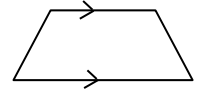
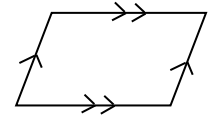


A quadrilateral is any four-sided polygon. There are six special cases of quadrilaterals with which students should be familiar.

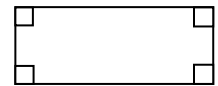
- Trapezoid – A quadrilateral with at least one pair of parallel sides.



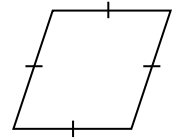
- Parallelogram – A quadrilateral with both pairs of opposite sides parallel.



- Rectangle – A quadrilateral with four right angles.



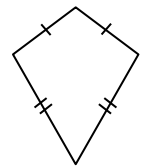
- Rhombus – A quadrilateral with four sides of equal length.



- Square – A quadrilateral with four right angles *and* four sides of equal length.

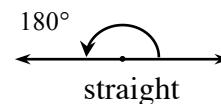
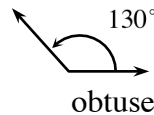
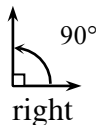
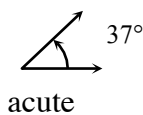


- Kite – A quadrilateral with two distinct pairs of consecutive sides of equal length.



Names of Basic Angles

Acute angles are angles with measures between (but not including) 0° and 90° , right angles measure 90° , and obtuse angles measure between (but not including) 90° and 180° . A straight angle measures 180° .



Students use protractors to measure the size of angles.

For more information see the Math Notes box in Lesson 8.3.1 of the *Core Connections, Course 2* text.

Example 1

For the figure at right, describe the quadrilateral using *all* terms that are appropriate.

It is a rectangle since it has four right angles.

It is a parallelogram since it has two pairs of parallel sides.

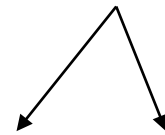
It is also a trapezoid since it has at least one pair of parallel sides.



Example 2

Describe the angle at right as right, obtuse or acute. Estimate the size of the angle and then use a protractor to measure the angle. It may be necessary to trace the angle and extend the sides.

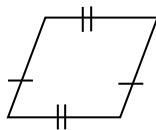
This angle opens narrower than a right angle so it is acute. Using a protractor shows that the angle measures 60° .



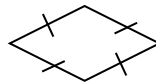
Problems

For each figure, describe the quadrilateral using *all* terms that are appropriate. Assume that sides that look parallel are parallel.

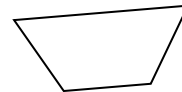
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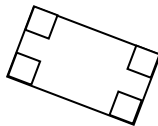
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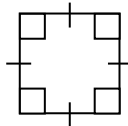
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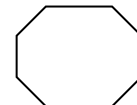
4.



5.

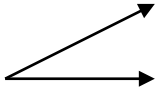


6.

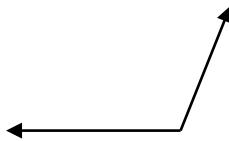


Describe the angles below as right, obtuse or acute. Estimate the size of the angle and then use a protractor to measure the angle.

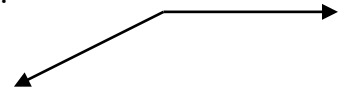
7.



8.



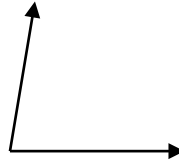
9.



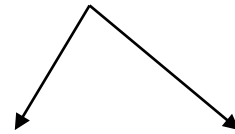
10.



11.



12.



