

10.2.D1 PARALLELOGRAMS

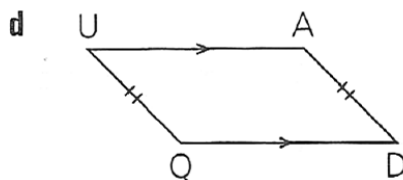
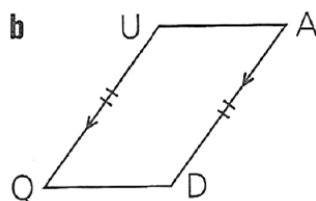
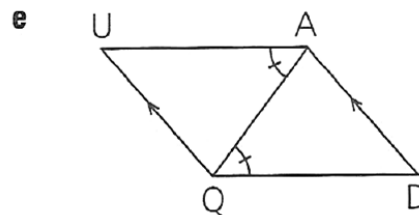
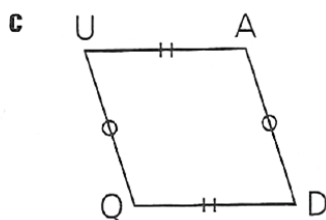
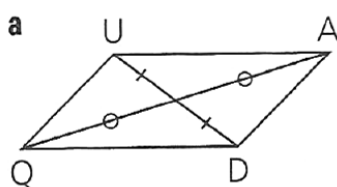
▮ Parallelograms

- A parallelogram is a quadrilateral with both pairs of opposite sides parallel. (definition)
- Parallelogram/Congruent-Parallel Side Theorem
 - If one pair of opposite sides of a quadrilateral is both congruent and parallel, then the quadrilateral is a parallelogram.

For a list of the properties of parallelograms, see page 829 of your text.

Examples

1. For each quadrilateral $QUAD$, state the property or definition that proves that $QUAD$ is a parallelogram. (Refer to the "Properties of Parallelograms" on page 829 of your text.)



2. Complete each statement about $JKLM$.

$$\overline{JK} \cong \underline{\hspace{1cm}} ?$$

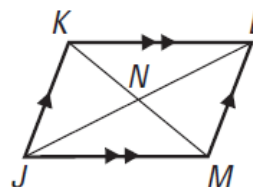
$$\angle MLK \cong \underline{\hspace{1cm}} ?$$

$$\angle JKL \cong \underline{\hspace{1cm}} ?$$

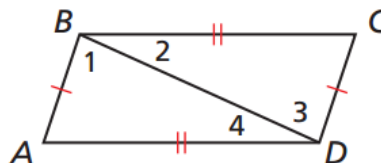
$$\overline{JN} \cong \underline{\hspace{1cm}} ?$$

$$\angle MNL \cong \underline{\hspace{1cm}} ?$$

$$\overline{NM} \cong \underline{\hspace{1cm}} ?$$

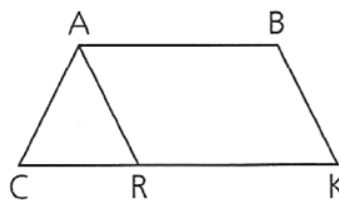


3. Given: $\overline{AB} \cong \overline{CD}$
 $\overline{BC} \cong \overline{DA}$
 Prove: $ABCD$ is a parallelogram



Statements	Reasons
1. $\overline{AB} \cong \overline{CD}$	1. Given
2. $\overline{BC} \cong \overline{DA}$	2. Given
3. $\overline{BD} \cong \overline{BD}$	3.
4. $\triangle DAB \cong \triangle BCD$	4.
5. $\angle 1 \cong \underline{\hspace{2cm}}$	5.
6. $\angle 4 \cong \underline{\hspace{2cm}}$	6.
7. $\overline{AB} \parallel \overline{CD}$	7.
8. $\overline{BC} \parallel \overline{DA}$	8.
9. $ABCD$ is a parallelogram	9.

