

[Aim: 100|100 in Maths]



PAIR OF LINEAR EQUATION IN TWO VARIABLES

Lecture #8

#LP: I am three times as old as my son. Five years later, I shall be two and a half times as old as my son. How old am I and how old is my son?

Let father's present age = 'x' yrs = F
 Son " " = 'y' yrs = S

5 yrs later

$$F' = x + 5$$

$$S' = y + 5$$

ATQ

$$F = 3S$$

$$x = 3y \quad |(I)$$

ATQ

$$F' = \frac{5}{2} S'$$

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

$$2(x+5) = 5(y+5)$$

$$2x + 10 = 5y + 25,$$

$$2x - 5y = 15 \quad |(II)$$

to solve

$$\begin{cases} x = 3y \\ 2x - 5y = 15 \end{cases}$$

#LP: The age of the father is twice the sum of the ages of his two children. After 20 years, his age will be equal to the sum of the ages of his children. Find the age of the father.

Let present ages of two children are x & y .

Present $\rightarrow F = 2(x+y)$ 20 yrs later $\rightarrow (x+20), (y+20)$

RHS $F' = [2(x+y)] + 20$ LHS $F' = (x+20) + (y+20)$

Comparing \textcircled{I} & \textcircled{II}

RHS $[2(x+y)] + 20 = (x+20) + (y+20)$

$$\Rightarrow 2x + 2y + 20 = x + 20 + y + 20$$

$$2x - x + 2y - y = 20 \Rightarrow x + y = 20$$

$$x + y = 20 \quad \textcircled{A}$$

$$\text{Ans} \rightarrow f = 2(x+y)$$
$$= 2(20)$$
$$= \underline{\underline{40 \text{ yrs}}}$$



#LP: A is elder to B by 2 years A's father F is twice as old as A and B is twice as old as his sister S. If the ages of the father and sister differ by 40 years find the age of A.

$$\text{ATQ} ; \quad \left\{ \begin{array}{l} A = B + 2 \\ F = 2A \\ B = 2S \end{array} \right.$$

$$B = A - 2$$

$$\frac{B}{2} = S$$

$$\left[\begin{array}{l} F - S = 40 \\ \downarrow \\ 2A - \frac{B}{2} = 40 \end{array} \right]$$

$$\Rightarrow 2A - \frac{B}{2} = 40$$

$$\Rightarrow \frac{4A - B}{2} = 40$$

$$\Rightarrow \boxed{4A - B = 80} \quad \textcircled{1}$$

$$4A - (A - 2) = 80$$

$$4A - A + 2 = 80$$

$$\begin{aligned} 3A &= 78 \\ A &= 26 \end{aligned}$$

#LP: If in a rectangle, the length is increased and breadth reduced each by 2 units, the area is reduced by 28 square units. If, however the length is reduced by 1 unit and the breadth increased by 2 units, the area increases by 33 square units. Find the area of the rectangle.



$$l = x \text{ units}$$

$$b = y \text{ units}$$

$$A = l \cdot b$$

$$\boxed{A = xy}$$

~~Case 1~~

$$l' = x + 2$$

$$b' = y - 2$$

$$\boxed{A' = A - 28}$$

$$l' \times b' = xy - 28$$

$$\rightarrow (x+2)(y-2) = xy - 28$$

$$\rightarrow xy + 2x - y - 4 = xy - 28$$

$$\rightarrow -2x + 2y = 4 - 28$$

$$-2x + 2y = -24$$

$$+2(x-y) = +24$$

$$\cancel{x-y=12} \quad \textcircled{Q}$$

~~Case 2~~

$$l' = x - 1$$

$$b' = y + 2$$

$$\boxed{A' = A + 33}$$

$$l' \times b' = xy + 33$$

$$\rightarrow (x-1)(y+2) = xy + 33$$

$$\rightarrow xy + 2x - y - 2 = xy + 33$$

$$\rightarrow 2x - y = 2 + 33$$

$$\boxed{2x - y = 35} \quad \textcircled{R}$$

$$\begin{array}{r}
 x - y = 12 \\
 2x + y = 35 \\
 \hline
 \end{array}$$

$+x = +23$

\downarrow

$x = 23$

$$23 - y = 12$$

$$\Rightarrow 23 - 12 = y$$

2) $11 = y$

$$\begin{aligned}
 A &= x \times y \\
 &= 23 \times 11
 \end{aligned}$$

$A \Rightarrow 253 \text{ sq. units}$

#LP: In a painting competition of a school a child made Indian national flag whose perimeter was 50 cm. Its area will be decreased by 6 square cm, if length is decreased by 3 cm and breadth is increased by 2 cm then find the dimension of flag.

