UDAAN

2025

Quadratic Equation

Mathematics | Lecture - 06

By – Ritik Sir

Topics *to be covered*

Word Problems (Part - 02)

- Word Problems on Speed , Time, Distance
- Upstream and Downstream Questions
- Word Problems on Ages
- Word Problems on Geometry
- Questions based on Time and Work
- Questions based on Miscellaneous Problems

Next class


WORK HARD
DREAM BIG
NEVER GIVE UP !!

$$S = \frac{D}{T}, \quad D = S \times T, \quad T = \frac{D}{S}.$$

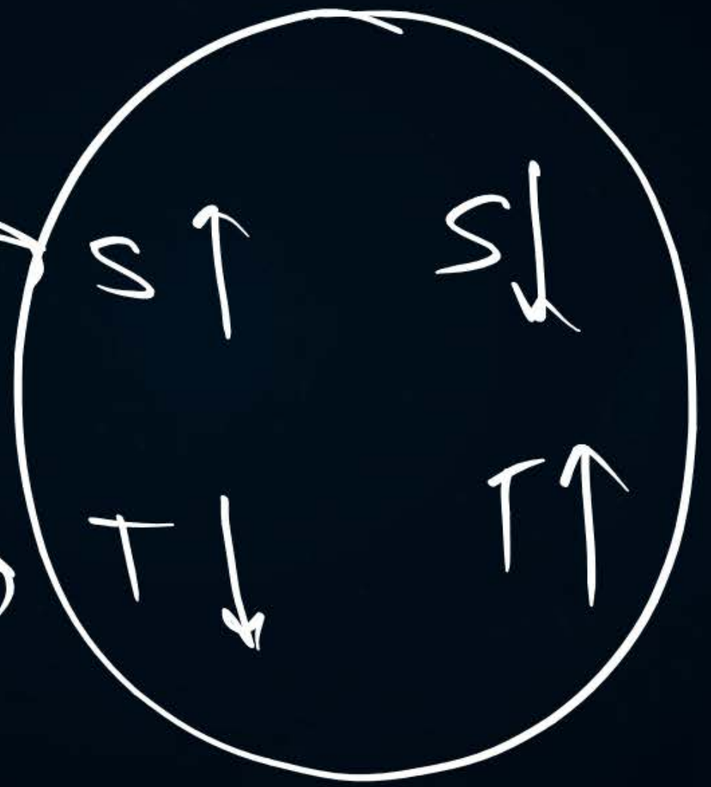
$D = 600\text{km}.$

$S = 100\text{km/hr}.$

$$T = \frac{D}{S}$$

$$T = \frac{600}{100}$$

$T = 6\text{hr}$



Topic : Word Problems on Speed , Time, Distance

#Q. A train travels a distance of 300 km at constant speed. If the speed of the train is increased by 5 km an hour, the journey would have taken 2 hours less. Find the original speed of the train.

Let speed be x km/hr.

$t = \frac{D}{S}$

Case-I

$T = \frac{300}{x}$

Case-II

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

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

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

$300\left[\frac{1}{x} - \frac{1}{x+5}\right] = \frac{2}{1}$

$\frac{1(x+5) - 1(x)}{x(x+5)} = \frac{2}{300}$

150

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

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

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

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

$P=-750,\ S=5$

$30, -25$

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

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

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

$x=-30$ XXX

$x=25$

Ans: So speed of train = 25 km/hr

Topic : Word Problems on Speed , Time, Distance

$T = \frac{D}{S}$

#Q. A train, travelling at a uniform speed for 360 km, would have taken 48 min less to travel the same distance, if its speed were 5 km/h more. Find the original speed of the train.

