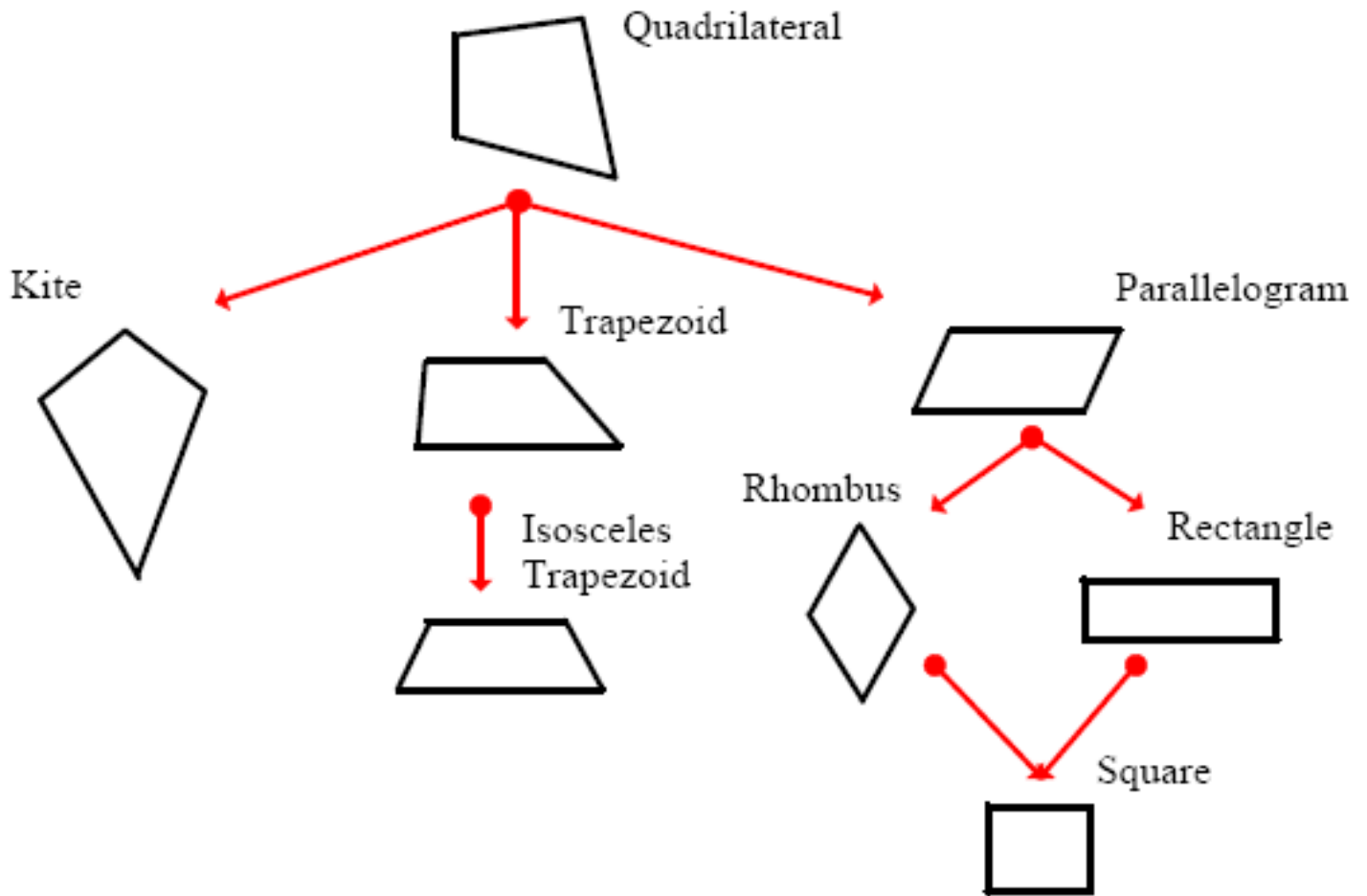


# CHAPTER 6

## Polygons, Quadrilaterals, and Special Parallelograms



Name: \_\_\_\_\_

Teacher: \_\_\_\_\_

Pd: \_\_\_\_\_

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**DAY 3:** (6-4) **SWBAT:** Solve Problems involving Rectangles  
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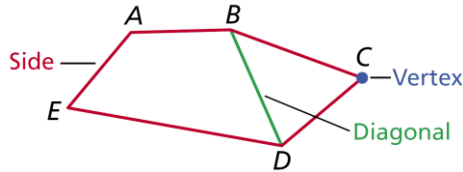
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# Chapter 6 (Section 1) – Day 1

## Angles in polygons

A polygon is a closed plane figure formed by three or more segments that intersect only at their endpoints.

Each segment that forms a polygon is a **side of the polygon**. The common endpoint of two sides is a **vertex of the polygon**. A segment that connects any two nonconsecutive vertices is a **diagonal**.

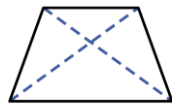


| Number of Sides | Name of Polygon |
|-----------------|-----------------|
| 3               | Triangle        |
| 4               | Quadrilateral   |
| 5               | Pentagon        |
| 6               | Hexagon         |
| 7               | Heptagon        |
| 8               | Octagon         |
| 9               | Nonagon         |
| 10              | Decagon         |
| 12              | Dodecagon       |
| $n$             | $n$ -gon        |

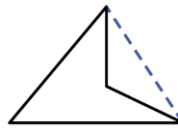
You can name a polygon by the number of its sides. The table shows the names of some common polygons.

All the sides are congruent in an equilateral polygon. All the angles are congruent in an equiangular polygon. A **regular polygon** is one that is both equilateral and equiangular. If a polygon is not regular, it is called irregular.

A polygon is **concave** if any part of a diagonal contains points in the exterior of the polygon. If no diagonal contains points in the exterior, then the polygon is **convex**. A regular polygon is always convex.



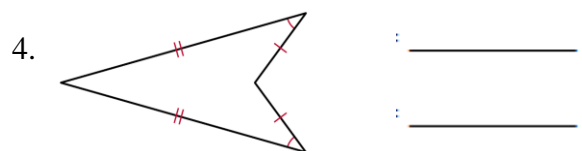
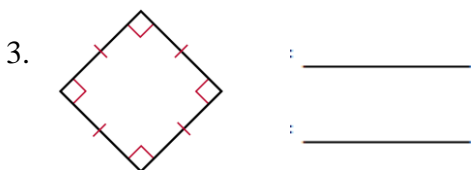
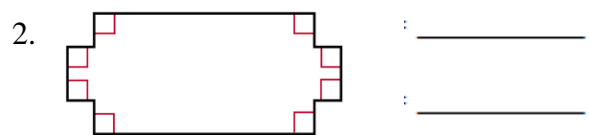
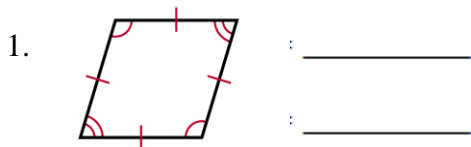
Convex quadrilateral



Concave quadrilateral

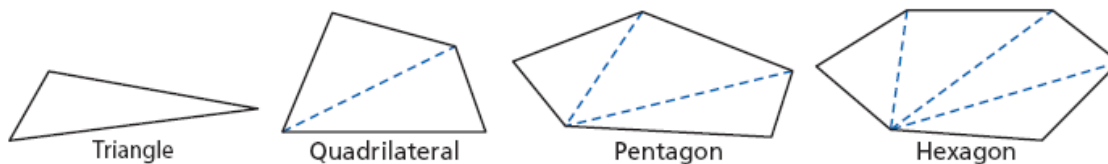
### Warm – Up

Tell whether the following polygons are concave or convex and regular or irregular.



## Sum of Interior Angles in Polygons

To find the sum of the interior angle measures of a convex polygon, draw all possible diagonals from one vertex of the polygon. This creates a set of triangles. The sum of the angle measures of all the triangles equals the sum of the angle measures of the polygon.



| Polygon       | Number of Sides | Number of Triangles | Sum of Interior Angle Measures |
|---------------|-----------------|---------------------|--------------------------------|
| Triangle      | 3               | 1                   | (1) $180^\circ = 180^\circ$    |
| Quadrilateral | 4               | 2                   | (2) $180^\circ = 360^\circ$    |
| Pentagon      | 5               | 3                   | (3) $180^\circ = 540^\circ$    |
| Hexagon       | 6               | 4                   | (4) $180^\circ = 720^\circ$    |
| $n$ -gon      | $n$             | $n - 2$             | $(n - 2)180^\circ$             |

In each convex polygon, the number of triangles formed is two less than the number of sides  $n$ . So the sum of the angle measures of all these triangles is  $(n - 2)180^\circ$ .



### **Theorem 6-1-1**

### **Polygon Angle Sum Theorem**

## Example 1: Calculating the Sum of Interior Angles

Find the sum of the interior angles of a decagon.

---

### **You Try It!**

Find the sum of the interior angles of a 14-gon.

**Example 2: Calculating the number of sides of a polygon given the sum of the interior angles**

The sum of the interior angles of a convex regular polygon measure  $1980^\circ$ , how many sides does the polygon have?

---

**You Try It!**

The sum of the interior angles of a convex regular polygon measure  $3240^\circ$ , how many sides does the polygon have?

**Interior Angles Formula for any  
Polygon**

**Example 3: Calculating the measure of each of  
interior Angle of any regular polygon**

What is the measure of each interior angle of a regular octagon?

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**You Try It!**

What is the measure of each interior angle of a regular 12-gon?

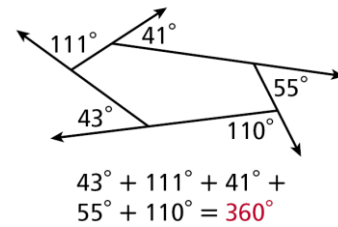
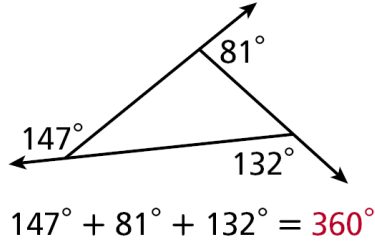
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**You Try It!**

How many sides does a regular polygon have if each interior angle measures  $160^\circ$ ?

# Exterior Angles

Refer to the two polygons below. What do you notice about the exterior angles of any polygon?



## Theorem 6.2

### Polygon Exterior Angles Sum

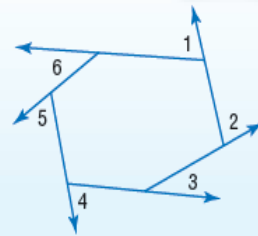
For Your

FOLDABLE

The sum of the exterior angle measures of a convex polygon, one angle at each vertex, is 360.

#### Example

$$m\angle 1 + m\angle 2 + m\angle 3 + m\angle 4 + m\angle 5 + m\angle 6 = 360$$



Know It!

Note

## Theorem 6-1-2

### Polygon Exterior Angle Sum Theorem

## Example 4: Calculating the measure of an exterior angle given the number of sides or Vice Versa

Find the measure of each exterior angle of a polygon with 18 sides.

### You Try It!

Find the measure of each exterior angle of a polygon with 36 sides.

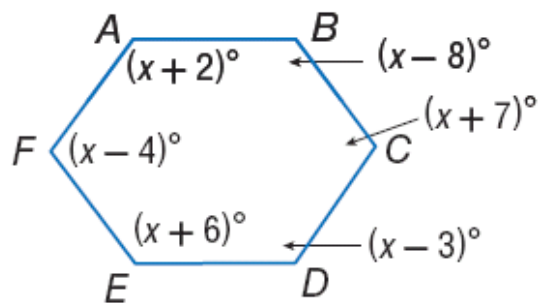
## You Try It!

The measure of an exterior angle of a convex regular polygon is  $45^\circ$ . Find the number of sides of the polygon.

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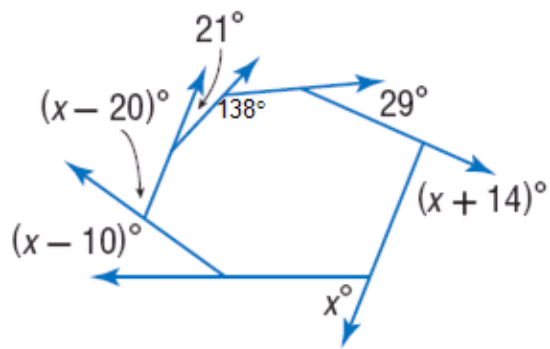
## Example 5: Solving Algebraic Problems

Find the value of  $x$ .



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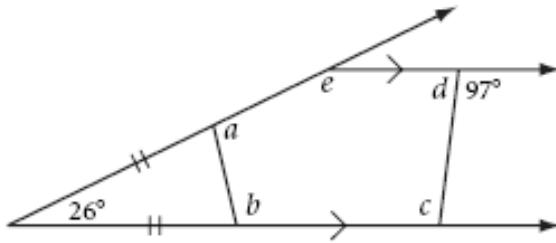
Find  $x$ :





## Challenge

In Exercises 1, find each lettered angle measure.



$$a = \underline{\hspace{2cm}}, b = \underline{\hspace{2cm}}, c = \underline{\hspace{2cm}},$$

$$d = \underline{\hspace{2cm}}, e = \underline{\hspace{2cm}}$$

## Summary

### Properties and Attributes of Polygons

Lesson 6-1

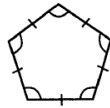
**Why?** Understanding properties of polygons and their angle sums is fundamental to successful work with quadrilaterals.

#### Remember

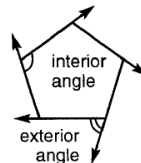
A polygon is *convex* if a segment connecting any two points in the interior of the polygon is completely in the interior.



A polygon that is not convex is *concave*.



A *regular* polygon is equilateral and equiangular.



#### Theorem

The sum of the interior angle measures of a convex polygon with  $n$  sides

$$S_i = (n - 2)180$$

#### Theorem

The sum of the exterior angle measures, one angle at each vertex, of a convex polygon is  $360^\circ$ .

