Edgenuity

Warm-Up | Special Parallelograms

Lesson Question

Lesson Goals

Analyze special ________.

Apply the properties of ________ to solve mathematical and real-world problems.

Apply the properties of ________ to solve mathematical and real-world problems.

Apply the properties of ________ to solve mathematical and real-world problems.

Warm-Up | Special Parallelograms

Words to Know

Fill in this table as you work through the lesson. You may also use the glossary to help you.

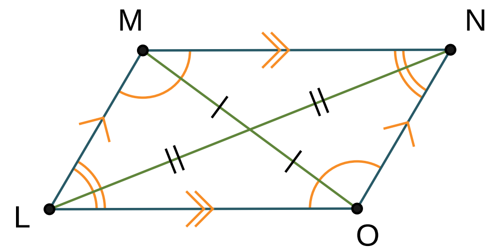
parallelogram	a ______ in which both pairs of opposite sides are ______
rectangle	a ______ with four ______ angles
rhombus	a parallelogram with four ______ sides
square	a parallelogram with four ______ angles and four ______ sides

Warm-Up | Special Parallelograms

Properties of a Parallelogram

A **parallelogram** is a quadrilateral in which both pairs of opposite sides are parallel.

Properties:



- Opposite sides are ______.
- Opposite ______ are congruent.
- Diagonals ______ each other.
- ______ angles are supplementary.

$m\angle L + m\angle M = 180°$

$m\angle L + m\angle O = 180°$

$m\angle M + m\angle N = 180°$

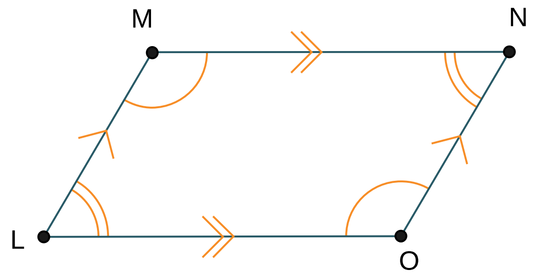
$m\angle N + m\angle O =$ ______

Instruction | Special Parallelograms

Slide 2

Properties of a Rectangle

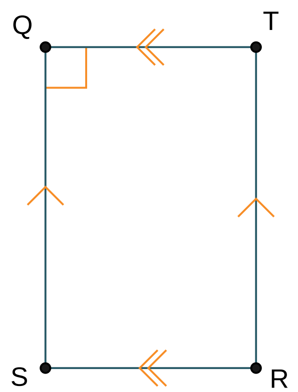
When is a parallelogram a **rectangle**?



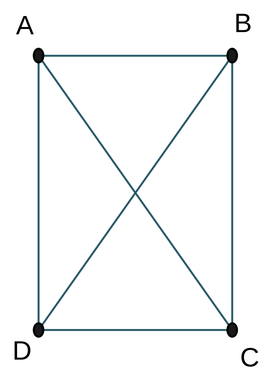
A rectangle has four ______ angles.

Rectangle Theorems

Rectangle angle theorem: A ______ is a rectangle if ______ of its angles is a right angle.



Rectangle diagonal theorem: A parallelogram is a ______ if and only if its ______ are congruent.



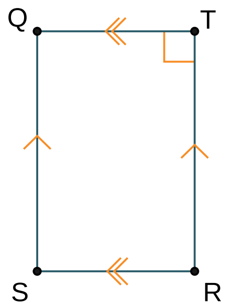
Instruction | Special Parallelograms

Slide 3

Proving the Rectangle Angle Theorem

Given: QTRS is a parallelogram; $m\angle \mathrm{T} = 90°$.

Prove: QTRS is a rectangle.



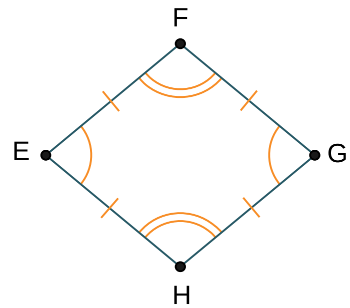
Statements	Reason
1. QTRS is a parallelogram	1. given
2. $m\angle \mathrm{T} = 90°$	2. given
3. $\angle \mathrm{T} \cong \angle S$	3. opp. $\angle s$ of a parallelogram are $\cong$
4. $m\angle \mathrm{T} = m\angle S$	4. def. of congruent
5. $90° = m\angle S$	5. $\boxed{}$
6. $m\angle \mathrm{R} + m\angle S =$ $\boxed{}$	6. consecutive $\angle s$ of a parallelogram are supp. $\angle s$
7. $m\angle \mathrm{R} + 90° = 180°$	7. substitution property
8. $\boxed{}$	8. subtraction property
9. $\angle \mathrm{R} \cong \angle \mathrm{Q}$	9. opposite $\angle s$ of a parallelogram are $\cong$
10. $m\angle \mathrm{R} = m\angle \mathrm{Q}$	10. def. of $\boxed{}$
11. $90° = m\angle \mathrm{Q}$	11. substitution
12. $\angle \mathrm{Q}$, $\angle \mathrm{T}$, $\angle \mathrm{R}$, and $\angle S$ are right $\angle s$	12. def. of right angle
13. QTRS is a rectangle	13. def. of $\boxed{}$