[CBSE Term 1, 2015]



dimension

$$\begin{aligned}l &= x \\b &= y\end{aligned}$$

$$P = 50 \quad | \quad A = xy$$

$$2(l+b) = 50$$

$$2(x+y) = 50$$

$$A^I$$

$$A' = A - 6$$

$$l' \times b' = xy - 6$$

$$\Rightarrow (x-3)(y+2) = xy - 6$$

$$\Rightarrow xy + 2x - 3y - 6 = xy - 6$$

$$2x - 3y = 0 \quad | \quad \text{II}$$

$$\begin{aligned}x &= 15 \text{ cm} = l \\y &= 10 \text{ cm} = b\end{aligned}$$

$$l' = x - 3$$

$$b' = y + 2$$

#LP: The larger of two supplementary angles exceeds the smaller by 18 degrees. Find them.

$x > y$

\overline{ATQ}

two angles sum = 180

$$x + y = 180 \quad \text{I}$$

$$x = y + 18 \quad \text{II}$$

$\sqrt{18}$

solve

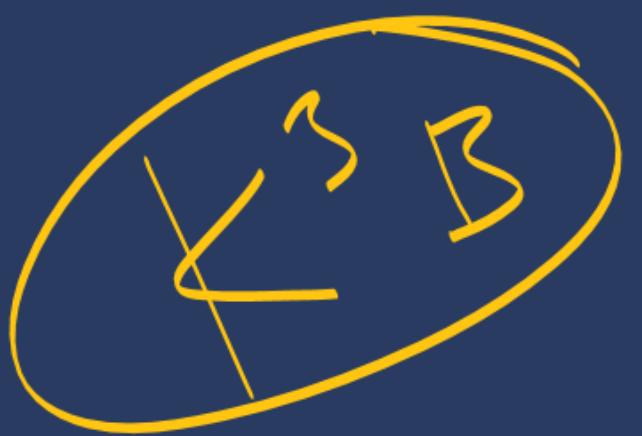
$x = 99^\circ, y = 81^\circ$



Q: Meena went to a bank to withdraw Rs 2000. She asked the cashier to give her Rs 50 and Rs 100 notes only. Meena got 25 notes in all. Find how many notes of Rs 50 and Rs 100 she received.

Currency	No. of notes	Total Value
₹ 100	x	₹ 100x ✓
₹ 50	y	₹ 50y ✓

$$\text{Total no. of notes} = x + y$$



$\frac{C}{T}$ $\frac{C}{t}$ distance
time
speed

$$\frac{C}{T} = \frac{2\pi r}{T} = \frac{2\pi r}{t} = \frac{d}{t}$$

$d = s \times t$

⇒ Speed, distance, time का समीक्षण

#LP: Points A and B are 90 km apart from each other on a highway. A car starts from A and another from B at the same time. If they go in the same direction they meet in 9 hours and if they go in the opposite direction they meet in 2 hours.

Case I



Let speed of A = x km/hr
Speed of B = y km/hr

Time taken by A to reach C = 9 hr
" " " B " " C = 9 hr



$d = sxt$

$$\underline{AC} - \underline{BC} = 90 \text{ km}$$
$$(\text{dist cov. by A}) - (\text{dist cov. by B}) = 90$$