4. Given: $\triangle CAR$ is isosceles w/base \overline{CR}
 $\overline{AC} \cong \overline{BK}$
 $\angle C \cong \angle K$
 Prove: $BARK$ is a parallelogram

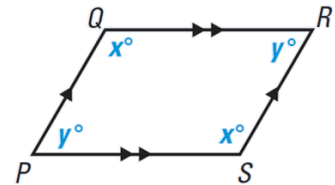


Statements	Reasons
1. $\triangle CAR$ is isosceles w/base \overline{CR}	1. Given
2. $\overline{AC} \cong \underline{\hspace{2cm}}$	2.
3. $\overline{AC} \cong \overline{BK}$	3. Given
4. $\overline{AR} \cong \overline{BK}$	4.
5. $\angle C \cong \underline{\hspace{2cm}}$	5.
6. $\angle C \cong \angle K$	6. Given
7. $\angle ARC \cong \angle K$	7.
8. $\overline{AR} \parallel \overline{BK}$	8.
9. $BARK$ is a parallelogram	9.

10.2.D2 PARALLELOGRAMS

- For a list of the properties of parallelograms, see page 829 of your text.
- Add to your properties list: *Consecutive angles of a parallelogram are supplementary.*

$$x + y = 180^\circ$$



Examples

1. $VRZA$ is a \square

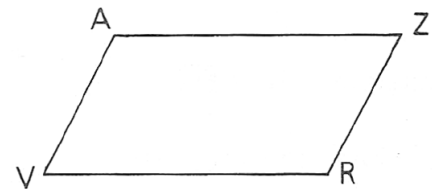
Given:

$$AV = 2x - 4$$

$$VR = 3y + 5$$

$$RZ = \frac{1}{2}x + 8$$

$$ZA = y + 12$$



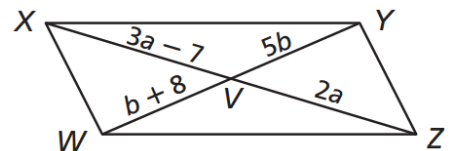
Find: The values of x and y and the perimeter of $VRZA$

What property of parallelograms are you going to use?

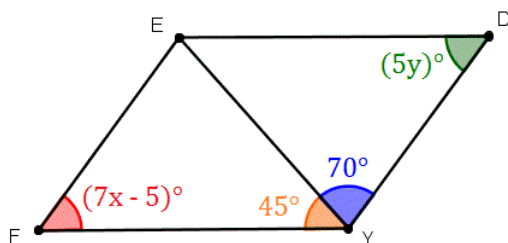
2. $WXYZ$ is a \square . Find:

- a
- b
- WV
- YW
- XZ
- ZV

What property of parallelograms are you going to use?



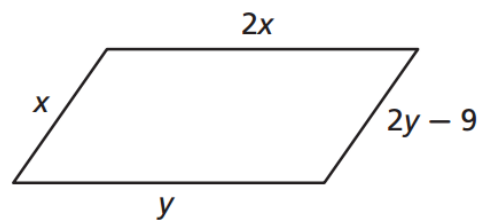
3. $FEDY$ is a \square . Find the value of each variable.



What property of parallelograms are you going to use?

4. For the given parallelogram, set up and solve a system of equations to find the value of the variables.

What property of parallelograms are you going to use?



10.1 SQUARES & RECTANGLES

☺ Squares

- A square is a quadrilateral with four right angles and all sides congruent. (definition)
 - Area: $A = s^2$

☺ Rectangles

- A rectangle is a quadrilateral with opposite sides congruent and with four right angles. (definition)
 - Area: $A = bh = \ell w$

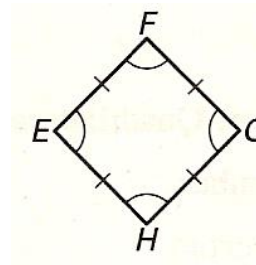
For a list of the properties of squares and rectangles, see page 828 of your text.

Examples

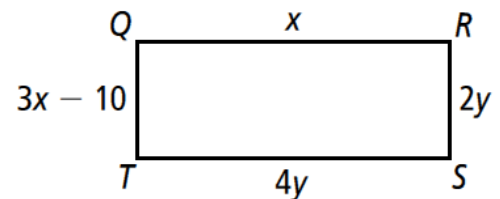
1. Given: $EFGH$ is a square with a perimeter of 36
 $EH = x + 6$
 $\angle F = 2y - 4$

Find: x & y

The area of square $EFGH$



2. Given: Rectangle $QRST$
- a. Set up and solve a system of equations to find the value of the variables.
 - b. Find the rectangle's base and height.
 - c. What is the perimeter and area of rectangle $QRST$?



