Architects make blueprints and models of their designs to show clients and contractors. These scale drawings and scale models have measurements in proportion to those of the project when built.
Complete these exercises to review skills you will need for this module.

**Solve Two-Step Equations**

**EXAMPLE** \(5x + 3 = -7\)

\[
5x + 3 - 3 = -7 - 3 \\
5x = -10 \\
\frac{5x}{5} = \frac{-10}{5} \\
x = -2
\]

**Subtract 3 from both sides.**

**Simplify.**

**Divide both sides by 5.**

**Solve.**

1. \(3x + 4 = 10\)  
2. \(5x - 11 = 34\)  
3. \(-2x + 5 = -9\)  
4. \(-11 = 8x + 13\)

5. \(4x - 7 = -27\)  
6. \(\frac{1}{2}x + 16 = 39\)  
7. \(12 = 2x - 16\)  
8. \(5x - 15 = -65\)

**Solve Proportions**

**EXAMPLE** \(\frac{a}{4} = \frac{27}{18}\)

What do you multiply 27 by to get \(a\)? \(18 \times \frac{2}{9} = 4\).

So multiply 27 by \(\frac{2}{9}\).

\[a = 27 \times \frac{2}{9} = 6\]

**Solve for \(x\).**

9. \(\frac{x}{5} = \frac{18}{30}\)
10. \(\frac{x}{12} = \frac{24}{36}\)
11. \(\frac{3}{9} = \frac{x}{3}\)
12. \(\frac{14}{15} = \frac{x}{75}\)

13. \(\frac{8}{x} = \frac{14}{7}\)
14. \(\frac{14}{x} = \frac{2}{5}\)
15. \(\frac{5}{6} = \frac{x}{15}\)
16. \(\frac{81}{33} = \frac{x}{5.5}\)
Visualize Vocabulary
Use the ✔ words to complete the graphic. You may put more than one word on each line.

- two lines joining at one point
- a shape made of straight lines
- unit measured by a protractor
- dimensions of two-dimensional shapes

Understand Vocabulary
Complete each sentence using a preview word.

1. What is a proportional two-dimensional drawing of an object?
   ____________________________

2. ____________________________ are angles that have the same measure.

3. ____________________________ are angles whose measures have a sum of 90°.

Active Reading

Key-Term Fold Before beginning the module, create a key-term fold to help you learn the vocabulary in this module. Write each highlighted vocabulary word on one side of a flap. Write the definition for each word on the other side of the flap. Use the key-term fold to quiz yourself on the definitions in this module.
Unpacking the Standards

Understanding the standards and the vocabulary terms in the standards will help you know exactly what you are expected to learn in this module.

**What It Means to You**

You will learn how to calculate actual measurements from a scale drawing.

**UNPACKING EXAMPLE 7.G.1**

A photograph of a painting has dimensions 5.4 cm and 4 cm. The scale factor is \( \frac{1}{15} \). Find the length and width of the actual painting.

\[
\frac{1}{15} = \frac{5.4}{\ell} \quad \frac{1}{15} = \frac{4}{w}
\]

\[
1 \times 5.4 = 5.4 \ell \quad 1 \times 4 = 4 w
\]

\[
15 \times 5.4 = \ell \quad 15 \times 4 = w
\]

\[
81 = \ell \quad 60 = w
\]

The painting is 81 cm long and 60 cm wide.

**What It Means to You**

You will learn about supplementary, complementary, vertical, and adjacent angles. You will solve simple equations to find the measure of an unknown angle in a figure.

**UNPACKING EXAMPLE 7.G.5**

Suppose \( m\angle 1 = 55^\circ \).

Adjacent angles formed by two intersecting lines are supplementary.

\[ m\angle 1 + m\angle 2 = 180^\circ \]

\[ 55^\circ + m\angle 2 = 180^\circ \quad \text{Substitute.} \]

\[ m\angle 2 = 180^\circ - 55^\circ \]

\[ = 125^\circ \]
EXPLORE ACTIVITY 1

Finding Dimensions

Scale drawings and scale models are used in mapmaking, construction, and other trades.

