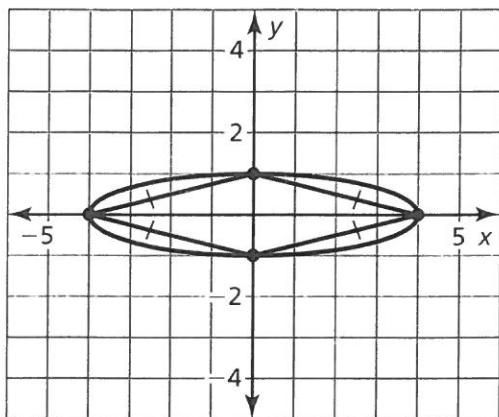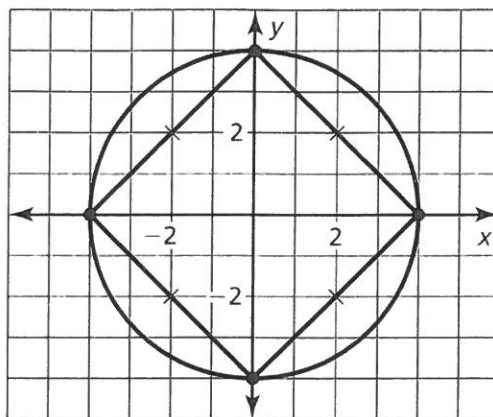## 7.4 Start Thinking

A rhombus and a square are both quadrilaterals with four congruent sides, but a square always contains four right angles. Examine the diagrams below and determine some other distinctive characteristics of the rhombus and the square.
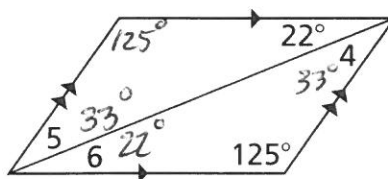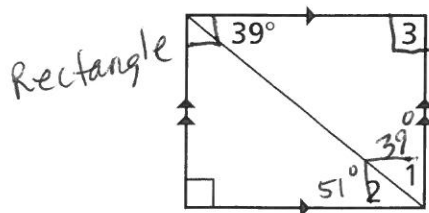

They are both parallelograms!
- Opp ∠s ≅
- Cons ∠s supp.
- Diagonals bisect

Rhombus → Diagonals ⊥

Square → Diagonals ≅

7.4 Warm Up

Use the diagrams to determine the measure of each angle.

Rectangle

1. $m\angle 1$ 90-39=51°   **2.** $m\angle 2$ 39°   **3.** $m\angle 3$ 90°

4. $m\angle 4$ 33°   **5.** $m\angle 5$ 33°   **6.** $m\angle 6$ 22°

7.4 Cumulative Review Warm Up

Determine whether the statement is *always*, *sometimes*, or *never* true. Explain your reasoning.

1. An isosceles triangle is a right triangle. Yes NO
   SOMETIMES
2. A right triangle is a scalene triangle. Yes NO
   SOMETIMES
3. An equilateral triangle is an equiangular triangle.
   ALWAYS
4. A right triangle is an equilateral triangle.
   NEVER

A right △ can't have angle measures of 60°, 60°, and 60°

7.4 Notetaking with Vocabulary
For use after Lesson 7.4

In your own words, write the meaning of each vocabulary term.

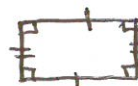rhombus *Parallelogram w/ 4 ≅ sides (NOT NECESSARILY 4 ≅ ∠s)*

rectangle *Parallelogram w/ 4 90° angles (NOT NECESSARILY 4 ≅ sides)*
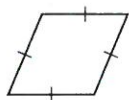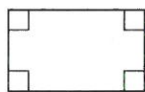
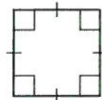square *Rhombus AND Rectangle! (4 ≅ sides & 4 ≅ ∠s)*

Core Concepts

Rhombuses, Rectangles, and Squares

A **rhombus** is a parallelogram with four congruent sides.

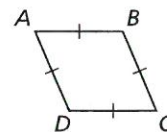A **rectangle** is a parallelogram with four right angles.

A **square** is a parallelogram with four congruent sides and four right angles.

Notes:

Biconditional statement
either both are true or both are false

Corollary 7.2   Rhombus Corollary

A quadrilateral is a rhombus if and only if it has four congruent sides.

