LEARNING OBJECTIVE: We will solve written linear equations that involve finding missing angle measures. (G8M4L4)

CONCEPT DEVELOPMENT:
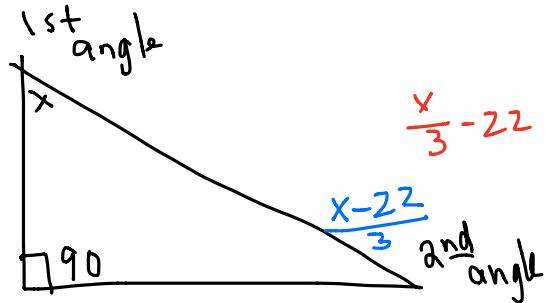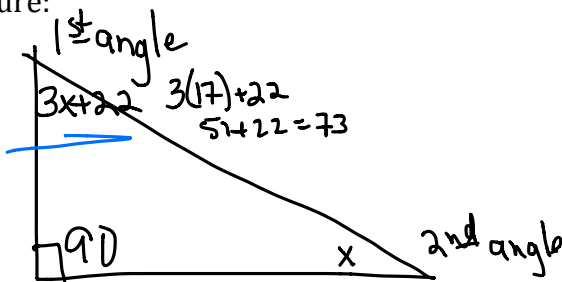
Supplementary $x = 180°$ } Complementary $x_s = 90°$

When you are trying to write and solve an equation (especially where these geometry questions are concerned), it can be helpful to DRAW A PICTURE.

Example: In a right triangle, the first angle is 22 more than 3 times the second angle, and the third angle is the right angle. What are the measurements of the angles?

Picture:

1st angle
$3x+22$ $3(17)+22$
$51+22=73$
90 x 2nd angle

1st angle
x
$\frac{x}{3}-22$
$\frac{x-22}{3}$
90 2nd angle

There can be different ways to solve these problems:

Solution #1 and #2: Let *x* be the second angle.

Complementary

$$90+x+3x+22=180$$
$$4x+112=180$$
$$-112=112$$
$$\frac{4x}{4}=\frac{68}{4}$$
$$\boxed{x=17}$$

$x_1=73°$
$x_2=17°$

$$x+3x+22=90$$

1st x 2nd x

Solution #3 and #4: Let *x* be the first angle.

$$x+\frac{x}{3}-22+90=180$$
$$+22 \qquad +22$$
$$x+\frac{x}{3}+90=202$$
$$-90 \quad -90$$
$$3\left(x+\frac{x}{3}\right)=(112)3$$
$$3x+x=336$$
$$\frac{4x}{4}=\frac{336}{4} \quad \boxed{x=84}$$

$$3\left(x+\frac{x-22}{3}\right)=(90)3$$
$$3x+x-22=270$$
$$4x-22=270$$
$$+22 \quad +22$$
$$\frac{4x}{4}=\frac{292}{4} \quad x=73$$

Guided Practice:

Steps for Solving for Missing Angle Measures
1. Read the problem carefully and define your variable.
2. If ~~helpful,~~ Draw a diagram.
3. Write an equation using variables.
4. If necessary, use the properties of equality to get all of your variables on one side of the equation.
5. Combine like terms.
6. Use the properties of equality to isolate your variable.
7. Interpret your answer.

A pair of congruent angles are described as follows: the measure of one angle is three more than twice a number and the other angle's measure is 54.5 less than three times <u>the number</u>. Find both angle measures. $X = $ the number $2x+3$ $3x-54.5$ $2x+3 = 3x-54.5$ $-2x \quad -2x$ $3 = x-54.5$ $+54.5 \quad +54.5$ $\boxed{x=57.5}$ $2(57.5)+3$ $115+3 = \boxed{118}$ $3(57.5)-54.5$ $172.5-54.5 = \boxed{118}$ *Each ∡ is 118°*	One angle measures nine more than six times a number. A sequence of rigid motions maps the angle onto another angle that is described as being thirty less than nine times the number. <u>Find the angle measures</u>. $6x+9 = 9x-30$ $-6x \quad -6x$ $9 = 3x-30$ $+30 \quad +30$ $39 = 3x$ $\boxed{13=x}$ $6x+9 \quad 9x-30$ $6(13)+9$ $78+9 = 87$ $9(13)-30$ $117-30 = 87$ *Each ∡ is 87°*
The measure of one angle is described as twelve more than four times a number. Its supplement is twice as large. Find the measure of each angle.	One angle is one less than six times the size of another. The two angles are complementary angles. Find the size of each angle.