A blueprint is a technical drawing that usually displays architectural plans. Pete’s blueprint shows a layout of a house. Every 4 inches in the blueprint represents 3 feet of the actual house. One of the walls in the blueprint is 24 inches long. What is the actual length of the wall?

A. Complete the table to find the actual length of the wall.

<table>
<thead>
<tr>
<th>Blueprint length (in.)</th>
<th>4</th>
<th>8</th>
<th>12</th>
<th>16</th>
<th>20</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual length (ft)</td>
<td>3</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reflect

1. In Pete’s blueprint the length of a side wall is 16 inches. Find the actual length of the wall.

2. The back wall of the house is 33 feet long. What is the length of the back wall in the blueprint?

3. **Check for Reasonableness** How do you know your answer to 2 is reasonable?
Using a Scale Drawing to Find Area

A **scale drawing** is a proportional two-dimensional drawing of an object. Scale drawings can represent objects that are smaller or larger than the actual object.

A **scale** is a ratio between 2 sets of measurements. It shows how a dimension in a scale drawing is related to the actual object. Scales are usually shown as two numbers separated by a colon such as 1:20 or 1 cm:1 m. Scales can be shown in the same unit or in different units.

You can solve scale-drawing problems by using proportional reasoning.

**EXAMPLE 1**

The art class is planning to paint a mural on an outside wall. This figure is a scale drawing of the wall. What is the area of the actual wall?

**STEP 1**

Find the number of feet represented by 1 inch in the drawing.

\[
\frac{2 \text{ in.}}{3 \text{ ft}} = \frac{1 \text{ in.}}{1.5 \text{ ft}}
\]

1 inch in this drawing equals 1.5 feet on the actual wall.

**STEP 2**

Find the height of the actual wall labeled 11 inches in the drawing.

\[
\frac{1 \text{ in.}}{1.5 \text{ ft}} \times 11 = \frac{11 \text{ in.}}{16.5 \text{ ft}}
\]

The height of the actual wall labeled 11 in. is 16.5 ft.

**STEP 3**

Find the length of the actual wall labeled 28 inches in the drawing.

\[
\frac{1 \text{ in.}}{1.5 \text{ ft}} \times 28 = \frac{28 \text{ in.}}{42 \text{ ft}}
\]

The length of the actual wall is 42 ft.

**STEP 4**

Since area is length times width, the area of the actual wall is \(16.5 \text{ ft} \times 42 \text{ ft} = 693 \text{ ft}^2\).

**Reflect**

4. **Analyze Relationships** How could you solve the example without having to determine the number of feet represented by 1 inch?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
EXPLORE ACTIVITY 2

Drawing in Different Scales

A scale drawing of a meeting hall is drawn on centimeter grid paper as shown. The scale is 1 cm:3 m.

Suppose you redraw the rectangle on centimeter grid paper using a scale of 1 cm:6 m. In the new scale, 1 cm represents more than/less than 1 cm in the old scale.

The measurement of each side of the new drawing will be twice/half as long as the measurement of the original drawing.

B Draw the rectangle for the new scale 1 cm:6 m.

Reflect

7. Find the actual length of each side of the hall using the original drawing. Then find the actual length of each side of the hall using your new drawing and the new scale. How do you know your answers are correct?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
1. The scale of a room in a blueprint is 3 in : 5 ft. A wall in the same blueprint is 18 in. Complete the table. (Explore Activity 1)

<table>
<thead>
<tr>
<th>Blueprint length (in.)</th>
<th>3</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual length (ft)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. How long is the actual wall?

b. A window in the room has an actual width of 2.5 feet. Find the width of the window in the blueprint.

2. The scale in the drawing is 2 in : 4 ft. What are the length and width of the actual room? Find the area of the actual room. (Example 1)

3. The scale in the drawing is 2 cm : 5 m. What are the length and width of the actual room? Find the area of the actual room. (Example 1)

4. A scale drawing of a cafeteria is drawn on centimeter grid paper as shown. The scale is 1 cm : 4 m. (Explore Activity 2)

   a. Redraw the rectangle on centimeter grid paper using a scale of 1 cm:6 m.

   b. What is the actual length and width of the cafeteria using the original scale? What are the actual dimensions of the cafeteria using the new scale?

