

1.6: Simplifying Expressions (cont'd)

Note Title

1/21/2016

Homework Q's

$$\underline{1.6 \# 9} \quad 4x - 3 + \frac{1}{2}x$$

$$= \underline{4}x + \frac{1}{2}x - 3$$

$$= \frac{4}{1}x \left(\frac{2}{2} \right) + \frac{1}{2}x - 3$$

$$= \frac{8}{2}x + \frac{1}{2}x - 3$$

$$= \boxed{\frac{9}{2}x - 3}$$

Note: This is equal to

why?

$$\frac{9}{2}x - 3$$

$$= \frac{9}{2} \cdot \frac{x}{1} - 3$$

$$= \frac{9x}{2} - 3$$

$$\boxed{\frac{9x}{2} - 3}$$

Also correct.

Do not write these:

$$\frac{9}{2}x - 3$$

$$9/2x - 3$$

$$4\frac{1}{2}x - 3$$

(It is OK to write $4.5x - 3$)

Note: $4\frac{1}{2}$ means $4 + \frac{1}{2}$.

You should reduce your answers. So,

if you got $\frac{18}{4}x - 3$, you would
reduce (simplify) to $\frac{9}{2}x - 3$.

$$\begin{aligned} \text{1.6 \# 55} & \quad -6\left(\frac{1}{2}x - \frac{1}{3}y\right) + 12\left(\frac{1}{4}x + \frac{2}{3}y\right) \\ &= -\underline{6}\left(\frac{1}{2}x\right) - \underline{6}\left(-\frac{1}{3}y\right) + \underline{12}\left(\frac{1}{4}x\right) + \underline{12}\left(\frac{2}{3}y\right) \\ &= -\frac{6}{2}x + \frac{6}{3}y + \frac{12}{4}x + \frac{24}{3}y \\ &= -\frac{6}{2}x + \frac{12}{4}x + \frac{6}{3}y + \frac{24}{3}y \\ &= -3x + 3x + 2y + 8y \\ &= \boxed{10y} \end{aligned}$$

Another problem with diagonal fraction bars:

$$\frac{2}{3}\left(\frac{6}{7}\right) = \frac{12}{21} = \frac{4}{7}$$

$$\begin{aligned} \frac{2}{3}\left(\frac{6}{7}\right) &= \boxed{\frac{12}{21}} \quad \leftarrow \text{much less confusing} \\ &= \boxed{\frac{4}{7}} \quad (\text{reduce it}) \end{aligned}$$

Ex. Evaluate $3x - 5y$ for $x = 2$ and $y = -4$.

$$3(2) - 5(-4) \\ = 6 + 20 = \boxed{26}$$

2.1: ^{Additive} ~~Multiplicative~~ Property of Equality

An equation consists of two expressions joined by an equals sign.

A solution to an equation is a value for the variable that makes the equation true.

To solve an equation means to find the solution.

Example: Is -3 a solution to $2x - 4 = 2$?

$$2(-3) - 4 = 2$$

$$-6 - 4 = 2$$

$$-10 = 2 \text{ False!}$$

So, No, -3 is not a solution.

Is -10 a solution

$$2x - 4 = 2$$

$$2(-10) - 4 = 2$$

$$-20 - 4 = 2$$

$$-24 = 2 \text{ False.}$$

No, this is not a solution.

see next page

Is 3 a solution to $2x - 4 = 2$?

$$2(3) - 4 = 2$$

$$6 - 4 = 2$$

$$2 = 2 \text{ True!}$$

Yes, 3 is a solution.

This whole chapter pertains to linear equations.
In a linear equation, the variable is to the 1st power only.

Additive Property of Equality

If $a = b$, then $a + c = b + c$.

In other words, we can add (or subtract) the same quantity from both sides.

Ex: $2x - 4 = 2$ Solve.

Add 4 to both sides: $2x - 4 + 4 = 2 + 4$

$$2x = 6$$

$$\frac{2x}{2} = \frac{6}{2}$$

$$x = 3$$

(multiplicative property of equality.)

