Grade 8 Solving Multistep Equations

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Key Idea

Solving Multi-Step Equations
To solve multi-step equations, use inverse operations to isolate the variable.

$+ - \quad \times \div$

1. Write Equation
2. Notice X
3. Undo math to get X's alone
4. Get X single

EXAMPLE 1 Solving a Two-Step Equation

The height (in feet) of a tree after x years is $1.5x + 15$. After how many years is the tree 24 feet tall?

$1.5x + 15 = 24$　　Write an equation.

Undo the addition. → $-15 \quad -15$　　Subtraction Property of Equality

$1.5x = 9$　　Simplify.

Undo the multiplication. → $\dfrac{1.5x}{1.5} = \dfrac{9}{1.5}$　　Division Property of Equality

$x = 6$　　Simplify.

So, the tree is 24 feet tall after 6 years.

EXAMPLE 2 Combining Like Terms to Solve an Equation

Solve $8x - 6x - 25 = -35$.

$8x - 6x - 25 = -35$　　Write the equation.

$2x - 25 = -35$　　Combine like terms.

Undo the subtraction. → $+25 \quad +25$　　Addition Property of Equality

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▷ So, the tree is 24 feet tall after 6 years.

EXAMPLE 2 Combining Like Terms to Solve an Equation

Solve $8x - 6x - 25 = -35$.

$8x - 6x - 25 = -35$	Write the equation.
$2x - 25 = -35$	Combine like terms.
(Undo the subtraction.) *to get Xs alone* $\quad +25 \quad +25$	Addition Property of Equality
$2x = -10$	Simplify.
(Undo the multiplication.) *to get single x* $\quad \dfrac{2x}{2} = \dfrac{-10}{2}$	Division Property of Equality
$x = -5$	Simplify.

▷ The solution is $x = -5$.

● **On Your Own**

Now You're Ready
Exercises 6–9

Solve the equation. Check your solution.

1. $-3z + 1 = 7$ 2. $\dfrac{1}{2}x - 9 = -25$ 3. $-4n - 8n + 17 = 23$

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EXAMPLE 3 Using the Distributive Property to Solve an Equation

$c(a + b) = ca + cb$

Solve $2(1 - 5x) + 4 = -8$.

Study Tip ✏️

Here is another way to solve the equation in Example 3.
$2(1 - 5x) + 4 = -8$
$2(1 - 5x) = -12$
$1 - 5x = -6$
$-5x = -7$
$x = 1.4$

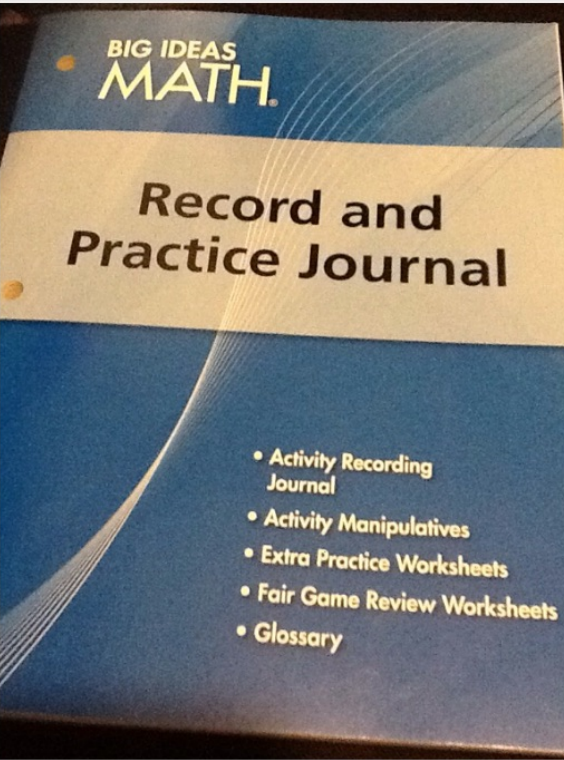|	
$2(1 - 5x) + 4 = -8$	Write the equation.
$2(1) - 2(5x) + 4 = -8$	Distributive Property
$2 - 10x + 4 = -8$	Multiply.
$-10x + 6 = -8$	Combine like terms.
Get X's alone $\quad -6 \quad -6$	Subtraction Property of Equality
$-10x = -14$	Simplify.
Get single X $\quad \dfrac{10x}{-10} = \dfrac{14}{-10}$	Division Property of Equality
$x = 1.4$	Simplify.

EXAMPLE 4 Real-Life Application

Use the table to find the number of miles x you need to run on Friday so that the mean number of miles run per day is 1.5.

Write an equation using the definition of *mean*.

sum of the data $\longrightarrow \dfrac{2 + 0 + 1.5 + 0 + x}{5} = 1.5$ Write the equation.

Day	Miles
Monday	2
Tuesday	0
Wednesday	1.5
Thursday	0
Friday	x

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Pg .10
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1. $3X - 11 = 22$
$$ +11 \ +11$$
$$\cancel{3}X = \frac{33}{3}$$
$$\cancel{3} \quad X = 11$$

2. $\dfrac{24 - 10b = 9}{-24 -24}$
$$\frac{-10b = 15}{-10 \quad -10}$$
$$b = -\frac{3}{2}$$

3. $2.4z + 1.2z - 6.5 = 0.7$
$$3.6z - 6.5 = 0.7$$
$$+6.5 \ {}^{+}_{=}6.5$$
$$\frac{3.6z = 7.2}{3.6 \qquad 3.6}$$
$$z = 2$$

4. $\frac{3}{4}W - \frac{1}{2}W - 4 = 12$

$.75W - .5W - 4 = 12$ $\quad\quad\quad \begin{array}{r} .75 \\ -.50 \\ \hline \end{array}$

$\underline{\quad}W - 4 = 12$

5. $2(a+7) - 7 = 9$ $\quad\quad$ 6. $20 + 8(g - 11) = -12$

$2a + 2.7 - 7 = 9$

7. Extra Credit