5. If you have an accurate, complete scale drawing and the scale, which measurements of the object of the drawing can you find?
6. **Art** Marie has a small copy of Rene Magritte’s famous painting, *The Schoolmaster*. Her copy has dimensions 2 inches by 1.5 inches. The scale of the copy is 1 in.:40 cm.

   a. Find the dimensions of the original painting.
   
   b. Find the area of the original painting.
   
   c. Since 1 inch is 2.54 centimeters, find the dimensions of the original painting in inches.
   
   d. Find the area of the original painting in square inches.

7. A game room has a floor that is 120 feet by 75 feet. A scale drawing of the floor on grid paper uses a scale of 1 unit:5 feet. What are the dimensions of the scale drawing?

8. **Multiple Representations** The length of a table is 6 feet. On a scale drawing, the length is 2 inches. Write three possible scales for the drawing.

9. **Analyze Relationships** A scale for a scale drawing is 10 cm:1 mm. Which is larger, the actual object or the scale drawing? Explain.

10. **Architecture** The scale model of a building is 5.4 feet tall.

   a. If the original building is 810 meters tall, what was the scale used to make the model?

   b. If the model is made out of tiny bricks each measuring 0.4 inch in height, how many bricks tall is the model?
11. You have been asked to build a scale model of your school out of toothpicks. Imagine your school is 30 feet tall. Your scale is 1 ft:1.26 cm.
   a. If a toothpick is 6.3 cm tall, how many toothpicks tall will your model be?
   
   _______________________________

   b. Your mother is out of toothpicks, and suggests you use cotton swabs instead. You measure them, and they are 7.6 cm tall. How many cotton swabs tall will your model be?
   
   _______________________________

12. **Draw Conclusions** The area of a square floor on a scale drawing is 100 square centimeters, and the scale of the drawing is 1 cm : 2 ft. What is the area of the actual floor? What is the ratio of the area in the drawing to the actual area?

   _______________________________

13. **Multiple Representations** Describe how to redraw a scale drawing with a new scale.

   _______________________________
   _______________________________
   _______________________________
   _______________________________
   _______________________________
   _______________________________

14. **Represent Real-World Problems** Describe how several jobs or professions might use scale drawings at work.

   _______________________________
   _______________________________
   _______________________________
   _______________________________
   _______________________________
   _______________________________

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**EXPLORE ACTIVITY 1**

**Drawing Three Sides**

Use geometry software to draw a triangle whose sides have the following lengths: 2 units, 3 units, and 4 units.

**A** Draw the segments.

**B** Let $AB$ be the base of the triangle. Place point $C$ on top of point $B$ and point $E$ on top of point $A$.

**C** Using the points $C$ and $E$ as fixed vertices, rotate points $F$ and $D$ to see if they will meet in a single point.

Note that the line segments form a triangle.

**D** Repeat **A** and **B**, but use a different segment as the base. Do the segments form a triangle? If so, is it the same as the original triangle?

**E** Use geometry software to draw a triangle with sides of length 2, 3, and 6 units, and one with sides of length 2, 3, and 5 units. Do the line segments form triangles? How does the sum of the lengths of the two shorter sides of each triangle compare to the length of the third side?

**Reflect**

1. **Conjecture** Do two segments of lengths $a$ and $b$ units and a longer segment of length $c$ units form one triangle, more than one, or none?
EXPLORE ACTIVITY 2

Two Angles and Their Included Side

Use a ruler and a protractor to draw each triangle.

<table>
<thead>
<tr>
<th>Triangle 1</th>
<th>Triangle 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angles: 30° and 80°</td>
<td>Angles: 55° and 50°</td>
</tr>
<tr>
<td>Length of included side: 2 inches</td>
<td>Length of included side: 1 inch</td>
</tr>
</tbody>
</table>

A  Draw Triangle 1.

STEP 1  Use a ruler to draw a line that is 2 inches long. This will be the included side.

