Quadratic Equations Ex 8.8 Q7

Answer :

Let the usual speed of aero plane be $x\,\text{km/hr}$. Then,

Increased speed of the aero plane $=(x+100)\,\text{km/hr}$

Time taken by the aero plane under usual speed to cover $1200\,\text{km}=\frac{1200}{x}\,\text{hr}$

Time taken by the aero plane under increased speed to cover $1200\,\text{km}=\frac{1200}{(x+100)}\,\text{hr}$

Therefore,

$$\frac{1200}{x}-\frac{1200}{(x+100)}=1$$

$$\frac{\{1200(x+100)-1200x\}}{x(x+100)}=1$$

$$\frac{1200x+120000-1200x}{x^2+100x}=1$$

$$\frac{\cancel{1200x}+120000-\cancel{1200x}}{x^2+100x}=1$$

$$120000=x^2+100x$$

$$x^2+100x-120000=0$$

$$x^2+100x-120000=0$$

$$x^2-300x+400x-120000=0$$

$$x(x-300)+400(x-300)=0$$

$$(x-300)(x+400)=0$$

So, either

$$(x-300)=0$$

$$x=300$$

Or

$$(x+400)=0$$

$$x=-400$$

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

Hence, the usual speed of train is $\boxed{x=300\,\text{km/hr}}$

Quadratic Equations Ex 8.8 Q8

Answer :

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

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

Time taken by the train under usual speed to cover $300\,\text{km} = \frac{300}{x}\,\text{hr}$

Time taken by the train under increased speed to cover $300\,\text{km} = \frac{300}{(x+5)}\,\text{hr}$

Therefore,

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

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

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

$$\frac{\cancel{300x} + 1500 - \cancel{300x}}{x^2 + 5x} = 2$$

$$1500 = 2x^2 + 10x$$

$$2x^2 + 10x - 1500 = 0$$

$$2\left(x^2 + 5x - 750\right) = 0$$

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

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

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

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

So, either

$$(x-25) = 0$$

$$x = 25$$

Or

$$(x+30) = 0$$

$$x = -30$$

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

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

Quadratic Equations Ex 8.8 Q9

Answer :

Let the original speed of train be x km/hr. Then,

Increased speed of the train $= (x+15)$ km/hr

Time taken by the train under usual speed to cover $90\,\text{km} = \frac{90}{x}\,\text{hr}$

Time taken by the train under increased speed to cover $90\,\text{km} = \frac{90}{(x+15)}\,\text{hr}$

Therefore,

$$\frac{90}{x} - \frac{90}{(x+15)} = \frac{30}{60}$$

$$\frac{\{90(x+15) - 90x\}}{x(x+15)} = \frac{1}{2}$$

$$\frac{90x + 1350 - 90x}{x^2 + 15x} = \frac{1}{2}$$

$$\frac{\cancel{90x} + 1350 - \cancel{90x}}{x^2 + 15x} = \frac{1}{2}$$

$$2700 = x^2 + 15x$$

$$x^2 + 15x - 2700 = 0$$

$$x^2 + 15x - 2700 = 0$$

$$x^2 - 45x + 60x - 2700 = 0$$

$$x(x-45) + 60(x-45) = 0$$

$$(x-45)(x+60) = 0$$

So, either

$$(x-45) = 0$$

$$x = 45$$

Or

$$(x+60) = 0$$

$$x = -60$$

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

Hence, the original speed of train is $\boxed{x = 45\,\text{km/hr}}$

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