

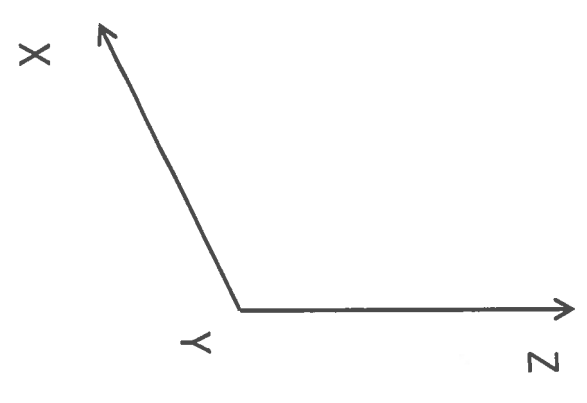
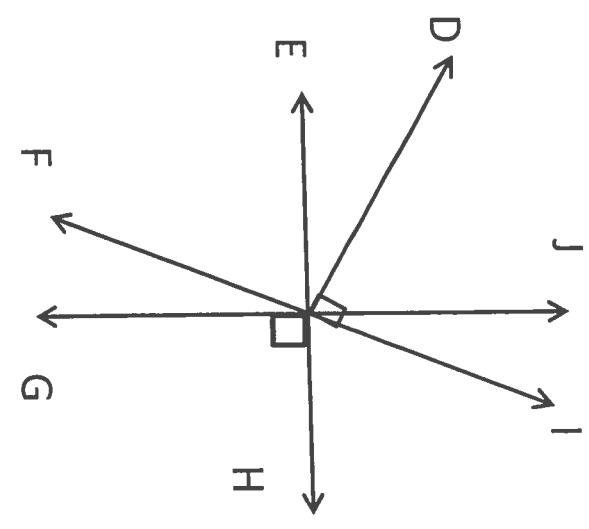
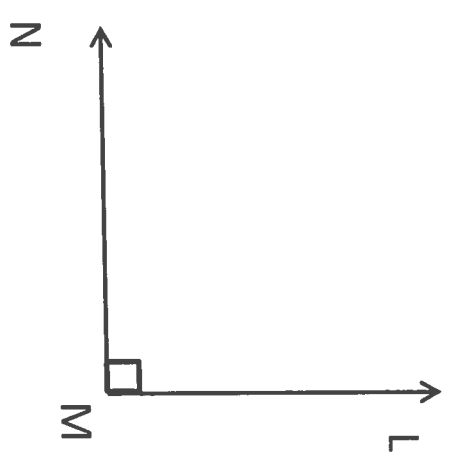
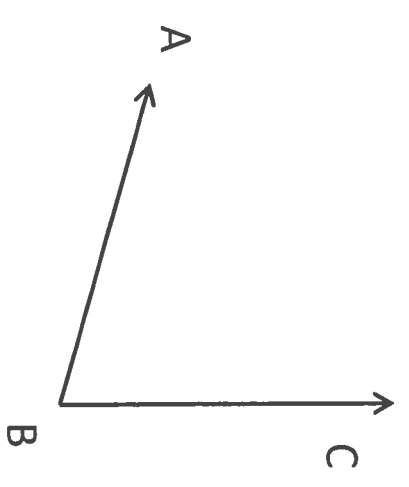
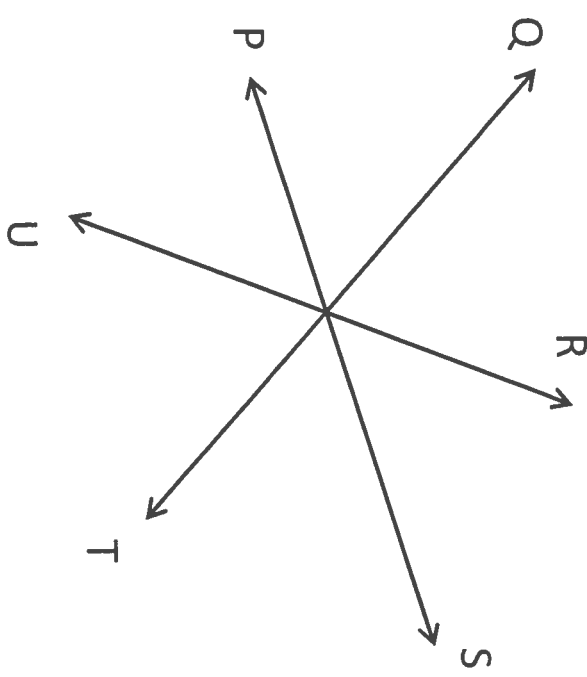
Angle Relationships

Q How can you use angle relationships to solve problems?

A. You can use the relationships about angle pairs, such as _____, _____, or _____ to write and _____ an equation to find the unknown measure of an angle.