STEP 2  Place the center of the protractor on the left end of the 2-in. line. Then make a 30°-angle mark.

STEP 3  Draw a line connecting the left side of the 2-in. line and the 30°-angle mark. This will be the 30° angle.

STEP 4  Repeat Step 2 on the right side of the triangle to construct the 80° angle.

STEP 5  The side of the 80° angle and the side of the 30° angle will intersect. This is Triangle 1 with angles of 30° and 80° and an included side of 2 inches.

B  Use the steps in A to draw Triangle 2.

Reflect

2. Conjecture  When you are given two angle measures and the length of the included side, do you get a unique triangle?
Tell whether each figure creates the conditions to form a unique triangle, more than one triangle, or no triangle. (Explore Activities 1 and 2)

1.  
   \[ \text{8 cm} \quad \text{45°} \]

2.  
   \[ \text{4 cm} \quad \text{11 cm} \quad \text{3 cm} \]

3.  
   \[ \text{40°} \quad \text{30°} \quad \text{7 cm} \]

4.  
   \[ \text{6 cm} \quad \text{12 cm} \quad \text{7 cm} \]

5. Describe lengths of three segments that could not be used to form a triangle.

8.2 Independent Practice

6. On a separate piece of paper, try to draw a triangle with side lengths of 3 centimeters and 6 centimeters, and an included angle of 120°. Determine whether the given segments and angle produce a unique triangle, more than one triangle, or no triangle.

7. A landscape architect submitted a design for a triangle-shaped flower garden with side lengths of 21 feet, 37 feet, and 15 feet to a customer. Explain why the architect was not hired to create the flower garden.
8. **Make a Conjecture**  The angles in an actual triangle-shaped traffic sign all have measures of 60°. The angles in a scale drawing of the sign all have measures of 60°. Explain how you can use this information to decide whether three given angle measures can be used to form a unique triangle or more than one triangle.

9. **Communicate Mathematical Ideas**  The figure on the left shows a line segment 2 inches long forming a 45° angle with a dashed line whose length is not given. The figure on the right shows a compass set at a width of $1 \frac{1}{2}$ inches with its point on the top end of the 2-inch segment. An arc is drawn intersecting the dashed line twice.

Explain how you can use this figure to decide whether two sides and an angle not included between them can be used to form a unique triangle, more than one triangle, or no triangle.

10. **Critical Thinking**  Two sides of an isosceles triangle have lengths of 6 inches and 15 inches, respectively. Find the length of the third side. Explain your reasoning.
EXPLORE ACTIVITY 1  7.G.3

Cross Sections of a Right Rectangular Prism

An intersection is a point or set of points common to two or more geometric figures. A cross section is the intersection of a three-dimensional figure and a plane. Imagine a plane slicing through the pyramid shown, or through a cone or a prism.

This figure shows the intersection of the cone and a plane. The cross section is a circle.

This figure shows the intersection of a triangular prism and a plane. The cross section is a triangle.

A three-dimensional figure can have several different cross sections depending on the position and the direction of the slice. For example, if the intersection of the plane and cone were vertical, the cross section would form a triangle.

Describe each cross section of the right rectangular prism with the name of its shape. (In a right prism, all the sides connecting the bases are rectangles at right angles with the base.)

A  B
EXPLORE ACTIVITY 1 (cont’d)

C

D

Reflect
1. **Conjecture** Is it possible to have a circular cross section in a right rectangular prism?

EXPLORE ACTIVITY 2

Describing Cross Sections

A right rectangular pyramid with a non-square base is shown. (In a right pyramid, the point where the triangular sides meet is centered over the base.)

A The shape of the base is a ____________________________

The shape of each side is a ____________________________

B Is it possible for a cross section of the pyramid to have each shape?

_ square_ rectangle_ triangle_ circle_ trapezoid

C Sketch the cross sections of the right rectangular pyramid below.

Math Talk

Reflect
2. **What If?** Suppose the figure in B had a square base. Would your answers in B be the same? Explain.
Describe each cross section.

