

CHAPTER 7

Geometry

What You've Learned

- In Chapter 1, you explored some of the properties of triangles when you used the Pythagorean Theorem.
- In Chapter 2, you wrote and solved algebraic equations.
- In Chapter 3, you determined whether the relationship between two variables is proportional.

You will need Evernote today. Call your notes Pairs of Angles.



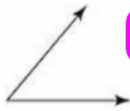


Check Your Readiness

Classifying and Measuring Angles

Measure each angle. Classify it as *acute*, *right*, *obtuse*, or *straight*.

1.



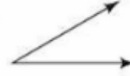
2.



3.



4.



Solving Two-Step Equations

Solve each equation. Check the solution.

5. $3x + 5 = 14$



6. $5b - 80 = 10$



7. $-4n + 6 = -2$



8. $24 = 18 + 2c$



9. $\frac{p}{4} + 3 = 6$



10. $\frac{s}{6} - 1 = 9$



Determining Whether Relationships Are Proportional

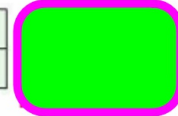
Determine whether the relationship shown in each table is proportional. Explain.

11.

x	2	4	6	8
y	8	16	24	32

12.

x	3	6	9	12
y	9	15	21	27



What You'll Learn Next

- In this chapter, you will use the properties of pairs of angles and parallel lines to find angle measures.
- You will explore properties of figures that have the same shape but may or may not have the same size.
- You will investigate relationships among the angle measures of triangles.
- Applying what you learn, you will solve problems involving side lengths and angle measures of geometric figures, such as those found in bridges, buildings, observatories, and other objects.

7-1

Pairs of Angles

What You'll Learn

To identify types of angles and to find angle measures using the relationship between angles

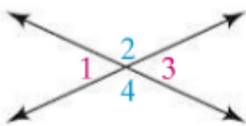
🔊 **New Vocabulary** vertical angles, congruent angles, adjacent angles, supplementary, complementary, perpendicular lines

Why Learn This?

City streets cross each other in certain ways. Understanding angles can help you read and draw maps.

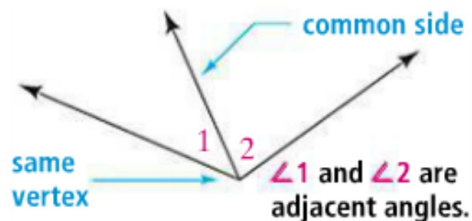
All of this page should be copied into your notes. Consider a picture.

Vertical angles are formed by two intersecting lines and are opposite each other. Vertical angles are congruent. **Congruent angles** have the same measure.



← $\angle 1$ and $\angle 3$ are vertical angles; $m\angle 1 = m\angle 3$.
 $\angle 2$ and $\angle 4$ are vertical angles; $m\angle 2 = m\angle 4$.

Adjacent angles have a common vertex and a common side, but no common interior points.



EXAMPLE Identifying Adjacent and Vertical Angles

- 1 City Planning** Name a pair of adjacent angles and a pair of vertical angles in the photo at the right. Find $m\angle JBT$.

$\angle DBJ$ and $\angle JBT$ are adjacent angles.

$\angle DBY$ and $\angle JBT$ are vertical angles.

Vertical angles are congruent, so $m\angle JBT = m\angle DBY$. So $m\angle JBT$ is 80° .



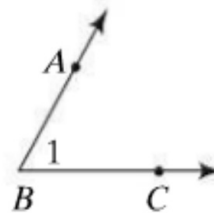
Copy the vocabulary tip into your notes please.

Vocabulary Tip

The **vertex** of an angle is the point of intersection of two sides of an angle or figure.

Test Prep Tip

You can name the angle below in four ways.

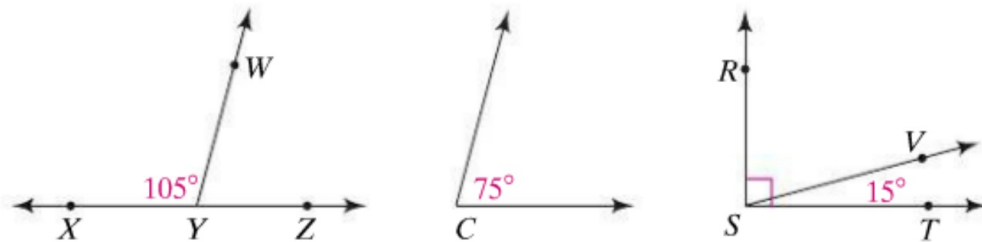


$\angle 1, \angle B, \angle ABC, \angle CBA$

Vocabulary terms need to be copied into your notes (perhaps as a picture?)

If the sum of the measures of two angles is 180° , the angles are **supplementary**. If the sum of the measures of two angles is 90° , the angles are **complementary**.

In the diagram below, $\angle C$ and $\angle WYZ$ are both supplements of $\angle XYW$. $\angle C$ and $\angle VSR$ are both complements of $\angle VST$.



You can solve equations to find the measures of supplementary and complementary angles.

EXAMPLE Finding Supplementary Angles

2 Algebra Suppose $m\angle BCD = 121^\circ$. Find the measure of its supplement.

Let $x^\circ =$ the measure of the supplement of $\angle BCD$.

$$x^\circ + m\angle BCD = 180^\circ$$

← The sum of the measures of supplementary angles is 180° .

$$x^\circ + 121^\circ = 180^\circ$$

← Substitute 121° for $m\angle BCD$.

$$x^\circ + 121^\circ - 121^\circ = 180^\circ - 121^\circ$$

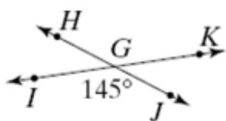
← Subtract 121° from each side.

$$x^\circ = 59^\circ$$

← Simplify.