Speed = x km/hr

Case-I

$T = \frac{360}{x}$

Case-II

$T - \frac{48}{60} = \frac{360}{x+5}$

$\frac{360}{x} - \frac{48}{60} = \frac{360}{x+5}$

$\frac{360}{x} - \frac{360}{x+5} = \frac{48}{60}$ 4 1

$360\left[\frac{1}{x} - \frac{1}{x+5}\right] = 4$

$\frac{x+5-x}{x(x+5)} = \frac{1}{5 \times 360}$

$$\frac{5}{x^2+5x} = \frac{1}{450}$$

$$x^2+5x-2250=0$$

$$x^2-45x+20x-2250=0$$

$$x(x-45)+20(x-45)=0$$

$$(x+20)(x-45)=0$$

$x=-20$ ✗

$x=45$ ✓

Ans: 45km/hr

60 min = 1 hr.

1 min = $\frac{1}{60}$ hr

48 min = $\frac{48}{60}$ hr

Topic : Word Problems on Speed , Time, Distance

$T = \frac{D}{S}$

#Q. A fast train takes 3 hours less than a slow train for a journey of 600 km. If the speed of the slow train is 10 km/hr less than that of the fast train, find the speeds of the two trains.

Let speed of slow train = $(x-10)$ km/hr.

speed of fast train = x km/hr.

Slow train

$$T = \frac{600}{x-10}$$

Fast train.

$$T - 3 = \frac{600}{x}$$

$$\frac{600}{x-10} - 3 = \frac{600}{x}$$

$$\frac{600}{x-10} - \frac{600}{x} = 3$$

Ans: Slow train = 40 km/hr

Fast train = 50 km/hr

Topic : Word Problems on Speed , Time, Distance

$T = \frac{D}{S}$

#Q. An aeroplane left 50 minutes later than its scheduled time, and in order to reach the destination, 1250 km away, in time, it had to increase its speed by 250 km/hr from its usual speed. Find its usual speed. [CBSE 2010]

usual speed = x.

$D = 1250$

$S = x$

$T_1 = y$

$y = \frac{1250}{x}$

$D = 1250$

$S = x + 250$

$T_2 = y - \frac{50}{60}$

$y - \frac{50}{60} = \frac{1250}{x+250}$

$\frac{1250}{x} - \frac{50}{60} = \frac{1250}{x+250}$

$\frac{1250}{x} - \frac{1250}{x+250} = \frac{50}{60}$

$1250\left[\frac{1}{x} - \frac{1}{x+250}\right] = \frac{5}{6}$

$\frac{x+250-x}{x(x+250)} = \frac{1}{6 \times 250}$

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

$$375000 = x^2 + 250x$$

$$0 = x^2 + 250x - 375000$$

$D = b^2 - 4ac$

$D = (250)^2 - 4(1)(-375000)$

$= 62500 + 1500000$

$D = 1562500$

$D = 1562.5 \times 100$

$= \sqrt{D}$

$= \sqrt{5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 10 \times 10}$

$= 5 \times 5 \times 5 \times 10$

$= 1250.$

5	1562.5
5	312.5
5	62.5
5	12.5
5	2.5
5	0.5
	0.1

$$x = \frac{-b \pm \sqrt{D}}{2a}$$

$$x = \frac{-250 \pm 1250}{2(1)}$$

$$x = \frac{-250 + 1250}{2}, \frac{-250 - 1250}{2}$$

XXX

$$x = 500 \text{ km/hr}$$

Topic : Problems

T = 2

#Q. In a flight of 600 km, an aircraft was slowed due to bad weather. Its average speed for the trip was reduced by 200 km/hr and time of flight increased by 30 minutes. Find the original duration of flight.

Let the original speed = x km/hr.

Case-I

$T = \frac{600}{x}$

Case-II

$T + \frac{30}{60} = \frac{600}{x-200}$

$\frac{600}{x} + \frac{30}{60} = \frac{600}{x-200}$

nikalna nai

Duration = Time

Ans: 1hr

Upstream and downstream.

↳ paani key against jaana

paani key saath jaana.

