Book Name: Selina Concise

EXERCISE 6 (A)

Solution 1:

Let the two consecutive integers be x and x + 1.
From the given information,
$x(x + 1) = 56$
$x^2 + x - 56 = 0$
$(x + 8)(x - 7) = 0$
$x = -8$ or 7
Thus, the required integers are − 8 and −7; 7 and 8.

Solution 2:

Let the numbers be x and x + 1.
From the given information,
$x^2 + (x + 1)^2 = 41$
$2x^2 + 2x + 1 - 41 = 0$
$x^2 + x - 20 = 0$
$(x + 5)(x - 4) = 0$
$x = -5, 4$
But, − 5 is not a natural number. So, x = 4.
Thus, the numbers are 4 and 5.

Solution 3:

Let the two numbers be x and x + 5.
From the given information,
$x^2 + (x + 5)^2 = 97$
$2x^2 + 10x + 25 - 97 = 0$
$2x^2 + 10x - 72 = 0$
$x^2 + 5x - 36 = 0$
$(x + 9)(x - 4) = 0$
$x = -9$ or 4
Since, − 9 is not a natural number. So, x = 4.
Thus, the numbers are 4 and 9.

Solution 4:

Let the numbers be x and $\frac{1}{x}$

From the given information,

$X + \frac{1}{x} = 4.25$

$\frac{x^2+1}{x} = \frac{425}{100} = \frac{17}{4}$

$4x^2 - 17x + 4 = 0$

$4x^2 - 16x - x + 4 = 0$

$4x(x-4) - 1(x-4) = 0$

$(x-4)(4x-1) = 0$

$X = 4, \frac{1}{4}$

$X = 4 \Rightarrow x = 4$

Thus, the numbers are 4 and $\frac{1}{4}$

Solution 5:

Let the numbers be x and x + 3.

From the given information,

$\frac{1}{x} + \frac{1}{x+3} = \frac{7}{10}$

$\frac{x+3+x}{x(x+3)} = \frac{7}{10}$

$\frac{2x+3}{x^2+3x} = \frac{7}{10}$

$20x + 30 = 7x^2 + 21x$

$7x^2 + x - 30 = 0$

$7x^2 - 14x + 15x - 30 = 0$

$7x(x-2) + 15(x-2) = 0$

$(x-2)(7x+15) = 0$

$X = 2, \frac{-15}{7}$

Since, x is a natural number, so x = 2.

Thus, the numbers are 2 and 5.

Solution 6:

Let the two parts be x and x − 15.

$\frac{1}{x} + \frac{1}{15-x} = \frac{3}{10}$

$$\frac{15 - x + x}{x(15 - x)} = \frac{3}{10}$$
$$\frac{15}{15x - x^2} = \frac{3}{10}$$

$150 = 45x - 3x^2$
$3x^2 - 45x + 150 = 0$
$x^2 - 15x + 50 = 0$
$(x - 5)(x - 10) = 0$
$X = 5, 10$
$x = 5 \Rightarrow$ One part = 5 and other part = 10
$x = 10 \Rightarrow$ One part = 10 and other part = 5
Thus, the required two parts are 5 and 10.

Solution 7:

Let the two numbers be x and y, y being the bigger number. From the given information,
$x^2 + y^2 = 208$ ..... (i)
$y^2 = 18x$ ..... (ii)
From (i), we get $y^2 = 208 - x^2$. Putting this in (ii), we get,
$208 - x^2 = 18x$
$\Rightarrow x^2 + 18x - 208 = 0$
$\Rightarrow x^2 + 26x - 8x - 208 = 0$
$\Rightarrow x(x + 26) - 8(x + 26) = 0$
$\Rightarrow (x - 8)(x + 26) = 0$
$\Rightarrow$ x can't be a negative number, hence $x = 8$
$\Rightarrow$ Putting $x = 8$ in (ii), we get $y^2 = 18 \times 8 = 144$
$\Rightarrow y = 12$, since y is a positive integer
Hence, the two numbers are 8 and 12.

Solution 8:

Let the consecutive positive even numbers be x and x + 2.
From the given information,
$x^2 + (x + 2)^2 = 52$
$2x^2 + 4x + 4 = 52$
$2x^2 + 4x - 48 = 0$
$x^2 + 2x - 24 = 0$
$(x + 6)(x - 4) = 0$
$x = -6, 4$
Since, the numbers are positive, so x = 4.
Thus, the numbers are 4 and 6.

Solution 9:
Let the consecutive positive odd numbers be x and x + 2.
From the given information,
$x^2 + (x + 2)^2 = 74$
$2x^2 + 4x + 4 = 74$
$2x^2 + 4x - 70 = 0$
$x^2 + 2x - 35 = 0$
$(x + 7)(x - 5) = 0$
$x = -7, 5$
Since, the numbers are positive, so, x = 5.
Thus, the numbers are 5 and 7.

Solution 10:
Let the required fraction be $\frac{x}{2x+1}$
From the given information,

$$\frac{x}{2x+1} + \frac{2x+1}{x} = 2.9$$

$$\frac{x^2 + 4x^2 + 1 + 4x}{x(2x+1)} = \frac{29}{10}$$

$$\frac{5x^2 + 1 + 4x}{2x^2 + x} = \frac{29}{10}$$

$50x^2 + 10 + 40x = 58x^2 + 29x$

$8x^2 – 11x – 10 = 0$
$X = \frac{11 \pm \sqrt{121 + 320}}{16}$
$X = \frac{11 \pm 21}{16}$
$X = 2, -\frac{5}{8}$
Thus, the required fraction is $\frac{2}{5}$

Solution 11:

Given, three positive numbers are in the ratio $\frac{1}{2} : \frac{1}{3} : \frac{1}{4} = 6 : 4 : 3$
Let the numbers be 6x, 4x and 3x.
From the given information,
$(6x)^2 + (4x)^2 + (3x)^2 = 244$
$36x^2 + 16x^2 + 9x^2 = 244$
$61x^2 = 244$
$x^2 = 4$
$x = \pm 2$
Since, the numbers are positive, so x = 2.
Thus, the numbers are 12, 8 and 6.

Solution 12:

Let the two parts be x and y.
From the given information,
$x + y = 20 \Rightarrow y = 20 - x$
$3x^2 = (20 - x) + 10$
$3x^2 = 30 - x$
$3x^2 + x - 30 = 0$
$3x^2 - 9x + 10x - 30 = 0$
$3x(x - 3) + 10(x - 3) = 0$
$(x - 3)(3x + 10) = 0$
$x = 3, \frac{-10}{3}$
Since, x cannot be equal to, $\frac{-10}{3}$ so, x = 3.
Thus, one part is 3 and other part is 20 − 3 = 17.