$$(x \times 9) - (y \times 9) = 90$$

$$9x - 9y = 90$$

$$9(x - y) = 90$$

$x - y = 10$ I

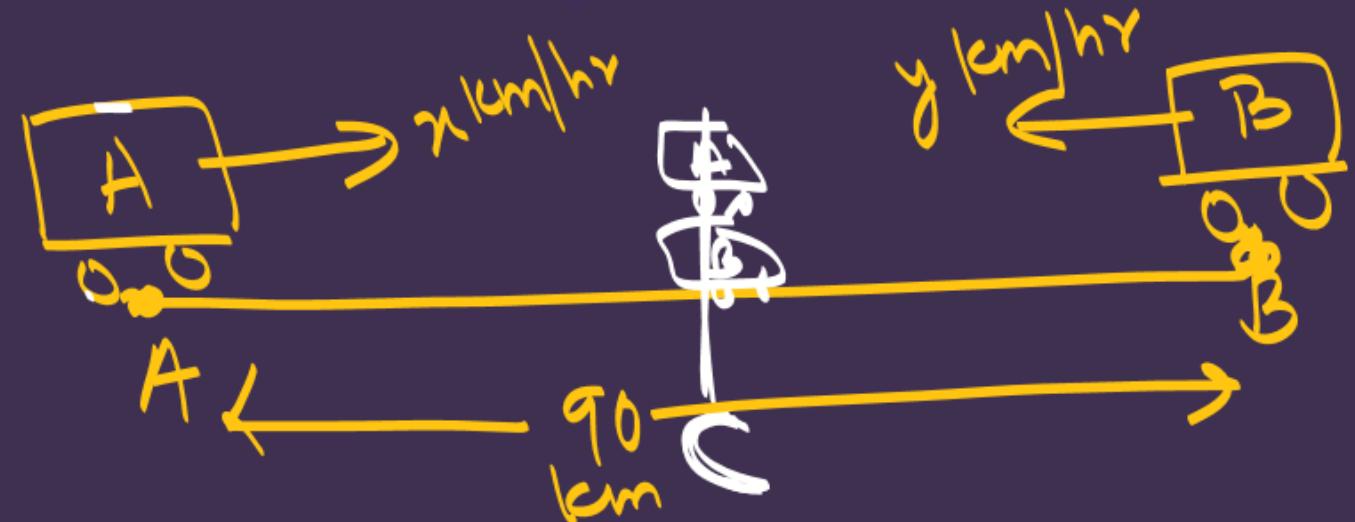
Speed, distance, time तरीके से

#LP. A and B are 90 km apart.

they start at the same time and they

meet in 9/7 hours and if they go in opposite directions they meet in 9/7 hours. Find their speeds.

Case II



Time taken by A to reach C = $\frac{9}{7}$ hr

" " " B " " " C = $\frac{9}{7}$ hr

$$d = s \times t$$

$$AC + BC = 90$$

$$\left(\begin{array}{l} \text{dist. cov.} \\ \text{by A} \end{array} \right) + \left(\begin{array}{l} \text{dist. cov.} \\ \text{by B} \end{array} \right) = 90$$

$$\left(u \times \frac{9}{7} \right) + \left(v \times \frac{9}{7} \right) = 90$$

$$\frac{9}{7}u + \frac{9}{7}v = 90$$

$$\frac{1}{7}(u+v) = 10 \Rightarrow u+v = 70$$

$$\begin{array}{r} \cancel{x - y = 10} \\ \cancel{x + y = 70} \\ \hline 2x = 80 \end{array}$$

A $\boxed{2x = 40}$ [km/hr].

