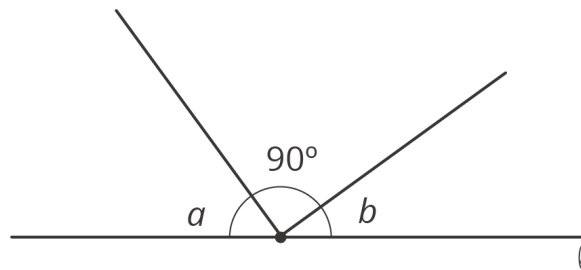# Unit 7, Lesson 5: Using Equations to Solve for Unknown Angles

Let's figure out missing angles using equations.

5.1: Is This Enough?

Tyler thinks that this figure has enough information to figure out the values of a and b.

Do you agree? Explain your reasoning.
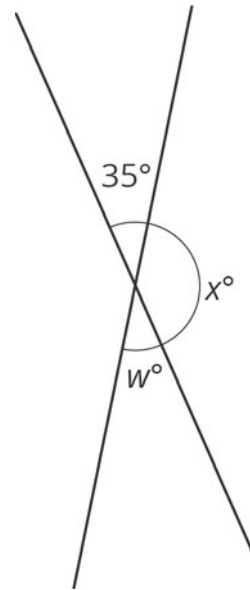
5.2: What Does It Look Like?

Elena and Diego each wrote equations to represent these diagrams. For each diagram, decide which equation you agree with, and solve it. You can assume that angles that look like right angles are indeed right angles.
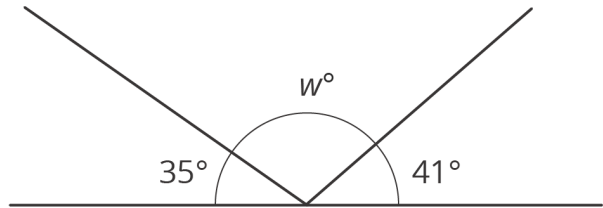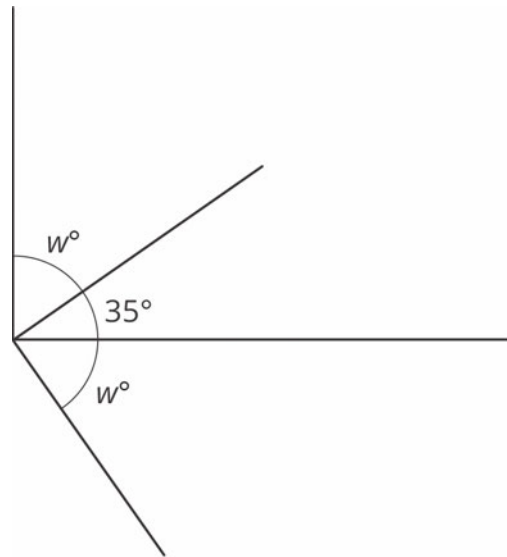
1. Elena: $x = 35$ Diego: $x + 35 = 180$

2. Elena: $35 + w + 41 = 180$ Diego: $35 + w = 180$
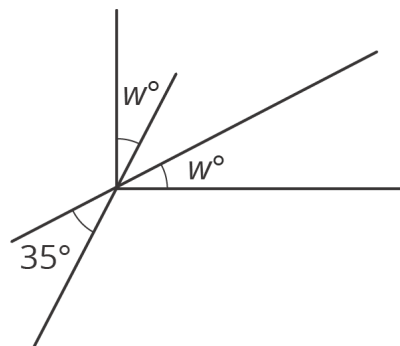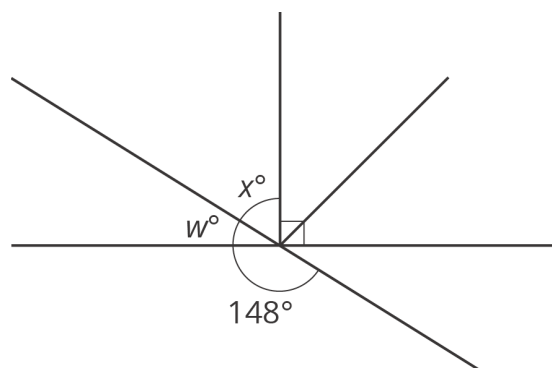
3. Elena: $w + 35 = 90$ Diego: $2w + 35 = 90$