1. (Explore Activity 1)

2. (Explore Activity 2)

3. (Explore Activity 2)

4. (Explore Activity 2)

5. What is the first step in describing what figure results when a given plane intersects a given three-dimensional figure?

ESSENTIAL QUESTION CHECK-IN

6. Describe different ways in which a plane might intersect the cylinder, and the cross section that results.
7. **Make a Conjecture** What cross sections might you see when a plane intersects a cone that you would **not** see when a plane intersects a pyramid or a prism? ______________________________________________________________________

8. **Critical Thinking** The two figures on the left below show that you can form a cross section of a cube that is a pentagon. Think of a plane cutting the cube at an angle in such a way as to slice through five of the cube’s six faces. Draw dotted lines on the third cube to show how to form a cross section that is a hexagon.

![Diagram of a cube with a cross section formed by a plane]

9. **Analyze Relationships** A sphere has a radius of 12 inches. A horizontal plane passes through the center of the sphere.
   
   a. Describe the cross section formed by the plane and the sphere. 
      ______________________________________________________________________
   
   b. Describe the cross sections formed as the plane intersects the interior of the sphere but moves away from the center. 
      ______________________________________________________________________
      ______________________________________________________________________

10. **Communicate Mathematical Ideas** A right rectangular prism is intersected by a horizontal plane and a vertical plane. The cross section formed by the horizontal plane and the prism is a rectangle with dimensions 8 in. and 12 in. The cross section formed by the vertical plane and the prism is a rectangle with dimensions 5 in. and 8 in. Describe the faces of the prism, including their dimensions. Then find its volume.
    ______________________________________________________________________
    ______________________________________________________________________

11. **Represent Real-World Problems** Describe a real-world situation that could be represented by planes slicing a three-dimensional figure to form cross sections.
    ______________________________________________________________________
    ______________________________________________________________________
    ______________________________________________________________________
ESSENTIAL QUESTION

How can you use angle relationships to solve problems?

EXPLORE ACTIVITY

Measuring Angles

It is useful to work with pairs of angles and to understand how pairs of angles relate to each other. **Congruent angles** are angles that have the same measure.

**STEP 1**
Using a ruler, draw a pair of intersecting lines. Label each angle from 1 to 4.

**STEP 2**
Use a protractor to help you complete the chart.

<table>
<thead>
<tr>
<th>Angle</th>
<th>Measure of Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>m∠1</td>
<td></td>
</tr>
<tr>
<td>m∠2</td>
<td></td>
</tr>
<tr>
<td>m∠3</td>
<td></td>
</tr>
<tr>
<td>m∠4</td>
<td></td>
</tr>
<tr>
<td>m∠1 + m∠2</td>
<td></td>
</tr>
<tr>
<td>m∠2 + m∠3</td>
<td></td>
</tr>
<tr>
<td>m∠3 + m∠4</td>
<td></td>
</tr>
<tr>
<td>m∠4 + m∠1</td>
<td></td>
</tr>
</tbody>
</table>

Reflect

1. **Make a Conjecture** Share your results with other students. Make a conjecture about pairs of angles that are opposite each other.

   __________________________________________________________
   __________________________________________________________

2. **Make a Conjecture** When two lines intersect to form four angles, what conjecture can you make about the pairs of angles that are next to each other?

   __________________________________________________________
   __________________________________________________________
Angle Pairs and One-Step Equations

Vertical angles are the opposite angles formed by two intersecting lines. Vertical angles are congruent because the angles have the same measure.

Adjacent angles are pairs of angles that share a vertex and one side but do not overlap.

Complementary angles are two angles whose measures have a sum of 90°.

Supplementary angles are two angles whose measures have a sum of 180°. You discovered in the Explore Activity that adjacent angles formed by two intersecting lines are supplementary.

EXAMPLE 1

Use the diagram.

A Name a pair of vertical angles.
Vertical angles are opposite angles formed by intersecting lines.
∠AFB and ∠DFE are vertical angles.

B Name a pair of adjacent angles.
Adjacent angles share a vertex and a side but do not overlap.
∠AFB and ∠BFD are adjacent angles.