$S_e = 360$  (always – no matter what the polygon)

#### Theorem

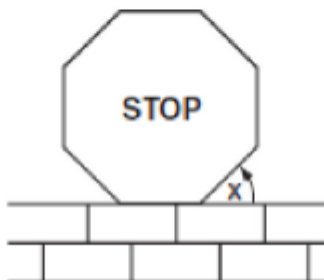
$$e = \frac{360}{n}$$

#### Theorem

$$i = \frac{180(n - 2)}{n}$$

## Exit Ticket

A stop sign in the shape of a regular octagon is resting on a brick wall, as shown in the accompanying diagram.



What is the measure of angle  $x$ ?

- 1)  $45^\circ$
- 2)  $60^\circ$
- 3)  $120^\circ$
- 4)  $135^\circ$

### Day 1: Homework

The number of sides of a convex polygon is given. Find the sum of the measures of the interior angles of each polygon.

1) 8

2) 12

The sum of the measures of the interior angles of a convex polygon is given. Find the number of sides of each polygon.

6)  $7020^\circ$

7)  $1980^\circ$

The number of sides of a regular polygon is given. Find the measure of each interior angle of each polygon.

11) 7

12) 9

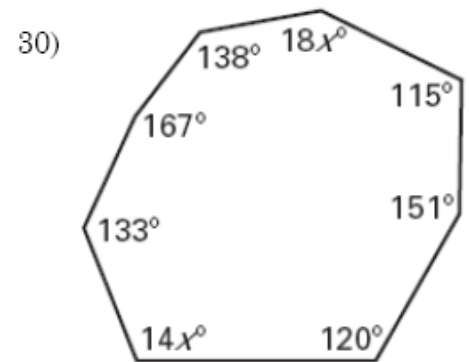
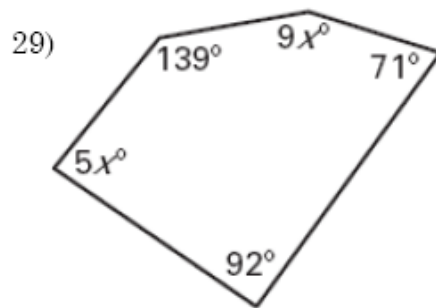
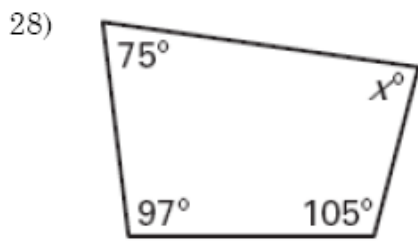
Find the exact measure of each exterior angle of the regular polygon.

19) 18-gon

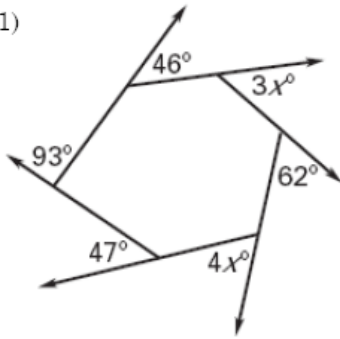
20) 20-gon

- 27) In quadrilateral ABCD the measures of  $\angle A$ ,  $\angle B$ ,  $\angle C$ , and  $\angle D$  are the ratio of 1:2:3:4, respectively. Find the measures of the four angles.

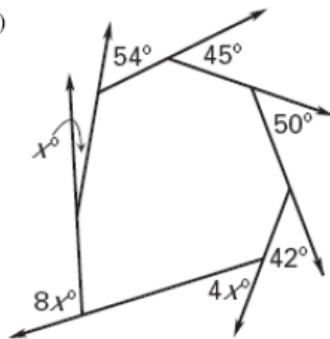
Find the value of x.



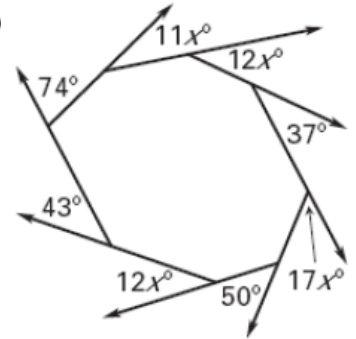
31)



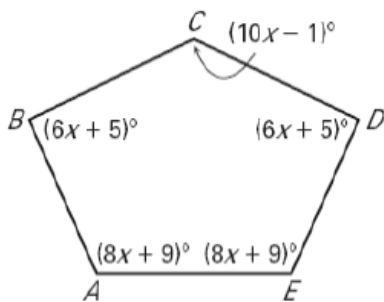
32)



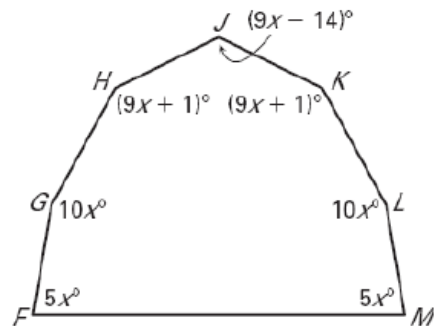
33)



- 34) **Light Fixture** The side view of a light fixture is shown below. Find the value of  $x$ . Then determine the measure of each angle.



- 35) **Tent** The front view of a camping tent is shown below. Find the value of  $x$ . Then determine the measure of each angle.



## Chapter 6 (Section 2) – Day 2

### Parallelograms

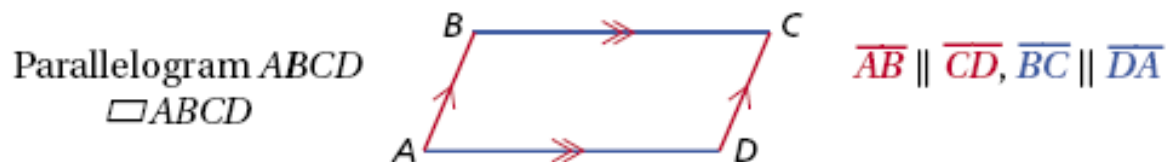
#### Warm – Up

The measures of five of the interior angles of a hexagon are  $150^\circ$ ,  $100^\circ$ ,  $80^\circ$ ,  $165^\circ$ , and  $150^\circ$ . What is the measure of the sixth interior angle?

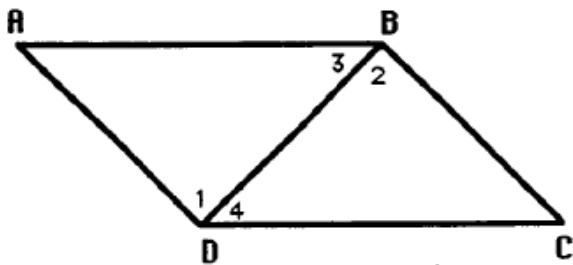
- 1)  $75^\circ$  2)  $80^\circ$  3)  $105^\circ$  4)  $180^\circ$

Any polygon with four sides is called a Quadrilateral. However, some quadrilaterals have special properties. These special quadrilaterals are given their own names.

A quadrilateral with two pairs of parallel sides is a **parallelogram**. To write the name of a parallelogram, you use the symbol  $\square$ .



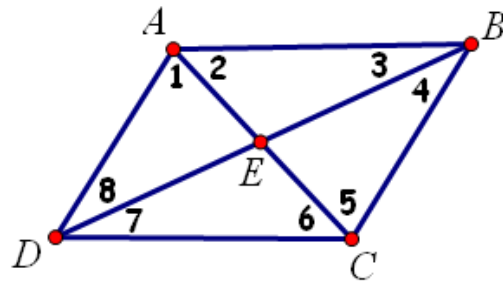
Given:  $\square ABCD$



\_\_\_\_\_  $\cong$  \_\_\_\_\_

\_\_\_\_\_  $\cong$  \_\_\_\_\_

Given:  $\square ABCD$

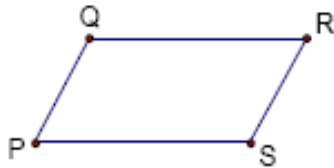


Identify all angles that are congruent.

\_\_\_\_\_  $\cong$  \_\_\_\_\_  
 \_\_\_\_\_  $\cong$  \_\_\_\_\_  
 \_\_\_\_\_  $\cong$  \_\_\_\_\_  
 \_\_\_\_\_  $\cong$  \_\_\_\_\_

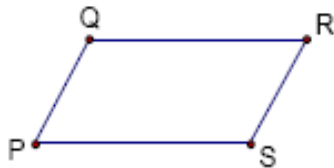
### Properties of Parallelograms

- If a quadrilateral is a parallelogram, then its **opposite angles** are congruent.



\_\_\_\_\_  $\cong$  \_\_\_\_\_  
 \_\_\_\_\_  $\cong$  \_\_\_\_\_

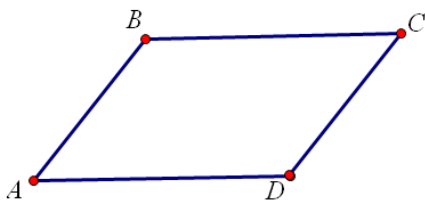
- If a quadrilateral is a parallelogram, then its **consecutive angles are supplementary**.



\_\_\_\_\_ + \_\_\_\_\_ =  $180^\circ$   
 \_\_\_\_\_ + \_\_\_\_\_ =  $180^\circ$   
 \_\_\_\_\_ + \_\_\_\_\_ =  $180^\circ$   
 \_\_\_\_\_ + \_\_\_\_\_ =  $180^\circ$

### Example 1:

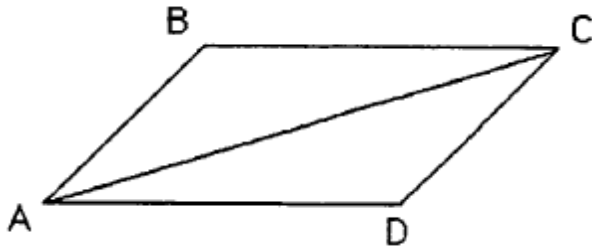
If  $m\angle A = 5x$  and  $m\angle B = 25x$  solve for x and the following angle measures.



$x =$  \_\_\_\_\_  $m\angle A =$  \_\_\_\_\_  $m\angle B =$  \_\_\_\_\_  $m\angle C =$  \_\_\_\_\_  $m\angle D =$  \_\_\_\_\_

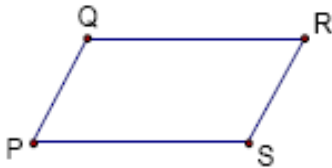
**Example 2:**

Given:  $\square ABCD$ ,  $m\angle BAC = 25^\circ$  and  $m\angle D = 135^\circ$ . Find the measure of all the other angles.



$$\begin{aligned} m\angle ACD &= \underline{\hspace{2cm}}^\circ \\ m\angle B &= \underline{\hspace{2cm}}^\circ \\ m\angle BCA &= \underline{\hspace{2cm}}^\circ \\ m\angle CAD &= \underline{\hspace{2cm}}^\circ \end{aligned}$$

- If a quadrilateral is a parallelogram, then its **opposite sides** are congruent.



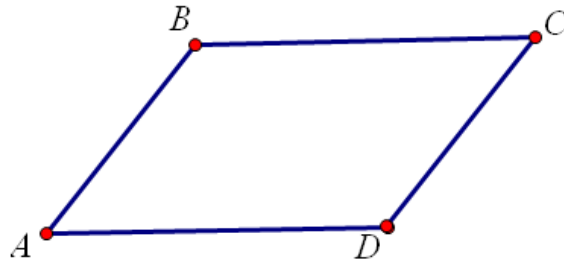
$$\underline{\hspace{2cm}} \cong \underline{\hspace{2cm}}$$

$$\underline{\hspace{2cm}} \cong \underline{\hspace{2cm}}$$

**Example 3: Solve for x and y.**

$$AB = 4(x+3); \quad BC = 6 - (2+y)$$

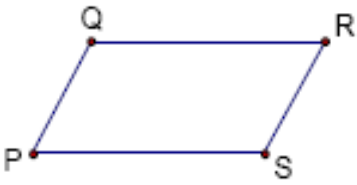
$$DC = 12(x-5); \quad AD = 3y$$



$$x = \underline{\hspace{2cm}}$$

$$y = \underline{\hspace{2cm}}$$

- If a quadrilateral is a parallelogram, then its **diagonals bisect each other**.



