LEARNING OBJECTIVE: We will use if-then moves to solve problems involving multiple steps. (G7M3L9)

CONCEPT DEVELOPMENT:
When Solving Equations, It's Important to KNOW the Following:
- Our goal in solving linear equations is to get x to equal a number. This is often called "**isolating the variable.**"
- The *properties of operations* are used to create equivalent expressions on *ONE SIDE* of the equation only. This would include using the **distributive property, the associative property**. It doesn't change the value of an expression, but can make the expression easier to work with.
- A good first step might be to **combine like terms** on each side of the equation.
- The *if-then moves* are used to modify *BOTH SIDES* of an equation at the same time. They will create different expressions on each side of the equal sign, but the solutions do not change.

Example:

$$\frac{2(x-5)}{3} = 30$$	Original expression. Solve for x.
$$\frac{2x-10}{3} = 30$$	Use the distributive property (Change **one side only**!)
$$3\left(\frac{(2x-10)}{3}\right) = 3 \cdot 30$$	Use if-then moves to get rid of denominator. (Change **both sides** of the same expression.)
$$2x - 10 = 90$$	
$$2x - 10 + 10 = 90 + 10$$	Use if-then moves—change **both sides** of the equation.
$$2x = 100$$	
$$\frac{1}{2}(2x) = \frac{1}{2}(100)$$	Use if-then moves—change **both sides** of the equation.

Guided Practice:

> **Steps for Solving Problems Involving Multiple Steps**
> 1. Read the problem carefully and decide if a diagram would be helpful.
> 2. Define your variable.
> 3. Write your equation to model the situation or story you are presented with.
> 4. Combine all like terms (if needed).
> 5. Use your if-then moves to solve for *x*.
> 6. Interpret your answer by answering the questions posed.

Maia, Trevor, and Anastasia are volunteer firefighters. On Saturday the volunteer fire department held their annual coin drop fundraiser near Castro Street. After one hour, Maia had collected $42.50 more than Trevor. Anastasia collected $15.00 less than Maia. Altogether, the three of them collected $125.95. How much did each person collect?

$T: 18.65$
$M: 61.15$
$A: 46.15$

$x =$ what Trevor collected.

$x + 42.50 =$ what Maia collected

$x + 42.50 - 15.00 =$ Anastasia

$\underline{x} + \underline{x} + 42.50 + x + 27.50 = 125.95$

$3x + 70 = 125.95$

$\begin{array}{c} -70 \end{array} \Big\} \begin{array}{c} 70.00 \\ \overline{55.95} \end{array} \quad \begin{array}{c} 42.50 \\ \boxed{\$18.65} \\ -15 \end{array}$

$\dfrac{3x}{3} \Big\} \dfrac{55.95}{3}$

Justin has $7.50 more than Eva has and Emma has $12.00 less than Justin does. How much money does each person have if they have a total of $63.00?

$x = $ Eva

$x + 7.50 =$ Justin

$x + 7.50 - 12 =$ Emma $= x - 4.50$

$\underline{x} + \underline{x} + 7.50 + x - 4.50 = 63$

$3x + 3 = 63$

$\begin{array}{c} -3 \end{array} \Big\} -3$

$\dfrac{3x}{3} \Big\} \dfrac{60}{3}$

$x = 20$

Eva → $20
Justin → $27.50
Emma → $15.50

Shelby is 7 times as old as Bonnie. If in 5 years, the sum of Bonnie's and Shelby's age is 98, find Bonnie's present age.

Let $x =$ Bonnie
Let $7x =$ Shelby

Bonnie is 11
Shelby is 77

$\underline{x} + 5 + \underline{7x} + 5 = 98$

$8x + 10 = 98$

$\begin{array}{c} -10 \end{array} \Big| \begin{array}{c} -10 \end{array}$

$\dfrac{8x}{8} \Big\} \dfrac{88}{8}$

$x = 11$

Michael is 17 years older than John. In 4 years, the sum of their ages will be 49. Find Michael's present age.

$x =$ John $x + 17 =$ Michael

$\underline{x} + 4 + \underline{x} + 21 = 49$

$2x + 25 = 49$

$\begin{array}{c} -25 \end{array} \Big| \begin{array}{c} -25 \end{array}$

$\dfrac{2x}{2} \Big\} \dfrac{24}{2}$

$x = 12$

John is 12
Michael is 29

Ms. Doyle plans her volleyball practices to include 10 minutes of stretching, $\frac{2}{3}$ of the entire practice scrimmaging, and the remaining practice time working on drills and specific skills. If she spent 100 minutes on Wednesday on stretching and scrimmaging, how long is the entire practice?	Atenea's morning routine involves getting dressed, eating breakfast, making her bed, and getting a ride to school. Atenea spends $\frac{1}{3}$ of her time getting dressed, 10 minutes eating breakfast, 5 minutes making her bed, and the rest of the time in the car going to school. If she spends $35\frac{1}{2}$ minutes getting dressed, eating breakfast, and making her bed, how long was Atenea in the car?