C Name a pair of supplementary angles.
Adjacent angles formed by intersecting lines are supplementary.
∠AFB and ∠BFD are supplementary angles.

D Name two pairs of supplementary angles that include ∠DFE.
Any angle that forms a line with ∠DFE is a supplementary angle to ∠DFE.
∠DFE and ∠EFA are supplementary angles, as are ∠DFE and ∠DFB.
D) **Find the measure of \( \angle AFB \).**

Use the fact that \( \angle AFB \) and \( \angle BFD \) in the diagram are supplementary angles to find \( \text{m} \angle AFB \).

\[
\text{m} \angle AFB + \text{m} \angle BFD = 180^\circ \\
x + 140^\circ = 180^\circ \\
-140^\circ -140^\circ \\
x = 40^\circ
\]

They are supplementary angles.

Subtract 140 from both sides.

\[
\text{m} \angle BFD = 50^\circ + 90^\circ = 140^\circ
\]

The measure of \( \angle AFB \) is 40°.

**Reflect**

3. **Analyze Relationships** What is the relationship between \( \angle AFB \) and \( \angle BFC \)? Explain.

________________________________________________________________________

________________________________________________________________________

4. **Draw Conclusions** Are \( \angle AFC \) and \( \angle BFC \) adjacent angles? Why or why not?

________________________________________________________________________

________________________________________________________________________

**Your Turn**

Use the diagram.

5. Name a pair of supplementary angles.

________________________________________________________________________

6. Name a pair of vertical angles.

________________________________________________________________________

7. Name a pair of adjacent angles.

________________________________________________________________________

8. Name a pair of complementary angles.

________________________________________________________________________

9. Find the measure of \( \angle CGD \).

________________________________________________________________________
Angle Pairs and Two-Step Equations

Sometimes solving an equation is only the first step in using an angle relationship to solve a problem.

**EXAMPLE 2**

**A.** Find the measure of $\angle EHF$.

**STEP 1** Identify the relationship between $\angle EHF$ and $\angle FHG$.

Since angles $\angle EHF$ and $\angle FHG$ form a straight line, the sum of the measures of the angles is $180^\circ$.

$\angle EHF$ and $\angle FHG$ are supplementary angles.

**STEP 2** Write and solve an equation to find $x$.

$$m\angle EHF + m\angle FHG = 180^\circ$$

$$2x + 48^\circ = 180^\circ$$

$$-48^\circ -48^\circ$$

$$2x = 132^\circ$$

$$x = 66^\circ$$

**STEP 3** Find the measure of $\angle EHF$.

$$m\angle EHF = 2x$$

$$= 2(66^\circ)$$

$$= 132^\circ$$

The measure of $\angle EHF$ is $132^\circ$.

**Check** Confirm that $\angle EHF$ and $\angle FHG$ are supplementary.

$$m\angle EHF + m\angle FHG \neq 180^\circ$$

$$132^\circ + 48^\circ \neq 180^\circ$$

$$180^\circ = 180^\circ$$

$$180^\circ = 180^\circ$$
B) Find the measure of $\angle ZXY$.

**STEP 1** Identify the relationship between $\angle WXZ$ and $\angle ZXY$.

$\angle WXZ$ and $\angle ZXY$ are complementary angles.

**STEP 2** Write and solve an equation to find $x$.

$$m\angle WXZ + m\angle ZXY = 90^\circ$$

$$4x + 7^\circ + 35^\circ = 90^\circ$$

$$4x + 42^\circ = 90^\circ$$

$$4x = 48^\circ$$

$$x = 12^\circ$$

**STEP 3** Find the measure of $\angle ZXY$.

$$m\angle ZXY = 4x + 7^\circ$$

$$= 4(12^\circ) + 7^\circ$$

$$= 55^\circ$$

The measure of $\angle ZXY$ is $55^\circ$.

---

**YOUR TURN**

10. Write and solve an equation to find the measure of $\angle JML$.

11. **Critique Reasoning** Cory says that to find $m\angle JML$ above, you can stop when you get to the solution step $3x = 126^\circ$. Explain why this works.

---

Math Talk

**Mathematical Practices**

The sum of the measures of complementary angles is $90^\circ$.

