day  
 Fine = 50 Rs./day  
 Let  $x$  be the number of days worked  
 Therefore  
 $150x - (30 - x)50 = 2100$   
 Or  $x = 18$  days.