\_\_\_\_\_  $\cong$  \_\_\_\_\_

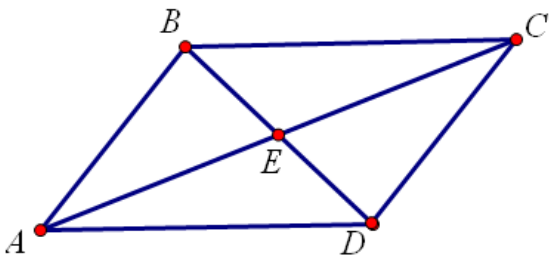
\_\_\_\_\_  $\cong$  \_\_\_\_\_

**Example 4: Solve for x and y.**

$BE = 6y - 22$ ,  $DE = 4y - 4$ ,  $AE = 3x - 2$ , and  $AC = 8x - 20$

$x =$  \_\_\_\_\_

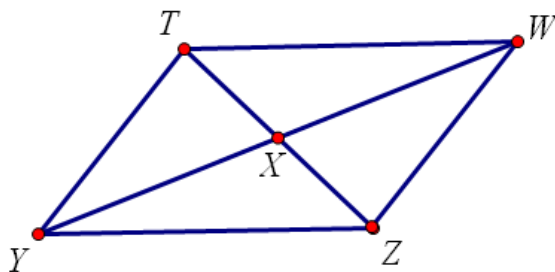
$y =$  \_\_\_\_\_





**You Try It!**

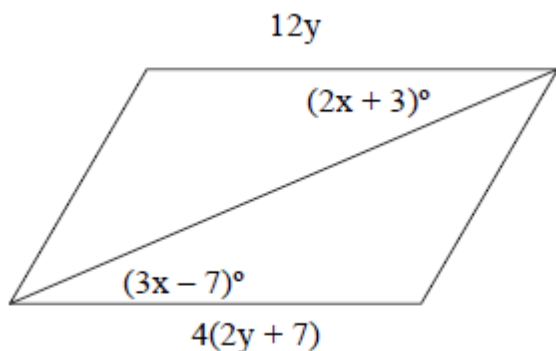
$TX = 4y,$       $YX = 30$   
 $XW = y + 3,$     $XZ = 3y + 12$



**Solve for x and y.**

$x =$  \_\_\_\_\_

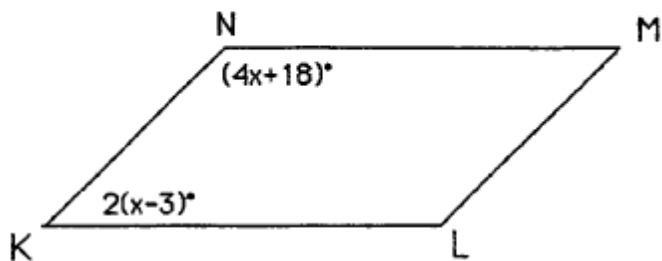
$y =$  \_\_\_\_\_



$x =$  \_\_\_\_\_

$y =$  \_\_\_\_\_

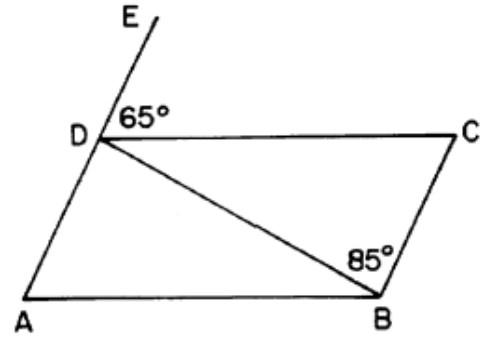
$\overline{NM} \parallel \overline{KL}$ , find  $x$ ,  $m\angle N$ , and  $m\angle K$ .



$x$                      $=$  \_\_\_\_\_  
 $m\angle N$             $=$  \_\_\_\_\_ $^\circ$   
 $m\angle K$              $=$  \_\_\_\_\_ $^\circ$

## Challenge

In the accompanying diagram of parallelogram  $ABCD$ , side  $\overline{AD}$  is extended through  $D$  to  $E$  and  $\overline{DB}$  is a diagonal. If  $m\angle EDC = 65$  and  $m\angle CBD = 85$ , find  $m\angle CDB$ .

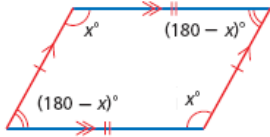


## Summary

### Properties of Parallelograms

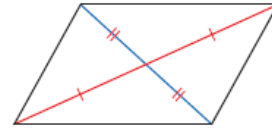
Lesson 6-2

**Why?** The properties of parallelograms make these figures useful in mechanics and construction.



A quadrilateral is a parallelogram  $\rightarrow$  all of these properties are true.

- Opposite sides are parallel.
- Opposite sides are congruent.
- Opposite angles are congruent.
- Consecutive angles are supplementary.
- Diagonals bisect each other.



## Exit Ticket

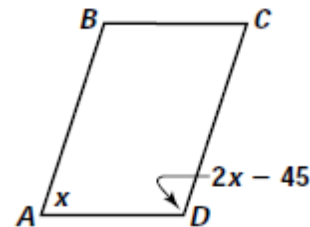
Which statement is *not* always true about a parallelogram?

- 1) The diagonals are congruent.
- 2) The opposite sides are congruent.
- 3) The opposite angles are congruent.
- 4) The opposite sides are parallel.

---

Find the value of  $x$  in parallelograms  $ABCD$ .

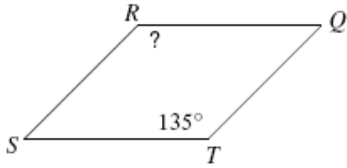
- A. 70      B. 75      C. 105      D. 110



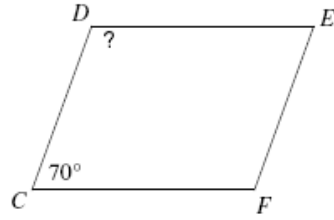
# Homework

Find the measurement indicated in each parallelogram.

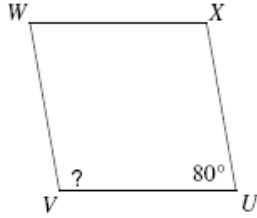
1)



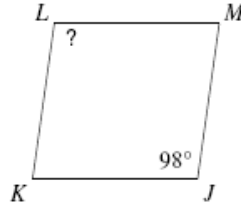
2)



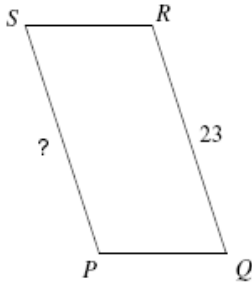
3)



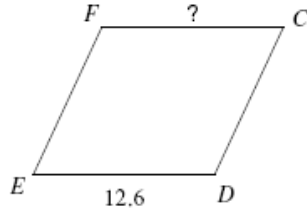
4)



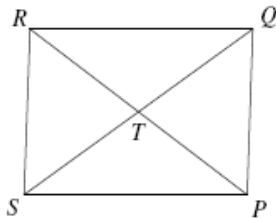
5)



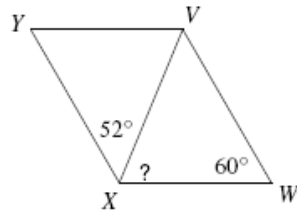
6)



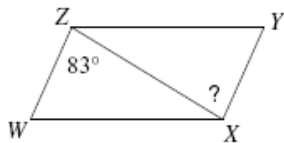
7)  $RT = 19.8$   
Find  $RP$



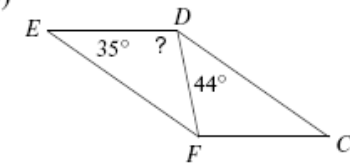
8)



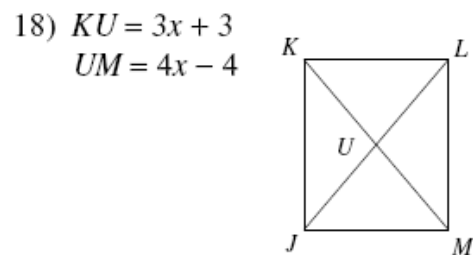
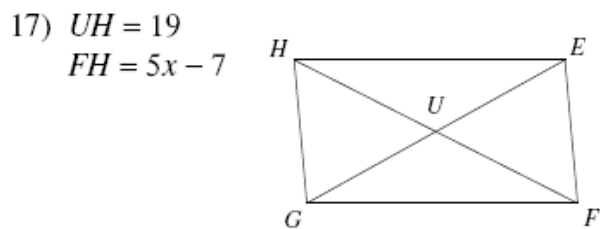
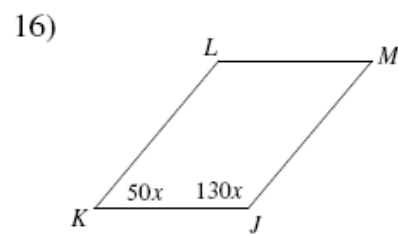
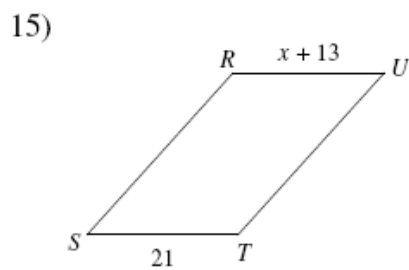
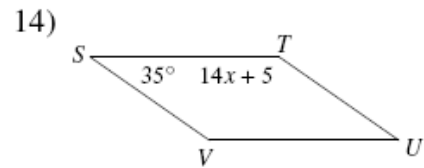
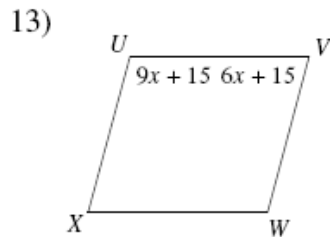
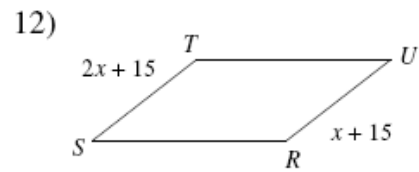
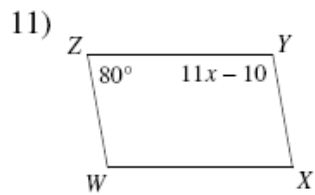
9)



10)

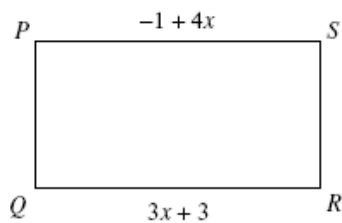


Solve for  $x$ . Each figure is a parallelogram.

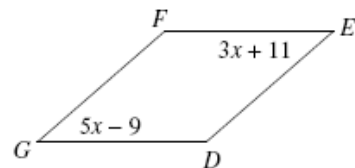


Find the measurement indicated in each parallelogram.

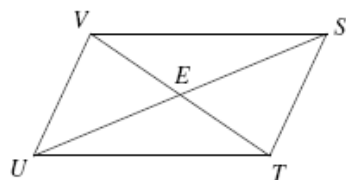
19) Find  $RQ$



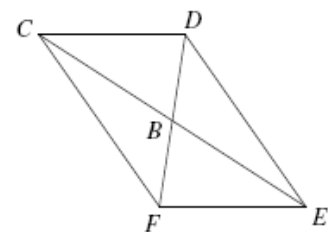
20) Find  $m\angle G$



21)  $TE = 4 + 2x$   
 $EV = 4x - 4$   
Find  $TE$



22)  $DB = 5x - 1$   
 $BF = 5 + 3x$   
Find  $DB$



# Chapter 6 (Section 4) – Day 3

## Rectangles

### Warm - Up

The measures of two consecutive angles of a parallelogram are in the ratio 5:4. What is the measure of an obtuse angle of the parallelogram?

- 1)  $20^\circ$
- 2)  $80^\circ$
- 3)  $100^\circ$
- 4)  $160^\circ$

Definition: A **rectangle** is a parallelogram with one right angle.



### Properties of a Rectangle

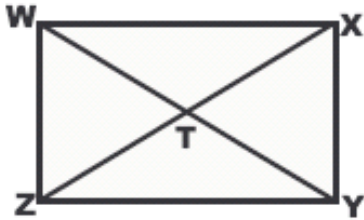
1. A rectangle has all the properties of a parallelogram.
2. A rectangle contains four right angles and is therefore equiangular.
3. The diagonals of a rectangle are congruent.

| Properties of Rectangles                                                                                                                                    |                                                                                                                                                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div style="text-align: center;"> <p><math>GHJK</math> is a parallelogram.</p> </div> <p>If a quadrilateral is a rectangle, then it is a parallelogram.</p> | <div style="text-align: center;"> <p><math>\overline{GJ} \cong \overline{HK}</math></p> </div> <p>If a parallelogram is a rectangle, then its diagonals are congruent.</p> |

Since a rectangle is a parallelogram, a rectangle also has all the properties of parallelograms.

**Let's explore the Properties of the rectangle!**

- The diagonals of a rectangle are congruent.



If  $WY = 19$ , then  $ZX = ?$

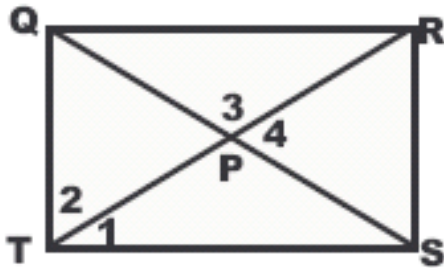
If  $WY = 19$ , then  $WT = ?$

If  $TX = 4.5$ , then  $WY = ?$

Rectangle GALS has diagonals  $\overline{GL}$  and  $\overline{AS}$ . If  $GL = 3a + 6$  and  $AS = 5a - 18$ , then  $a = ?$

- The angles of a rectangle are all right angles.

➤ If  $m\angle 1 = 55^\circ$ , find all the missing angle measures.



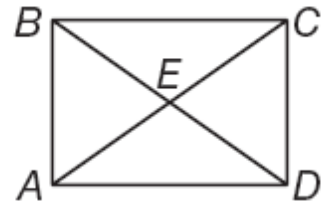
$m\angle 2 = \underline{\hspace{1cm}}^\circ$

$m\angle 3 = \underline{\hspace{1cm}}^\circ$

$m\angle 4 = \underline{\hspace{1cm}}^\circ$

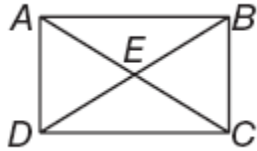
➤ Quadrilateral  $ABCD$  is a rectangle.

If  $m\angle BDC = 7x + 1$  and  $m\angle ADB = 9x - 7$ , find  $m\angle BDC$ .



## Practice Problems

- a. If  $AE = 5$ , and  $DC = 8$ , find  $AC$ ,  $BD$ ,  $AD$ , and  $AB$ .



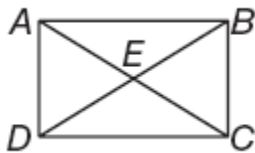
$AC = \underline{\hspace{2cm}}$

$BD = \underline{\hspace{2cm}}$

$AD = \underline{\hspace{2cm}}$

$AB = \underline{\hspace{2cm}}$

- b. If  $BD = 3x - 7$  and  $CA = x + 5$ , find  $BD$ ,  $ED$ ,  $CA$ , and  $AE$ .



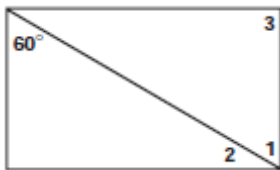
$BD = \underline{\hspace{2cm}}$

$ED = \underline{\hspace{2cm}}$

$CA = \underline{\hspace{2cm}}$

$AE = \underline{\hspace{2cm}}$

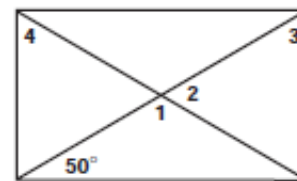
- c. Find the measures of the numbered angles in each rectangle.



