Quadratic Equations Ex 8.8 Q4

Answer :

Let the usual speed of train be x km/hr then

Increased speed of the train $=(x+5)$ km/hr

Time taken by the train under usual speed to cover $150\,\text{km}=\frac{150}{x}\,\text{hr}$

Time taken by the train under increased speed to cover $150\,\text{km}=\frac{150}{(x+5)}\,\text{hr}$

Therefore,

$$\frac{150}{x}-\frac{150}{(x+5)}=1$$

$$\frac{\{150(x+5)-150x\}}{x(x+5)}=1$$

$$\frac{150x+750-150x}{x^2+5x}=1$$

$$\frac{\cancel{150x}+750-\cancel{150x}}{x^2+5x}=1$$

$$750=x^2+5x$$

$$x^2+5x-750=0$$

$$x^2+5x-750=0$$

$$x^2-25x+30x-750=0$$

$$x(x-25)+30(x-25)=0$$

$$(x-25)(x+30)=0$$

So, either

$$(x-25)=0$$

$$x=25$$

Or

$$(x+30)=0$$

$$x=-30$$

But, the speed of the train can never be negative.

Hence, the usual speed of train is $\boxed{x=25\,\text{km/hr}}$

Quadratic Equations Ex 8.8 Q5

Answer :

Let the ongoing speed of person be $x\,\text{km/hr}$. Then,

Returning speed of the person is $=(x+10)\,\text{km/hr}$.

Time taken by the person in going direction to cover $150\,\text{km}=\frac{150}{x}\,\text{hr}$

Time taken by the person in returning direction to cover $150\,\text{km}=\frac{150}{(x+10)}\,\text{hr}$

Therefore,

$$\frac{150}{x}-\frac{150}{(x+10)}=\frac{5}{2}$$

$$\frac{\{150(x+10)-150x\}}{x(x+10)}=\frac{5}{2}$$

$$\frac{150x+1500-150x}{x^2+10x}=\frac{5}{2}$$

$$\frac{\cancel{150x}+1500-\cancel{150x}}{x^2+10x}=\frac{5}{2}$$

$$\frac{1500}{x^2+10x}=\frac{5}{2}$$

$$3000=5x^2+50x$$

$$5x^2+50x-3000=0$$

$$5x^2+50x-3000=0$$

$$5(x^2+10x-600)=0$$

$$x^2+10x-600=0$$

$$x^2-20x+30x-600=0$$

$$x(x-20)+30(x-20)=0$$

$$(x-20)(x+30)=0$$

So, either

$$(x-20)=0$$

$$x=20$$

Or

$$(x+30)=0$$

$$x=-30$$

But, the speed of the train can never be negative.

Thus, when $x=20$ then

$$=(x+10)$$

$$=(20+10)$$

$$=30$$

Hence, ongoing speed of person is $\boxed{x=20\,\text{km/hr}}$

and returning speed of the person is $\boxed{x=30\,\text{km/hr}}$ respectively.

Quadratic Equations Ex 8.8 Q6

Answer :

Let the usual speed of plane be x km/hr . Then,

Increased speed of the plane $= (x+400)$ km/hr

Time taken by the plane under usual speed to cover $1600\,\text{km} = \frac{1600}{x}\,\text{hr}$

Time taken by the plane under increased speed to cover $1600\,\text{km} = \frac{1600}{(x+400)}\,\text{hr}$

Therefore,

$$\frac{1600}{x} - \frac{1600}{(x+400)} = \frac{40}{60}$$

$$\frac{\{1600(x+400) - 1600x\}}{x(x+400)} = \frac{2}{3}$$

$$\frac{1600x + 640000 - 1600x}{x^2 + 400x} = \frac{2}{3}$$

$$\frac{\cancel{1600x} + 640000 - \cancel{1600x}}{x^2 + 400x} = \frac{2}{3}$$

$$1920000 = 2x^2 + 800x$$

$$2x^2 + 800x - 1920000 = 0$$

$$2(x^2 + 400x - 960000) = 0$$

$$x^2 + 400x - 960000 = 0$$

$$x^2 - 800x + 1200x - 960000 = 0$$

$$x(x-800) + 1200(x-800) = 0$$

$$(x-800)(x+1200) = 0$$

So, either

$$(x-800) = 0$$

$$x = 800$$

Or

$$(x+1200) = 0$$

$$x = -1200$$

But, the speed of the plane can never be negative.

Hence, the usual speed of train is $\boxed{x = 800\,\text{km/hr}}$

********** END **********