4. Elena: $2w + 35 = 90$ Diego:
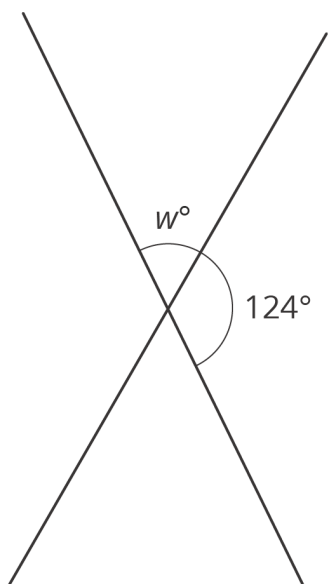 $w + 35 = 90$

5. Elena: $w + 148 = 180$ Diego:
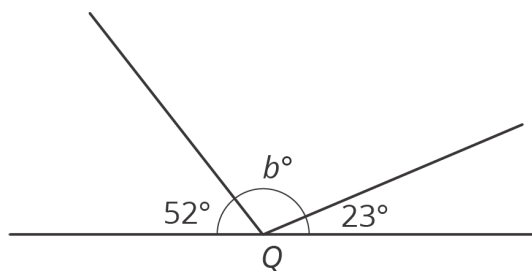 $x + 90 = 148$

5.3: Calculate the Measure

Find the unknown angle measures. Show your thinking. Organize it so it can be followed by others.
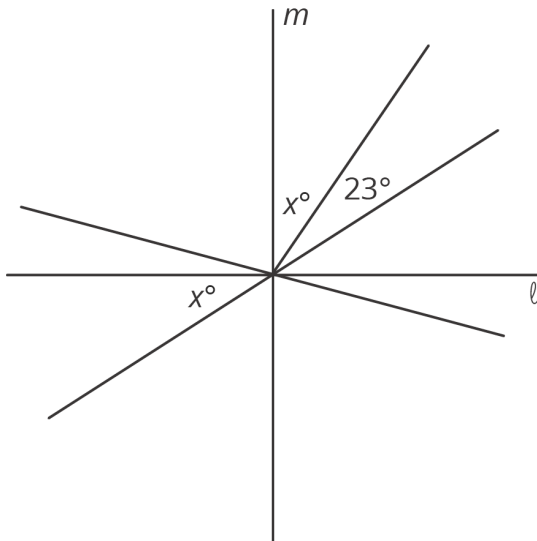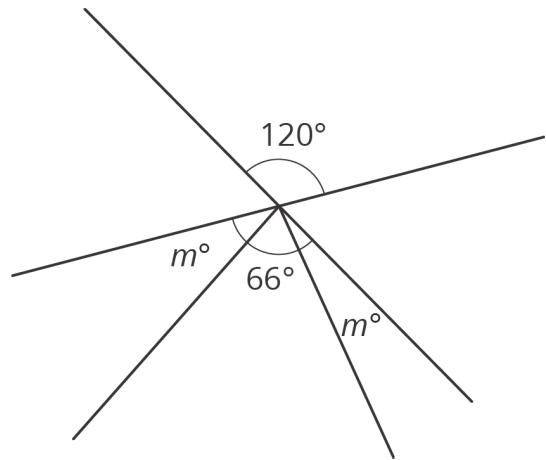
1.

2.

NAME   DATE   PERIOD

3. Lines ℓ and m are perpendicular.

4.

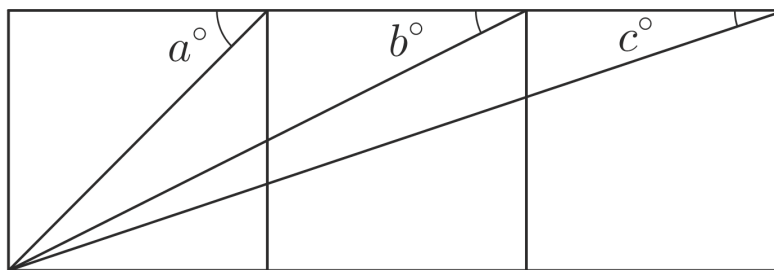**Are you ready for more?**

The diagram contains three squares. Three additional segments have been drawn that connect corners of the squares. We want to find the exact value of $a + b + c$.

