Quadratic Equations Ex 8.8 Q1

Answer :

Let the speed of stream be $x\,\text{km/hr}$ then

Speed downstream $=(8+x)\,\text{km/hr}$.

Therefore, Speed upstream $=(8-x)\,\text{km/hr}$

Time taken by the boat to go $15\,\text{km}$ upstream $=\frac{15}{(8-x)}\text{hr}$

Time taken by the boat to returns $22\,\text{km}$ downstream $=\frac{22}{(8+x)}\text{hr}$

Now it is given that the boat returns to the same point in 5 hr.

So,

$$\frac{15}{(8-x)}+\frac{22}{(8+x)}=5$$

$$\frac{15(8+x)+22(8-x)}{(8-x)(8+x)}=5$$

$$\frac{120+15x+176-22x}{64-x^2}=5$$

$$\frac{296-7x}{64-x^2}=5$$

$$5x^2-7x+296-320=0$$

$$5x^2-7x-24=0$$

$$5x^2-15x+8x-24=0$$

$$5x(x-3)+8(x-3)=0$$

$$(x-3)(5x+8)=0$$

$$x=3,\ x=-\frac{8}{5}$$

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

Hence, the speed of the stream is $\boxed{x=3\,\text{km/hr}}$

Quadratic Equations Ex 8.8 Q2

Answer :

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

Increased speed of the train $= (x+10)$ km/hr

Time taken by the train under usual speed to cover $360\,\text{km} = \dfrac{360}{x}\,\text{hr}$

Time taken by the train under increased speed to cover $360\,\text{km} = \dfrac{360}{(x+10)}\,\text{hr}$

Therefore,

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

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

$$\frac{360x + 3600 - 360x}{x^2 + 10x} = 3$$

$$\frac{\cancel{360x} + 3600 - \cancel{360x}}{x^2 + 10x} = 3$$

$$3600 = 3x^2 + 30x$$

$$3x^2 + 30x - 3600 = 0$$

$$3(x^2 + 10x - 1200) = 0$$

$$x^2 + 10x - 1200 = 0$$

$$x^2 - 30x + 40x - 1200 = 0$$

$$x(x-30) + 40(x-30) = 0$$

$$(x-30)(x+40) = 0$$

So, either

$$(x-30) = 0$$

$$x = 30$$

Or

$$(x+40) = 0$$

$$x = -40$$

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

Hence, the usual speed of train is $\boxed{x = 30\,\text{km/hr}}$

Quadratic Equations Ex 8.8 Q3

Answer :

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

the speed of the slow train be $=(x-10)$ km/hr

Time taken by the fast train to cover $200\,\text{km}=\frac{200}{x}\,\text{hr}$

Time taken by the slow train to cover $200\,\text{km}=\frac{200}{(x-10)}\,\text{hr}$

Therefore,

$$\frac{200}{x}-\frac{200}{(x-10)}=1$$

$$\frac{\{200(x-10)-200x\}}{x(x-10)}=1$$

$$\frac{200x-2000-200x}{x^2-10x}=1$$

$$\frac{\cancel{200x}-2000-\cancel{200x}}{x^2-10x}=1$$

$$x^2-10x=-2000$$

$$x^2-10x+2000=0$$

$$x^2-10x+2000=0$$

$$x^2-50x+40x+2000=0$$

$$x(x-50)+40(x-50)=0$$

$$(x-50)(x+40)=0$$

So, either

$$(x-50)=0$$

$$x=50$$

Or

$$(x+40)=0$$

$$x=-40$$

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

Thus, when $x=50$ then

$$=(x-10)$$

$$=(50-10)$$

$$=40$$

Hence, the speed of the fast train is $\boxed{x=50\,\text{km/hr}}$

and the speed of the slow train is $\boxed{x=40\,\text{km/hr}}$ respectively.

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