Solution 13:

Let the numbers be x−1, x and x + 1.
From the given information,
$x^2 = (x + 1)^2 - (x - 1)^2 + 60$
$x^2 = x^2 + 1 + 2x - x^2 - 1 + 2x + 60$
$x^2 = 4x + 60$
$x^2 - 4x - 60 = 0$
$(x - 10)(x + 6) = 0$
$x = 10, -6$
Since, x is a natural number, so x = 10.
Thus, the three numbers are 9, 10 and 11.

Solution 14:

Let the numbers be p − 1, p and p + 1.
From the given information,
$3(p + 1)^2 = (p - 1)^2 + p^2 + 67$
$3p^2 + 6p + 3 = p^2 + 1 - 2p + p^2 + 67$
$p^2 + 8p - 65 = 0$
$(p + 13)(p - 5) = 0$
$p = -13, 5$
Since, the numbers are positive so p cannot be equal to −13.
Thus, p = 5.

Solution 15:

Work done by A in one day = $\frac{1}{x}$
Work done by B in one day = $\frac{1}{x+16}$
Together A and B can do the work in 15 days. Therefore, we have:

$$\frac{1}{x} + \frac{1}{x+16} = \frac{1}{15}$$

$$\frac{x + 16 + x}{x(x+16)} = \frac{1}{15}$$

$$\frac{2x + 16}{x^2 + 16x} = \frac{1}{15}$$

$30x + 240 = x^2 + 16x$

$x^2 - 14x - 240 = 0$
$(x - 24)(x + 10) = 0$
X = 24, − 10
Since, x cannot be negative
Thus, x = 24.

Solution 16:

Let one pipe fill the cistern in x hours and the other fills it in (x - 3) hours.
Given that the two pipes together can fill the cistern in 6 hours 40 minutes, i.e.,$6\frac{40}{60} hours = 6\frac{2}{3} hours$

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

$\frac{x-3+x}{x(x-3)} = \frac{3}{20}$

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

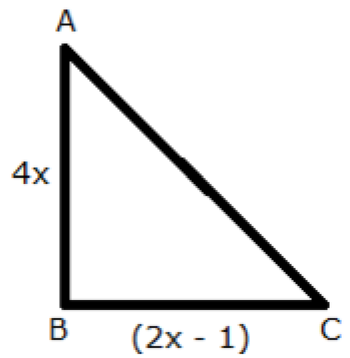
$40x – 60 = 3x^2 – 9x$
$3x^2 – 49x + 60 = 0$
$3x^2 – 45x - 4x + 60 = 0$
$3x(x – 15) – 4 (x – 15) = 0$
$(x – 15) (3x – 4) = 0$
X = 15, $\frac{4}{3}$
If x = $\frac{4}{3}$, then x – 3 = $\frac{4}{3} - 3 = \frac{4-9}{3} = \frac{-5}{3}$, which is not possible
So, x = 15
Thus, one pipe fill the cistern in 15 hours and the other fills in (x − 3) = 15 − 3 = 12 hours.

Solution 17:

Let the smaller part be x.
Then, (larger part)^2 = 8x
\ larger part = $\sqrt{8x}$
Now, the sum of the squares of both the terms is given to be 208
$x^2 + (\sqrt{8x})^2 = 20$
$\Rightarrow x^2 + 8x = 20$
$\Rightarrow x^2 + 8x – 20 = 0$
$\Rightarrow x^2 – 2x + 10x − 20 = 0$
$\Rightarrow x(x – 2) + 10 (x – 2) = 0$
$\Rightarrow (x – 2) (x + 10) = 0$
$\Rightarrow x = 2, − 10$
X = − 10 is rejected as it is negative
$\therefore$ x = 2
Smaller part = 2
Larger part = $\sqrt{8 \times 2}$ = 4
Thus, the required number is 2 + 4 = 6.

EXERCISE. 6 (B)

Solution 1:



Area of triangle = 30 cm^2

$\therefore \frac{1}{2} \times (4x) \times (2x - 1 = 30$

$2x^2 - x = 15$

$2x^2 - x - 15 = 0$

$2x^2 - 6x + 5x - 15 = 0$

$2x(x - 3) + 5(x - 3) = 0$

$(x - 3)(2x + 5) = 0$

$X = 3, \frac{-5}{2}$

But, x cannot be negative, so x = 3.

Thus, we have:

AB = 4 × 3 cm = 12 cm

BC = (2 ×3 − 1) cm = 5 cm

CA = $\sqrt{12^2 + 5^2}$ cm = 13cm (Using Pythagoras theorem).

Solution 2:

Hypotenuse = 26 cm

The sum of other two sides is 34 cm.

So, let the other two sides be x cm and (34 − x) cm.

Using Pythagoras theorem,

$(26)^2 = x^2 + (34 - x)^2$

$676 = x^2 + x^2 + 1156 - 68x$

$2x^2 - 68x + 480 = 0$

$x^2 - 34x + 240 = 0$

$x^2 - 10x - 24x + 240 = 0$

$x(x - 10) - 24(x - 10) = 0$

$(x - 10)(x - 24) = 0$

$x = 10, 24$

When x = 10, (34 − x) = 24

When $x = 24$, $(34 - x) = 10$
Thus, the lengths the three sides of the right-angled triangle are 10 cm, 24 cm and 26 cm.

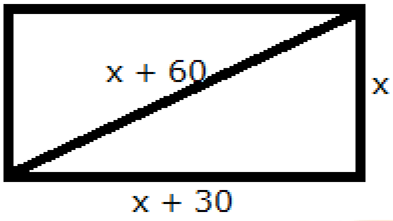
Solution 3:

Longer side = Hypotenuse = $(3x + 1)$ cm
Lengths of other two sides are $(x - 1)$ cm and $3x$ cm.
Using Pythagoras theorem,
$(3x + 1)^2 = (x - 1)^2 + (3x)^2$
$9x^2 + 1 + 6x = x^2 + 1 - 2x + 9x^2$
$x^2 - 8x = 0$
$x(x - 8) = 0$
$x = 0, 8$
But, if $x = 0$, then one side $= 3x = 0$, which is not possible.
So, $x = 8$
Thus, the lengths of the sides of the triangle are $(x - 1)$ cm = 7 cm, $3x$ cm = 24 cm and $(3x + 1)$ cm = 25 cm.
Area of the triangle = $\frac{1}{2} \times 7\ cm\ \times 24\ cm = 84\ cm^2$

Solution 4:

Let one hypotenuse of the triangle be x cm.
From the given information,
Length of one side = $(x - 1)$ cm
Length of other side = $(x - 18)$ cm
Using Pythagoras theorem,
$x^2 = (x - 1)^2 + (x - 18)^2$
$x^2 = x^2 + 1 - 2x + x^2 + 324 - 36x$
$x^2 - 38x + 325 = 0$
$x^2 - 13x - 25x + 325 = 0$
$x(x - 13) - 25(x - 13) = 0$
$(x - 13)(x - 25) = 0$
$x = 13, 25$, When $x = 13$, $x - 18 = 13 - 18 = -5$, which being negative, is not possible.
So, $x = 25$
Thus, the lengths of the sides of the triangle are $x = 25$ cm, $(x-1) = 24$ cm and $(x-18) = 7$ cm.