Vocab

1. Congruent angles - _____
2. Vertical angles - _____
3. Adjacent angles - _____
4. Complementary angles - _____
5. Supplementary angles - _____
6. Acute angle - _____
7. Right angle - _____
8. Obtuse angle - _____



LESSON
9-1

Angle Relationships

Reading Strategies: Understanding Vocabulary

You can use definitions of angles to determine the measures of missing angles.

Pairs of angles can be classified into different types.

Complementary angles	Supplementary angles	Adjacent angles	Vertical angles	Congruent angles
The angle measures equal 90° .	The angle measures equal 180° .	The angles share a common vertex and side.	The angles are nonadjacent angles formed by two intersecting lines.	The angles have the same measure.

Find $m\angle DFE$.

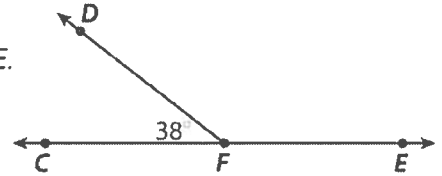
$\angle DFE$ and $\angle CFD$ are supplementary angles. So the angle measures equal 180° . You can write an equation to find $m\angle DFE$.

$m\angle DFE + m\angle CFD = 180^\circ$ Original equation

$m\angle DFE + 38^\circ = 180^\circ$ Substitute 38° for $m\angle CFD$.

$m\angle DFE + 38^\circ - 38^\circ = 180^\circ - 38^\circ$ Subtract 38° from both sides.

$m\angle DFE = 142^\circ$ Simplify.



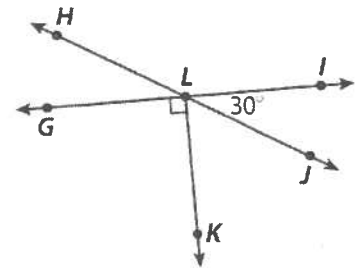
Use the diagram to find each angle measure. Show your work.

1. Find $m\angle GLH$.

2. Find $m\angle KLJ$.

3. Find $m\angle HLI$.

4. Find $m\angle ILK$.



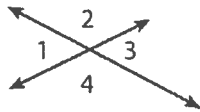
LESSON
9-1

Angle Relationships

Success for English Learners

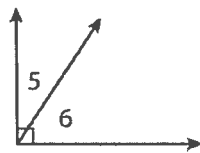
Problem 1

Vertical angles



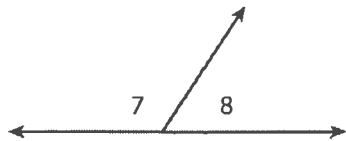
∠1 and ∠3 are vertical angles.
∠2 and ∠4 are vertical angles.
Vertical angles have the same measure.

Complementary angles



∠5 and ∠6 are complementary angles.
Complementary angles have a sum of 90°.

Supplementary angles



∠7 and ∠8 are supplementary angles.
Supplementary angles have a sum of 180°.

Problem 2

What is $m\angle x$?

$$\begin{array}{r}
 25^\circ + 37^\circ + x = 180^\circ \\
 62^\circ + x = 180^\circ \\
 \underline{-62^\circ} \quad \underline{-62^\circ} \\
 x = 118^\circ
 \end{array}$$

1. What is the sum of complementary angles? supplementary angles?

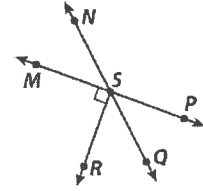
2. What is the sum of the measures of the angles in any triangle?

LESSON
9-1

Angle Relationships

Practice and Problem Solving: D

For Exercises 1–3, use the figure. The first one is done for you.



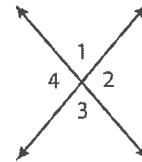
1. Name a pair of vertical angles.

$\angle PSQ$ and $\angle MSN$

2. Name a pair of complementary angles.

3. Name a pair of supplementary angles.

Use the diagram to find each angle measure.
The first one is done for you.



4. If $m\angle 3 = 60^\circ$, find $m\angle 1$.

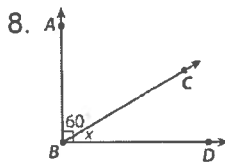
$\angle 1$ and $\angle 3$ are vertical angles,
so $m\angle 1 = 60^\circ$

5. If $m\angle 4 = 100^\circ$, find $m\angle 2$.

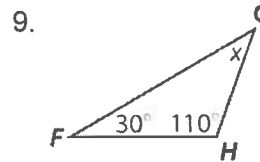
6. If $m\angle 1 = 50^\circ$, find $m\angle 2$.

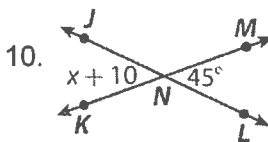
7. If $m\angle 2 = 125^\circ$, find $m\angle 3$.