$m \angle 1 = \underline{\hspace{2cm}}^\circ$

$m \angle 2 = \underline{\hspace{2cm}}^\circ$

$m \angle 3 = \underline{\hspace{2cm}}^\circ$



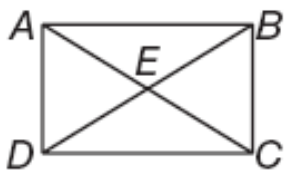
$m \angle 1 = \underline{\hspace{2cm}}^\circ$

$m \angle 2 = \underline{\hspace{2cm}}^\circ$

$m \angle 3 = \underline{\hspace{2cm}}^\circ$

$m \angle 4 = \underline{\hspace{2cm}}^\circ$

- d. If  $m\angle DAC = 2x + 4$  and  $m\angle BAC = 3x + 1$ , find  $m\angle BAC$ .



## CHALLENGE

In a rectangle, the length is twice the width, and the perimeter is 48. Find the area of the rectangle.

## SUMMARY

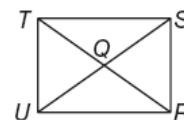
**Properties of Rectangles** A **rectangle** is a quadrilateral with four right angles. Here are the properties of rectangles.

A rectangle has all the properties of a parallelogram.

- Opposite sides are parallel.
- Opposite angles are congruent.
- Opposite sides are congruent.
- Consecutive angles are supplementary.
- The diagonals bisect each other.

Also:

- All four angles are right angles.  $\angle UTS$ ,  $\angle TSR$ ,  $\angle SRU$ , and  $\angle RUT$  are right angles.
- The diagonals are congruent.  $\overline{TR} \cong \overline{US}$



**Example 1** Quadrilateral *RUTS* above is a rectangle. If  $US = 6x + 3$  and  $RT = 7x - 2$ , find  $x$ .

The diagonals of a rectangle are congruent, so  $US = RT$ .

$$\begin{aligned}6x + 3 &= 7x - 2 \\3 &= x - 2 \\5 &= x\end{aligned}$$

**Example 2** Quadrilateral *RUTS* above is a rectangle. If  $m\angle STR = 8x + 3$  and  $m\angle UTR = 16x - 9$ , find  $m\angle STR$ .

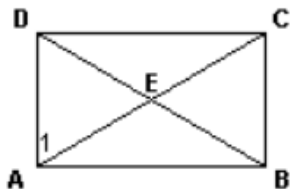
$\angle UTS$  is a right angle, so  $m\angle STR + m\angle UTR = 90$ .

$$\begin{aligned}8x + 3 + 16x - 9 &= 90 \\24x - 6 &= 90 \\24x &= 96 \\x &= 4 \\m\angle STR &= 8x + 3 = 8(4) + 3 \text{ or } 35\end{aligned}$$

## Exit Ticket

In rectangle *ABCD*,  $\overline{AC}$  and  $\overline{BD}$  are diagonals. If  $m\angle 1 = 55$ , find  $m\angle ABD$ .

1. 20
2. 35
3. 55
4. 65

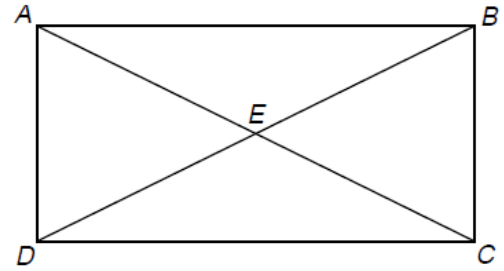




# Homework

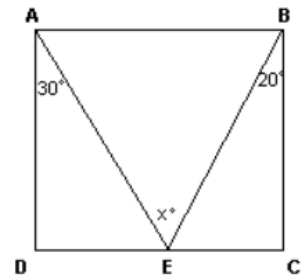
Use rectangle  $ABCD$  and the given information to solve each problem.

1. If  $AC = 4x - 60$  and  $BD = 30 - x$ , find  $BD$ .
2. If  $AC = 4x - 60$  and  $AE = x + 5$ , find  $EC$ .
3. If  $m\angle BAC = 4x + 5$  and  $m\angle CAD = 5x - 14$ , find  $m\angle CAD$ .
4. If  $AE = 2x + 3$  and  $BE = 12 - x$ , find  $BD$ .
5. If  $m\angle BAC = 3x + 5$  and  $m\angle ACD = 40 - 2x$ . Find  $m\angle AED$ .



6. In the diagram,  $ABCD$  is a rectangle,  $E$  is a point on  $\overline{CD}$ ,  $m\angle DAE = 30$ , and  $m\angle CBE = 20$ . What is  $m\angle x$ ?

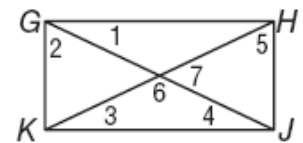
1. 25
2. 50
3. 60
4. 70



Quadrilateral  $GHJK$  is a rectangle. Find each measure if  $m\angle 1 = 37$ .

7.  $m\angle 2$
9.  $m\angle 4$
11.  $m\angle 6$

8.  $m\angle 3$
10.  $m\angle 5$
12.  $m\angle 7$

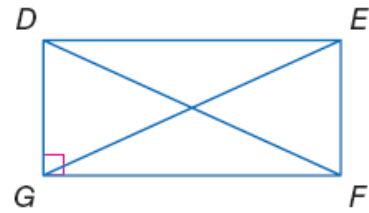


# Chapter 6 (Section 4) – Day 4

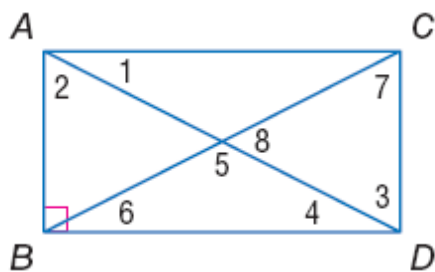
## Rhombi and Squares

### Warm - Up

1. Quadrilateral  $DEFG$  is a rectangle.  
 If  $FD = 3x - 7$  and  $EG = x + 5$ , find  $EG$ .



2. Quadrilateral  $ABCD$  is a rectangle. Find each measure if  $m\angle 2 = 40^\circ$ .

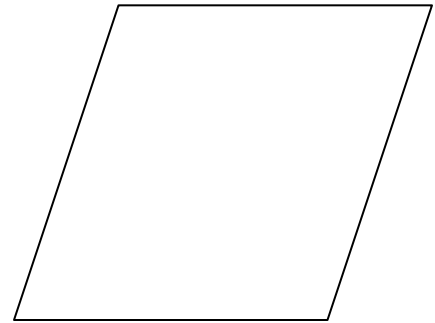


|                                              |                                              |
|----------------------------------------------|----------------------------------------------|
| $m\angle 1 = \underline{\hspace{1cm}}^\circ$ | $m\angle 5 = \underline{\hspace{1cm}}^\circ$ |
| $m\angle 2 = 40^\circ$                       | $m\angle 6 = \underline{\hspace{1cm}}^\circ$ |
| $m\angle 3 = \underline{\hspace{1cm}}^\circ$ | $m\angle 7 = \underline{\hspace{1cm}}^\circ$ |
| $m\angle 4 = \underline{\hspace{1cm}}^\circ$ | $m\angle 8 = \underline{\hspace{1cm}}^\circ$ |

# Rhombus

Definition: A **quadrilateral with 4 congruent** sides.

- 1) Opposite sides are congruent (they equal each other).
- 2) Opposite angles are congruent (they equal each other).
- 3) Consecutive angles are supplementary (they add up to 180).
- 4) Diagonals bisect each other (the parts are equal).
- 5) Diagonals perpendicular (the form right angles in the middle).
- 6) Diagonals bisect angles (the angles are equal to each other).
- 7) All four sides are congruent.
- 8) The diagonals are NOT congruent.

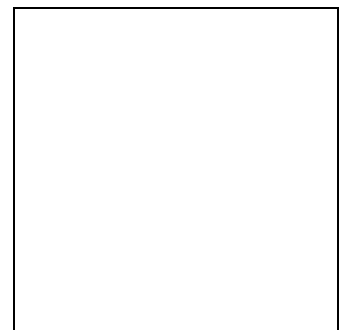


# Square

Definition: A **square** is a rectangle with 2 congruent consecutive sides.

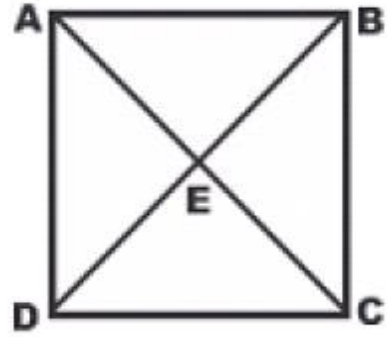
SQUARES:

- 1) Opposite sides are congruent (they equal each other).
- 2) Opposite angles are congruent (they equal each other).
- 3) Consecutive angles are supplementary (they add up to 180).
- 4) Diagonals bisect each other (the parts are equal).
- 5) Diagonals are congruent (they equal each other).
- 6) All four corner angles are  $90^\circ$ .
- 7) Diagonals perpendicular (the form right angles in the middle).
- 8) Diagonals bisect angles (the angles equal to each other).



Problems Involving the Squares

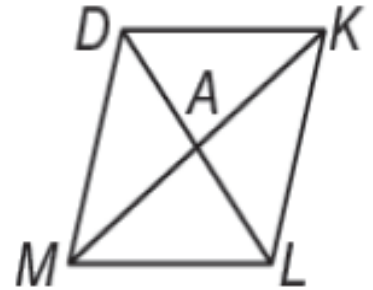
- If  $AB = 2x + 4$  and  $CD = 3x - 5$ ,  
Find  $BC$  and  $BD$ .



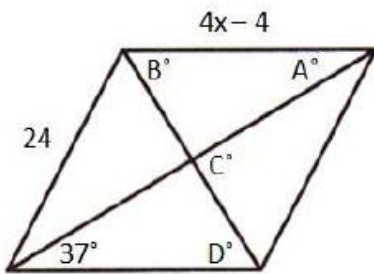
- If  $m\angle AEB = (3x)^\circ$ , find 'x'.
- If  $m\angle BAC = (9x)^\circ$ , find 'x'.
- The perimeter of the square is 32 cm.  
Find the length of diagonal  $DB$ .

**Problems Involving the Rhombus**

- If  $DM = 6y + 4$  and  $ML = 5y + 8$ , find the length of  $KL$ .



Find each variable in the rhombus.



$x = \underline{\hspace{2cm}}$

$m \angle A = \underline{\hspace{2cm}}^\circ$

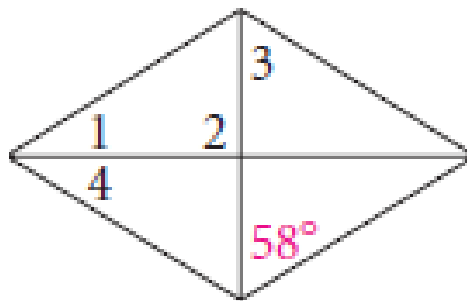
$m \angle B = \underline{\hspace{2cm}}^\circ$

$m \angle C = \underline{\hspace{2cm}}^\circ$

$m \angle D = \underline{\hspace{2cm}}^\circ$

- Find the measures of the numbered angles in each rhombus.

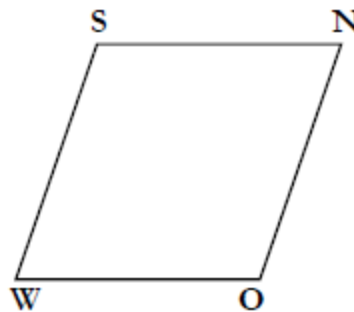
- $m \angle 1 = \underline{\hspace{2cm}}^\circ$
- $m \angle 2 = \underline{\hspace{2cm}}^\circ$
- $m \angle 3 = \underline{\hspace{2cm}}^\circ$
- $m \angle 4 = \underline{\hspace{2cm}}^\circ$



- The diagonals of a Rhombus are 10, and 24 cm. Find the length of the side of the rhombus.

## Challenge

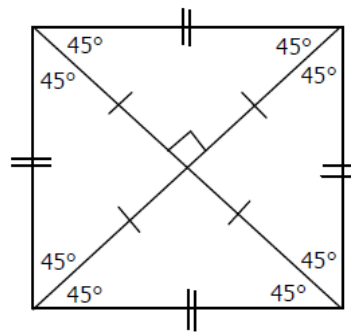
SNOW is a rhombus with  $SN = 2x^2 - 20$ ,  $NO = x^2 + 9x + 16$ , and  $OW = y$ . Find the value of  $x$  and  $y$ .



## SUMMARY

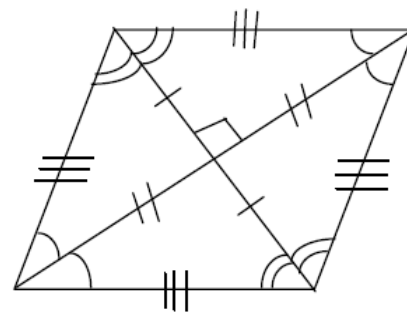
### SQUARES:

- 1) Opposite sides are congruent (they equal each other).
- 2) Opposite angles are congruent (they equal each other).
- 3) Consecutive angles are supplementary (they add up to 180).
- 4) Diagonals bisect each other (the parts are equal).
- 5) Diagonals are congruent (they equal each other).
- 6) All four corner angles are  $90^\circ$ .
- 7) Diagonals perpendicular (they form right angles in the middle).
- 8) Diagonals bisect angles (the angles equal to each other).



### RHOMBI:

- 1) Opposite sides are congruent (they equal each other).
- 2) Opposite angles are congruent (they equal each other).
- 3) Consecutive angles are supplementary (they add up to 180).
- 4) Diagonals bisect each other (the parts are equal).
- 5) Diagonals perpendicular (they form right angles in the middle).
- 6) Diagonals bisect angles (the angles are equal to each other).
- 7) All four sides are congruent.
- 8) The diagonals are NOT congruent.