Solution 5:



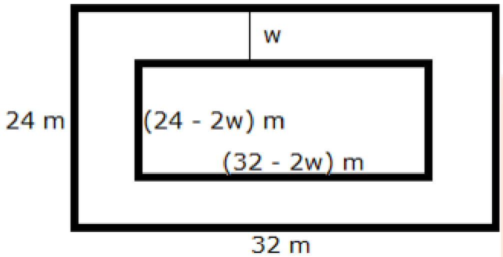
Let the shorter side be x m.
Length of the other side = (x + 30) m
Length of hypotenuse = (x + 60) m
Using Pythagoras theorem,
$(x + 60)^2 = x^2 + (x + 30)^2$
$x^2 + 3600 + 120x = x^2 + x^2 + 900 + 60x$
$x^2 - 60x - 2700 = 0$
$x^2 - 90x + 30x - 2700 = 0$
$x(x - 90) + 30(x - 90) = 0$
$(x - 90)(x + 30) = 0$
$x = 90, -30$
But, x cannot be negative. So, x = 90.
Thus, the sides of the rectangle are 90 m and (90 + 30) m = 120 m.

Solution 6:

Let the length and the breadth of the rectangle be x m and y m.
Perimeter = 2(x + y) m
$\therefore 104 = 2(x + y)$
$x + y = 52$
$y = 52 - x$
Area = 640 m^2
$\therefore xy = 640$
$x(52 - x) = 640$
$x^2 - 52x + 640 = 0$
$x^2 - 32x - 20x + 640 = 0$
$x(x - 32) - 20(x - 32) = 0$
$(x - 32)(x - 20) = 0$
$x = 32, 20$
When x = 32, y = 52 − 32 = 20
When x = 20, y = 52 − 20 = 32
Thus, the length and breadth of the rectangle are 32 cm and 20 cm.

Solution 7:

Let w be the width of the foot path.



Area of the path = Area of outer rectangle - Area of inner rectangle

$\therefore$ 208 = (32)(24) − (32 − 2w)(24 − 2w)

$208 = 768 - 768 + 64w + 48w - 4w^2$

$4w^2 - 112w + 208 = 0$

$w^2 - 28w + 52 = 0$

$w^2 - 26w - 2w + 52 = 0$

$w(w - 26) - 2(w - 26) = 0$

$(w - 26)(w - 2) = 0$

w = 26, 2

If w = 26, then breadth of inner rectangle = (24 − 52) m = −28 m, which is not possible.

Hence, the width of the footpath is 2 m.

Solution 8:

Given that, two squares have sides x cm and (x + 4) cm.

Sum of their area = 656 cm^2

$\therefore\ x^2 + (x + 4)^2 = 656$

$x^2 + x^2 + 16 + 8x = 656$

$2x^2 + 8x - 640 = 0$

$x^2 + 4x - 320 = 0$

$x^2 + 20x - 16x - 320 = 0$

$x(x + 20) - 16(x + 20) = 0$

$(x + 20)(x - 16) = 0$

x = − 20, 16

But, x being side, cannot be negative.

So, x = 16

Thus, the sides of the two squares are 16 cm and 20 cm.

Solution 9:
Let the width of the gravel path be w m.
Length of the rectangular field = 50 m
Breadth of the rectangular field = 40 m
Let the length and breadth of the flower bed be x m and y m respectively.

Therefore, we have:
$x + 2w = 50$ ... (1)
$y + 2w = 40$ ... (2)

Also, area of rectangular field = 50 m × 40 m = 2000 m^2

Area of the flower bed = xy m^2
Area of gravel path = Area of rectangular field - Area of flower bed = (2000 - xy) m^2

Cost of laying flower bed + Gravel path = Area × cost of laying per sq. m
$\therefore 52000 = 30 \times xy + 20 \times (2000 - xy)$
$52000 = 10xy + 40000$
$xy = 1200$
Using (1) and (2), we have:
$(50 - 2w)(40 - 2w) = 1200$
$2000 - 180w + 4w^2 = 1200$
$4w^2 - 180w + 800 = 0$
$w^2 - 45w + 200 = 0$
$w^2 - 5w - 40w + 200 = 0$
$w(w - 5) - 40(w - 5) = 0$
$(w - 5)(w - 40) = 0$
$w = 5, 40$

If $w = 40$, then $x = 50 - 2w = -30$, which is not possible.
Thus, the width of the gravel path is 5 m.

Solution 10:
Let the size of the larger tiles be x cm.
Area of larger tiles = x^2 cm^2
Number of larger tiles required to pave an area is 128.
So, the area needed to be paved = 128 x^2 cm^2 ... (1)
Size of smaller tiles = (x − 2)cm
Area of smaller tiles = $(x - 2)^2$ cm^2
Number of larger tiles required to pave an area is 200.
So, the area needed to be paved = 200 $(x - 2)^2$ cm^2.... (2)

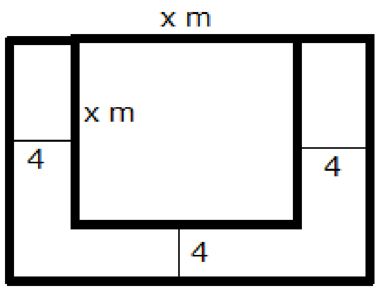
Therefore, from (1) and (2), we have:
$128\,x^2 = 200\,(x - 2)^2$
$128\,x^2 = 200x^2 + 800 - 800x$
$72x^2 - 800x + 800 = 0$
$9x^2 - 100x + 100 = 0$
$9x^2 - 90x - 10x + 100 = 0$
$9x(x - 10) - 10(x - 10) = 0$
$(x - 10)(9x - 10) = 0$
$x = 10, \frac{10}{9}$
If $x = \frac{10}{9}$, then $x - 2 = \frac{10}{9} - 2 = \frac{10-18}{9} = \frac{-8}{9}$ which is not possible.

Hence, the size of the larger tiles is 10 cm.