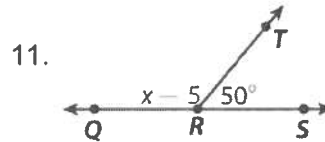
Find the value of x in each figure. The first one is done for you.



$m\angle ABC + m\angle CBD = 90$, so $x = 30$





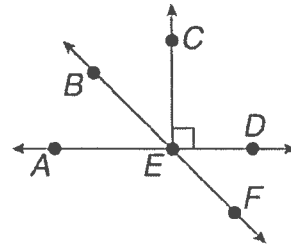


LESSON
9-1

Angle Relationships

Practice and Problem Solving: A/B

For Exercises 1–3, use the figure.

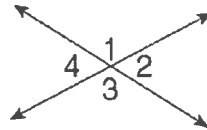


1. Name a pair of vertical angles.

2. Name a pair of complementary angles.

3. Name a pair of supplementary angles.

Use the diagram to find each angle measure.



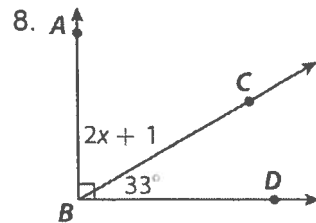
4. If $m\angle 1 = 120^\circ$, find $m\angle 3$.

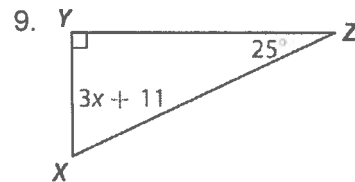
5. If $m\angle 2 = 13^\circ$, find $m\angle 4$.

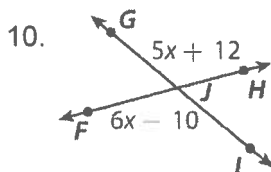
6. If $m\angle 3 = 110^\circ$, find $m\angle 2$.

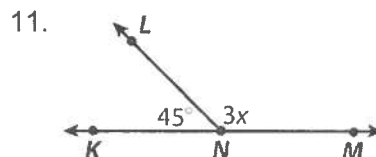
7. If $m\angle 4 = 65^\circ$, find $m\angle 1$.

Find the value of x in each figure.









Angle Relationships

Q How can you use angle relationships to solve problems?

A. You can use the relationships about angle pairs, such as complementary, supplementary, or vertical angles to write and solve an equation to find the unknown measure of an angle.

Vocab

1. Congruent angles - angles with same measurement
2. Vertical angles - opposite angles formed by 2 intersecting lines
3. Adjacent angles - 2 angles side by side that share 1 side and the vertex and that do not overlap
4. Complementary angles - 2 angles that add to 90°
5. Supplementary angles - 2 angles that add to 180°
6. Acute angle - angle that is less than 90°
7. Right angle - angle that is 90°
8. Obtuse angle - angle that is greater than 90° but less than 180°

$$\text{Complementary } C = 90^\circ$$

$$\text{Supplementary } S = 180^\circ$$

LESSON
9-1

Angle Relationships

Reading Strategies: Understanding Vocabulary

You can use definitions of angles to determine the measures of missing angles.

Pairs of angles can be classified into different types.

Complementary angles	Supplementary angles	Adjacent angles	Vertical angles	Congruent angles
The angle measures equal 90° .	The angle measures equal 180° .	The angles share a common vertex and side.	The angles are nonadjacent angles formed by two intersecting lines.	The angles have the same measure.

Find $m\angle DFE$.

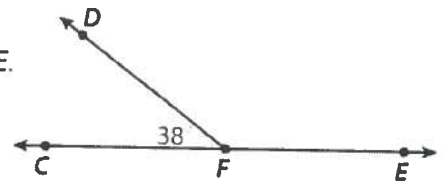
$\angle DFE$ and $\angle CFD$ are supplementary angles. So the angle measures equal 180° . You can write an equation to find $m\angle DFE$.

$m\angle DFE + m\angle CFD = 180^\circ$ Original equation

$m\angle DFE + 38^\circ = 180^\circ$ Substitute 38° for $m\angle CFD$.

$m\angle DFE + 38^\circ - 38^\circ = 180^\circ - 38^\circ$ Subtract 38° from both sides.

$m\angle DFE = 142^\circ$ Simplify.



Use the diagram to find each angle measure. Show your work.