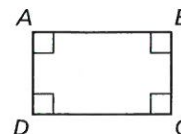$ABCD$ is a rhombus if and only if $\overline{AB} \cong \overline{BC} \cong \overline{CD} \cong \overline{AD}$.

Corollary 7.3   Rectangle Corollary

A quadrilateral is a rectangle if and only if it has four right angles.

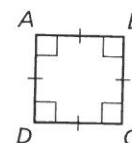$ABCD$ is a rectangle if and only if $\angle A$, $\angle B$, $\angle C$, and $\angle D$ are right angles.

Name_____ Date_____

Corollary 7.4   Square Corollary

A quadrilateral is a square if and only if it is a rhombus and a rectangle.

$ABCD$ is a square if and only if $\overline{AB} \cong \overline{BC} \cong \overline{CD} \cong \overline{AD}$ and $\angle A$, $\angle B$, $\angle C$, and $\angle D$ are right angles.
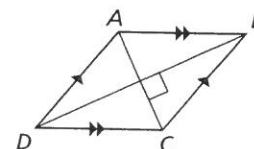
Notes:

Theorem 7.11   Rhombus Diagonals Theorem

A parallelogram is a rhombus if and only if its diagonals are perpendicular.

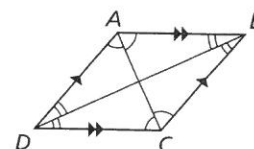$\square ABCD$ is a rhombus if and only if $\overline{AC} \perp \overline{BD}$.

Notes:

Theorem 7.12   Rhombus Opposite Angles Theorem

A parallelogram is a rhombus if and only if each diagonal bisects a pair of opposite angles.

$\square ABCD$ is a rhombus if and only if $\overline{AC}$ bisects $\angle BCD$ and $\angle BAD$, and $\overline{BD}$ bisects $\angle ABC$ and $\angle ADC$.
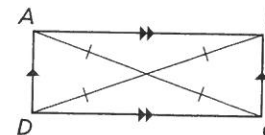
Notes:

Theorem 7.13   Rectangle Diagonals Theorem

A parallelogram is a rectangle if and only if its diagonals are congruent.

$\square ABCD$ is a rectangle if and only if $\overline{AC} \cong \overline{BD}$.

Notes:

7.4   **Notetaking with Vocabulary** (continued)

Extra Practice

1. For any rhombus *MNOP*, decide whether the statement $\overline{MO} \cong \overline{NP}$ is *always* or *sometimes* true. Draw a diagram and explain your reasoning.

~~Always~~   *Sometimes; those are the diagonals*

2. For any rectangle *PQRS*, decide whether the statement $\angle PQS \cong \angle RSQ$ is *always* or *sometimes* true. Draw a diagram and explain your reasoning.
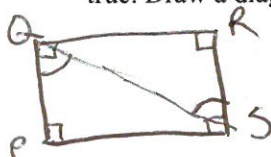
Always; ~~All of angles must be~~ Alt. int. $\angle$s $\cong$

In Exercises 3–5, the diagonals of rhombus *ABCD* intersect at *E*. Given that $m\angle BCA = 44°$, $AB = 9$, and $AE = 7$, find the indicated measure.
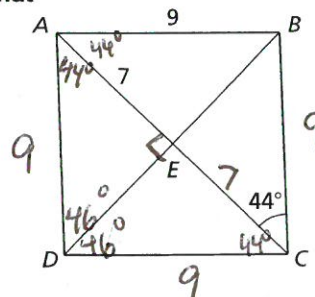
3. *BC*

   9

4. *AC*

   14

5. $m\angle ADC$

   $46° + 46°$

   92°

In Exercises 6–8, the diagonals of rectangle *EFGH* intersect at *I*. Given that $m\angle HFG = 31°$ and $EG = 17$, find the indicated measure.

6. $m\angle FHG$

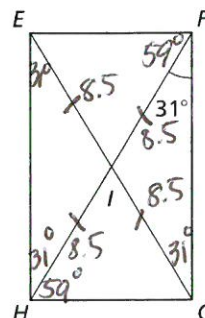 $90° - 31°$

   59°

7. *HF*

   17

8. $m\angle EFH$

   59°

In Exercises 9–11, the diagonals of square *LMNP* intersect at *K*. Given that $MK = \dfrac{1}{2}$, find the indicated measure.

9. *PK*

   $\dfrac{1}{2}$

10. $m\angle PKN$

   90°

11. $m\angle MNK$

   $\dfrac{90°}{2} = 45°$