Speed of boat / aapki speed = x

Speed of stream / water / current = y

Downstream speed	$x+y$
upstream speed	$x-y$

Topic : Upstream and Downstream

$T = \frac{D}{S}$

#Q. The speed of a boat in still water is 8 km/hr. It can go 15 km upstream and 22 km downstream in 5 hours. Find the speed of the stream.

Speed of boat = 8 km/hr.

Let, speed of stream = x km/hr.

$S_D = 8 + x$

$S_{up} = 8 - x$

Upstream	Downstream
$D = 15$	$D = 22$
$S = 8 - x$	$S = 8 + x$
$T = T_1$	$T = T_2$

$T_1 = \frac{15}{8-x}$

$T_2 = \frac{22}{8+x}$

$T_1 + T_2 = 5$

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

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

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

$$\frac{120+15x+176-22x}{8^2-x^2}=5$$

$$-7x+296=5(64-x^2)$$

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

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

$$\boxed{5x^2-7x-24=0}$$

$x=3$ $x=-\frac{8}{5}$ ✗

$x=3$ km/hr

Topic : Word Problems on Speed , Time, Distance

#Q. The speed of a boat in still water is 15 km/hr. It can go 30 km upstream and return downstream to the original point in 4 hours 30 minutes. Find the speed of the stream.

Speed of boat = 15 km/hr

let, Speed of stream = x km/hr

$S_D = 15 + x$

$S_{up} = 15 - x$

Upstream

$D = 30$

$S = 15 - x$

$T = T_1$

$T_1 = \frac{30}{15-x}$

Downstream.

$D = 30$

$S = 15 + x$

$T = T_2$

$T_2 = \frac{30}{15+x}$

$T_1 + T_2 = 4 \text{ hr } 30 \text{ min.}$

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

Next Page.

$$\frac{30}{15-x} + \frac{20}{15+x} = 4+\frac{1}{2}$$

$$30\left[\frac{1}{15-x} + \frac{1}{15+x}\right] = \frac{9}{2}$$

$$\frac{15+x+15-x}{15^2-x^2} = \frac{9}{60}$$

$$\frac{30}{225-x^2} = \frac{3}{20}$$

$$600 = 3(225-x^2)$$

$$600 = 675-3x^2$$

$$3x^2+600-675=0$$

$$3x^2-75=0$$

$$3x^2=75$$

$$x^2=25$$

$$x=\pm 5$$

$$x = 5\ km/hr$$

Topic : Word Problems on Speed , Time, Distance

#Q. Swati can row her boat at a. speed of 5 km/hr in still water. If it takes her 1 hour more to row the boat 5.25 km upstream than to return downstream, Find the speed of the stream.

Speed stream = x km/hr.

speed of boat = 5 km/hr.

Speed downstream = 5+x

" upstream = 5-x

Hw

upstream	Downstream
D = 5.25	D = 5.25
S = 5-x	S = 5+x
T = y+1	T = y

$y+1 = \frac{5.25}{5-x}$

$y = \frac{5.25}{5+x}$

$$\frac{5.25}{5+x}+1=\frac{5.25}{5-x}$$

$$1=\frac{5.25}{5-x}-\frac{5.25}{5+x}$$

$$1=5.25\left[\frac{1}{5-x}-\frac{1}{5+x}\right]$$

$$1=\frac{525}{100}\left[\frac{(5+x)-(5-x)}{(5-x)(5+x)}\right]$$

$$1=\frac{21}{4}\left[\frac{5+x-5+x}{5^2-x^2}\right]$$

$$\frac{4}{21}=\frac{2x}{25-x^2}$$

$$4(25-x^2)=42x$$

$$100-4x^2=42x$$

$$0=4x^2+42x-100$$

$$0=2x^2+21x-50$$

$x=2$, $x=-\frac{25}{2}$ (X)

Ans: 2km/hr

Homework

DPP – try karlena ?

nahi bana

THANK YOU