10.2 & 10.3 RHOMBI & KITES

⌚ Rhombi

➤ A rhombus is a quadrilateral with all sides congruent. (definition)

▪ Area: $A = d_1 d_2$

- Add to your properties list: *Consecutive angles are supplementary.*

⌚ Kites

➤ A kite is a quadrilateral with two pairs of consecutive congruent sides with opposite sides that are not congruent. (definition)

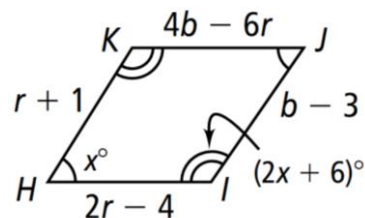
▪ Area: $A = d_1 d_2$

For a list of the properties of rhombi and kites, see page 830 of your text.

Examples

1. Given: Rhombus $HIJK$

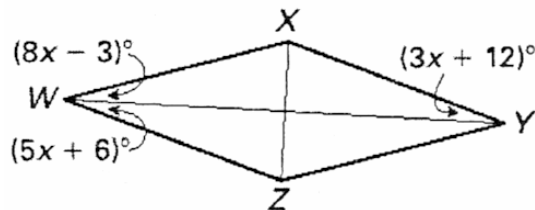
- Find the value of the variables.
- What is the perimeter of rhombus $HIJK$?
- Find $m\angle J$ & $m\angle K$.



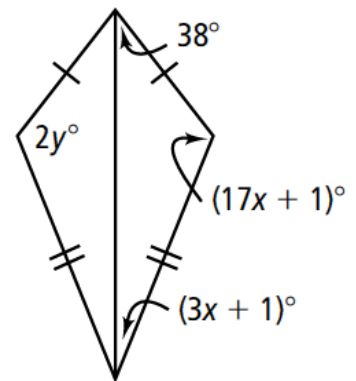
2. Given: Rhombus $WXYZ$

$$XZ = 10 \text{ \& } WY = 24$$

- Find the value of x .
- Find the area of rhombus $WXYZ$.
- Find the perimeter of rhombus $WXYZ$.

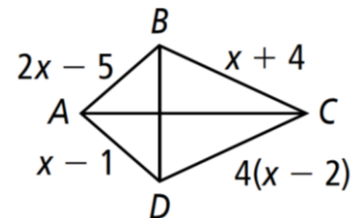


3. Find the value of the variables in the kite.



4. Given: Kite $ABCD$

Find the value of x and the perimeter of $ABCD$.



10.3.D2 TRAPEZOIDS

☺ Trapezoids

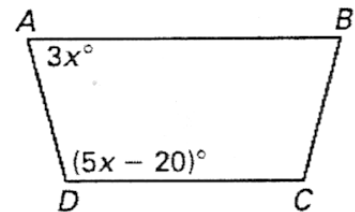
- A trapezoid is a quadrilateral with exactly one pair of parallel sides. (definition)
 - Add to your properties list: *Consecutive non-base angles are supplementary.*
- An isosceles trapezoid is a trapezoid with congruent non-parallel sides. (definition)
 - Area: $A = \frac{1}{2}h(b_1 + b_2)$

For a list of the properties of isosceles trapezoids, see page 831 of your text.

Examples

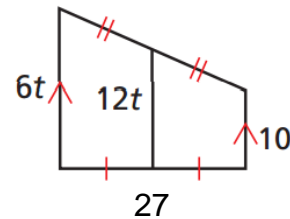
1. Given: $ABCD$ is a trapezoid.

- d. Find the value of x .
- e. Find $m\angle A$ & $m\angle D$.