Solution 11:
Let the length and breadth of the rectangular sheep pen be x and y respectively.
From the given information,
$x + y + x = 70$
$2x + y = 70 \ldots (1)$

Also, area = $xy = 600$
Using (1), we have:
$x\,(70 - 2x) = 600$
$70x - 2x^2 = 600$
$2x^2 - 70x + 600 = 0$
$x^2 - 35x + 300 = 0$
$x^2 - 15x - 20x + 300 = 0$
$x(x - 15) - 20(x - 15) = 0$
$(x - 15)(x - 20) = 0$
$x = 15, 20$
If $x = 15$, then $y = 70 - 2x = 70 - 30 = 40$
If $x = 20$, then $y = 70 - 2x = 70 - 40 = 30$
Thus, the length of the shorter side is 15 m when the longer side is 40 m. The length of the shorter side is 20 m when the longer side is 30 m.

Solution 12:
Let the side of the square lawn be x m.
Area of the square lawn = x^2 m^2
The square lawn is bounded on three sides by a path which is 4 m wide.



Area of outer rectangle = (x + 4) (x + 8) = x^2 + 12x + 32
Area of path = x^2 + 12x + 32 − x^2 = 12x + 32
From the given information, we have:
12x + 32 = $\frac{7}{8}x^2$
96x + 256 = $7x^2$
$7x^2$ – 96x – 256 = 0
$7x^2$ – 112x + 16x − 256 = 0
7x(x – 16)+16 (7x + 16) = 0
(x-16) (7x+16) = 0
X = 16, $\frac{-16}{7}$
Since, x cannot be negative. So, x = 16 m.
Thus, each side of the square lawn is 16 m.

Solution 13:

Let the original length and breadth of the rectangular room be x m and y m respectively.
Area of the rectangular room = xy = 300
⟹ y = $\frac{300}{x}$ ……… (1)
New length = (x − 5) m
New breadth = (y + 5) m
New area = (x − 5) (y + 5) = 300 (given)
Using (1), we have:
(x – 5) $\left(\frac{300}{x}+5\right)$ = 300
300 + 5x − $\frac{1500}{x} - 25 = 300$
5x − $\frac{1500}{x}$ – 25 = 0
$5x^2$ – 25x – 1500 = 0
x^2 – 5x – 300 = 0
x^2 – 20x + 15x – 300 = 0
x(x – 20) + 15 (x – 20) = 0
(x – 20) (x + 15) = 0

X = 20, − 15
But, x cannot be negative. So, x = 20.
Thus, the length of the room is 20 m.

EXERCISE. 6 (C)

Solution 1:

(i) Speed of ordinary train = x km/hr
Speed of express train = (x + 25) km/hr
Distance = 300 km
We know:
Time = $\frac{Distance}{speed}$
∴ Time taken by ordinary train to cover 300 km = $\frac{300}{x}$ hrs
Time taken by express train to cover 300 km = $\frac{300}{x+25}$ hrs

(ii) Given that the ordinary train takes 2 hours more than the express train to cover the distance.
Therefore,

$$\frac{300}{x} - \frac{300}{x+25} = 2$$

$\frac{300x+7500-300x}{x(x+25)}$ = 2
7500 = $2x^2$ + 50x
$2x^2$ + 50x – 7500 = 0
x^2 + 25x – 3750 = 0
x^2 + 75x – 50x – 3750 = 0
x(x + 75) – 50 (x + 75) = 0
(x + 75) (x – 50) = 0
X = − 75, 50
But speed cannot be negative. so, x = 50.
∴ speed of the express train = (x + 25) km/hr = 75 km/hr.

Solution 2:

Let the speed of the car be x km/hr.
Distance = 36 km
Time taken to cover a distance of 36 km = $\frac{36}{x}$ hrs

$$\left(\text{Time} = \frac{Distance}{speed}\right)$$

New speed of the car = (x + 10) km/hr

New time taken by the car to cover a distance of 36 km = $\frac{36}{x+10}$ hrs

From the given information, we have:

$$\frac{36}{x} - \frac{36}{x+10} = \frac{18}{60}$$

$$\frac{36x + 360 - 36x}{x(x+10)} = \frac{3}{10}$$

$$\frac{360}{x^2 + 10x} = \frac{3}{10}$$

$$\frac{120}{x^2 + 10x} \quad \frac{1}{10}$$

$X^2 + 10x – 1200 = 0$

(x + 40) (x – 30) = 0

X = − 40, 30

But, speed cannot be negative. So, x = 30.

Hence, the original speed of the car is 30 km/hr.

Solution 3:

Let the original speed of the aeroplane be x km/hr.

Time taken to cover a distance of 1200 km = $\frac{1200}{x}$ hrs

$$\left(\text{Time} = \frac{Distance}{speed}\right)$$

Let the new speed of the aeroplane be (x - 40) km/hr.

Time taken to cover a distance of 1200 km = $\frac{1200}{x-40}$ hrs

From the given information, we have:

$$\frac{1200}{x-40} - \frac{20}{60} = \frac{1200}{x}$$

$$\frac{1200}{x-40} - \frac{1200}{x} = \frac{20}{60}$$

$$\frac{1200 - 1200x + 48000}{x(x-40)} = \frac{1}{3}$$

x(x – 40) = 48000 × 3

$x^2 – 40x – 144000 = 0$

$x^2 – 400x + 360x – 144000 = 0$

x(x – 400) + 360 (x – 400) = 0

(x – 400)(x + 360) = 0

X = 400, − 360

But, speed cannot be negative. So, x = 400.
Thus, the original speed of the aeroplane is 400 km/hr.

Solution 4:
Let x km/h be the original speed of the car.
We know that,
Time = $\frac{Distance}{speed}$
It is given that the car covers a distance of 400 km with the speed of x km/h.
Thus, the time taken by the car to complete 400 km is
t = $\frac{400}{x}$
Now, the speed is increased by 12 km.
Increased speed = (x + 12) Km/h
Also given that, increasing the speed of the car will decrease the time taken by 1 hour 40 minutes.

Hence,
$\frac{400}{x} - \frac{400}{x+12}$ = 1 hour 40 minutes
$\Rightarrow \frac{400}{x} - \frac{400}{x+12} = 1\ \frac{40}{60}$
$\Rightarrow \frac{400\,(x+12) - 400x}{x\,(+12)}$
$\Rightarrow \frac{400x + 4800 - 400x}{x(x+12)} = 1\ \frac{2}{3}$
$\Rightarrow \frac{4800}{x(x+12)} = \frac{5}{3}$
⇒ 3 × 4800 = 5 × x × (x + 12)
⇒ 14400 = $5x^2$ + 60x
⇒ $5x^2$ + 60x – 14400 = 0
⇒ x^2 + 12x – 2880 = 0
⇒ x^2 + 60x – 48x − 2880 = 0
⇒ x(x + 60) -48 (x + 60) = 0
⇒ x(x + 60) (x – 48) = 0
⇒ x + 60 = 0 Or x – 48 = 0
⇒ x = − 60 Or x = 48
Since speed cannot be negative, the original
Speed of the car is 48 km/ h.