1. Find $m\angle GLH$.

30°

2. Find $m\angle KLJ$.

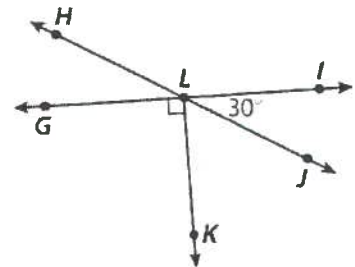
60°

3. Find $m\angle HLI$.

150°

4. Find $m\angle ILK$.

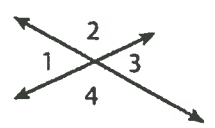
90°



LESSON 9-1 **Angle Relationships**
Success for English Learners

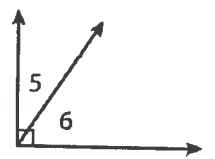
Problem 1

Vertical angles



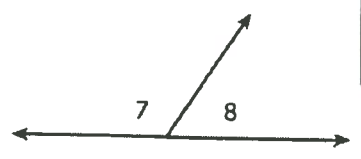
$\angle 1$ and $\angle 3$ are vertical angles.
 $\angle 2$ and $\angle 4$ are vertical angles.
 Vertical angles have the same measure.

Complementary angles



$\angle 5$ and $\angle 6$ are complementary angles.
 Complementary angles have a sum of 90° .

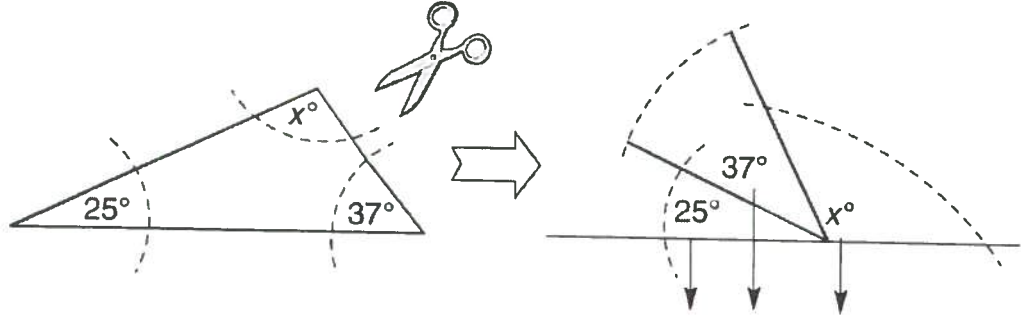
Supplementary angles



$\angle 7$ and $\angle 8$ are supplementary angles.
 Supplementary angles have a sum of 180° .

Problem 2

What is $m\angle x$?



$$\begin{aligned}
 25^\circ + 37^\circ + x &= 180^\circ \\
 62^\circ + x &= 180^\circ \\
 \underline{-62^\circ} \quad \underline{-62^\circ} & \\
 x &= 118^\circ
 \end{aligned}$$

1. What is the sum of complementary angles? supplementary angles?

Comp = 90° Supp = 180°

2. What is the sum of the measures of the angles in any triangle?

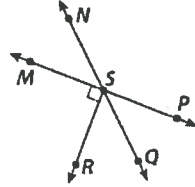
180°

LESSON
9-1

Angle Relationships

Practice and Problem Solving: D

For Exercises 1–3, use the figure. The first one is done for you.



1. Name a pair of vertical angles.

$\angle PSQ$ and $\angle MSN$

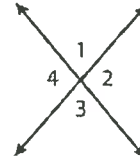
2. Name a pair of complementary angles.

$\angle PSQ$ and $\angle QSR$

3. Name a pair of supplementary angles.

$\angle MSN$ and $\angle NSP$

Use the diagram to find each angle measure. The first one is done for you.



4. If $m\angle 3 = 60^\circ$, find $m\angle 1$.

$\angle 1$ and $\angle 3$ are vertical angles,
so $m\angle 1 = 60^\circ$

5. If $m\angle 4 = 100^\circ$, find $m\angle 2$.

they are vertical so $\angle 2 = 100^\circ$

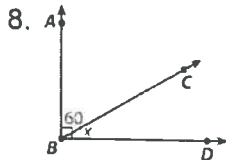
6. If $m\angle 1 = 50^\circ$, find $m\angle 2$.

they are suppl. so $\angle 2 = 130$

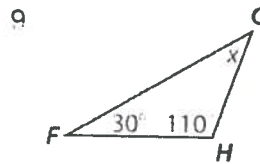
7. If $m\angle 2 = 125^\circ$, find $m\angle 3$.

they are suppl. so $\angle 3 = 55$

Find the value of x in each figure. The first one is done for you.

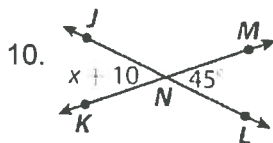


$m\angle ABC + m\angle CBD = 90$, so $x = 30$

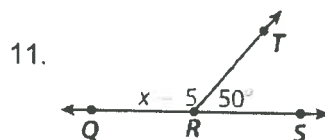


$\angle F + \angle H + \angle G = 180$
 $30 + 110 + x = 180$
 $140 + x = 180$

$x = 40^\circ$



$x + 10 = 45$
 $x = 35$



$x - 5 + 50 = 180$
 $x + 45 = 180$

$x = 135$