Simplification - Equation
(SHORTCUTS & EXPLANATION)

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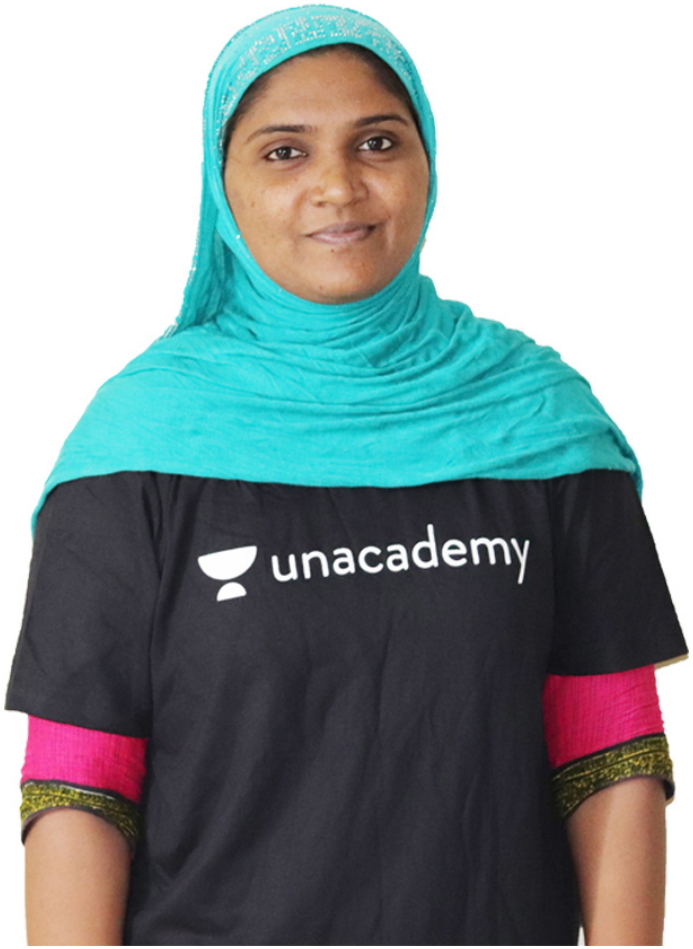

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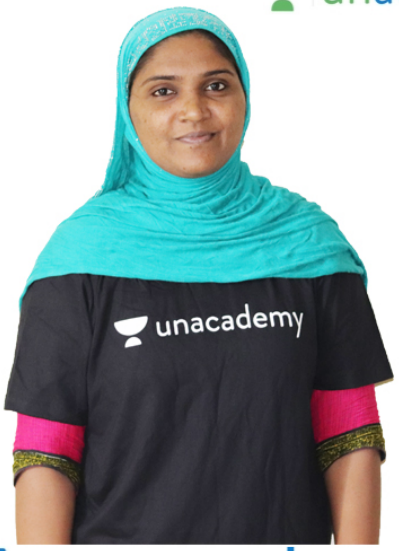
H. Jannathul Bradhavus



I have qualified with M.sc , B.ed in mathematics.

Worked one year under CBSE Syllabus and won Excellent maths teacher award.

At present, I prepare the aspirants for competitive examinations and Guidance by online courses in Unacademy, Websites and YouTube.

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1. If $\dfrac{2x}{1+\dfrac{1}{1+\dfrac{x}{1-x}}} = 1$, Find x.

$$\frac{2x}{1+\dfrac{1}{\dfrac{1-x+x}{1-x}}} = 1$$

$$\frac{2x}{1+\dfrac{1}{(1/1-x)}} = 1$$

$$= \frac{2x}{1+1-x} = 1$$

$$\Rightarrow 2x = 2-x$$

$$2x+x = 2$$

$$3x = 2 \Rightarrow x = \frac{2}{3}$$

2. If $\frac{a}{b} = \frac{3}{4}$ and $8a + 5b = 22$, find a.

$$\frac{a}{b} = \frac{3}{4}$$

$$b = \frac{4}{3}a$$

$$8a + 5b = 22$$

$$8a + 5 \times \frac{4}{3}a = 22$$

$$8a + \frac{20}{3}a = 22$$

$$44a = 66$$

$$a = \frac{66}{44}$$

$$= 3/2$$

3. If $2x+3y = 34$ and $\frac{x+y}{y} = \frac{13}{8}$, then find $5y+7x$

$2x+3y = 34$ — (1)

$\frac{x+y}{y} = \frac{13}{8}$

$8x+8y = 13y$

$8x-5y = 0$ — (2)

$\times$ (1) by 5; $10x+15y = 170$

$\times$ (2) by 3; $24x-15y = 0$

$34x = 170$

$x = 5$

$x=5$ in (1)

$2(5)+3y = 34$

$3y = 3y-10 \Rightarrow y = \frac{24}{3} = 8.$

$3y = 24$

$\Rightarrow$ value of $5y+7x$

$= 5(8)+7(5)$

$= 40+35$

$= 75$

4. From a group of boys and girls, 15 girls leave. There are then left 2 boys for each girl. After this, 45 boys leave. There are then 5 girls for each boy Find the number of girls in the beginning.

Boys be x.

Then numbers of girls at present $= 5x$

Before the boys had left, Number of boys $= x + 45$ and number of girls $= 5x$

$$x + 45 = 2 \times 5x$$

$$9x = 45$$

$$x = 5$$

Number of girls in the begining $= 5x + 15$

$= 25 + 15 = 40$

5. An employer pays Rs. 20 for each day a worker works, and forfeits Rs. 3 for each day he is idle. At the end of 60 days, a worker gets Rs. 280. For how many days did the worker remain idle?