Solution 5:
We know:

Time = $\frac{Distance}{speed}$
Given, the girl covers a distance of 6 km at a speed x km/ hr.
Time taken to cover first 6 km = $\frac{6}{x}$
Also, the girl covers the remaining 6 km distance at a speed (x + 2) km/ hr.
Time taken to cover next 6 km = $\frac{6}{x+2}$
Total time taken to cover the whole distance = 2 hrs 30 mins = 2 $\frac{30}{60}$ = $2\frac{1}{2}$ = $\frac{5}{2}$ hrs
$\therefore \frac{6}{x} + \frac{6}{x+2} = \frac{5}{2}$

$$\frac{6x + 12 + 6x}{x(x+2)} = \frac{5}{2}$$

$\frac{12+12x}{x^2+2x} = \frac{5}{2}$

$24 + 24x = 5x^2 + 10x$
$5x^2 – 14x – 24 = 0$
$5x^2 – 20x + 6x – 24 = 0$
$5x(x – 4) + 6 (x – 4) = 0$
$(5x + 6) (x – 4) = 0$
X = $\frac{-6}{5}, 4$
Since, speed cannot be negative. Therefore, x = 4.

Solution 6:

Let the original speed of the car be y km/ hr
We know
Speed = $\frac{Distance}{Time}$
$\therefore$ y = $\frac{390}{x}$
$\Rightarrow$ x = $\frac{390}{y}$ ….. (1)
New speed of the car = (y + 4) km/hr
New time taken by the car to cover 390 km = $\frac{390}{y+4}$
From the given information,

$$\frac{390}{y} - \frac{390}{y+4} = 2$$

$\frac{390y+1560-390y}{y(y+4)}$ = 2

$$\frac{780}{y^2+4y} = 1$$

$y^2 + 4y – 780 = 0$

$y^2 + 30y - 26y - 780 = 0$
$y(y + 30) - 26(y + 30) = 0$
$(y + 30)(y - 26) = 0$
$y = -30, 26$
since, time cannot be negative, so y = 26
From (1), we have:
$X = \frac{390}{y} = \frac{390}{26} = 15$

Solution 7:

Let the speed of goods train be x km/hr. So, the speed of express train will be (x + 20) km/hr.
Distance = 1040 km
We know:
Time = $\frac{Distance}{Speed}$
Time taken by goods train to cover a distance of 1040 km = $\frac{1040}{x}$ hrs
Time taken by express train to cover a distance of 1040 km = $\frac{1040}{x+20}$ hrs
It is given that the express train arrives at a station 36 minutes before the goods train. Also, the express train leaves the station 2 hours after the goods train. This means that the express train arrives at the station $\left(\frac{36}{60} + 2\right) Hrs = \frac{13}{5}$ hrs before the goods train.
Therefore, we have:

$$\frac{1040}{x} - \frac{1040}{x+20} = \frac{13}{5}$$

$$\frac{1040x + 20800 - 1040x}{x(x+20)} = \frac{13}{5}$$

$$\frac{20800}{x^2 + 20x} = \frac{13}{5}$$

$$\frac{1600}{x^2 + 20x} = \frac{1}{5}$$

$X^2 + 20x - 8000 = 0$
$(x - 80)(x + 100) = 0$
$X = 80, -100$
Since, the speed cannot be negative. So, x = 80.
Thus, the speed of goods train is 80 km/hr and the speed of express train is 100 km/hr.

Solution 8:

C.P. of the article = Rs x
S.P. of the article = Rs 16
Loss = Rs (x − 16)
We know:
Loss% = $\frac{Loss}{C.P} \times 100$
∴ x = $\frac{x-16}{x} \times 100$
X^2 – 100x + 1600 = 0
(x – 80) (x – 20) = 0
X = 80, 20
Thus, the cost price of the article is Rs. 20 Or Rs. 80

Solution 9:

C.P. of the article = Rs x
S.P. of the article = Rs 52
Loss = Rs (52 − x)
We know:
Profit % = $\frac{Profit}{C.P} \times 100$
∴ x – 10 = $\frac{52-x}{x} \times 100$
X^2 – 10x = 5200 – 100x
X^2 + 90x – 5200 = 0
(x + 130) (x – 40) = 0
X = −130, 40
Since, C.P. cannot be negative. So, x = 40.
Thus, the cost price of the article is Rs 40.

Solution 10:

Let the C.P. of the chair be Rs x
S.P. of chair = Rs 75
Profit = Rs (75 − x)
We know:
Profit % = $\frac{Profit}{C.P} \times 100$
∴ x = $\frac{75-x}{x} \times 100$
X^2 = 7500 – 100x
X^2 + 100x − 7500 = 0
(x + 150) (x – 50) = 0

X = −150, 50
But, C.P. cannot be negative. So, x = 50.
Hence, the cost of the chair is Rs 50.

EXERCISE 6 (D)

Solution 1:
From the given information, we have:
$n(n + 2) = 168$
$n^2 + 2n - 168 = 0$
$n^2 + 14n - 12n - 168 = 0$
$n(n + 14) - 12(n + 14) = 0$
$(n + 14)(n - 12) = 0$
$n = -14, 12$
But, n cannot be negative.
Therefore, n = 12.

Solution 2:
From the given information,
$16t^2 + 4t = 420$
$4t^2 + t - 105 = 0$
$4t^2 - 20t + 21t - 105 = 0$
$4t(t - 5) + 21(t - 5) = 0$
$(4t + 21)(t - 5) = 0$
$t = -\frac{21}{4}, 5$
But, time cannot be negative.
Thus, the required time taken is 5 seconds.

Solution 3:
Let the ten's and unit's digit of the required number be x and y respectively.
From the given information,
$X \times y = 24$
$Y = \frac{24}{x}$ ……… (1)
Also, $y = 2x + 2$
$\frac{24}{x} = 2x + 2$ [using (1)]
$24 = 2x^2 + 2x$

$2x^2 + 2x - 24 = 0$
$X^2 + x - 12 = 0$
$(x + 4)(x - 3) = 0$
$X = -4, 3$
The digit of a number cannot be negative, so x = 3
$\therefore y = \frac{24}{3} = 8$
Thus, the required number is 38.