Solution set is $\{3\}$.

$\{3\}$

Ex.:

Solve.

$$2x - 7 = 6 + 3x$$

Subtract $3x$ from both sides:

$$2x - 3x - 7 = 6 + 3x - 3x$$

$$-x - 7 = 6$$

$$-x - 7 = 6$$

$$-x - 7 + 7 = 6 + 7$$

$$-x = 6 + 7$$

$$-x = 13$$

$$x = -13$$

Add 7 to both sides

$$\boxed{\{-13\}}$$

Ex.:

Solve.

$$6(1+3x) = 8(2x-1) + x$$

$$6 + 18x = 16x - 8 + x$$

$$6 + 18x = 17x - 8$$

$$6 + 18x - 17x = -8$$

$$6 + x = -8$$

$$x = -8 - 6$$

$$x = -14$$

$$\boxed{\{-14\}}$$

$$6 + 18x = 17x - 8$$

$$6 + x = -8$$

$$x = -14$$

$$\boxed{\{-14\}}$$

Ex: Solve.

$$\frac{2}{3}x - 7 = 5 - \frac{1}{3}x$$

$$\frac{2}{3}x + \frac{1}{3}x = 5 + 7$$

$$\begin{aligned} 1x = 12 & \quad \left\langle \begin{aligned} \frac{3}{3}x &= 12 \\ x &= 12 \end{aligned} \right. \\ \text{because } \frac{3}{3} &= 1. \end{aligned}$$

$$\boxed{\{12\}}$$

Note: $\frac{5}{5} = 1$, $\frac{1}{1} = 1$, etc

Note: $\frac{0}{0}$ is not defined (because division by 0 is not defined).

2.2: Multiplicative Property of Equality

Example: What is the solution of $3x = 12$?

4

$$\text{Check it: } 3(4) = 12$$

$$12 = 12 \checkmark \text{ True}$$

Multiplicative Property of Equality:

If $a = b$, then $ac = bc$ as long as $c \neq 0$.

This means that we can multiply (or divide) both sides by the same nonzero number.

Ex.:

$$3x = 12$$

$$\frac{3x}{3} = \frac{12}{3}$$

$$x = 4$$

$\{4\}$ Solution Set.

Ex.: Solve.

$$-4x + 1 = 49$$

$$-4x = 49 - 1$$

$$-4x = 48$$

$$\frac{-4x}{-4} = \frac{48}{-4}$$

$$x = -12$$

$\{-12\}$ Solution Set

Ex.: Solve.

$$\frac{2}{3}x = 7$$

$$\frac{\frac{2}{3}x}{\frac{2}{3}} = \frac{7}{\frac{2}{3}}$$

$$\frac{2}{3}x \left(\frac{3}{2} \right) = \underline{7} \left(\frac{3}{2} \right)$$

$$\frac{6}{6}x = \frac{21}{2}$$

$$x = \frac{21}{2}$$

Recall: Dividing by a fraction is the same as multiplying by its reciprocal.

$\left\{ \frac{21}{2} \right\}$

Ex:

Solve.

$$-\frac{7}{3}x = \frac{1}{4}$$

$$\left(-\frac{3}{7}\right)\left(-\frac{7}{3}x\right) = \frac{1}{4}\left(-\frac{3}{7}\right)$$

$$1x = -\frac{3}{28}$$

$$\left\{-\frac{3}{28}\right\}$$

Ex:

$$-\frac{1}{4}x = -\frac{2}{5}$$

$$\left(-\frac{4}{1}\right)\left(-\frac{1}{4}x\right) = -\frac{2}{5}\left(-\frac{4}{1}\right)$$

$$x = +\frac{8}{5}$$

Ex:

$$\frac{2}{3}x = -\frac{1}{6}$$

$$\left(\frac{3}{2}\right)\left(\frac{2}{3}x\right) = -\frac{1}{6}\left(\frac{3}{2}\right)$$

$$x = -\frac{3}{12}$$

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

$$\left\{-\frac{1}{4}\right\}$$