Left problem work:

Let x = length of practice.

Stretching = 10 min.
Scrimmage = 100 - 10 = 90
Skill/Drill = 35 min.

$\frac{2}{3}x + 10 = 100$
$\quad -10 \qquad -10$
$\frac{3}{2}(\frac{2}{3}x) \gtrless 90(\frac{3}{2})$
$\qquad x \gtrless 135$

> Ms. Doyle's practice is 2 hr 15 min. long

Right problem work:

Breakfast = 10 min   Bed = 5 min

x = Total time spent in morning

$10 + 5 + \frac{1}{3}x = 35\frac{1}{2}$
$15 + \frac{1}{3}x = 35\frac{1}{2}$
$-15 \qquad 2 -15$
$3(\frac{1}{3}x) \gtrless (20\frac{1}{2})3$
$\qquad x \gtrless 61\frac{1}{2}$

$\quad 61.5$
$- 35.5$
$\boxed{26 \text{ minutes}}$

Every day, Quincy practices softball and saxophone. Each day, she practices the sax for 2 hours. After 5 days, she practiced both softball and sax for 20 hours total. How many hours did Quincy practice softball each day?	Every day for 5 days, Malik practices karate. Over those five days, he also practices writing calligraphy for 2 hours. If he practiced both karate and calligraphy for a total of 20 hours, how many hours a day did he practice karate?

Left problem work:

x = the hours of softball each day.

$5(x+2) = 20$
$5x + 5 \cdot 2 = 20$
$5x + 10 = 20$
$\quad -10 \qquad -10$
$\frac{5x}{5} \gtrless \frac{10}{5}$
$\qquad x = 2$

Right problem work:

x = # of hours of karate each day.

$5x + 2 = 20$
$\quad -2 \qquad -2$
$\frac{5x}{5} \gtrless \frac{18}{5}$
$x = 3.6 \text{ hours}$

Lizzy and Laynie did a bike-run-athon that was 138.2 miles total. Lizzy does the biking at 8 miles per hour, and Laynie does the running at 4 miles an hour. It took 20 hours and 33 minutes for them to complete the race. How far did each girl race, and how long did it take them? Remember that $d = rt$ $(distance = rate \times time)$.	A Vespa scooter has a top speed that goes 2 miles per hour faster than Honda's scooter. If after 3 hours, the Vespa traveled 24 miles, at what rate did the Honda scooter travel at its top speed? $d = rt$ $(distance = rate \times time)$.

Line of Learning:

1. Writing equation can be harder than solving it.

2. At the beginning, define what "x" equals

3. Whatever you to left side of equation, do
   it to the right side
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4. Read the problem carefully.

5. Important to identify variable.

6. When you have a two step equation, add or subtract
   first!!

Independent Practice:

Kevin is twice as old now as his brother is. If Kevin was 8 years old 2 years ago, how old is Kevin's brother now?	A number is 6 greater than $\frac{1}{2}$ another number. If the sum of the two numbers is 21, find the two numbers.
A vending machine has twice as many quarters as dollar bills in it. If the quarters and the dollar bills have a combined total of $96.00, how many quarters are in the machine? How many dollar bills are there?	The cost of admission to the technology museum is $3.25 per person over the age of 3; kids 3 and under get in for free. If the total cost of admission for the Martinez family, including their two 6 month old twins, is $19.50, how many members of their family are over 3 years old?

Caterina went to Abercrombie to buy school clothes. She had a credit from a previous return in the amount of $39.58. She bought 4 of the same style shirt in different colors. After she applied her credit, the total she paid was $52.22. How much was each shirt?	Kaishu rode his bike 70 miles in 4 hours. He rode 17 miles per hour for t hours and an average rate of 22 miles per hour for the rest of the time. How long did Kaishu ride at the slower speed?
Esther ordered 250 pens and 250 pencils to sell for the theatre club fundraiser. The pens cost 11 cents more than the pencils. The total cost for Esther's order was $42.50. How much did each pen and pencil cost?	A family left their house in two cars at the same time. One car went 7 miles per hour faster than the other. After 5 ½ hours of driving, both cars had driven 599.5 miles. If the second car continues at the same average speed, how much time to the nearest minute before the second car arrives?

Activating Prior Knowledge:

We already know how to use the distance formula $d = rt$ $(distance = rate \times time)$

A marathon runner did a workout where she ran at an average rate of 7.5 miles per hour for 100 minutes. How many miles did she run?	Your Thanksgiving trip from Mountain View to San Luis Obispo takes $3\frac{1}{2}$ hours to drive at an average speed of 58 miles an hour. How many miles was the trip?

Closure:

Teacher Notes:

This is lessons 8 and 9 from ENY Mod 3. This will be a long lesson??
Will be breaking up into small groups for the second period:

1. Engage NY page 144-45 puzzles. Or Square puzzles?

2. Math Forum PoW or Khan Academy

3. Computers-Knowre.

4. Ken Ken.