Instruction | Special Parallelograms

Slide 5

Properties of a Rhombus

When is a parallelogram a **rhombus**?

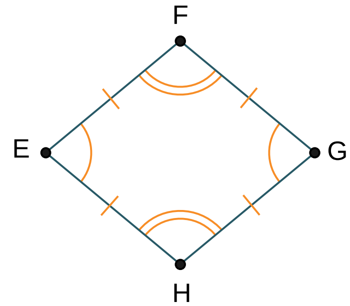


A rhombus has four ______ sides.

Rhombus Angle Bisector Theorem

Rhombus angle bisector theorem: A parallelogram is a rhombus if and only if each of its ______ bisects two of its angles.

Draw the diagonals on the rhombus.



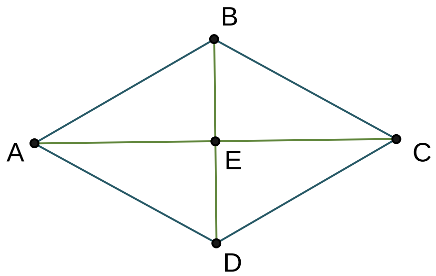
Instruction | Special Parallelograms

Slide 6

Properties of Rhombi

Given: ABCD is a parallelogram; $\overline{AC}$ bisects $\angle BCD$ and $\angle BAD$; $\overline{BD}$ bisects $\angle CDA$ and $\angle ABC$.

Prove: ABCD is a rhombus.



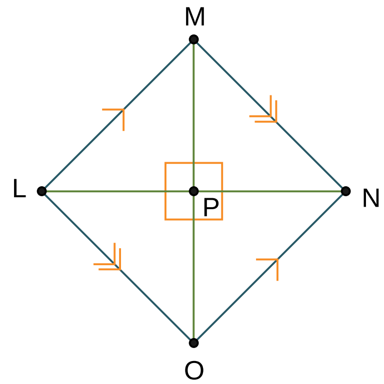
Statement	Reason
1. ABCD is a parallelogram	1. $\boxed{}$
2. $\overline{AC}$ bisects $\angle BCD$ and $\angle BAD$	2. given
3. $\overline{BD}$ bisects $\angle CDA$ and $\angle ABC$	3. given
4. $\angle ABE \cong \angle CBE$; $\angle ADE \cong \angle CDE$	4. def. of $\boxed{}$
5. $\angle ABE$ and $\angle CDE$ alt. int. $\angle s$	5. def. of alternate interior angles
6. $\angle ADE$ and $\angle \boxed{}$ alt. int. $\angle s$	6. def. of alternate interior angles
7. $\angle ABE \cong \angle CDE$; $\angle ADE \cong \angle CBE$	7. alternate interior angles congruent
8. $\angle ABE \cong \angle ADE \cong \angle CDE \cong \angle CBE$	8. $\boxed{}$ property
9. $\angle BAE \cong \angle BCE \cong \angle DCE \cong \angle DAE$	9. similar argument as steps 4–8
10. $\boxed{}$	10. diagonals of a parallelogram bisect each other
11. $\triangle ABE \cong \triangle CBE \cong \triangle CDE \cong \triangle ADE$	11. AAS
12. $\overline{AB} \cong \overline{CB} \cong \overline{CD} \cong \overline{AD}$	12. $\boxed{}$
13. ABCD is a rhombus	13. def. of rhombus

Instruction | Special Parallelograms

Slide 8

Rhombus Diagonal Theorem

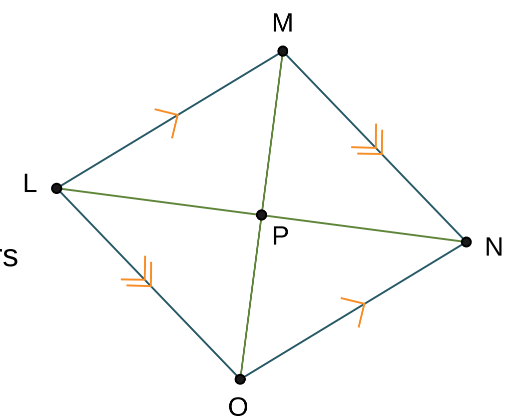
Rhombus diagonal theorem: A parallelogram is a rhombus if and only if its ________ are ________.



