

X Test-9

- 1) Using quadratic formula, solve $m^2x^2 + (m^2 - n^2)x - n^2 = 0$
 - 2) In a journey of 600km, a train was slowed down due to an accident. Its original speed was reduced by 200 km/hr and time of journey increased by 30 minutes. Find the original duration of the journey.
 - 3) Solve for x : $2 \left(\frac{2x-1}{x+3} \right) - 3 \left(\frac{x+3}{2x-1} \right) = 5$; $x \neq -3, \frac{1}{2}$
 - 4) Places X and Y are 70km apart on a road. A car starts from X and another from B simultaneously. If they travel in same direction, they meet in 7 hours but if they travel towards each other, they meet in one hour. Find the speed of the two cars.
 - 5) Two numbers are in the ratio of 1:3. If 5 is added to both the numbers, the ratio becomes 1:2. Find the numbers.
 - 6) Solve for x and y : $152x - 378y = -74$
 $-378x + 152y = -604$
 - 7) Find p and q for which the given equations has infinitely many solutions: $3x - (a+1)y = 2b-1$
 $5x + (1-2a)y = 3b$
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The given equation be of the form $ax^2+bx+c=0$;

$$1) \quad a = m^2; \quad b = m^2 - n^2; \quad c = -n^2$$

$$D = b^2 - 4ac = (m^2 - n^2)^2 + 4m^2n^2$$

$$= m^4 + n^4 - 2m^2n^2 + 4m^2n^2$$

$$= m^4 + n^4 + 2m^2n^2$$

$$= (m^2 + n^2)^2$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(m^2 - n^2) \pm (m^2 + n^2)}{2m^2}$$

$$x = \frac{-\cancel{m^2} + n^2 + \cancel{m^2} + n^2}{2m^2}$$

$$= \frac{2n^2}{2m^2} = \frac{n^2}{m^2}$$

$$x = \frac{-\cancel{m^2} + n^2 - \cancel{m^2} - n^2}{2m^2}$$

$$= \frac{-2m^2}{2m^2} = \underline{\underline{-1}}$$

2) Let the usual speed of the train be x km/hr

$$\text{ATQ, } \frac{600}{x-200} - \frac{600}{x} = \frac{30}{60}$$

$$\Rightarrow 600 \left[\frac{1}{x-200} - \frac{1}{x} \right] = \frac{1}{2}$$

$$\Rightarrow 600 \left[\frac{x - x + 200}{(x-200)x} \right] = \frac{1}{2}$$

$$\Rightarrow 600 \times 200 \times 2 = x^2 - 200x$$

$$\Rightarrow x^2 - 200x - 240000 = 0$$

$$\Rightarrow (x-600)(x+400) = 0$$

$$x = 600, -400$$

S	-P
-200	-240000
	^
	-600, 400

$\therefore x$ cannot be -ve, required value of x is 600

Hence, speed of train is 600 km/hr

$$\text{Original duration of the journey} = \frac{\text{Distance}}{\text{Speed}}$$

$$= \frac{600}{600}$$

$$= 1 \text{ hour}$$

$$3) \text{ Put } \frac{2x-1}{x+3} = y$$

$$\text{Then, } 2y - \frac{3}{y} = 5$$

$$\Rightarrow 2y^2 - 3 = 5y$$

$$\Rightarrow 2y^2 - 5y - 3 = 0$$

$$\Rightarrow 2y^2 - 6y + y - 3 = 0$$

$$\Rightarrow 2y(y-3) + (y-3) = 0$$

$$\Rightarrow (2y+1)(y-3) = 0$$

$$\therefore y = -\frac{1}{2}, 3$$

$$\begin{matrix} S & P \\ -5 & -6 \end{matrix} < \frac{1}{-6}$$

$$\text{When } y = -\frac{1}{2}, \frac{2x-1}{x+3} = -\frac{1}{2}$$

$$\Rightarrow 4x - 2 = -x - 3$$

$$\Rightarrow 5x = -1$$

$$x = \underline{\underline{-\frac{1}{5}}}$$

$$\text{When } y = 3, \frac{2x-1}{x+3} = 3$$

$$\Rightarrow 2x - 1 = 3x + 9$$

$$\Rightarrow -x = 10$$

$$x = \underline{\underline{-10}}$$

4) Let the speed of car starting from place X be x km/hr and that from Y be y km/hr