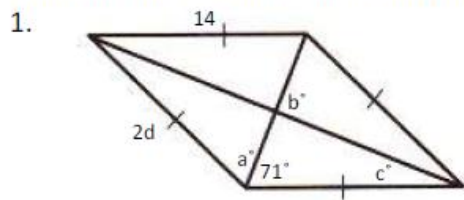


### Exit Ticket

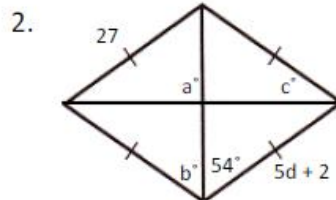
| Property                                  | Rectangle | Rhombus | Square |
|-------------------------------------------|-----------|---------|--------|
| 1. All the properties of a parallelogram? |           |         |        |
| 2. Equiangular (4 right corner angles?)   |           |         |        |
| 3. Equilateral (4 congruent sides?)       |           |         |        |
| 4. Diagonals bisect angles?               |           |         |        |
| 5. Diagonals congruent?                   |           |         |        |
| 6. Diagonals perpendicular?               |           |         |        |

## Homework

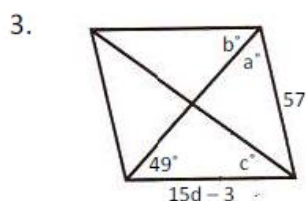
Find the value of each variable in each rhombus.



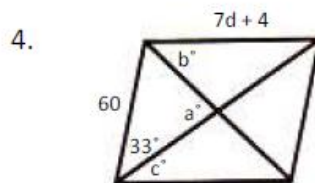
a = \_\_\_\_\_ b = \_\_\_\_\_ c = \_\_\_\_\_ d = \_\_\_\_\_



a = \_\_\_\_\_ b = \_\_\_\_\_ c = \_\_\_\_\_ d = \_\_\_\_\_

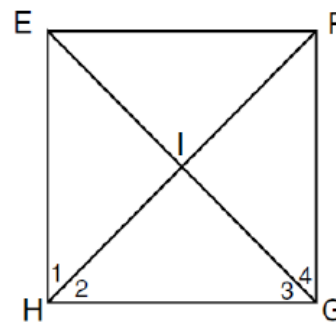
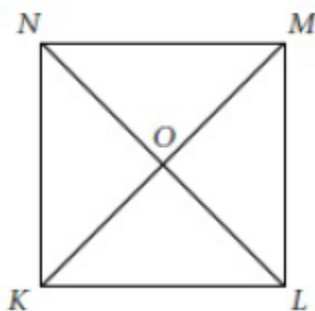


a = \_\_\_\_\_ b = \_\_\_\_\_ c = \_\_\_\_\_ d = \_\_\_\_\_



a = \_\_\_\_\_ b = \_\_\_\_\_ c = \_\_\_\_\_ d = \_\_\_\_\_

5.  $KLMN$  is a square  
 $\overline{NM} = 14$   
 $m\angle LMO =$   
 $m\angle KLM =$   
 Perimeter  $KLMN =$

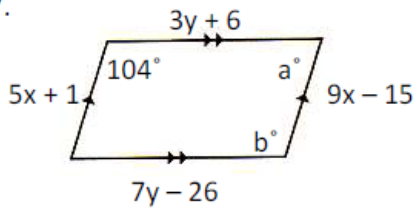


6.  $EFGH$  is a square. If  $EF = 10$ , find the following:

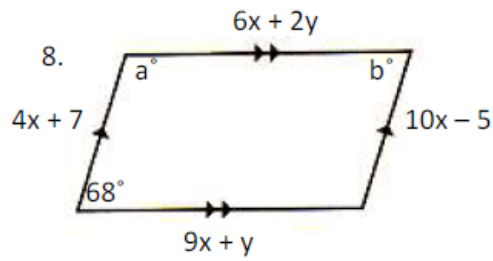
- |                         |                         |                       |
|-------------------------|-------------------------|-----------------------|
| a. $FG =$ _____         | d. $EI =$ _____         | g. $\angle 1 =$ _____ |
| b. $\angle EFG =$ _____ | e. $IF =$ _____         | h. $\angle 3 =$ _____ |
| c. $EG =$ _____         | f. $\angle EIF =$ _____ | i. $HF =$ _____       |

Find each value in the parallelograms.

7.



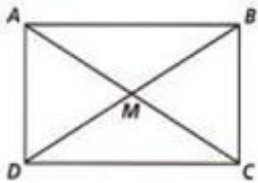
$a = \underline{\hspace{2cm}}$   $b = \underline{\hspace{2cm}}$   $x = \underline{\hspace{2cm}}$   $y = \underline{\hspace{2cm}}$



$a = \underline{\hspace{2cm}}$   $b = \underline{\hspace{2cm}}$   $x = \underline{\hspace{2cm}}$   $y = \underline{\hspace{2cm}}$

Find the value of each variable in the rectangle.

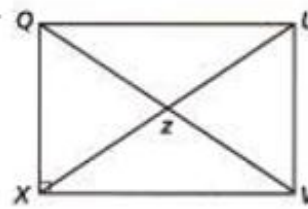
9.



$\overline{AM} = 4x - 1$   
 $\overline{DB} = 6x + 16$   
 $\angle ABC = 8a + 2$

$a = \underline{\hspace{2cm}}$   $x = \underline{\hspace{2cm}}$

10.



$QV = 10x - 14$   
 $UX = 3x + 1$   
 $\angle XVU = 4a - 22$

$a = \underline{\hspace{2cm}}$   $x = \underline{\hspace{2cm}}$

11. The diagonals of a rhombus are 12 and 16 cm. Find the length of a side of the rhombus.

12. The shorter diagonal of a rhombus measures 18cm. The side of the rhombus measures 41 cm. Find the length of the longer diagonal.

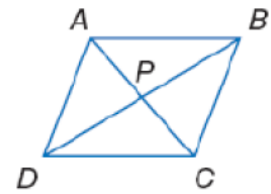


# Chapter 6 (Section 6) – Day 5

## Trapezoids

### Warm - Up

1.  $ABCD$  is a rhombus. If  $PB = 12$ ,  $AB = 15$ , and  $m\angle ABD = 24$ , find each measure.



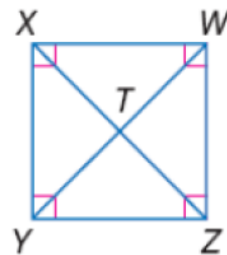
**23.**  $AP$

**24.**  $CP$

**25.**  $m\angle BDA$

**26.**  $m\angle ACB$

2.  $WXYZ$  is a square. If  $WT = 3$ , find each measure.



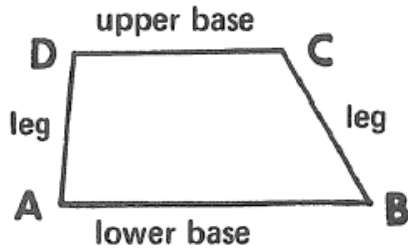
**27.**  $ZX$

**28.**  $XY$

**29.**  $m\angle WTZ$

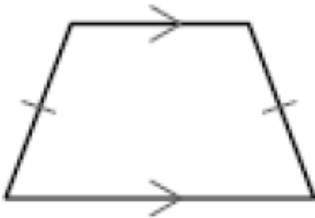
**30.**  $m\angle WYX$

Definition: A **trapezoid** is a quadrilateral with one pair of parallel sides.



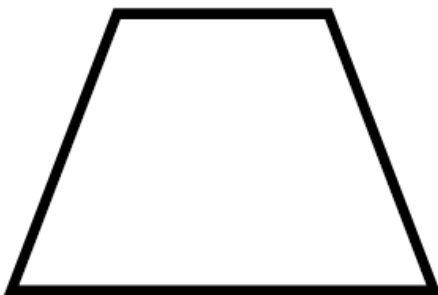

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Definition: An **Isosceles trapezoid** is a trapezoid with non parallel sides congruent.



**Properties of Isosceles Trapezoids**

- If a quadrilateral is an isosceles trapezoid, then each pair of base angles are congruent.



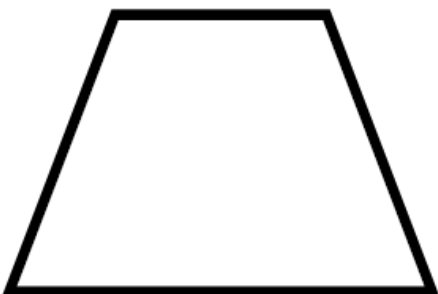
\_\_\_\_\_  $\cong$  \_\_\_\_\_

\_\_\_\_\_  $\cong$  \_\_\_\_\_

\_\_\_\_\_ + \_\_\_\_\_ =  $180^\circ$

\_\_\_\_\_ + \_\_\_\_\_ =  $180^\circ$

- If a quadrilateral is an isosceles trapezoid, then the diagonals are congruent



\_\_\_\_\_  $\cong$  \_\_\_\_\_

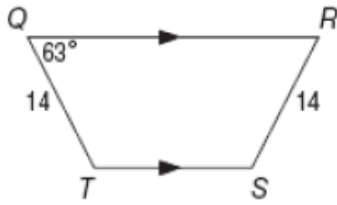
\_\_\_\_\_  $\cong$  \_\_\_\_\_

\_\_\_\_\_  $\cong$  \_\_\_\_\_

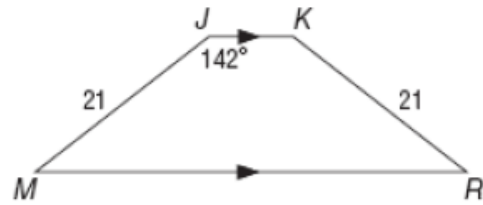
## Practice Problems

**ALGEBRA** Find each measure.

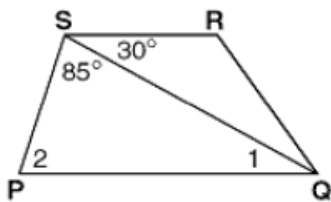
1.  $m\angle S$



2.  $m\angle M$



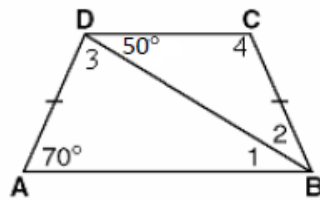
3. Trapezoid PQRS. Find the  $m\angle 1$  and  $\angle 2$ .



$m\angle 1 = \underline{\hspace{2cm}}^\circ$

$m\angle 2 = \underline{\hspace{2cm}}^\circ$

4. Isosceles Trapezoid ABCD.



$m\angle 1 = \underline{\hspace{2cm}}^\circ$

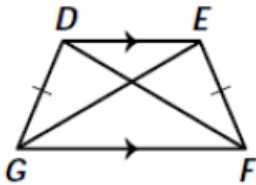
$m\angle 2 = \underline{\hspace{2cm}}^\circ$

$m\angle 3 = \underline{\hspace{2cm}}^\circ$

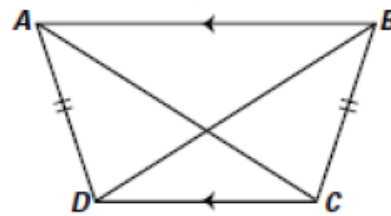
$m\angle 4 = \underline{\hspace{2cm}}^\circ$

5. Find the values of the variables.

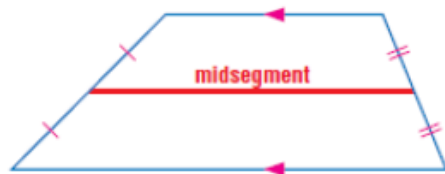
$DF = 4x, EG = 2x + 16$



6.  $AC = 7x - 15, BD = 4x + 15$



The **midsegment of a trapezoid** is the segment that connects the midpoints of the legs of the trapezoid. The theorem below relates the midsegment and the bases of a trapezoid.



$$\text{Median} = \frac{1}{2} (\text{base} + \text{base})$$

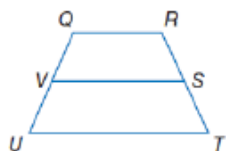
$$2m = b_1 + b_2$$

- The midsegment of a trapezoid is parallel to each base.  $\overline{AB} \parallel \overline{MN}$  and  $\overline{AB} \parallel \overline{LP}$
- The length of the midsegment is one-half the sum of the length of the bases.  

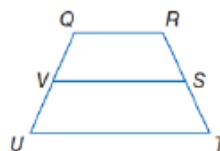
$$AB = \frac{1}{2}(MN + LP)$$

For trapezoid  $QRTU$ ,  $V$  and  $S$  are midpoints of the legs.

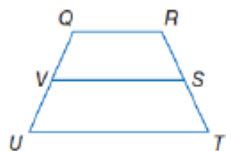
7. If  $QR = 12$  and  $UT = 22$ , find  $VS$ .



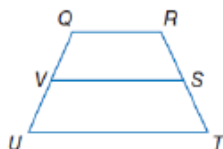
8. If  $QR = 4$  and  $UT = 16$ , find  $VS$ .



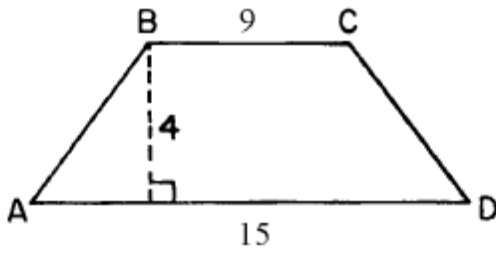
9. If  $VS = 9$  and  $UT = 12$ , find  $QR$ .