Solution 4:

The ages of two sisters are 11 years and 14 years.
Let in x number of years the product of their ages be 304.
$\therefore (11 + x)(14 + x) = 304$
$154 + 11x + 14x + x^2 = 304$
$X^2 + 25x - 150 = 0$
$(x + 30)(x - 5) = 0$
$X = -30, 5$
But, the number of years cannot be negative. So, x = 5.
Hence, the required number of years is 5 years.

Solution 5:

Let the present age of the son be x years.
$\therefore$ Present age of man = x^2 years
One year ago,
Son's age = $(x - 1)$ years
Man's age = $(x^2 - 1)$ years
It is given that one year ago; a man was 8 times as old as his son.
$\therefore (x^2 - 1) = 8(x - 1)$
$x^2 - 8x - 1 + 8 = 0$
$x^2 - 8x + 7 = 0$
$(x - 7)(x - 1) = 0$
$x = 7, 1$
If x = 1, then $x^2 = 1$, which is not possible as father's age cannot be equal to son's age.
So, x = 7.
Present age of son = x years = 7 years
Present age of man = x^2 years = 49 years.

Solution 6:

Let the present age of the son be x years.

∴ Present age of father = $2x^2$ years
Eight years hence,
Son's age = (x + 8) years
Father's age = $(2x^2 + 8)$ years
It is given that eight years hence, the age of the father will be 4 years more than three times the age of the son.
∴ $2x^2 + 8 = 3(x + 8) + 4$
$2x^2 + 8 = 3x + 24 + 4$
$2x^2 - 3x - 20 = 0$
$2x^2 - 8x + 5x - 20 = 0$
$2x(x - 4) + 5(x - 4) = 0$
$(x - 4)(2x + 5) = 0$
$x = 4, \frac{-5}{2}$
But, the age cannot be negative, so, x = 4.
∴ Present age of son = 4 years
Present age of father = $2(4)^2$ years = 32 years.

Solution 7:

Let the speed of the stream be x km/hr.
∴ Speed of the boat downstream = (15 + x) km/hr
Speed of the boat upstream = (15 - x) km/hr
Time taken to go 30 km downstream = $\frac{30}{15+x}$ hr
Time taken to come back = $\frac{30}{15-x}$ hr
From the given information,

$$\frac{30}{15+x} + \frac{30}{15-x} = 4\,\frac{30}{60}$$

$$\frac{30}{15+x} + \frac{30}{15-x} = \frac{9}{2}$$

$$\frac{450 - 30x + 450 + 30x}{(15+x)(15-x)} = \frac{9}{2}$$

$$\frac{900}{225 - x^2} = \frac{9}{2}$$

$$\frac{100}{225 - x^2} = \frac{1}{2}$$

$225 - x^2 = 200$
$X^2 = 25$

X = ± 5
But, x cannot be negative, so, x = 5.
Thus, the speed of the stream is 5 km/hr.

Solution 8:

Number of oranges = y
Cost of one orange = Rs. $\frac{15}{y}$
The servant ate 3 oranges, so Mr. Mehra received (y - 3) oranges.
So, x = y − 3 ⇒ y = x + 3 ...(1)
Cost of one orange paid by Mr. Mehra = Rs. $\frac{15}{y} + 0.25$
= Rs. $\frac{15}{x+3} + \frac{1}{4}$ [using (1)]
Now, Mr. mehra pays a total of Rs 15.
∴ $\left(\frac{15}{x+3} + \frac{1}{4}\right) \times x = 15$
$$\frac{60 + x + 3}{4(x+3)} \times x = 15$$
63x + x^2 = 60x + 180
X^2 + 3x – 180 = 0
(X + 15) (x – 12) = 0
X = −15, 12
But, the number of oranges cannot be negative. So, x = 12.

Solution 9:

Let the number of children be x.
It is given that Rs 250 is divided amongst x students.
So, money received by each child = Rs $\frac{250}{x}$
If there were 25 children more, then
Money received by each child = Rs $\frac{250}{x+25}$
From the given information,
$$\frac{250}{x} - \frac{250}{x+25} = \frac{50}{100}$$
$$\frac{250x + 6250 - 250x}{x(x+25)} = \frac{1}{2}$$
$$\frac{6250}{x^2 + 25x} = \frac{1}{2}$$
X^2 + 25x – 12500 = 0

(x + 125)(x – 100) = 0
X = − 125, 100
Since, the number of students cannot be negative, so, x = 100.
Hence, the number of students is 100.

Solution 10:

Original weekly wage of each worker = Rs x
Original weekly wage bill of employer = Rs 3150
Number of workers = $\frac{3150}{x}$
New weekly wage of each worker = Rs (x + 5)
New weekly wage bill of employer = Rs 3250
Number of workers = $\frac{3250}{x+5}$
From the given condition,
$\frac{3150}{x} - 5 = \frac{3250}{x+5}$
$\frac{3150-5x}{x} = \frac{3250}{x+5}$
$3150x - 5x^2 + 15750 - 25x = 3250x$
$-5x^2 + 15750 - 125x = 0$
$X^2 + 25x - 3150 = 0$
$X^2 + 70x - 45x - 3150 = 0$
X(x + 70) – 45(x + 70) = 0
(x +70) (x – 45) = 0
X = − 70, 45
Since, wage cannot be negative, x = 45.
Thus, the original weekly wage of each worker is Rs 45.

Solution 11:

Number of articles bought by the trader = x
It is given that the trader bought the articles for Rs 1200.
So, cost of one article = Rs $\frac{1200}{x}$
Ten articles were damaged. So, number of articles left = x - 10
Selling price of each of (x - 10) articles = Rs $\left(\frac{1200}{x} + 2\right)$
Selling price of (x - 10) articles = Rs (x − 10) $\left(\frac{1200}{x} + 2\right)$
Profit = Rs 60

$\therefore$ (x – 10) $\left(\frac{1200}{x} + 2\right)$ – 1200 = 60
1200 + 2x − $\frac{12000}{x} - 20 - 1200 = 60$
2x – $\frac{12000}{x} - 80 = 0$
$2x^2 - 80x - 12000 = 0$
$X^2 - 40x - 6000 = 0$
$X^2 - 100x + 60x - 6000 = 0$
X(x – 100) + 60(x – 100) = 0
(x – 100)(x + 60) = 0
X = 100, − 60
Number of articles cannot be negative. So, x = 100.

Solution 12:
Let the number of articles bought be x.
Total cost price of x articles = Rs 4800
Cost price of one article = Rs $\frac{4800}{x}$
Selling price of each article = Rs 100
Selling price of x articles = Rs 100x
Given, Profit = C.P. of 15 articles
$\therefore$ 100x − 4800 = 15 × $\frac{4800}{x}$
$100x^2 - 4800x = 15 \times 4800$
$x^2 - 48x - 720 = 0$
$x^2 - 60x + 12x - 720 = 0$
x(x − 60) + 12(x − 60) = 0
(x − 60) (x + 12) = 0
x = 60, −12
Since, number of articles cannot be negative. So, x = 60.
Thus, the number of articles bought is 60.