Distance = Speed \times time

$$\text{Case 1 :- } XY = XZ - YZ$$

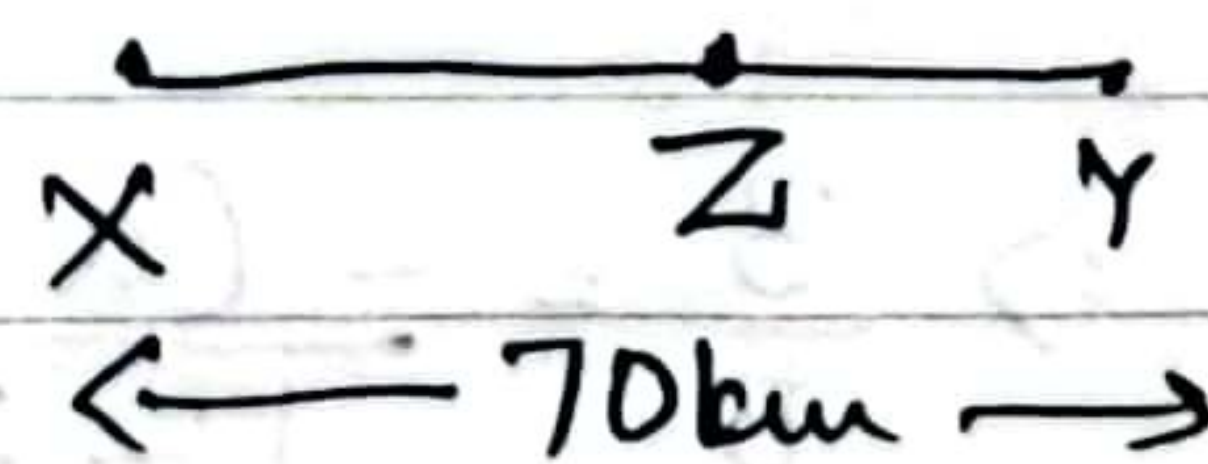
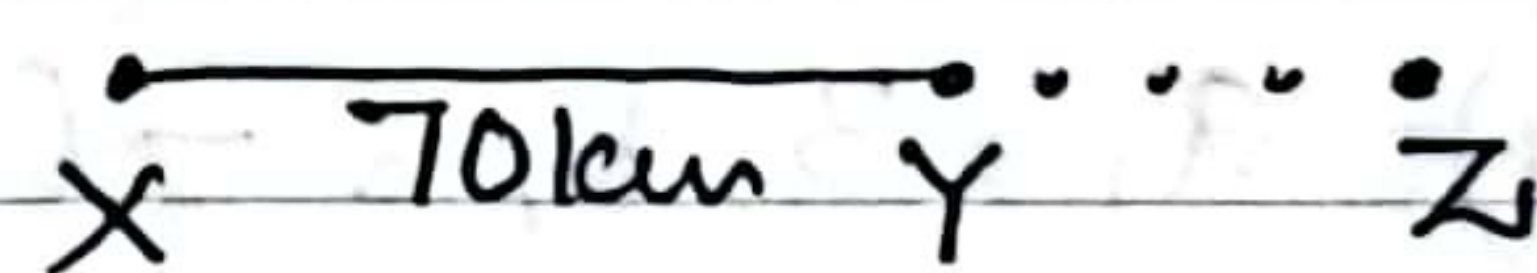
$$70 = 7x - 7y$$

$$x - y = 10 \rightarrow (1)$$

$$\text{Case 2 :- } XY = XZ + ZY$$

$$70 = 1x + 1y$$

$$x + y = 70 \rightarrow (2)$$



$$(1) + (2), 2x = 80$$

$$x = 40$$

$$y = 30$$

Hence, the speed of two cars are 40 km/hr and 30 km/hr

5) Let the numbers be x and $3x$

$$\text{ATQ, } \frac{x+5}{3x+5} = \frac{1}{2}$$

$$\Rightarrow 2x+10 = 3x+5$$

$$\Rightarrow x = 5$$

Hence, the no.s are 5 and 15

$$6) \quad 152x - 378y = -74 \rightarrow (1)$$

$$-378x + 152y = -604 \rightarrow (2)$$

$$(1) + (2), -226x - 226y = -678$$

$$\div (-226), x + y = 3 \rightarrow (3)$$

$$(1) - (2), 530x - 530y = 530$$

$$(\div 530), x - y = 1 \rightarrow (4)$$

$$(3) + (4), 2x = 4$$

$$\boxed{\begin{matrix} x = 2 \\ y = 1 \end{matrix}}$$

$$7) \quad a_1 = 3, b_1 = -(a+1), c_1 = -(2b-1)$$

$$a_2 = 5, b_2 = 1-2a, c_2 = -3b$$

For infinitely many solutions, $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$$\Rightarrow \frac{3}{5} = \frac{-(a+1)}{1-2a} = \frac{-(2b-1)}{-3b}$$

$$\text{I and II, } \frac{3}{5} = \frac{-a-1}{1-2a}$$

$$\Rightarrow 3-6a = -5a-5$$

$$\Rightarrow -a = -8$$

$$\boxed{a = 8}$$

$$\text{From I and III,}$$

$$9b = 10b - 5$$

$$-b = -5$$

$$\boxed{b = 5}$$

$$\frac{378}{15} = 22 \frac{18}{15}$$

$$\frac{604}{22} = 27 \frac{10}{22}$$

$$\frac{678}{22} = 30 \frac{18}{22}$$

$$\frac{530}{530} = 1$$

$$\frac{530}{530} = 1$$