By SSS, all four triangles formed by the diagonals are ________.

Rhombi

- Are ________
- Have ________ congruent sides
- Have diagonals that are ________ bisectors
- Have ________ diagonals



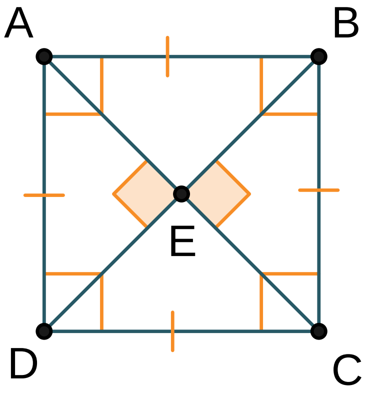
Instruction | Special Parallelograms

Slide 8

Squares

A **square** is both a [ ] and a rhombus.

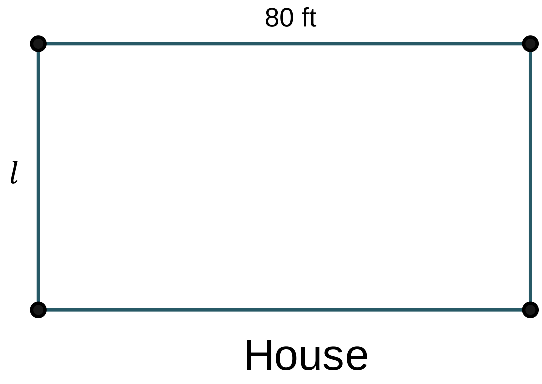
- Are parallelograms
- Have four [ ] angles
- Have [ ] diagonals
- Have four congruent sides
- Have diagonals that are angle bisectors
- Have [ ] diagonals



11

Solving Problems with Properties of Rectangles

Sanjay has 250 feet of fencing to use to enclose a rectangular grassy area for his dog to play. He wants to use 80 feet of his house as the width of one side of the play area. What is the maximum length the rectangle can have?



$250 - 80 = 170 \text{ ft}$

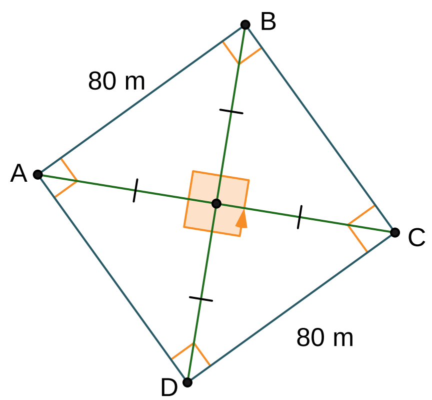
$\frac{170}{2} = \boxed{} \text{ ft}$

Instruction | Special Parallelograms

Slide 13

Applying Properties of Squares to Solve Problems

A new walking path around a playground is in the shape of a square. What is the approximate distance from one corner of the path to the corner opposite it? Round to the nearest meter.



$$x^2 + x^2 = 80^2$$

$$2x^2 = 6400$$

$$\sqrt{x^2} = \sqrt{3200}$$

$$x \approx \boxed{} \text{ m}$$

$$2(56.57) \approx \boxed{} \text{ m}$$

Summary | Special Parallelograms

Lesson Question

What special properties do rectangles, squares, and rhombi have?

Answer

Review: Key Concepts

Slide 2

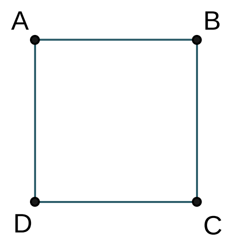
Rectangles:

- are parallelograms with ______ right angles.
- have congruent ______.

Rhombi:

- are parallelograms with congruent ______.
- have diagonals that bisect angles.
- have diagonals that are ______.

Squares are both rectangles ______ rhombi.



Summary | Special Parallelograms

Use this space to write any questions or thoughts about this lesson.