Answers

1. parallelogram, trapezoid

2. rhombus, parallelogram, trapezoid

3. trapezoid

4. rectangle, parallelogram, trapezoid

5. square, rhombus, rectangle, parallelogram, trapezoid

6. not a quadrilateral

7. acute, 25°

8. obtuse, 110°

9. obtuse, 153°

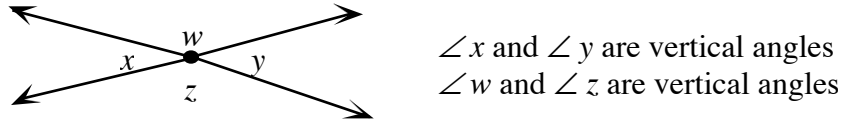
10. right, 90°

11. acute, 80°

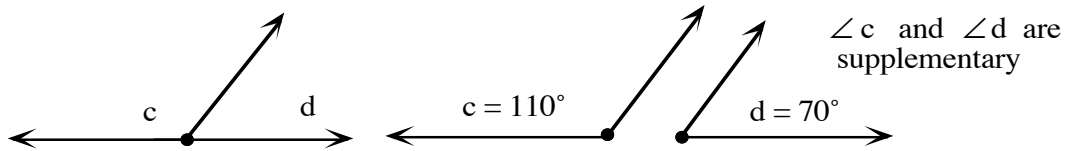
12. acute, 82°

Properties of Angle Pairs

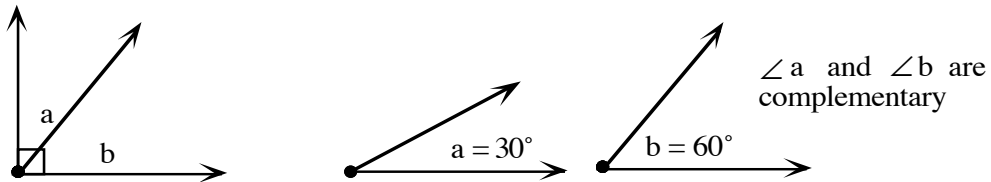
Intersecting lines form four angles. The pairs of angles across from each other are called vertical angles. The measures of vertical angles are equal.



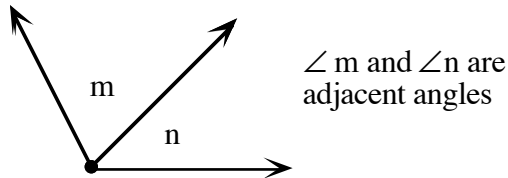
If the sum of the measures of two angles is exactly 180° , then the angles are called supplementary angles.



If the sum of the measures of two angles is exactly 90° , then the angles are called complementary angles.



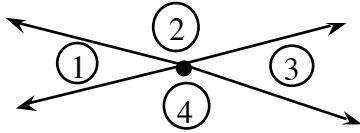
Angles that share a vertex and one side but have no common interior points (that is, do not overlap each other) are called adjacent angles.



For additional information, see the Math Notes box in Lesson 8.3.2 of the *Core Connections, Course 2* text.

Example 1

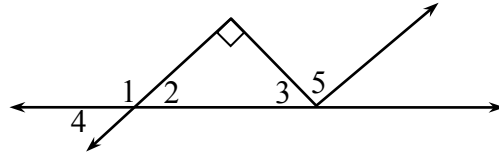
Find the measure of the missing angles if $m \angle 3 = 50^\circ$.



- $m \angle 1 = m \angle 3$ (vertical angles)
 $\Rightarrow m \angle 1 = 50^\circ$
- $\angle 2$ and $\angle 3$ (supplementary angles)
 $\Rightarrow m \angle 2 = 180^\circ - 50^\circ = 130^\circ$
- $m \angle 2 = m \angle 4$ (vertical angles)
 $\Rightarrow m \angle 4 = 130^\circ$

Example 2

Classify each pair of angles below as vertical, supplementary, complementary, or adjacent.

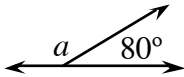


- a. $\angle 1$ and $\angle 2$ are adjacent and supplementary
- b. $\angle 2$ and $\angle 3$ are complementary
- c. $\angle 3$ and $\angle 5$ are adjacent
- d. $\angle 1$ and $\angle 4$ are adjacent and supplementary
- e. $\angle 2$ and $\angle 4$ are vertical

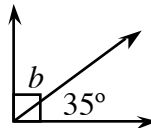
Problems

Find the measure of each angle labeled with a variable.

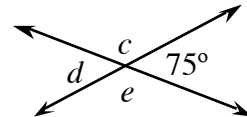
1.



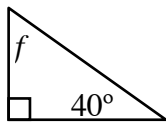
2.



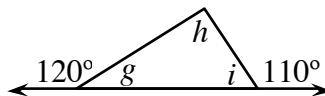
3.



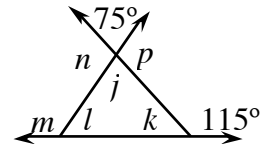
4.



5.



6.



Answers

1. $m \angle a = 100^\circ$

2. $m \angle b = 55^\circ$

3. $m \angle c = 105^\circ$
 $m \angle d = 75^\circ$
 $m \angle e = 105^\circ$

4. $m \angle f = 50^\circ$

5. $m \angle g = 60^\circ$
 $m \angle h = 50^\circ$
 $m \angle i = 70^\circ$

6. $m \angle j = 75^\circ$ $m \angle k = 65^\circ$
 $m \angle l = 40^\circ$ $m \angle m = 140^\circ$
 $m \angle n = 105^\circ$ $m \angle p = 105^\circ$