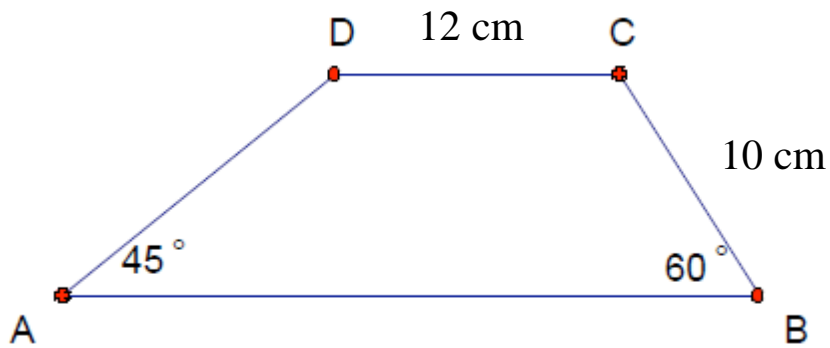
10. If  $RQ = 3x - 3$ ,  $UT = 4x + 2$ , and  $VS = 10$ , find  $VS$ .



11. In the accompanying figure, isosceles trapezoid  $ABCD$  has bases of lengths 9 and 15 and an altitude of length 4. Find  $AB$ .



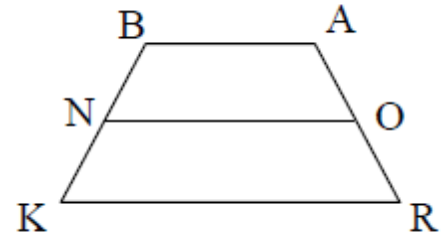
12. Find the length of base  $\overline{AB}$  of trapezoid  $ABCD$ .



## CHALLENGE

Given trapezoid BARK with midsegment  $\overline{NO}$ .

$BA = c^2$ ,  $NO = 6c$ ,  $KR = c^2 + 18$ . Find  $c$ .



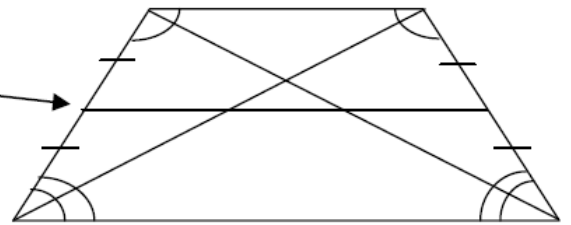
## SUMMARY

ISOSCELES TRAPEZOIDS:

**Median =  $\frac{1}{2}$  (base + base)**

$$2m = b_1 + b_2$$

- 1) Lower two base angles are congruent (they equal each other).
- 2) Upper two base angles are congruent (they equal each other).
- 3) The diagonals are congruent (they equal each other).
- 4) opposite angles are supplementary ( they add up to 180).



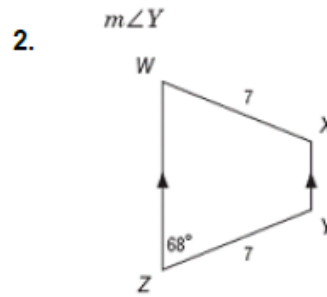
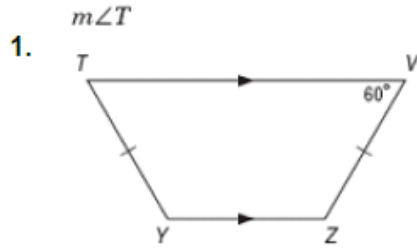
## Exit Ticket

Isosceles trapezoid  $ABCD$  has diagonals  $\overline{AC}$  and  $\overline{BD}$ . If  $AC = 5x + 13$  and  $BD = 11x - 5$ , what is the value of  $x$ ?

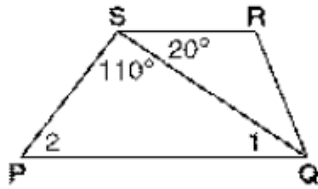
- 1) 28
- 2)  $10\frac{3}{4}$
- 3) 3
- 4)  $\frac{1}{2}$

## Homework – Trapezoids

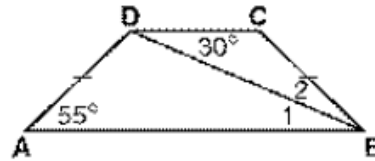
**Find each measure.**



3. Trapezoid PQRS. Find the  $m\angle 1$  and  $\angle 2$ .

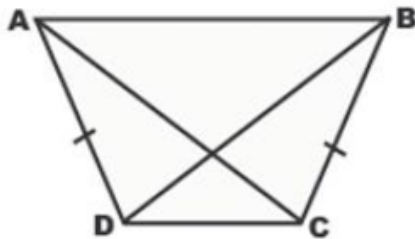


4. ABCD is an isosceles trapezoid. Find the  $m\angle 1$  and  $\angle 2$ .

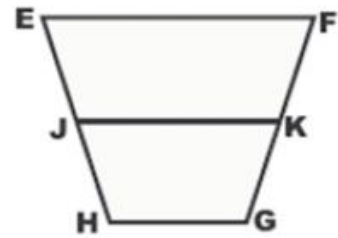


5. MATH is an isosceles trapezoid with  $\overline{AT} \parallel \overline{MH}$ . If  $m\angle M = (3x - 9)^\circ$  and  $m\angle H = (x + 3)^\circ$ , find the value of 'x'.

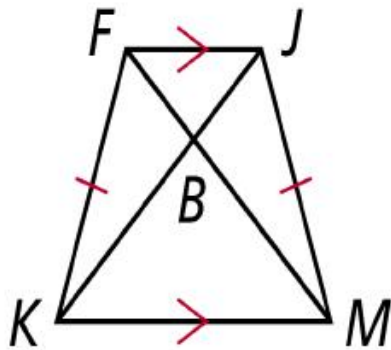
6. Let  $AC = 25$  and  $DB = 5x$ .



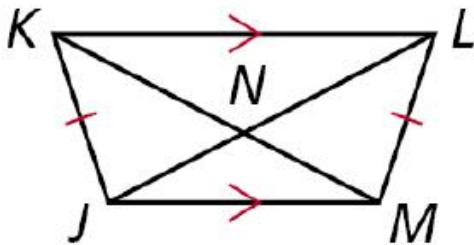
7. If  $EH = FG$ , and  $m\angle E = 65^\circ$ , then  $m\angle G = ?$   
and  $m\angle GKJ = ?$



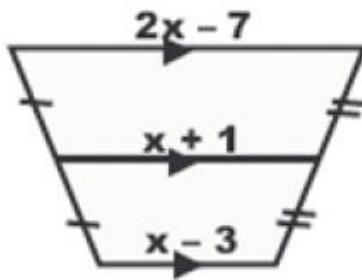
8.  $KB = 12$  and  $MF = 30$ . Find  $FB$ .



9.  $JN = 10$ , and  $NL = 14$ . Find  $KM$ .

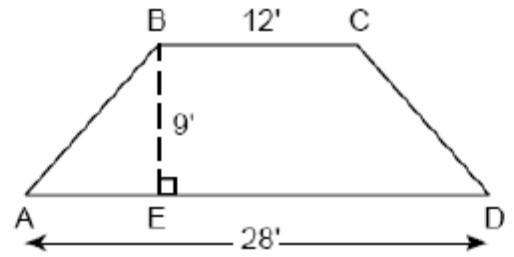


10. Find the value of  $x$ .

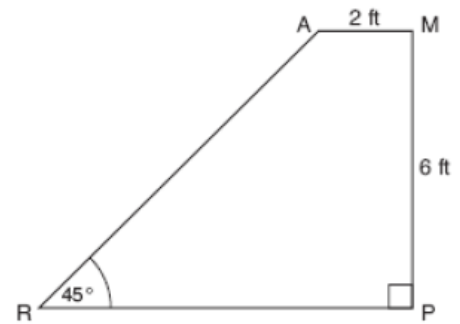




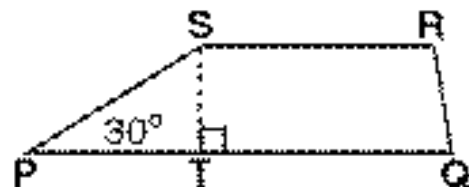
11. The cross section of an attic is in the shape of an isosceles trapezoid, as shown in the accompanying figure. If the height of the attic is 9 feet,  $BC = 12$  feet, and  $AD = 28$  feet, find the length of  $\overline{AB}$  to the nearest foot.



12. The accompanying diagram shows ramp  $\overline{RA}$  leading to level platform  $\overline{AM}$ , forming an angle of  $45^\circ$  with level ground. If platform  $\overline{AM}$  measures 2 feet and is 6 feet above the ground. Find  $RA$ .



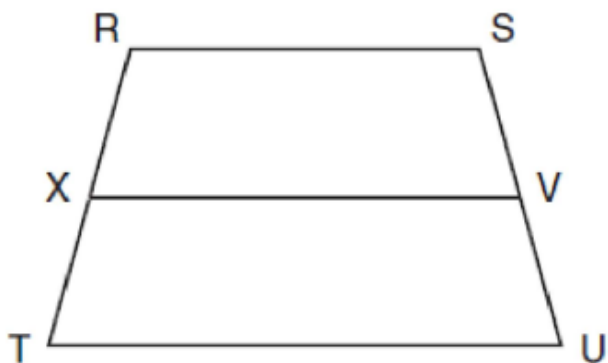
13. If  $PQ = 15$ , and  $SR = 9$ , find  $ST$  and  $PS$ .



## Chapter 6 (Review) – Day 6

### Warm – Up

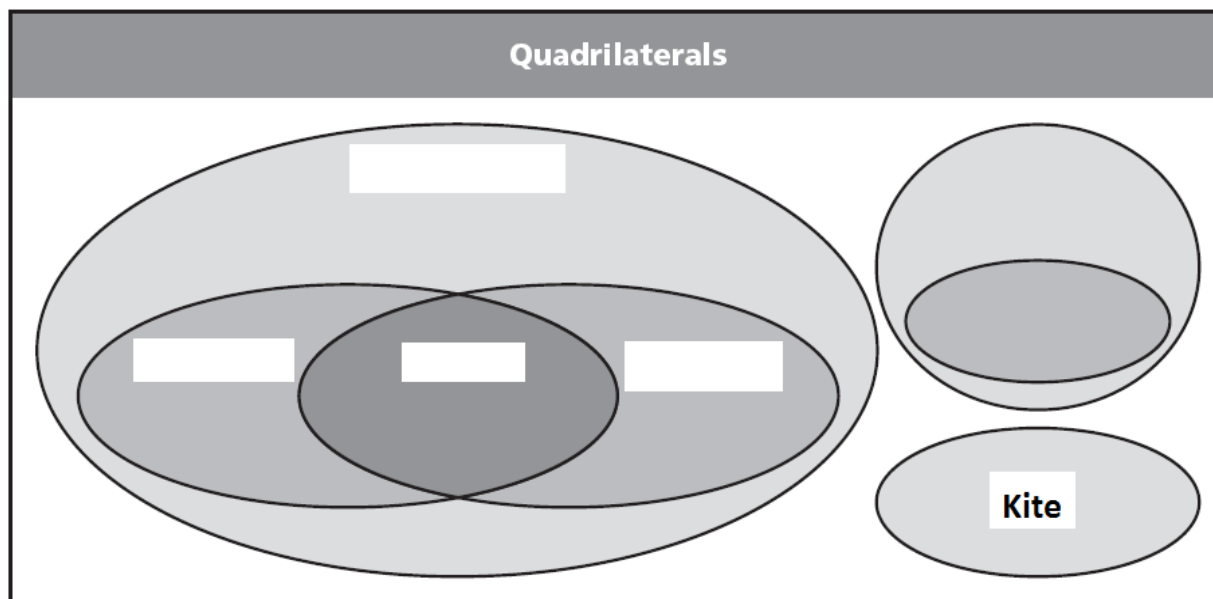
In the diagram below of trapezoid  $RSUT$ ,  $\overline{RS} \parallel \overline{TU}$ ,  $X$  is the midpoint of  $\overline{RT}$ , and  $V$  is the midpoint of  $\overline{SU}$ .



If  $RS = 30$  and  $XV = 44$ , what is the length of  $\overline{TU}$ ?

- 1) 37
- 2) 58
- 3) 74
- 4) 118

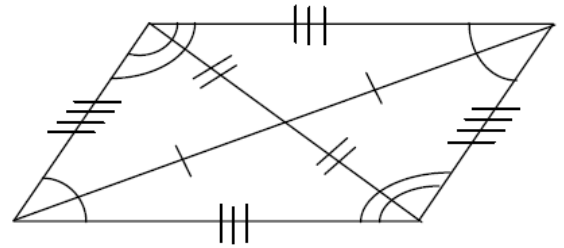
Write the missing terms in the unlabeled sections.



## SUMMARY

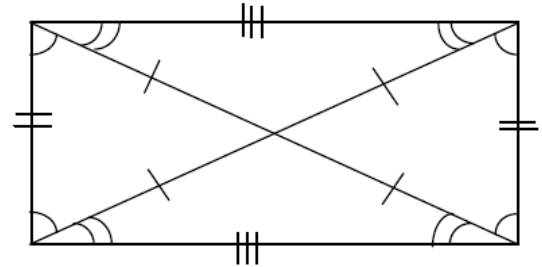
### PARALLELOGRAMS (rectangles, squares, and rhombi):

- 1) Opposite sides of a parallelogram are congruent.
- 2) Opposite angles of a parallelogram are congruent.
- 3) Consecutive angles in a parallelogram are supplementary.
- 4) The diagonals of a parallelogram bisect each other.



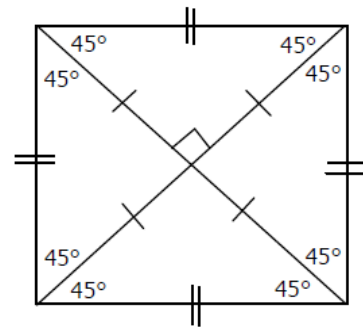
### RECTANGLES:

- 1) Opposite sides are congruent (they equal each other).
- 2) Opposite angles are congruent (they equal each other).
- 3) Consecutive angles are supplementary (they add up to 180).
- 4) Diagonals bisect each other (the parts are equal).
- 5) Diagonals are congruent (they equal each other).
- 6) All four corner angles are  $90^\circ$ .