Combining like terms.

Subtracting 42 from both sides.

Dividing both sides by 4.

How can you check that your answer is reasonable?
Guided Practice

For 1–2, use the figure. (Example 1)

1. **Vocabulary** The sum of the measures of \( \angle UWV \) and \( \angle UWZ \) is \( 90^\circ \), so \( \angle UWV \) and \( \angle UWZ \) are
   ________________ angles.

2. **Vocabulary** \( \angle UWV \) and \( \angle VWX \) share a vertex and one side. They do not overlap, so \( \angle UWV \) and \( \angle VWX \) are
   ________________ angles.

For 3–4, use the figure.

3. \( \angle AGB \) and \( \angle DGE \) are ________________ angles, so \( m\angle DGE = \) ________________ (Example 1)

4. Find the measure of \( \angle EGF \). (Example 2)
   
   \[
   m\angle CGD + m\angle DGE + m\angle EGF = 180^\circ
   \]
   \[
   _____ + _____ + _____ = 180^\circ
   \]
   \[
   _____ + 2x = 180^\circ
   \]
   \[
   2x = _____
   \]
   \[
   m\angle EGF = 2x = _____
   \]

5. Find the value of \( x \) and the measure of \( \angle MNQ \) (Example 2)
   
   \[
   m\angle MNQ + m\angle QNP = 90^\circ
   \]
   \[
   _____ + _____ = 90^\circ, \text{ so } 3x + _____ = 90^\circ.
   \]
   Then \( 3x = _____ \) and \( x = _____ \).
   \[
   m\angle MNQ = 3x - 13^\circ = 3(_______) - 13^\circ
   \]
   \[
   = _____ - 13^\circ
   \]
   \[
   = _____
   \]

ESSENTIAL QUESTION CHECK-IN

6. Suppose that you know that \( \angle T \) and \( \angle S \) are supplementary, and that \( m\angle T = 3(m\angle S) \). How can you find \( m\angle T \)?
   
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
For 7–11, use the figure.

7. Name a pair of adjacent angles. Explain why they are adjacent.

8. Name a pair of acute vertical angles.

9. Name a pair of supplementary angles.

10. **Justify Reasoning** Find m\(^{\circ}\)QUR. Justify your answer.

11. **Draw Conclusions** Which is greater, m\(^{\circ}\)TUR or m\(^{\circ}\)RUQ? Explain.

For 12–13, use the figure. A bike path crosses a road as shown. Solve for each indicated angle measure or variable.

12. \(x\) ______________________

13. m\(^{\circ}\)KMH ______________________

For 14–16, use the figure. Solve for each indicated angle measure.

14. m\(^{\circ}\)CBE ______________________

15. m\(^{\circ}\)ABF ______________________

16. m\(^{\circ}\)CBA ______________________

17. The measure of \(\angle A\) is 4\(^{\circ}\) greater than the measure of \(\angle B\). The two angles are complementary. Find the measure of each angle.

18. The measure of \(\angle D\) is 5 times the measure of \(\angle E\). The two angles are supplementary. Find the measure of each angle.
19. **Astronomy** Astronomers sometimes use angle measures divided into degrees, minutes, and seconds. One degree is equal to 60 minutes, and one minute is equal to 60 seconds. Suppose that \( \angle J \) and \( \angle K \) are complementary, and that the measure of \( \angle J \) is 48 degrees, 26 minutes, 8 seconds. What is the measure of \( \angle K \)?

---

20. **Represent Real-World Problems** The railroad tracks meet the road as shown. The town will allow a parking lot at angle \( K \) if the measure of angle \( K \) is greater than 38°. Can a parking lot be built at angle \( K \)? Why or why not?

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21. **Justify Reasoning** Kendra says that she can draw \( \angle A \) and \( \angle B \) so that \( m\angle A = 119° \) and \( \angle A \) and \( \angle B \) are complementary angles. Do you agree or disagree? Explain your reasoning.