EXERCISE. 6 (E)

Solution 1:
Speed of car = x km/hr
Speed of train = (x + 16) km/hr
(i) we know: Time = $\frac{Distance}{Speed}$
Time taken by the car to reach town B from A = $\frac{216}{x}$ hrs

(ii) Time taken by the train to reach town B from A = $\frac{208}{(x+16)}$ hrs

(iii) From the given information,

$$\frac{216}{x} - \frac{208}{x+16} = 2$$

$$\frac{216x + 3456 - 208x}{x\,(\,x+16)} = 2$$

$$\frac{8x + 3456}{x(x+16)} = 2$$

$4x + 1728 = x^2 + 16x$
$X^2 + 12x – 1728 = 0$
$X^2 + 48x – 36x – 1728 = 0$
$X(x + 48) – 36x\ (x + 48) = 0$
$(x + 48)\ (x – 36) = 0$
$X = -48, 36$

But, speed cannot be negative. So, x = 36

(iv) speed of train = (36 + 16) km/hr = 52 km/hr.

Solution 2:

Number of articles = x
Total cost of articles = Rs. 600
(i) cost of one article = Rs. $\frac{600}{x}$

(ii) From the given information, we have

$$\frac{600}{x-4} - \frac{600}{x} = 5$$

$$\frac{600x - 600x + 2400}{x\,(\,x-4)} = 5$$

$$\frac{480}{x(x-4)} = 1$$

$X^2 – 4x – 480 = 0$
$X^2 – 24x + 20x – 480 = 0$
$X(x – 24) + 20\ (x – 24) = 0$
$(x - 24)\ (x + 20) = 0$
$X = 24, -20$

Since, number of articles cannot be negative. So, x = 24.

Solution 3:

Let the number of people staying overnight be x.
Total hotel bill = Rs. 4800
Hotel bill for each person = Rs. $\frac{4800}{x}$
From the given information,

$$\frac{4800}{x} - \frac{4800}{x+4} = 200$$

$$\frac{4800x + 4800 \times 4 - 4800x}{x(x+4)} = 200$$

$$\frac{96}{x^2 + 4x} = 1$$

$X^2 + 4x - 96 = 0$
$X^2 + 12x - 8x - 96 = 0$
$X(x + 12) - 8(x + 12) = 0$
$(x - 8)(x + 12) = 0$
$X = 8, -12$
Since, the number of people cannot be negative. So, x = 8
Thus, the number of people staying overnight is 8.

Solution 4:

Distance = 400 km
Average speed of the aero plane = x km/hr
Speed while returning = (x + 40) km/hr

(i) we know: Time = $\frac{Distance}{Speed}$
Time taken for onward journey = $\frac{400}{x}$ hrs

(ii) Time taken for return journey = $\frac{400}{(x+40)}$ hrs
From the given information, we have:

$$\frac{400}{x} - \frac{400}{x+4} = \frac{30}{60}$$

$$\frac{400x + 16000 - 400x}{x(x+40)} = \frac{1}{2}$$

$$\frac{16000}{x(x+40)} = \frac{1}{2}$$

$x^2 + 40x - 32000 = 0$
$x^2 + 200x - 160x - 32000 = 0$
$x(x + 200) - 160(x + 200) = 0$
$(x + 200)(x - 160) = 0$
$X = -200, 160$
Since, the speed cannot be negative. Thus, x = 160

Solution 5:

Let the original number of persons be x.
Total money which was divided = Rs. 6500
Each person's share = Rs. $\frac{6500}{x}$
From the given information,

$$\frac{6500}{x} - \frac{6500}{x+15} = 30$$

$$\frac{6500x + 6500 \times 15 - 6500x}{x(x+15)} = 30$$

$$\frac{3250}{x(x+15)} = 1$$

$x^2 + 15x - 3250 = 0$
$x^2 + 65x - 50x - 3250 = 0$
$x(x + 65) - 50(x + 65) = 0$
$(x + 65)(x - 50) = 0$
$X = -65, 50$

Since, the number of persons cannot be negative.
Hence, the original number of persons is 50.

Solution 6:

Let the usual speed of plane be x km/hr.
Distance = 1500 km
From the given information, we have:

$$\frac{1500}{x} - \frac{1500}{x+250} = \frac{30}{60}$$

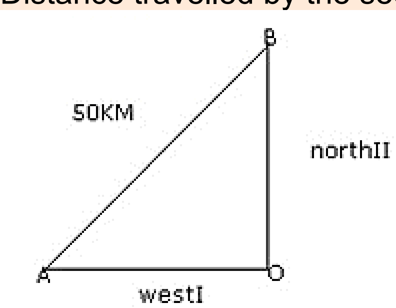
$$\frac{1500x + 1500 \times 250 - 1500x}{x(x+250)} = \frac{1}{2}$$

$$\frac{1500 \times 250}{x^2 + 250x} = \frac{1}{2}$$

$x^2 + 250x – 750000 = 0$
$x^2 + 1000x – 750x – 750000 = 0$
$x(x + 1000) – 750(x + 1000) = 0$
$(x + 1000)(x – 750) = 0$
X = − 1000, 750
Since, speed cannot be negative. So, x = 750
Hence, the usual speed of plane is 750 km/hr.

Solution 7:

Let the speed of the second train be x km/hr.
Then the speed of the first train is (x + 5) km/hr.
Let O be the position of the railway station from which the two trains leave.
Distance travelled by the first train in 2 hours = OA = Speed × Time = 2(x + 5)km
Distance travelled by the second train in 2 hours in OB = speed × Time = 2x km



By Pythagoras theorem, we have
$AB^2 = OA^2 + OB^2$
$\Rightarrow (50)^2 = [2 (x + 5)]^2 + (2x)^2$
$\Rightarrow 2500 = 4 (x + 5)^2 + 4x^2$
$\Rightarrow 2500 = 4 (x^2 +25 +10x) + 4x^2$
$\Rightarrow 8x^2 + 40x – 2400 = 0$
$\Rightarrow x^2 + 5x – 300 = 0$
$\Rightarrow x^2 + 20x − 15x – 300 = 0$
$\Rightarrow (x + 20) (x – 15) = 0$
$\Rightarrow x = −20$ or $x = 15$
$\Rightarrow x = 15$ [$\because$ x cannot be negative]

Hence, the speed of the second train is 15km/hr and the speed of the first train is 20km/hr.