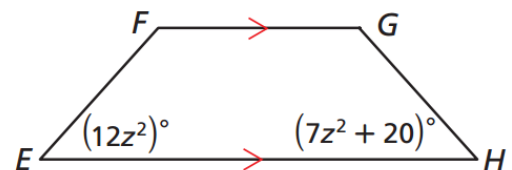


2. Find the length of the midsegment of the trapezoid.

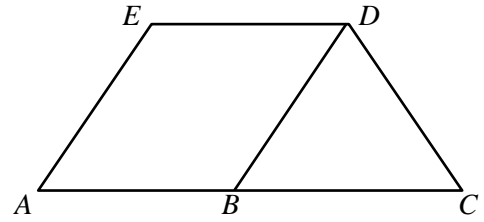
What is the trapezoid's area?



3. Find the value of z so that trapezoid $EFGH$ is isosceles.



4. Given: $ABDE$ is a parallelogram
 $\triangle BCD$ is isosceles with base \overline{BC}
 Prove: $ACDE$ is an isosceles trapezoid



Statements	Reasons

10.4 & 10.5 INTERIOR & EXTERIOR ANGLES OF POLYGONS

⌚ Polygons

A vertex is the point of intersection of two sides.

A segment whose endpoints are nonconsecutive vertices is a *diagonal*.

Consecutive vertices are the two endpoints of any side.

Sides that share a vertex are called *consecutive sides*.

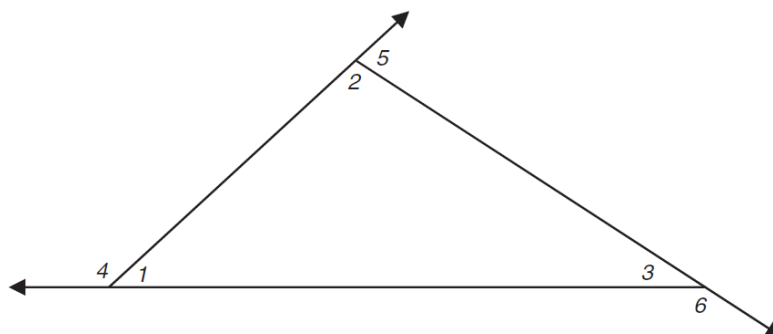
Info Graphic

⌚ Interior Angles of Polygons

➤ The sum of the measures of the interior angles of a polygon with n sides is _____

• Exterior Angles of Polygons

Use the figure to answer each question.

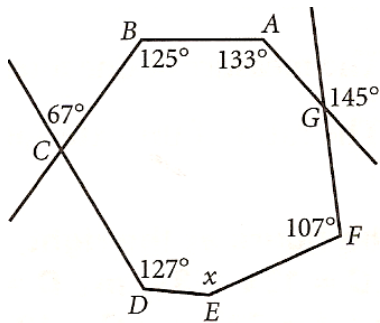


1. What is the sum of the measures of $\angle 1$ & $\angle 4$? Explain your reasoning.
2. What is the sum of the measures of $\angle 2$ & $\angle 5$?
3. What is the sum of the measures of $\angle 3$ & $\angle 6$?
4. What is the sum of the measures of $\angle 1$, $\angle 2$, $\angle 3$, $\angle 4$, $\angle 5$, and $\angle 6$? Explain your reasoning.
5. What is the sum of the measures of $\angle 1$, $\angle 2$, and $\angle 3$? Explain your reasoning.
6. What is the difference of the sum of the measures of $\angle 1$, $\angle 2$, $\angle 3$, $\angle 4$, $\angle 5$, and $\angle 6$ and the sum of the measures of $\angle 1$, $\angle 2$, and $\angle 3$? What does this demonstrate?
7. What is the sum of the exterior angles of any polygon?

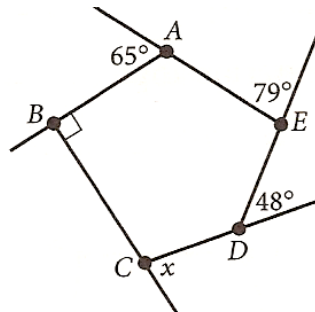
Examples

Find the value of x in each convex polygon.

1.