The measure of the supplement of $\angle BCD$ is 59° .

1 EXAMPLE Find the measure of the supplement of $\angle IGJ$.



$$x^\circ + m \angle IGJ = 180^\circ$$

← The sum of the measures of supplementary angles is 180° .

$$x^\circ + 145^\circ = 180^\circ$$

← Substitute 145° for $m \angle DEF$.

$$x^\circ + 145^\circ - 145^\circ = 180^\circ - 145^\circ$$

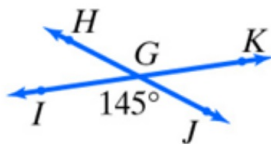
← Subtract 145° from each side.

$$x^\circ = 35^\circ$$

← Simplify.

The measure of the supplement of $m \angle IGJ$ is 35° .

2 EXAMPLE Name a pair of adjacent angles and a pair of vertical angles in the figure. Find $m \angle HGK$.



The **adjacent angles** are $\angle HGK$ and $\angle KGJ$; $\angle KGJ$ and $\angle JGI$; $\angle JGI$ and $\angle IGH$; $\angle IGH$ and $\angle HGK$.

The **vertical angles** are $\angle JGI$ and $\angle HGK$; $\angle HGI$ and $\angle KGJ$.

Since vertical angles are congruent, $m \angle HGK = m \angle JGI = 145^\circ$.

Vocabulary term for your notes.

Perpendicular lines are two lines that intersect to form a right angle. Recall that a right angle has a measure of 90° .

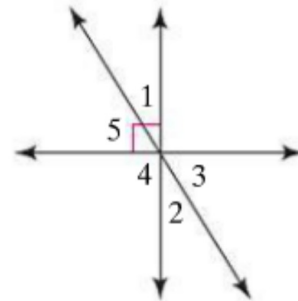
EXAMPLE Finding Angle Measures

3 In the diagram at the right, $m\angle 5 = 58^\circ$. Find the measures of $\angle 1$ and $\angle 2$.

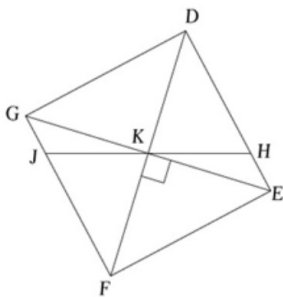
$$m\angle 1 + 58^\circ = 90^\circ \quad \leftarrow \angle 1 \text{ and } \angle 5 \text{ are complementary.}$$

$$m\angle 1 = 32^\circ \quad \leftarrow \text{Subtract } 58^\circ \text{ from each side.}$$

Since $\angle 1$ and $\angle 2$ are vertical angles, $m\angle 2 = 32^\circ$.



3 EXAMPLE In this figure, if $m\angle DKH = 73^\circ$, find the measures of $\angle GKJ$ and $\angle JKF$.



$$m\angle DKE + 90^\circ = 180^\circ \quad \leftarrow \angle DKE \text{ and } \angle FKE \text{ are supplementary.}$$

$$m\angle DKE = 90^\circ \quad \leftarrow \text{Subtract } 90^\circ \text{ from each side.}$$

$$m\angle KHE + 73^\circ = 90^\circ \quad \leftarrow \angle KHE \text{ and } \angle DKH \text{ are complementary.}$$

$$m\angle KHE = 17^\circ \quad \leftarrow \text{Subtract } 73^\circ \text{ from each side.}$$

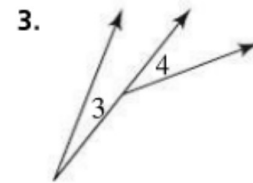
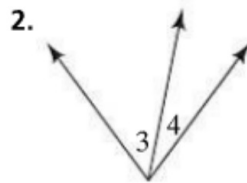
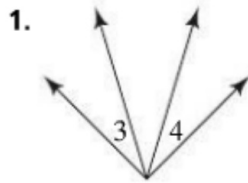
$$m\angle GKJ = m\angle KHE = 17^\circ \quad \leftarrow \angle GKJ \text{ and } \angle KHE \text{ are vertical angles.}$$

$$m\angle JKF = m\angle DKH = 73^\circ \quad \leftarrow \angle JKF \text{ and } \angle DKH \text{ are vertical angles.}$$

So, the measure of $\angle GKJ$ is 17° and the measure of $\angle JKF$ is 73° .

 **Check Your Understanding**

Vocabulary Are $\angle 3$ and $\angle 4$ adjacent angles? Explain.

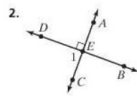
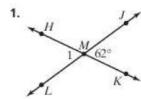


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Practice 7-1 Pairs of Angles

Name a pair of vertical angles and a pair of adjacent angles in each figure. Find $m\angle 1$.



Find the measure of the supplement and the complement of each angle.

3. 10° 4. 42.5° 5. 80°
- _____

Use the diagram at the right for Exercises 6–11. Decide whether each statement below is true or false.

6. $\angle GAF$ and $\angle BAC$ are vertical angles. _____
7. $\angle EAF$ and $\angle EAD$ are adjacent angles. _____
8. $\angle CAD$ is a supplement of $\angle DAF$. _____
9. $\angle CAD$ is a complement of $\angle EAF$. _____
10. $\angle DAF = 109^\circ$ _____
11. $\angle CAE \cong \angle DAF$ _____