---

22. **Draw Conclusions** If two angles are complementary, each angle is called a *complement* of the other. If two angles are supplementary, each angle is called a *supplement* of the other.

   a. Suppose \( m\angle A = 77° \). What is the measure of a complement of a complement of \( \angle A \)? Explain.

   b. What conclusion can you draw about a complement of a complement of an angle? Explain.
8.1 Similar Shapes and Scale Drawings

1. A house blueprint has a scale of 1 in. : 4 ft. The length and width of each room in the actual house are shown in the table. Complete the table by finding the length and width of each room on the blueprint.

<table>
<thead>
<tr>
<th>Room</th>
<th>Actual ( \ell \times w ) (ft)</th>
<th>Blueprint ( \ell \times w ) (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living</td>
<td>16 \times 20</td>
<td></td>
</tr>
<tr>
<td>Kitchen</td>
<td>12 \times 12</td>
<td></td>
</tr>
<tr>
<td>Office</td>
<td>8 \times 12</td>
<td></td>
</tr>
<tr>
<td>Bedroom 1</td>
<td>20 \times 12</td>
<td></td>
</tr>
<tr>
<td>Bedroom 2</td>
<td>12 \times 12</td>
<td></td>
</tr>
<tr>
<td>Bathroom</td>
<td>6 \times 8</td>
<td></td>
</tr>
</tbody>
</table>

8.2 Geometric Drawings

2. Can a triangle be formed with the side lengths of 8 cm, 4 cm, and 12 cm? _______

3. A triangle has side lengths of 11 cm and 9 cm. Which could be the value of the third side, 20 cm or 15 cm? __________________________

8.3 Cross Sections

4. Name one possible cross section of a sphere. __________________

5. Name at least two shapes that are cross sections of a cylinder. ____________________________________________

8.4 Angle Relationships

6. \( \angle BGC \) and \( \angle FGE \) are _______ angles, so \( m\angle FGE = \) _______

7. Suppose you know that \( \angle S \) and \( \angle Y \) are complementary, and that \( m\angle S = 2(m\angle Y) - 30^\circ \). Find \( m\angle Y \). ______________

8. How can you model geometry figures to solve real-world problems?

__________________________
__________________________
Selected Response

1. Which number can you add to 15 to get a sum of 0?
   - A \(-10\)
   - B \(-15\)
   - C \(0\)
   - D \(15\)

2. Students are painting the backdrop for the school play. The backdrop is 15 feet wide and 10 feet high. Every 16 inches on the scale drawing represents 5 feet on the backdrop. What is the area of the scale drawing?
   - A \(150 \text{ in}^2\)
   - B \(6 \text{ in}^2\)
   - C \(3,096 \text{ in}^2\)
   - D \(1,536 \text{ in}^2\)

3. Two sides of a triangle measure 8 cm and 12 cm. Which of the following CANNOT be the measure of the third side?
   - A \(4\)
   - B \(12\)
   - C \(8\)
   - D \(16\)

4. A cross section is the intersection of a three-dimensional figure and a ___________.
   - A point
   - B plane
   - C line
   - D set

6. Which describes the relationship between \(\angle BFA\) and \(\angle CFD\)?
   - A adjacent angles
   - B complementary angles
   - C supplementary angles
   - D vertical angles

7. All clothing is being marked down 15%. Which expression represents the new retail price?
   - A \(0.85x\)
   - B \(1.15x\)
   - C \(1.85x\)
   - D \(0.15x\)

Mini-Tasks

8. Ira built a model of the Great Pyramid in Egypt for a school project. The Great Pyramid has a square base with sides of length 756 feet. The height of the Great Pyramid is 481 feet. Ira made his model pyramid using a scale of 1 inch : 20 feet.
   a. What is the length of each side of the base of Ira’s pyramid?
      ________________
   b. What is the area of the base of Ira’s pyramid?
      ________________
   c. What is the height of Ira’s pyramid?
      ________________
   d. Ira built his model using cross sections that were cut parallel to the base. What shape was each cross section?
      ________________

5. What is the measure of \(\angle BFC\)?
   - A \(18^\circ\)
   - B \(108^\circ\)
   - C \(72^\circ\)
   - D \(144^\circ\)