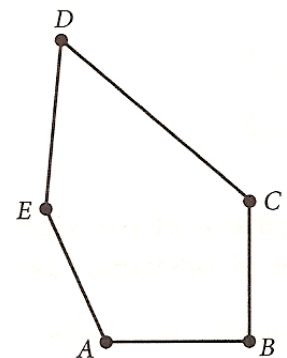


2.

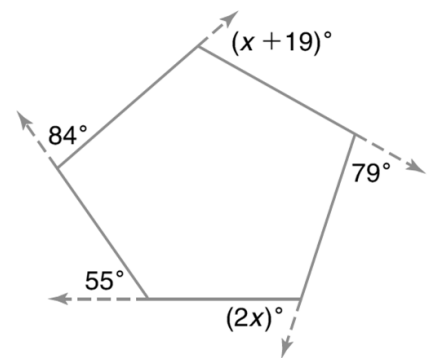


3. Given: $m\angle A = 4x + 7$, $m\angle B = 4x - 18$, $m\angle C = 5(x - 1)$, $m\angle D = 2x + 1$, &
 $m\angle E = 7x - 39$

Set up and solve an equation and find the value of x .



4. Set up and solve an equation to find the value of x .



5. If a regular polygon has 30 sides, what is the measure of (a) each interior angle? And (b) each exterior angle?
6. If the measure of each exterior angle of a regular polygon is 18° , how many sides does the polygon have?

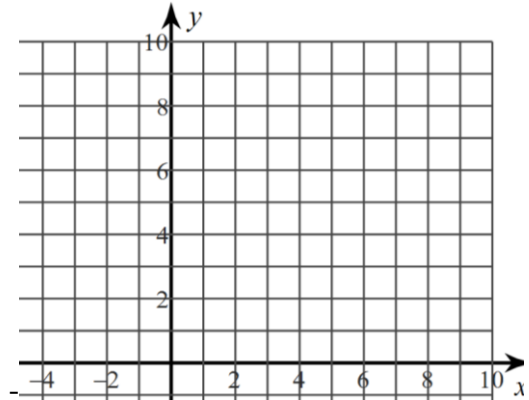
10.7 CLASSIFYING QUADRILATERALS ON THE COORDINATE PLANE

FORMULAS & THE COORDINATE PLANE	
Formula	When to Use it
Distance Formula: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$	To determine whether... <ul style="list-style-type: none"> Sides are congruent Diagonals are congruent
Midpoint Formula: $(x_m, y_m) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$	To determine... <ul style="list-style-type: none"> The coordinates of a midpoint of a side Whether diagonals bisect each other
Slope Formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$	To determine whether... <ul style="list-style-type: none"> Opposite sides are parallel Diagonals are perpendicular Sides are perpendicular

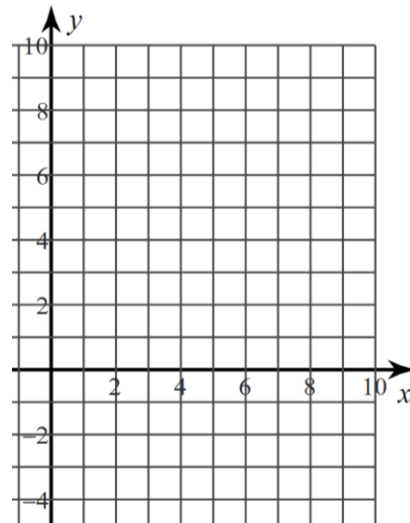
QUADRILATERAL	PROVE:
PARALLELOGRAM	<ul style="list-style-type: none"> Both pairs of opposite sides are parallel (definition) Both pairs of opposite sides are congruent One pair of opposite sides are parallel and congruent Diagonals bisect each other
RECTANGLE	<ul style="list-style-type: none"> Both pairs of opposite sides are congruent and all four angles are right angles (definition) Or...first prove it's a parallelogram, and then prove... <ul style="list-style-type: none"> The diagonals are congruent Two consecutive sides are perpendicular
RHOMBUS	<ul style="list-style-type: none"> All four sides are congruent (definition) Or...first prove it's a parallelogram, and then prove... <ul style="list-style-type: none"> The diagonals are perpendicular
SQUARE	<ul style="list-style-type: none"> All four angles are right angles and all four sides are congruent (definition) Or...prove it's a rectangle AND a rhombus
TRAPEZOID	<ul style="list-style-type: none"> Only one pair of sides are parallel (definition)
ISOSCELES TRAPEZOID	Prove it's a trapezoid AND... <ul style="list-style-type: none"> The non-parallel sides are congruent The diagonals are congruent
KITE	<ul style="list-style-type: none"> Two pairs of consecutive sides are congruent and the opposite sides are not congruent (definition)