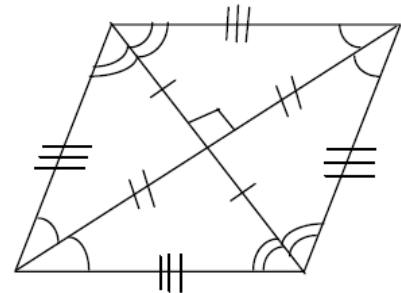
### SQUARES:

- 1) Opposite sides are congruent (they equal each other).
- 2) Opposite angles are congruent (they equal each other).
- 3) Consecutive angles are supplementary (they add up to 180).
- 4) Diagonals bisect each other (the parts are equal).
- 5) Diagonals are congruent (they equal each other).
- 6) All four corner angles are  $90^\circ$ .
- 7) Diagonals perpendicular (they form right angles in the middle).
- 8) Diagonals bisect angles (the angles are equal to each other).



### RHOMBI:

- 1) Opposite sides are congruent (they equal each other).
- 2) Opposite angles are congruent (they equal each other).
- 3) Consecutive angles are supplementary (they add up to 180).
- 4) Diagonals bisect each other (the parts are equal).
- 5) Diagonals perpendicular (they form right angles in the middle).
- 6) Diagonals bisect angles (the angles are equal to each other).
- 7) All four sides are congruent.
- 8) The diagonals are NOT congruent.

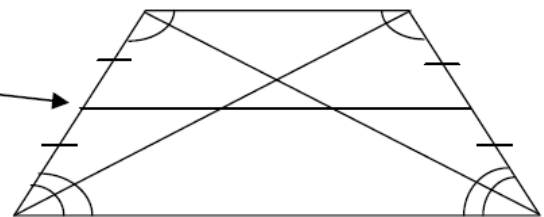


### ISOSCELES TRAPEZOIDS:

$$\text{Median} = \frac{1}{2} (\text{base} + \text{base})$$

$$2m = b_1 + b_2$$

- 1) Lower two base angles are congruent (they equal each other).
- 2) Upper two base angles are congruent (they equal each other).
- 3) The diagonals are congruent (they equal each other).
- 4) opposite angles are supplementary ( they add up to 180).



## Chapter 6 – Review

### Angles in Polygons

**Remember**

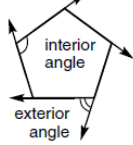
A polygon is *convex* if a segment connecting any two points in the interior of the polygon is completely in the interior.



A polygon that is not convex is *concave*.



A *regular* polygon is equilateral and equiangular.



### Formulas

$$S_i = (n - 2)180$$

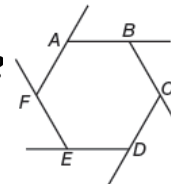
$$S_e = 360 \text{ (always – no matter what the polygon)}$$

$$e = \frac{360}{n}$$

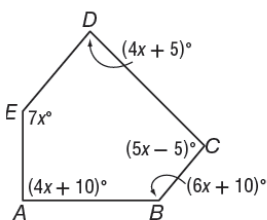
$$i = \frac{180(n - 2)}{n}$$

1. Find the sum of the interior angles of a heptagon?
  
2. Each interior angle of a regular convex polygon measures  $150^\circ$ . How many sides does the polygon have?
  
3. The sum of the interior angles of a convex regular polygon measures  $1620^\circ$ . How many sides does the polygon have?
  
4. How many sides does a polygon have if each exterior angle measures  $36^\circ$ ?

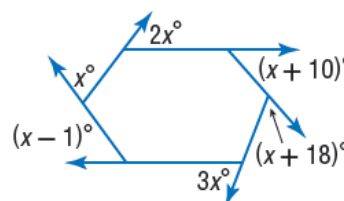
5. Find the measure of each exterior angle of regular hexagon ABCDEF?



6. Find the value of  $x$ .



7. Find the value of  $x$ .



# Properties of Quadrilaterals

List all the properties of a **parallelogram** below:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

The **rectangle** has all the properties of the parallelogram AND

1. \_\_\_\_\_
2. \_\_\_\_\_

The **rhombus** has all the properties of the parallelogram AND

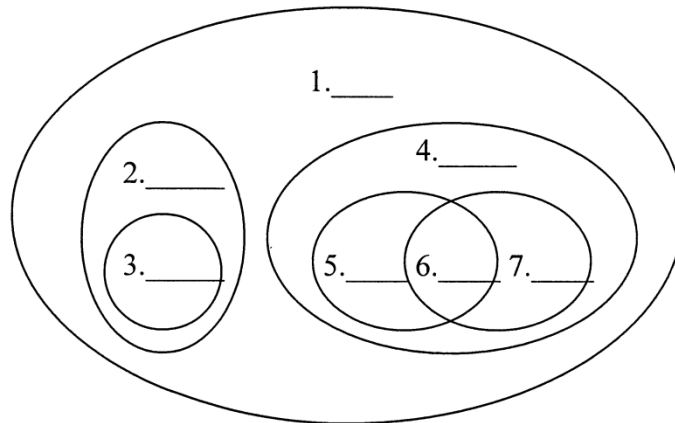
1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

The **square** has all the properties of the parallelogram AND

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

Complete the Venn diagram using the letter of the word(s) provided.

- A. Trapezoid
- B. Parallelogram
- C. Rhombus
- D. Square
- E. Rectangle
- F. Quadrilateral
- G. Isosceles Trapezoid



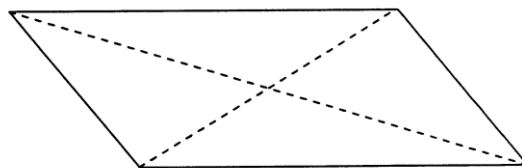
| <b>Property</b>                                  | <b>Quadrilateral</b> | <b>Parallelogram</b> | <b>Rectangle</b> | <b>Rhombus</b> | <b>Square</b> | <b>Trapezoid</b> | <b>Isosceles Trapezoid</b> | <b>Kite</b> |
|--------------------------------------------------|----------------------|----------------------|------------------|----------------|---------------|------------------|----------------------------|-------------|
| Both pairs of opposite sides are congruent.      |                      |                      |                  |                |               |                  |                            |             |
| Both pairs of opposite angles are congruent.     |                      |                      |                  |                |               |                  |                            |             |
| Has 4 sides.                                     |                      |                      |                  |                |               |                  |                            |             |
| Has 4 angles.                                    |                      |                      |                  |                |               |                  |                            |             |
| Both diagonals are congruent.                    |                      |                      |                  |                |               |                  |                            |             |
| 4 congruent sides.                               |                      |                      |                  |                |               |                  |                            |             |
| 4 congruent angles.                              |                      |                      |                  |                |               |                  |                            |             |
| The diagonals bisect the opposite angles.        |                      |                      |                  |                |               |                  |                            |             |
| All consecutive angles are supplementary.        |                      |                      |                  |                |               |                  |                            |             |
| Both pairs of opposite sides are parallel.       |                      |                      |                  |                |               |                  |                            |             |
| Exactly one pair of opposite sides are parallel. |                      |                      |                  |                |               |                  |                            |             |
| The diagonals are perpendicular.                 |                      |                      |                  |                |               |                  |                            |             |
| The diagonals bisect each other.                 |                      |                      |                  |                |               |                  |                            |             |
| Exactly one pair of opposite sides congruent.    |                      |                      |                  |                |               |                  |                            |             |
| 4 right angles.                                  |                      |                      |                  |                |               |                  |                            |             |

# Properties of Quadrilaterals – True or False

Mark each as **true** or **false**. Remember, that a property is true only if it is true all the time.

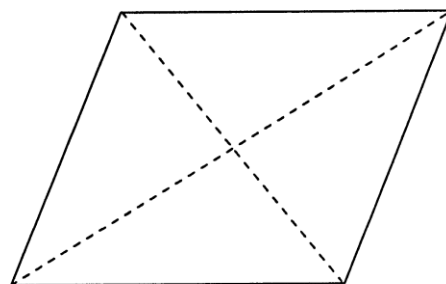
## 1. Parallelogram

- \_\_\_\_\_ a. both pairs of opposite sides are parallel
- \_\_\_\_\_ b. both pairs of opposite sides are congruent
- \_\_\_\_\_ c. both pairs of opposite angles are congruent
- \_\_\_\_\_ d. all consecutive angles are supplementary
- \_\_\_\_\_ e. the diagonals are congruent
- \_\_\_\_\_ f. the diagonals bisect each other



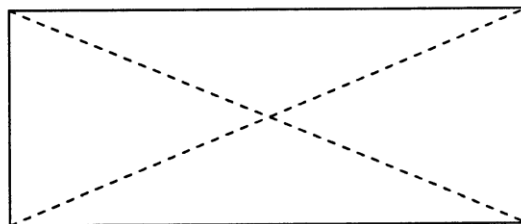
## 2. Rhombus

- \_\_\_\_\_ a. all consecutive angles are supplementary
- \_\_\_\_\_ b. all consecutive sides are congruent
- \_\_\_\_\_ c. all consecutive sides form right angles
- \_\_\_\_\_ d. the diagonals are perpendicular
- \_\_\_\_\_ e. the diagonals bisect the opposite angles
- \_\_\_\_\_ f. exactly one pair of opposite sides is parallel



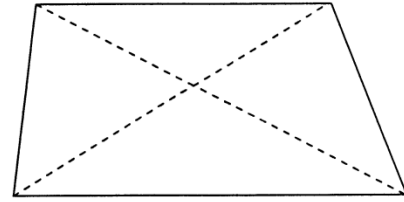
## 3. Rectangle

- \_\_\_\_\_ a. the diagonals are perpendicular
- \_\_\_\_\_ b. the diagonals are congruent
- \_\_\_\_\_ c. the diagonals bisect the opposite angles
- \_\_\_\_\_ d. the diagonals bisect each other
- \_\_\_\_\_ e. all consecutive angles are congruent
- \_\_\_\_\_ f. all consecutive angles are supplementary



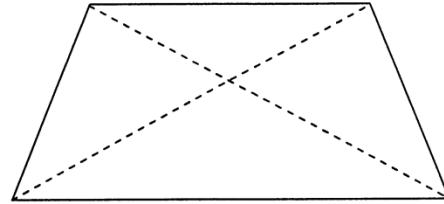
5. Trapezoid

- \_\_\_\_\_ a. both pairs of opposite sides are parallel
- \_\_\_\_\_ b. the diagonals are congruent
- \_\_\_\_\_ c. the diagonal bisect each other
- \_\_\_\_\_ d. the diagonal bisect the opposite angles
- \_\_\_\_\_ e. it can never be drawn as a concave polygon
- \_\_\_\_\_ f. any pair of upper and lower base angles will be supplementary



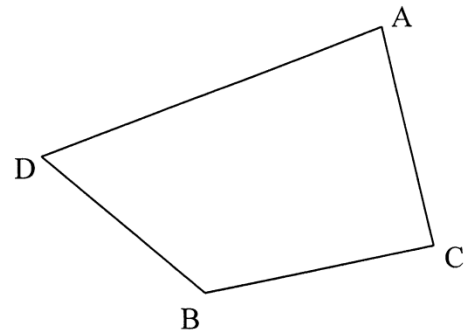
6. Isosceles Trapezoid

- \_\_\_\_\_ a. the diagonals are congruent
- \_\_\_\_\_ b. the diagonals bisect each other
- \_\_\_\_\_ c. the diagonals bisect the opposite angles
- \_\_\_\_\_ d. exactly one pair of opposite sides are parallel
- \_\_\_\_\_ e. exactly one pair of opposite sides is congruent
- \_\_\_\_\_ f. any pair of upper and lower base angles will be supplementary and the upper and lower base angles will be congruent.



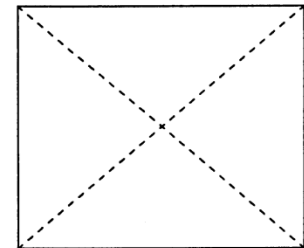
7. Quadrilateral

- \_\_\_\_\_ a. has 3 sides
- \_\_\_\_\_ b. has 5 angles
- \_\_\_\_\_ c. can be drawn as either a convex or a concave polygon
- \_\_\_\_\_ d. has four diagonals
- \_\_\_\_\_ e. the one shown could be named ABCD



8. Square

- \_\_\_\_\_ a. any two consecutive sides are congruent
- \_\_\_\_\_ b. any two consecutive angles are supplementary
- \_\_\_\_\_ c. the slopes of the diagonals are opposite reciprocals
- \_\_\_\_\_ d. the slopes of any two consecutive sides are opposite reciprocals
- \_\_\_\_\_ e. the diagonals split opposite angles into two  $45^\circ$  angles.
- \_\_\_\_\_ f. is both a rectangle and a rhombus at the same time





# Parallelograms

1. In  $\square ABCD$ ,  $\angle A = 68^\circ$ . Find the measure of the other angles. Draw a sketch to help you.

a.  $\angle B =$  \_\_\_\_\_

b.  $\angle C =$  \_\_\_\_\_

c.  $\angle D =$  \_\_\_\_\_

2. In  $\square ABCD$ ,  $\angle A = x$ ,  $\angle B = 2x + 60$ .  $\angle D =$  \_\_\_\_\_. Draw a sketch to help you.

3. Use parallelogram CDFB to find each measure.

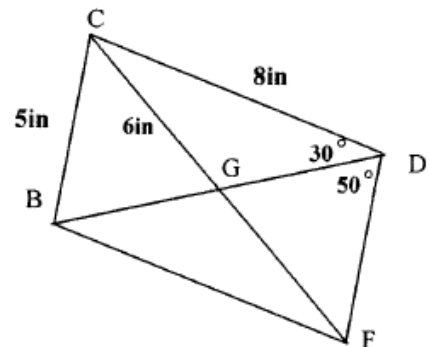
FD = \_\_\_\_\_

BF = \_\_\_\_\_

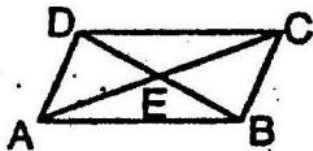
$m\angle CBF =$  \_\_\_\_\_

$m\angle BCD =$  \_\_\_\_\_

GF = \_\_\_\_\_



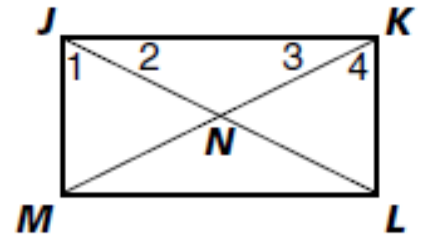
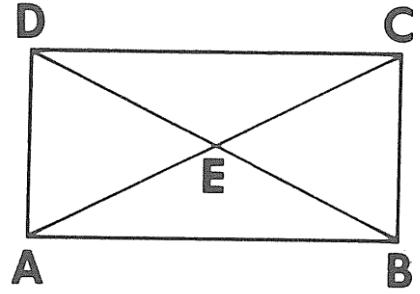
4. **Given:** Parallelogram ABCD  
 with  $\overline{AB} = 20$ ,  $\overline{BD} = 18$ ,  $\overline{AC} = 24$   
 Find the perimeter of  $\triangle DEC$ . \_\_\_\_\_



