

Warm up

Warm Up Q here



7.1 Properties of Quadrilaterals & Parallelograms

OBJECTIVE

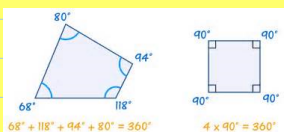
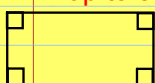
-Recognize and apply properties of the sides and angles of quadrilaterals and parallelograms

-Recognize and apply properties of the diagonals of parallelograms.

Quadrilaterals

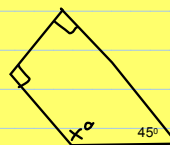
-Have 4 sides

-The interior angles of a quadrilateral add up to 360°



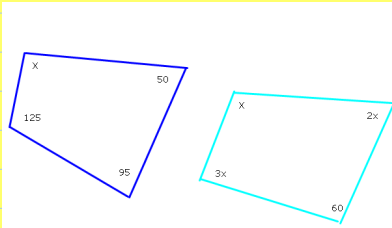
To find any missing angle in a quadrilateral, create an equation that solves for the missing angle.

Find x.



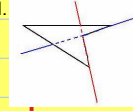
Now, you try!

Find x.

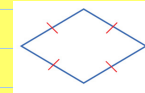


Concave and Convex Quadrilaterals

Concave Quadrilateral- a quadrilateral for which there is a line containing a side of the quadrilateral that also contains a point in the interior of the quadrilateral.



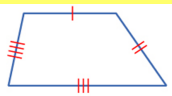
Convex Quadrilateral- A Quadrilateral for which there is no line that contains both a side of the polygon and a point in the interior of the quadrilateral.



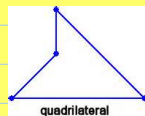
Now, you try!

Determine if the quadrilateral is concave or convex.

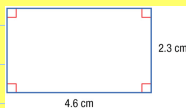
A)



B)



C)



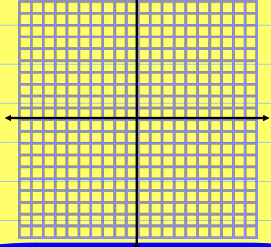
Properties of Quadrilaterals & Parallelograms

THEOREMS		Examples
6.3	Opposite sides of a parallelogram are congruent. Abbreviation: <i>Opp. sides of □ are ≅.</i>	$\overline{AB} \cong \overline{DC}$ $\overline{AD} \cong \overline{BC}$
6.4	Opposite angles in a parallelogram are congruent. Abbreviation: <i>Opp. ∠ of □ are ≅.</i>	$\angle A \cong \angle C$ $\angle B \cong \angle D$
6.5	Consecutive angles in a parallelogram are supplementary. Abbreviation: <i>Cons. ∠ in □ are suppl.</i>	$m\angle A + m\angle B = 180$ $m\angle B + m\angle C = 180$ $m\angle C + m\angle D = 180$ $m\angle D + m\angle A = 180$
6.6	If a parallelogram has one right angle, it has four right angles. Abbreviation: <i>If □ has 1 rt. ∠, it has 4 rt. ∠.</i>	$m\angle G = 90$ $m\angle H = 90$ $m\angle J = 90$ $m\angle K = 90$

Properties of Quadrilaterals & Parallelograms

In a parallelogram, opposite sides are parallel to each other, so slopes will be equal. Use **Slope Formula** to determine if the quadrilateral is a parallelogram.

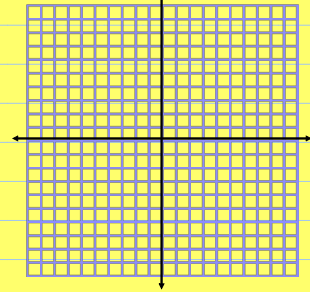
Quadrilateral KLMN
 K(2,3), L(8, 4), M(7, -2), N(1, -3)



Now, you try! **Properties of Quadrilaterals & Parallelograms**

In a parallelogram, opposite sides are parallel to each other, so slopes will be equal. Use **Slope Formula** to determine if the quadrilateral is a parallelogram.

Quadrilateral FGHI
 F(-2,4), G(4, 2), H(4, -2), J(-2, -1)



Properties of Parallelograms

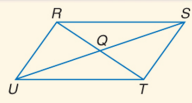


THEOREM 6.7

The diagonals of a parallelogram bisect each other.

Abbreviation: *Diag. of □ bisect each other.*

Example: $\overline{RQ} \cong \overline{QT}$ and $\overline{SQ} \cong \overline{QU}$

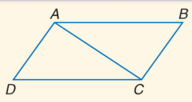


THEOREM 6.8

Each diagonal of a parallelogram separates the parallelogram into two congruent triangles.

Abbreviation: *Diag. separates □ into 2 ≅ Δs.*

Example: $\triangle ACD \cong \triangle CAB$



Properties of Parallelograms



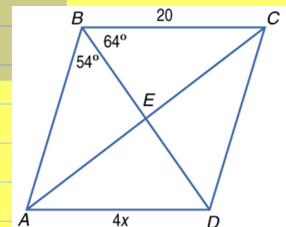
Try again!

ABCD is a parallelogram.

a) Find $m\angle BDC$.

b) Find $m\angle BCD$.

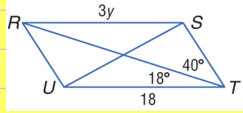
c) Find x



Three blue horizontal bars for writing answers.

Properties of Parallelograms

Quadrilateral $RSTU$ is a parallelogram. Find $m\angle URT$, $m\angle RST$, and y .



Four rows of blue redaction bars covering the workspace for the first problem.

Five rows of blue redaction bars covering the workspace for the second problem.