Examples

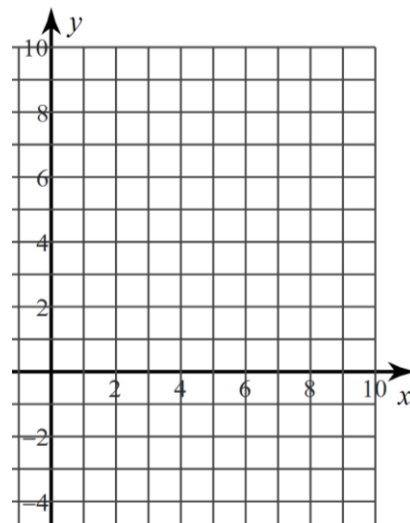
1. The vertices of $JOSH$ are $J(-3, 1)$, $O(3, 3)$, $S(5, 7)$, & $H(-1, 5)$. Prove that $JOSH$ is a parallelogram.



2. The vertices of $KARI$ are $K(2, 1)$, $A(4, 4)$, $R(10, 0)$, & $I(8, -3)$. Show that $KARI$ is a rectangle.

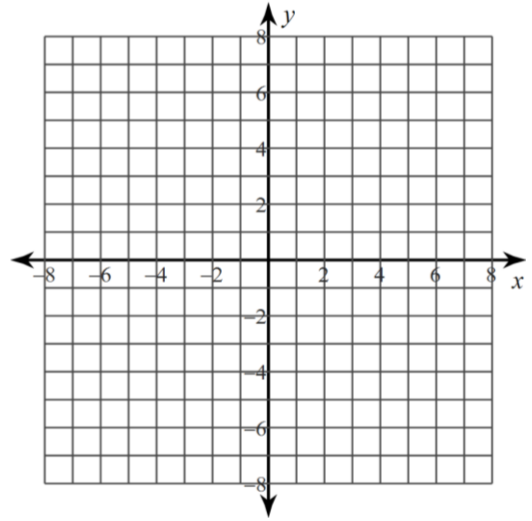


3. Quadrilateral $JACK$ has vertices $J(1, -4)$, $A(10, 2)$, $C(8, 5)$, & $K(2, 1)$. Prove that $JACK$ is a trapezoid.

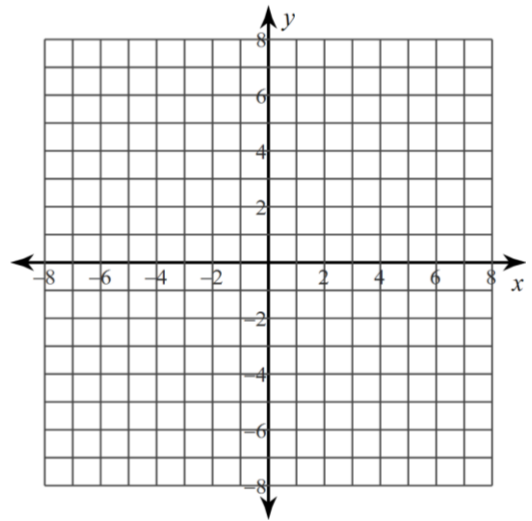


Use the diagonals to determine whether a parallelogram with the given vertices is a rectangle, rhombus, or square. Give all the names that apply.

4. $A(0, 2), B(3, 6), C(8, 6), D(5, 2)$



5. $E(-4, -1), F(-3, 2), G(3, 0), H(2, -3)$



6. The coordinates of three vertices of parallelogram $RHOM$ are given. Find the coordinates of O so that a rhombus is formed.