Solution 8:

$S = n(n + 1)$

Given, $S = 420$

$n(n + 1) = 420$

$n^2 + n - 420 = 0$

$n^2 + 21n - 20n - 420 = 0$

$n(n + 21) - 20(n + 21) = 0$

$(n + 21)(n - 20) = 0$

$n = -21, 20$

Since, n cannot be negative.

Hence, $n = 20$.

Solution 9:

Let the present ages of father and his son be x years and $(45 - x)$ years respectively.

Five years ago,

Father's age = $(x - 5)$ years

Son's age = $(45 - x - 5)$ years = $(40 - x)$ years

From the given information, we have:

$(x - 5)(40 - x) = 124$

$40x - x^2 - 200 + 5x = 124$

$x^2 - 45x + 324 = 0$

$x^2 - 36x - 9x + 324 = 0$

$x(x - 36) - 9(x - 36) = 0$

$(x - 36)(x - 9) = 0$

$x = 36, 9$

If $x = 9$,

Father's age = 9 years, Son's age = $(45 - x)$ = 36 years

This is not possible.

Hence, $x = 36$

Father's age = 36 years

Son's age = $(45 - 36)$ years = 9 years.

Solution 10:

Let the number of rows in the original arrangement be x.

Then, the number of seats in each row in original arrangement = x
Total number of seats = x × x = x^2
From the given information,
$2x(x - 10) = x^2 + 300$
$2x^2 - 20x = x^2 + 300$
$x^2 - 20x - 300 = 0$
$(x - 30)(x + 10) = 0$
x = 30, −10
Since, the number of rows or seats cannot be negative. So, x = 30.
(i) The number of rows in the original arrangement = x = 30
(ii) The number of seats after re-arrangement = $x^2 + 300 = 900 + 300 = 1200$

Solution 11:

Let the number of days in which mohan completes the work be x.
Number of days in which manoj completes the work = x + 16
In one day, Mohan completes $\frac{1}{x}$ part of work.
In one day, manoj completes $\frac{1}{x+16}$ part of work.
It is given that they both can do the work in 15 days.

$\therefore \frac{1}{x} + \frac{1}{x+16} = \frac{1}{15}$

$\frac{x+16+x}{x(x+16)} = \frac{1}{15}$

$$\frac{2x+16}{x^2+16x} = \frac{1}{15}$$

$30x + 240 = x^2 + 16x$
$X^2 - 14x + 10x – 240 = 0$
$X^2 – 24x + 10x – 240 = 0$
$X(x – 24) + 10(x – 24) = 0$
$(x – 24)(x + 10) = 0$
X = 24, −10
Since, the number of days cannot be negative. So, x = 24.
Thus, Mohan alone can complete the work in 24 days.

Solution 12:

Let the age of son 2 years ago be x years.
Then, father's age 2 years ago = $3x^2$ years

Present age of son = (x + 2) years
Present age of father = ($3x^2$ + 2) years

3 years hence:
Son's age = (x + 2 + 3) years = (x + 5) years
Father's age = ($3x^2$ + 2 + 3) years = ($3x^2$ + 5) years

From the given information,
$3x^2 + 5 = 4(x + 5)$
$3x^2 - 4x - 15 = 0$
$3x^2 - 9x + 5x - 15 = 0$
$3x(x - 3) + 5(x - 3) = 0$
$(x - 3)(3x + 5) = 0$
x = 3,
Since, age cannot be negative. So, x = 3.

Present age of son = (x + 2) years = 5 years
Present age of father = ($3x^2$ + 2) years = 29 years

Solution 13:

Let the fraction be $\frac{x}{x+3}$
When 1 is subtracted from both numerator and denominator, then the fraction becomes $\frac{x-1}{x+2}$
From the given information, we have:

$$\frac{x}{x+3} - \frac{1}{14} = \frac{x-1}{x+2}$$

$$\frac{14x - x - 3}{14(x+3)} = \frac{x-1}{x+2}$$

$$\frac{13x - 3}{14(x+3)} = \frac{x-1}{x+2}$$

$(13x – 3)(x + 2) = 14(x – 1)(x + 3)$
$13x^2 + 26x – 3x – 6 = 14 (x^2 – x + 3x – 3)$
$13x^2 + 23x – 6 = 14x^2 + 28x – 42$
$X^2 + 5x – 36 = 0$
$X^2 + 9x – 4x – 36 = 0$
$X(x + 9) – 4(x + 9) = 0$
$(x + 9)(x – 4) = 0$
$X = -9, 4$

Since, x cannot be negative. So, x = 4
Hence, the fraction is $\frac{x}{x+3} = \frac{4}{7}$

Solution 14:

Given, the difference between two digits is 6 and the ten's digit is bigger than the unit's digit.
So, let the unit's digit be x and ten's digit be (x + 6).
From the given condition, we have:
x(x + 6) = 27
$x^2 + 6x - 27 = 0$
$x^2 + 9x - 3x - 27 = 0$
x(x + 9) − 3(x + 9) = 0
(x + 9) (x − 3) = 0
x = −9, 3
Since, the digits of a number cannot be negative. So, x = 3.
Unit's digit = 3
Ten's digit = 9
Thus, the number is 93.

Solution 15:

Distance = 300 km
Let the original speed of the bus be x km/hr.
While returning, speed of the bus = (x – 5) km/hr
From the given information, we have:

$$\frac{300}{x-5} - \frac{300}{x} = 2$$

$$\frac{300x - 300x + 1500}{x(x-5)} = 2$$

$$\frac{750}{x(x-5)} = 1$$

$x^2 - 5x - 750 = 0$
$X^2 - 30x + 25x - 750 = 0$
X(x – 30) + 25(x – 30) = 0
(x – 30)(x + 25) = 0
X = 30, − 25
Since, speed cannot be negative. So, x = 30
Speed of the bus while returning = 25 km/hr
Time taken by the bus to return = $\frac{300}{25}$ hrs = 12hrs

Solution 16:

Total amount = Rs. 480
Let the number of children be x.
The amount each children got = $\frac{480}{x}$
When the number of children were 20,
Amount of each children = $\frac{480}{x+20}$
From the given information, we have:

$$\frac{480}{x} - \frac{480}{x+20} = 12$$

$$\frac{480x + 480 \times 20 - 480x}{x(x+20)} = 12$$

$$\frac{9600}{x(x+20)} = 12$$

$X^2 + 20x - 800 = 0$
$X^2 + 40x - 20x - 800 = 0$
X(x + 40) – 20(x + 40) = 0
(x – 20)(x + 40) = 0
X = 20, − 40
Since, number of children cannot be negative. So, x = 20
Number of children = 20.