Suppose the worker remained idle for x days.

He worked for $60-x$ days.

$$20(60-x) - 3x = 280$$

$$1200 - 20x - 3x = 280$$

$$-23x = -1200 + 280$$

$$23x = 920$$

$$x = \frac{920}{23}$$

$$= 40$$

6. Kiran had 85 currency notes in all, some of which were of Rs. 100 denomination and the remaining of Rs. 50 denomination. The total amount of all these currency notes was Rs. 5000/- How much amount did she have in the denomination of Rs 50?

Let the number of 50 rupee notes be x

then number of 100 rupee notes $= 85 - x$

$$50x + 100(85 - x) = 5000$$

$\div$ by 50, $x + 2(85 - x) = 100$

$$x + 170 - 2x = 100$$

$$170 - 100 = x$$

$$x = 70$$

required amount $=$ Rs. 50×70

$= 3500$

7. Two pens and three pencils cost Rs. 86. Four Pens and a pencil Cost Rs. 112. Find the cost of a pen and pencil.

Cost of a pen $- x$

Cost of a Pencil $- y$

$2x + 3y = 86 \quad -(1)$

$4x + y = 112 \quad -(2)$

$(2) \times 3 \Rightarrow 12x + 3y = 336 \quad -(3)$

$y = 12$

(1) & (3)

$$\begin{array}{r} 2x + 3y = 86 \\ 12x + 3y = 336 \\ \hline -10x = -250 \end{array}$$

$x = 25$

8. Arun and Sajal are friends. Each has some money. If arun gives Rs. 30 to Sajal, then Sajal will have twice the money left with Arun But, if Sajal gives Rs. 10 to Arun, then Arun will have thrice as much as is left with Sajal. How much money does each have?

Arun = Rs. x

Sajal = Rs. y

$2(x-30) = y+30 \Rightarrow 2x-60 = y+30$

$2x-y = 90 \quad -(1)$

$x+10 = 3(y-10) \Rightarrow x+10 = 3y-30$

$x-3y = -40 \quad -(2)$

Solving $x = 62$ and $y = 34$

9. What is the value of $\frac{P+Q}{P-Q}$ if $\frac{P}{Q} = 7$?

$$\frac{P+Q}{P-Q} = \frac{\frac{P}{Q}+1}{\frac{P}{Q}-1}$$

$$= \frac{7+1}{7-1}$$

$$= \frac{8}{6}$$

$$= \frac{4}{3}$$

10. $\frac{x}{y} = \frac{4}{5}$ then $\frac{4}{7} + \frac{2y-x}{2y+x} = ?$

$$\frac{4}{7} + \frac{2y-x}{2y+x} = \left(\frac{4}{7} + \frac{2-\frac{x}{y}}{2+\frac{x}{y}}\right)$$

$$= \frac{4}{7} + \frac{2-\frac{4}{5}}{2+\frac{4}{5}}$$

$$= \frac{4}{7} + \frac{6/5}{14/5}$$

$$= \frac{4}{7} + \left(\frac{6}{5} \times \frac{5}{14}\right)$$

$$= \frac{4}{7} + \frac{6}{14} = \frac{4}{7} + \frac{3}{7} = \frac{7}{7} = 1$$

11: If $4x+5y=83$ $\frac{3x}{2y}=\frac{21}{22}$ then $y-x=?$

$$\frac{3x}{2y}=\frac{21}{22}$$

$$\Rightarrow \frac{x}{y}=\frac{21}{2}\times\frac{2}{3}=\frac{7}{11}$$

$$x=\frac{7}{11}y$$

$$4x+5y=83 \Rightarrow 4\times\frac{7}{11}y+5y=83$$

$$\frac{28}{11}y+5y=83$$

$$83y=83\times 11$$

$$y=11$$

$$x=\frac{7}{11}y=\frac{7}{11}\times 11=7$$

$$y-x=11-7=4$$

12. If $3x - 5y = 5$ and $\frac{x}{x+y} = \frac{5}{7}$ then $x - y$.

$3x - 5y = 5 \quad \text{--- (1)}$

$\frac{x}{x+y} = \frac{5}{7}$

$\Rightarrow 7x = 5x + 5y$

$2x - 5y = 0 \quad \text{--- (2)}$

(2) - (1) $\Rightarrow x = 5$

$x = 5$ in (1), $y = 2$

$x - y = 5 - 2 = 3.$

13. If $2x+y=17$, $y+2z=15$ and $x+y=9$ then $4x+3y+z=?$

$2x+y=17$ —(1)

$y+2z=15$ —(2)

$x+y=9$ —(3)

(1)-(3) $= x=8$

$x=8$ in (1)

$y=1$

$y=1$ in (2)

$2z=14$

$z=7$

$4x+3y+z = 4\times 8 + 3\times 1 + 7$

$= 42$

14. If $\frac{x}{4} - \frac{x-3}{6} = 1$ then $x = ?$

$$\frac{x}{4} - \frac{x-3}{6} = 1$$

$$\Rightarrow \frac{3x - 2(x-3)}{12} = 1$$

$$\Rightarrow 3x - 2x - 6 = 12$$

$$\Rightarrow x = 6.$$

$2 \mid 4, 6$

$2, 3$

LCM $= 2 \times 2 \times 3$

$= 12$

15. $a^2+b^2=117$, $ab=54$ then $\frac{a+b}{a-b}=?$

$(a+b)^2 = a^2+b^2+2ab = 117+2\times54 = 225$

$(a+b) = 15$

$(a-b)^2 = a^2+b^2-2ab = 117-2\times54 = 9$

$(a-b) = 3$

$\frac{a+b}{a-b} = \frac{15}{3} = 5.$

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