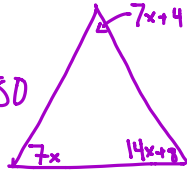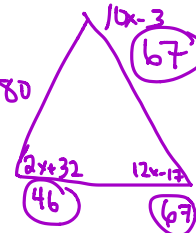| A triangle has angles described as follows: the first angle is four more than seven times a number. Another angle is four less than the first, and the third angle is twice as large as the first. Find the angle measures.	One angle of a triangle is 3 less than ten times a number. The second angle is thirty-two more than twice the number and the third angle is 17 less than twelve times the number. Find the angle measures.
$7x+4$ (diagram) $7x$ $14x+8$ $7x+4+7x+14x+8=180$ $28x+12=180$ $-12-12$ $\dfrac{28x}{28}=\dfrac{168}{28}$ $\boxed{x=6}$ $1^{st} = 7(6)+4=46$ $2^{nd} = 7(6)=42$ $3^{rd} = 14(6)+8=92$	$10x-3$ ⑥⑦ (diagram) $2x+32$ ㊻ $12x-17$ ㊻ $10x-3+2x+32+12x-17=180$ $24x+12=180$ $-12-12$ $\dfrac{24x}{24}=\dfrac{168}{24}$ $x=7$
A right triangle is described as having an angle of the size "six less than negative two times a number." Another angle was "three less than negative one-fourth the number" and the third angle was a right angle. Find the measure of the angles.	One acute angle of a right triangle is described as 9 more than three times a number, and the other acute angle is three times that size. What are the angle measures?

Independent Practice:

The measure of one angle is thirteen less than five times the measure of another angle. The sum of the measures of the two angles is 140 degrees. What is the measure of each angle?	An angle measure is seventeen more than three times a number. Its supplement is three more than seven times the number. What is the measure of each angle?
The angles of a triangle are described as follows: $\angle A$ is the largest angle, its measure is twice the measure of $\angle B$. The measure of $\angle C$ is two less than half the measure of $\angle B$. Find the three angle measures.	The measure of one angle is eleven more than four times a number. A second angle is twice that size. The sum of their measure is 195 degrees. What is the measure of each angle?

Three angles are described as follows: $\angle B$ is half the size of $\angle A$. The measure of $\angle C$ is equal to one less than two times the measure of $\angle B$. The sum of $\angle A$ and $\angle B$ is 114°. Can these angles form a triangle? Why or why not?	A pair of vertical angles are described as follows. One angle is four times a number, and the other angle is forty-five less than nine times that number. What is the measure of each angle?
Two intersecting lines created four angles. One angle measure is 220 more than eight times a number. Its vertical angle is 181 more than five times that same number. Find the angle measures.	Two intersecting lines created four angles. One angle measure fifty-seven more than three times a number. An adjacent angle is twenty-one less than five times the number. What are the angle measures?

Activating Prior Knowledge:
We already know about complementary and supplementary angles.

If one angle is 75 degrees, what is the measure of the complementary angle?	If one angle is 31 degrees, what is the measure of the supplementary angle?

Closure:

A pair of corresponding angles are described as follows: the measure of one angle is five less than seven times a number and the measure of the other angle is eight more than seven times the number. Are these angles congruent? Why or why not?

Teacher Notes:
ENY Lesson 5
Khan HW: Equation Practice with Angle Addition