

# 4. 3 Solving Equations Literally

A Practice Understanding Task

Start with the left side of the paper - this is your warmup

Solve each of the following equations for x:

1.  $\frac{3x+2}{5} = 7$   
 $\times 5 \quad \times 5$   
 $3x+2 = 35$   
 $-2 \quad -2$   
 $\frac{3x}{3} = \frac{33}{3}$   $x=11$

5.  $\frac{3x+2y}{5} = 7.5$   
 $3x+2y = 35$   
 $-2y \quad -2y$   
 $\frac{3x}{3} = \frac{35-2y}{3}$   
 $x = \frac{35-2y}{3}$

3.  $\frac{4x}{3} - 5 = 11$   
 $+5 \quad +5$   
 $\frac{4x}{3} = 16$   
 $\times 3 \quad \times 3$   
 $4x = 48$   
 $\frac{4x}{4} = \frac{48}{4}$   
 $x = 12$

4.  $\frac{4x}{3} - 5y = 11$   
 $+5y \quad +5y$   
 $\frac{4x}{3} = 11+5y$   
 $\frac{4x}{4} = \frac{33+15y}{4}$   
 $x = \frac{33+15y}{4}$

5.  $\frac{2}{5}(x+3) = 6$   
 $\frac{2}{5}x + \frac{6}{5} = 6$   
 $-\frac{6}{5} \quad -\frac{6}{5}$   
 $\frac{2}{5}x = \frac{24}{5}$   
 $\frac{2}{5}x = \frac{24}{5}$   
 $\frac{2}{2}x = \frac{24}{2}$   
 $x = 12$

5.  $\frac{2}{5}(x+y) = 6.5$   
 $2(x+y) = 30$   
 $x+y = 15$   
 $-y \quad -y$   
 $x = 15-y$

7.  $2(3x+4) = 4x+12$   
 $6x+8 = 4x+12$   
 $-4x \quad -4x$   
 $2x+8 = 12$   
 $-8 \quad -8$   
 $2x = 4$   
 $\frac{2x}{2} = \frac{4}{2}$   
 $x = 2$

8.  $2(3x+4y) = 4x+12y$   
 $6x+8y = 4x+12y$   
 $-8y \quad -8y$   
 $6x = 4x+4y$   
 $-4x \quad -4x$   
 $2x = 4y$   
 $\frac{2x}{2} = \frac{4y}{2}$   
 $x = 2y$

Write a **verbal description** for each step of the equation solving process used to solve the following equations for x. Your description should include statements about how you know what to do next. For example, you might write, "First I \_\_\_\_\_ because \_\_\_\_\_."

9.  $\frac{ax+b}{c} - d = e$   
 $+d \quad +d$  Add d

Solve for X

10.  $\frac{mx}{n} + s = t$

~~$\frac{ax+b}{c} = (e+d) \cdot c$~~  Multiply by  $c$   
 $ax+b = (e+d) \cdot c$   
 $-b \quad -b$  Minus b  
 $x = \frac{(e+d) \cdot c - b}{a}$  Divide by a

~~$\frac{ab+c}{x} = (y+m) \cdot x$~~  Multiply by  $x$   
 $ab+c = (y+m) \cdot x$   
 $\frac{ab+c}{(y+m)} = \frac{(y+m) \cdot x}{(y+m)}$  Divide by  $y+m$   
 $\frac{ab+c}{y+m} = x$

Solve each equation for x. Provide the justifications for each step. See the first example as a reminder for the types of justifications that might be used.

Example:

$3x - 6 = 15$	Justification
$+6 +6$	Addition Property of equality
$\frac{3x}{3} = \frac{21}{3}$	Division Property of equality
$x = 7$	

11.

$4x - 10 = 2$	Justification
<del><math>+10</math></del> $+10$	Addition Prop
<del><math>4x</math></del> $\frac{12}{4}$	Division Prop
$x = 3$	

12.

$6x + 3 = 18$	Justification
<del><math>-x</math></del> <del><math>-x</math></del>	Subtraction Prop
<del><math>5x + 3 = 18</math></del>	Subtraction Prop
<del><math>-3</math></del> $-3$	
$\frac{5x}{5} = \frac{15}{5}$	Division Prop
$x = 3$	

13.

$3x - 10 = 2x + 12$	Justification
<del><math>+10</math></del> $+10$	Addition Prop
<del><math>3x</math></del> $3x = 2x + 22$	Subtraction Prop
<del><math>-2x</math></del> $-2x$	
$x = 22$	

14.

$12x + 3y = 15$	Justification
<del><math>-3y</math></del> $-3y$	Subtraction Prop
<del><math>12x</math></del> $\frac{15-3y}{12}$	Division Prop
$x = \frac{5}{4} - \frac{1}{4}y$	Simplify Prop

15.

$x(B+7) = 9$	Justification
<del><math>B+7</math></del> $\frac{9}{B+7}$	Division Prop
$x = \frac{9}{B+7}$	

2) Solve for x  
 $3x + y = z$       $x = \frac{z-y}{3}$       $\frac{z}{3} - \frac{y}{3}$

7) Solve for d  
 $q + ad = m$       $d = \frac{m-q}{a}$

5) Solve for c  
 $Ac - 10 = h$       $C = \frac{h+10}{A}$  or  $\frac{h}{A} + \frac{10}{A}$

16) Solve for g  
 $bg + 9f = 27$       $g = \frac{27-9f}{b}$

9) Solve for g  
 $2g - 4f = 10f$       $g = 5f$

8) Solve for a      $\frac{2g}{2} = \frac{10f}{2}$       $5f = g$   
 $ab + d = c + e$       $a = \frac{c+e-d}{b}$

15) Solve for w  
 $\frac{24}{l \cdot h} = \frac{l \cdot w \cdot h}{l \cdot h}$       $w = \frac{24}{l \cdot h}$

1)  $D = rt$  solve for t      $t = \frac{D}{r}$