Diagonals of a Parallelogram

What are the coordinates of the intersection of the diagonals of parallelogram $MNPR$, with vertices $M(-3, 0)$, $N(-1, 3)$, $P(5, 4)$, and $R(3, 1)$?

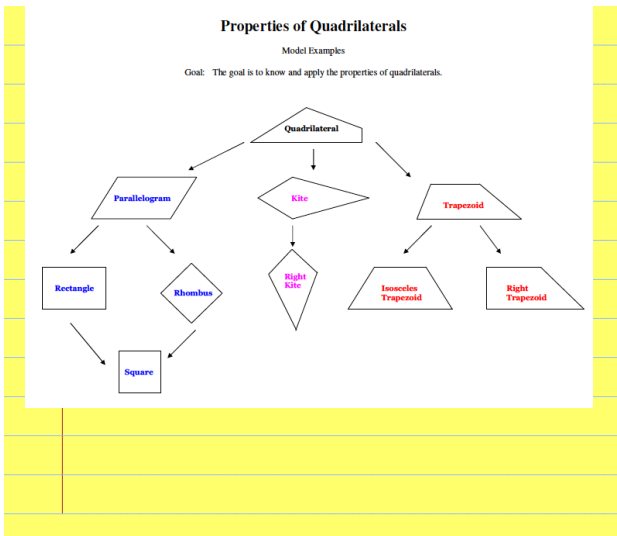
Five rows of blue redaction bars covering the workspace for the third problem.

Now, you try!

What are the coordinates of the intersection of the diagonals of parallelogram $LMNO$, with vertices $L(0, -3)$, $M(-2, 1)$, $N(1, 5)$, $O(3, 1)$?



Four rows of blue redaction bars covering the workspace for the fourth problem.



Properties of Quadrilaterals & Parallelograms
Properties of Rectangles

KEY CONCEPT		Rectangle
Words A rectangle is a quadrilateral with four right angles.		
Properties	Examples	
1. Opposite sides are congruent and parallel.	$\overline{AB} \cong \overline{DC}$ $\overline{AB} \parallel \overline{DC}$ $\overline{BC} \cong \overline{AD}$ $\overline{BC} \parallel \overline{AD}$	
2. Opposite angles are congruent.	$\angle A \cong \angle C$ $\angle B \cong \angle D$	
3. Consecutive angles are supplementary.	$m\angle A + m\angle B = 180$ $m\angle B + m\angle C = 180$ $m\angle C + m\angle D = 180$ $m\angle D + m\angle A = 180$	
4. Diagonals are congruent and bisect each other.	$\overline{AC} \cong \overline{BD}$ \overline{AC} and \overline{BD} bisect each other.	
5. All four angles are right angles.	$m\angle DAB = m\angle BCD = m\angle ABC = m\angle ADC = 90$	

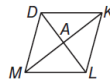
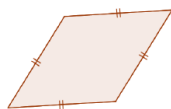
Properties of Rectangles

Quadrilateral $ABCD$ has vertices $A(-2, 1)$, $B(4, 3)$, $C(5, 0)$, & $D(-1, -2)$. Determine whether $ABCD$ is a rectangle by measuring the diagonals using the Distance Formula.

Properties of Rectangles

Quadrilateral $WXYZ$ has vertices $W(-2, 1)$, $X(-1, 3)$, $Y(3, 1)$, and $Z(2, -1)$. Determine whether $WXYZ$ is a rectangle by measuring the diagonals using the Distance Formula.

- A rhombus is a quadrilateral with four congruent sides. All rhombuses are parallelograms.

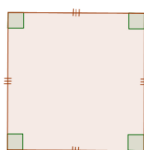


If $DA = 4x$ and $AL = 5x - 3$, find DL .

If $DA = 4x$ and $AL = 5x - 3$, find AD .

All of the properties of a parallelogram apply to a rhombus plus the sides are congruent and the diagonals of a rhombus are perpendicular to each other.

- A square is a quadrilateral with four right angles and four congruent sides. All squares are rectangles and rhombuses.

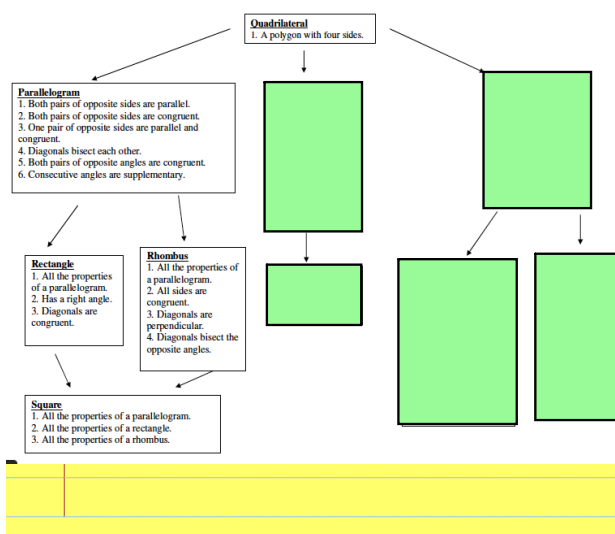


COORDINATE GEOMETRY Given each set of vertices, determine whether $\square QRST$ is a rhombus, a rectangle, or a square. List all that apply. Explain.

$$Q(-6, -1), R(4, -6), S(2, 5), T(-8, 10)$$

All of the properties of parallelograms, rectangles and rhombii apply to squares.

1. Draw a square. Draw in the diagonals of the square. Make at least one conjecture about the diagonals of the square.
2. A quadrilateral has four congruent sides. What type of quadrilateral must it be? What type of quadrilateral could it be?
3. Solve for x (picture not drawn to scale).



Classwork
Homework