## Rectangles

5. In rectangle  $ABCD$ ,  $CB = 6$ ,  $AB = 8$   
Find the missing lengths:

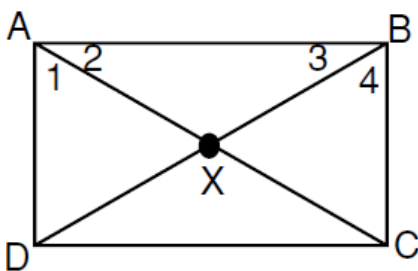
- a.  $AD$     b.  $CD$     c.  $EC$     d.  $AE$
- e.  $DE$     f.  $EB$     g.  $DB$



6. Given:  $JKLM$  is a rectangle.  $JK = 16$      $KL = 12$      $m\angle 1 = 53^\circ$

- a.  $m\angle JKL = \underline{\hspace{2cm}}$     c.  $m\angle 2 = \underline{\hspace{2cm}}$     e.  $m\angle JNK = \underline{\hspace{2cm}}$
- b.  $JL = \underline{\hspace{2cm}}$     d.  $m\angle 4 = \underline{\hspace{2cm}}$     f.  $MN = \underline{\hspace{2cm}}$

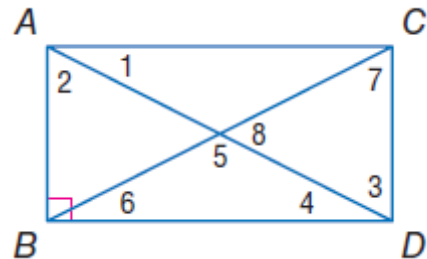
7.  $ABCD$  is a rectangle. If  $AB = 24$ ,  $BC = 10$ , and  $\angle 1 = 50^\circ$ , find the following:



- a.  $CD = \underline{\hspace{2cm}}$     d.  $BD = \underline{\hspace{2cm}}$     g.  $\angle DAB = \underline{\hspace{2cm}}$
- b.  $AD = \underline{\hspace{2cm}}$     e.  $AX = \underline{\hspace{2cm}}$     h.  $\angle 3 = \underline{\hspace{2cm}}$
- c.  $AC = \underline{\hspace{2cm}}$     f.  $BX = \underline{\hspace{2cm}}$     i.  $\angle AXB = \underline{\hspace{2cm}}$

8. Quadrilateral  $ABCD$  is a rectangle. Find each Measure if  $m\angle 2 = 70^\circ$ .

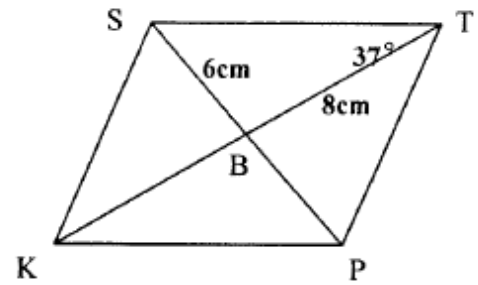
- $m\angle 1$              $m\angle 7$              $m\angle 3$
- $m\angle 5$              $m\angle 6$              $m\angle 8$



## Rhombus

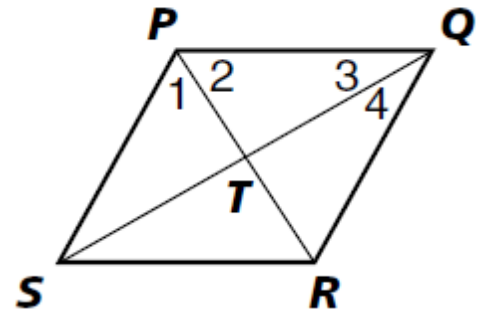
9. Use rhombus STPK to find each measure.

$TP =$  \_\_\_\_\_  
 $PB =$  \_\_\_\_\_  
 $KT =$  \_\_\_\_\_  
 $m\angle KTP =$  \_\_\_\_\_  
 $m\angle KBP =$  \_\_\_\_\_



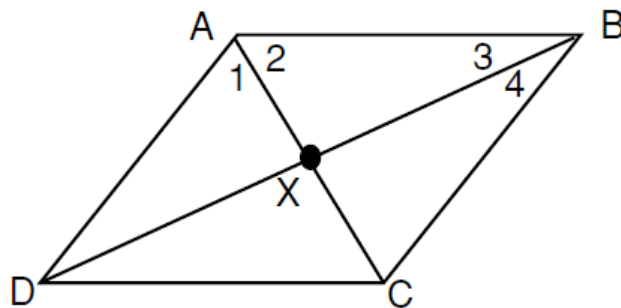
10. Given: PQRS is a rhombus.  $PQ = 4$   $m\angle PQR = 60^\circ$

a.  $QR =$  \_\_\_\_\_      c.  $m\angle 2 =$  \_\_\_\_\_      e.  $ST =$  \_\_\_\_\_  
 b.  $m\angle 3 =$  \_\_\_\_\_      d.  $PT =$  \_\_\_\_\_      f.  $m\angle SPQ =$  \_\_\_\_\_



11. ABCD is a rhombus. If  $AB = 6$ ,  $XC = 3$ , and  $\angle DAB = 120^\circ$ , find the following:

a.  $BC =$  \_\_\_\_\_      d.  $\angle AXB =$  \_\_\_\_\_      g.  $\angle 3 =$  \_\_\_\_\_  
 b.  $\angle ADC =$  \_\_\_\_\_      e.  $\angle 1 =$  \_\_\_\_\_      h.  $\angle 4 =$  \_\_\_\_\_  
 c.  $\angle DCB =$  \_\_\_\_\_      f.  $\angle 2 =$  \_\_\_\_\_      i.  $AX =$  \_\_\_\_\_

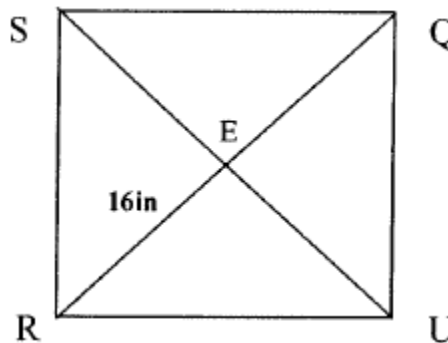


12. The diagonals of a rhombus are 32cm and 126 cm. Find the perimeter of the rhombus.

## Square

13. Use Square SQRU to find each measure.

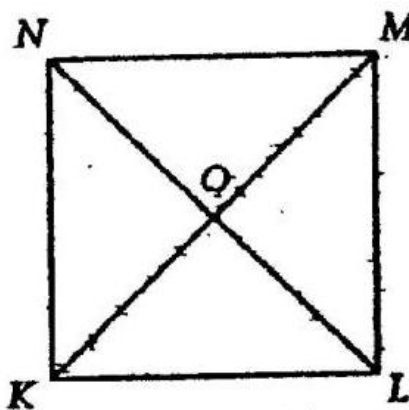
- EQ = \_\_\_\_\_  
 SU = \_\_\_\_\_  
 $m\angle SQU =$  \_\_\_\_\_  
 $m\angle REU =$  \_\_\_\_\_  
 $m\angle SQE =$  \_\_\_\_\_



14. KLMN is a square and  $NO = 6$ .

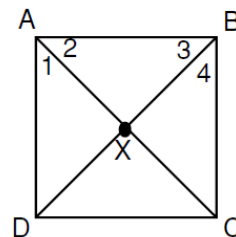
Find:

- $m\angle QKL =$  \_\_\_\_\_  
 $m\angle MOL =$  \_\_\_\_\_  
 Perimeter  $KLMN =$  \_\_\_\_\_



15. ABCD is a square. If  $AB = 16$  and  $AC = 16\sqrt{2}$ , find the following:

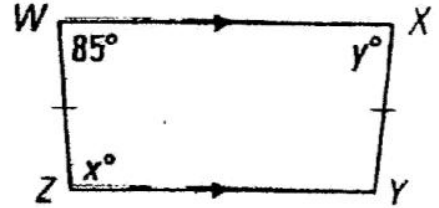
- |                       |                         |
|-----------------------|-------------------------|
| a. $BC =$ _____       | e. $\angle 2 =$ _____   |
| b. $BD =$ _____       | f. $\angle AXB =$ _____ |
| c. $AD =$ _____       | g. $\angle BXC =$ _____ |
| d. $\angle 1 =$ _____ | h. $\angle 4 =$ _____   |



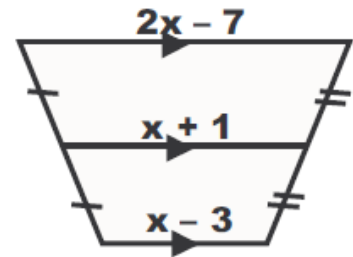
16. The perimeter of a square measures 72cm. Find the length of the diagonal.

## Trapezoids

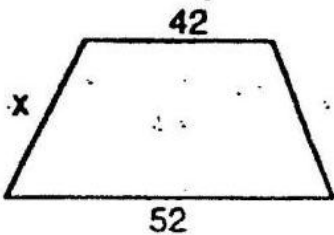
17.  $WXYZ$  is an isosceles trapezoid. What are values of  $x$  and  $y$ ?



18. Find the length of the midsegment.

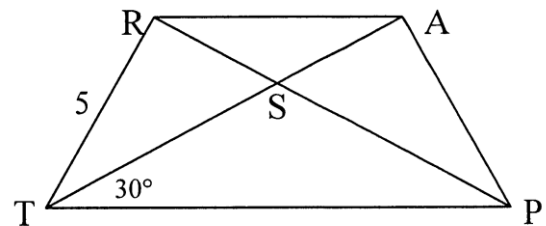


19. **Given:** An isosceles trapezoid with a perimeter of 120 cm.  
Find  $x$ . \_\_\_\_\_

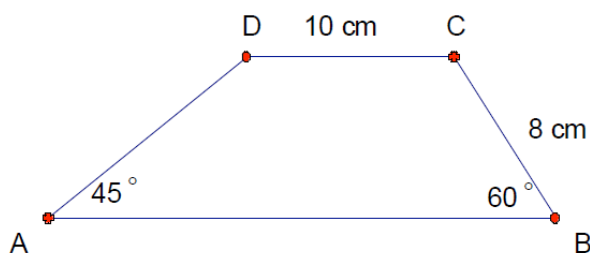


20.  $TRAP$  is an *isosceles trapezoid*.  $\angle RTP = 70^\circ$ ,  $AS = 4$ , and  $SP = 7$ . Find the following:

- |                         |                         |
|-------------------------|-------------------------|
| a. $\angle TRA =$ _____ | b. $\angle RAT =$ _____ |
| c. $\angle APT =$ _____ | d. $\angle TRP =$ _____ |
| e. $\angle RAP =$ _____ | f. $\angle TSP =$ _____ |
| g. $RP =$ _____         | h. $\angle ASP =$ _____ |
| i. $AP =$ _____         | j. $RS =$ _____         |



21. Find the length of base  $\overline{AB}$  of trapezoid  $ABCD$ .



SUMMARY CHARTS:

| Special Quadrilateral      | Diagonals        |                  | Diagonals Bisect         |                       |
|----------------------------|------------------|------------------|--------------------------|-----------------------|
|                            | Congruent        | Perpendicular    | Each Other               | Angles                |
| <b>Parallelogram</b>       | <b>Sometimes</b> | <b>Sometimes</b> | <b>Always</b>            | <b>Sometimes</b>      |
| <b>Rectangle</b>           | <b>Always</b>    | <b>Sometimes</b> | <b>Always</b>            | <b>Sometimes</b>      |
| <b>Rhombus</b>             | <b>Sometimes</b> | <b>Always</b>    | <b>Always</b>            | <b>Always</b>         |
| <b>Square</b>              | <b>Always</b>    | <b>Always</b>    | <b>Always</b>            | <b>Always</b>         |
| <b>Trapezoid</b>           | <b>Sometimes</b> | <b>Never</b>     | <b>Never</b>             | <b>Never</b>          |
| <b>Isosceles Trapezoid</b> | <b>Always</b>    | <b>Never</b>     | <b>Never</b>             | <b>Never</b>          |
| <b>Kite</b>                | <b>Never</b>     | <b>Always</b>    | <b>Only one diagonal</b> | <b>Only one angle</b> |

| Property                                  | Rectangle | Rhombus | Square |
|-------------------------------------------|-----------|---------|--------|
| 1. All the properties of a parallelogram? | Yes       | Yes     | Yes    |
| 2. Equiangular (4 right corner angles?)   | Yes       | No      | Yes    |
| 3. Equilateral (4 congruent sides?)       | No        | Yes     | Yes    |
| 4. Diagonals bisect angles?               | No        | Yes     | Yes    |
| 5. Diagonals congruent?                   | Yes       | No      | Yes    |
| 6. Diagonals perpendicular?               | No        | Yes     | Yes    |