1. Use a protractor to measure the three angles. Use your measurements to conjecture about the value of $a + b + c$.

2. Find the exact value of $a + b + c$ by reasoning about the diagram.

Lesson 5 Summary

To find an unknown angle measure, sometimes it is helpful to write and solve an equation that represents the situation. For example, suppose we want to know the value of x in this diagram.
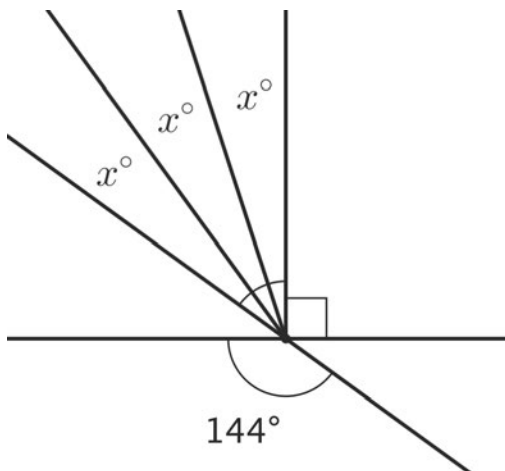
Using what we know about vertical angles, we can write the equation $3x + 90 = 144$ to represent this situation. Then we can solve the equation.

$$3x + 90 = 144$$
$$3x + 90 - 90 = 144 - 90$$
$$3x = 54$$
$$3x \cdot \frac{1}{3} = 54 \cdot \frac{1}{3}$$
$$x = 18$$
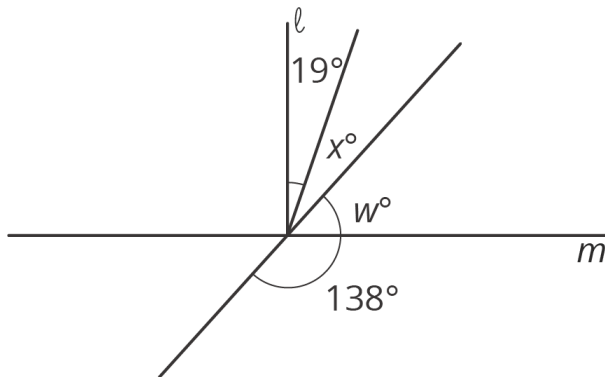
Unit 7, Lesson 5: Using Equations to Solve for Unknown Angles

1. Segments AB, DC, and EC intersect at point C. Angle DCE measures 148°. Find the value of x.
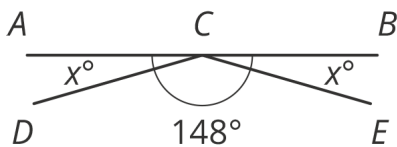
2. Line ℓ is perpendicular to line m. Find the value of x and w.

3. If you knew that two angles were complementary and were given the measure of one of those angles, would you be able to find the measure of the other angle? Explain your reasoning.

4. For each inequality, decide whether the solution is represented by $x < 4.5$ or $x > 4.5$.

   a. $-24 > -6(x - 0.5)$

   b. $-8x + 6 > -30$

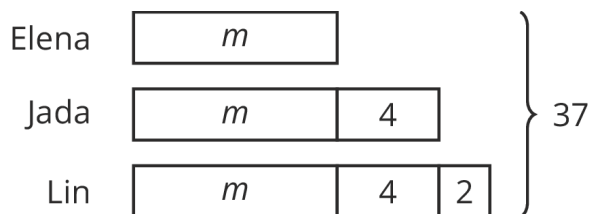NAME   DATE   PERIOD

c. $-2(x + 3.2) < -15.4$

(from Unit 6, Lesson 15)

5. A runner ran $\frac{2}{3}$ of a 5 kilometer race in 21 minutes. They ran the entire race at a constant speed.

a. How long did it take to run the entire race?

b. How many minutes did it take to run 1 kilometer?

(from Unit 4, Lesson 2)

6. Jada, Elena, and Lin walked a total of 37 miles last week. Jada walked 4 more miles than Elena, and Lin walked 2 more miles than Jada. The diagram represents this situation:

Find the number of miles that they each walked. Explain or show your reasoning.

(from Unit 6, Lesson 12)

7. Select **all** the expressions that are equivalent to $-36x + 54y - 90$.

A. $-9(4x - 6y - 10)$
B. $-18(2x - 3y + 5)$
C. $-6(6x + 9y - 15)$
D. $18(-2x + 3y - 5)$
E. $-2(18x - 27y + 45)$
F. $2(-18x + 54y - 90)$

(from Unit 6, Lesson 19)