EX 4.3

Q.4. The sum of the reciprocals of Rehman's ages, (in years) 3 years ago and 5 years from now is $\frac{1}{3}$. Find his present age.

Sol. Let the present age of Rehman = x

∴ 3 years ago Rehman's age = (x – 3) years

5 years later Rehman's age = (x + 5) years

Now, according to the condition,

$$\frac{1}{x-3}+\frac{1}{x+5}=\frac{1}{3}$$

$$\Rightarrow \frac{(x+5)+(x-3)}{(x-3)(x+5)}=\frac{1}{3}$$

$\Rightarrow 3[x + 5 + x – 3] = (x – 3)(x + 5)$

$\Rightarrow 3[2x + 2] = x^2 + 2x – 15$

$\Rightarrow 6x + 6 = x^2 + 2x – 15$

$\Rightarrow x^2 + 2x – 6x – 15 – 6 = 0$

$\Rightarrow x^2 – 4x – 21 = 0$

Now, comparing (1) with $ax^2 + bx + c = 0$, we have:

$a = 1$

$b = – 4$

$c = – 21$

$b^2 – 4ac = (– 4)^2 – 4(1)(– 21)$

$= 16 + 84$

$= 100$

Since,

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$\Rightarrow x=\frac{-(-4)\pm\sqrt{100}}{2(1)}$$

$$=\frac{4\pm10}{2}$$

Taking positive sign, we have:

$$x=\frac{4+10}{2}=\frac{14}{2}=7$$

Taking negative sign, we have:

$$x=\frac{4-10}{2}=\frac{-6}{2}=-3$$

Since age cannot be negative,

$\therefore x \neq 3 \Rightarrow x = 7$

So, the present age of Rehman = 7 years.

Q.5. In a class test, the sum of Shefali's marks in Mathematics and English is 30. Had she got 2 marks more in Mathematics and 3 marks less in English, the product of their marks would have been 210? Find her marks in the two subjects.

Q.6. The diagonal of a rectangular field is 60 metres more than the shorter 30 metres more than the shorter side, find the sides of the field.

Q.7. The difference of squares of two numbers is 180. The square of the smaller number is 8 times the larger number. Find the two numbers.

Q.8. A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.

Q.9. Two water taps together can fill a tank in $9\frac{3}{8}$ hours. The tap of larger diameter takes 10 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.

Sol. Let the smaller tap fills the tank in × hours.

$\therefore$ The larger tap fills the tank (x – 10) hours.

$\Rightarrow$ Time to fill the tank by smaller tap = $\frac{1}{x}$ hours.

Time to fill the tank by larger tap = $\frac{1}{x-10}$ hours.

Since, the tank filled by the two taps together in 1 hour = $\frac{1}{x}+\frac{1}{x-10}=\frac{x-10+x}{x(x-10)}$

$=\frac{2x-10}{x^2-10x}$

Now, according to the condition,

$\frac{75}{8}\left(\frac{2x-10}{x^2-10x}\right)=1$ $\quad\because 9\frac{3}{8}=\frac{75}{8}$

$\Rightarrow \frac{75(2x-10)}{8(x^2-10x)}=1$

$\Rightarrow \frac{150x-750}{8x^2-80x}=1$

$\Rightarrow 8x^2-80x=150x-750$

$\Rightarrow 8x^2-80x-150x=-750$

$\Rightarrow 8x^2-230x+750=0$

Comparing (1) with $ax^2+bx+c=0$, we get

$a=8$

$b=-230$

$c-750$

$\therefore b^2-4ac=(-230)^2-4\,(8)\,(750)$

$= 52900 - 24000$

$= 28900$

Since,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\Rightarrow x = \frac{-(-230) \pm \sqrt{28900}}{2(8)}$$

$$\Rightarrow x = \frac{230 \pm 170}{16}$$

Taking, the + ve sign, we get

$$\Rightarrow x = \frac{230 + 170}{16} = \frac{400}{16} = 25$$

Taking the – ve sign, we get

$$\Rightarrow x = \frac{230 - 170}{16} = \frac{60}{16} = \frac{15}{4}$$

For $x = \frac{15}{4}, (x - 10) = \frac{15}{4} - 10 = \frac{-25}{4}$

which is not possible, [∴ Time cannot be negative

$\therefore x = 25$

$\Rightarrow x - 10 = 25 - 10 = 15$

Q.10. An express train takes 1 hour less than a passenger train to travel 132 km between Mysore a Bangalore (without taking into consideration the time they stop at intermediate stations). If the average speed of the express train is 11 km/h more than that of the passenger train, find average speed of the two trains.

Q.11. Sum of the areas of two squares is 468 m2. If the difference of their perimeters is 24 m, find sides of the two squares.

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