$\frac{y}{x}$

$$y_0 - y = 10$$

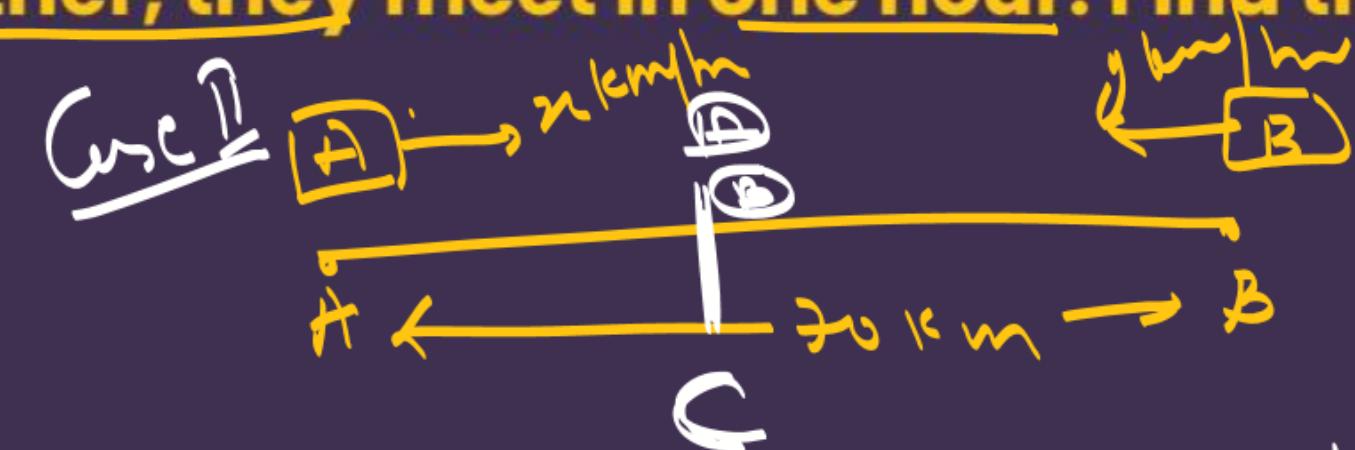
$$\begin{array}{r} y_0 - p = y \\ \cancel{y_0 - y} = \cancel{p} \\ \hline y = 30 \text{ [km/hr]} \end{array}$$

#LP: Points A and B are 70 km apart on a highway. A car starts from A and another car starts from B simultaneously. If they travel in the 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. [CBSE 2002]



time taken by A to reach C = 7 hr
" " B " " C = 7 hr.

Now $AC - BC = 70$
 $(\text{dist by } A) - (\text{dist by } B) = 70$
 $(x \times 7) - (y \times 7) = 70$
 $x - y = 10$ $\boxed{\text{Eqn 1}}$



time taken by A to reach C = 1 hr
in " B " " C = 1 hr.

Now, $AC + BC = 70$
 $(\text{dist by } A) + (\text{dist by } B) = 70$
 $x \times 1 + y \times 1 = 70$

$x + y = 70$ $\boxed{\text{Eqn 2}}$

#LP: A train covered a certain distance at a uniform speed. If the train would have been 6 km/hr faster, it would have taken 4 hours less than the scheduled time. And, if the train were slower by 6 km/hr, it would have taken 6 hours more than the scheduled time. Find the length of the journey. [CBSE 2002]

Let speed = x km/hr
time taken = y hr

$$\text{Final Ans} \rightarrow \boxed{D = xy}$$

Case I $s' = (x+6)$ km/hr

$$t' = (y-4) \text{ hr}$$

D will remain same.

$$\boxed{D = xy}$$

$$s' \times t' = xy$$

$$(x+6)(y-4) = xy$$

$$xy - 4x + 6y - 24 = xy$$

$$-4x + 6y = 24$$

$$-2(2x - 3y) = 24$$

$$\boxed{2x - 3y = -12 \quad \text{I}}$$

Case II

$$s' = (x-6) \text{ km/hr}$$

$$t' = (y+6) \text{ hr}$$

$$\boxed{D = xy}$$

$$s' \times t' = xy$$

$$y(x-6)(y+6) = xy$$

$$y^2b + 6x - 6y - 36 = xy$$

$$\Rightarrow 6x - 6y = 36$$

$$\Rightarrow 8(x-y) = 36$$

$$\boxed{\Rightarrow x-y=6 \quad \text{II}}$$

#LP: In a competitive examination, one mark is awarded for each correct answer while $\frac{1}{2}$ mark is deducted for every wrong answer. Jayanti answered 120 questions and got 90 marks. How many questions did she answer correctly.

Marking Scheme

$$\left\{ \begin{array}{l} \text{per correct Ans} = 1 \text{ marks} \\ \text{per wrong Ans} = -\frac{1}{2} \text{ marks} \end{array} \right.$$

For Jayanti Let no. of questions she attempted correct = x questions
 " " " incorrect = y questions

$$\therefore \text{Total no. of ques} - \boxed{x+y = 120} \quad (\text{given})$$

No w, RTQ

$$\begin{aligned} \text{Total marks} &= 90 \\ (1 \times x) - \left(\frac{1}{2}y\right) &= 90 \end{aligned}$$

$$\rightarrow x - \frac{y}{2} = 90$$

$$\boxed{2x - y = 180} \quad (\text{II})$$

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PL€2V

