

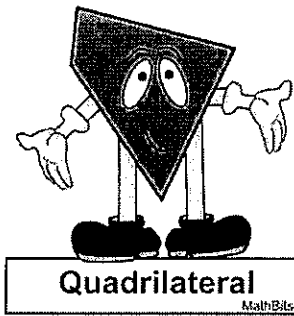
Geometry

Unit 2-6

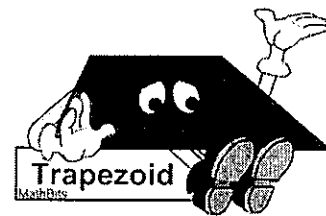
Quadrilaterals

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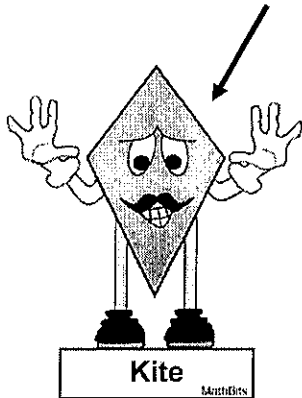
The Quadrilateral Family



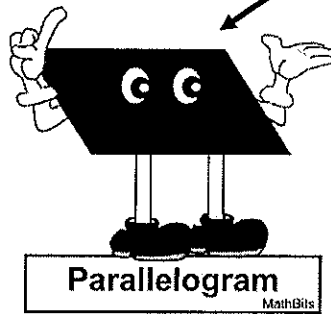
1. four sided polygon
2. sum of interior angles is 360°



1. quad with at least one pair of parallel sides
2. median is parallel to bases and $\frac{1}{2}$ sum of bases



1. 2 pair adjacent sides \cong
2. diagonals perpendicular
3. 1 diag. forms 2 isos. Δ s
4. other diag. forms 2 \cong Δ s
5. 1 pair opposite \angle s \cong
6. 1 diag. bisects \angle s
7. 1 diag. bisects the other



SIDES:

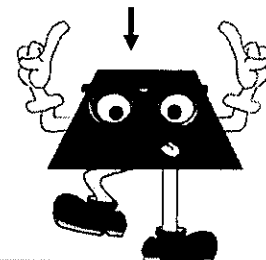
1. opposite sides parallel
2. opposite sides \cong

ANGLES:

3. opposite angles \cong
4. consecutive angles supplementary

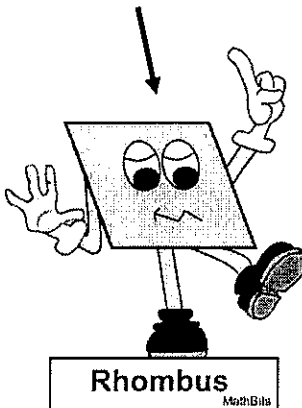
DIAGONALS:

5. diagonals bisect each other
6. diagonals form \cong triangles

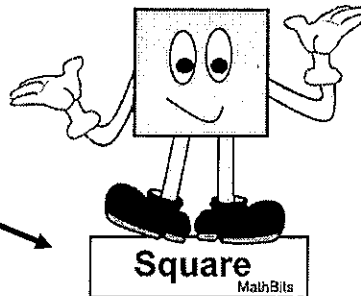


Isosceles Trapezoid

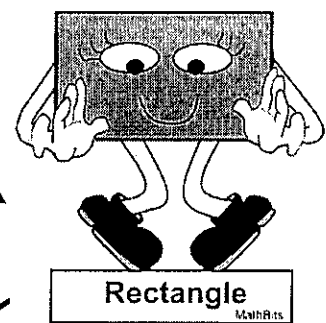
1. trapezoid
2. if one set of parallel sides, the non-parallel sides (legs) \cong
3. line of symmetry bisects one pair of opposite sides
4. base angles \cong
5. diagonals \cong
6. opposite angles supplementary



1. parallelogram
2. 4 \cong sides
3. diagonals bisect angles
4. diagonals perpendicular



1. parallelogram
2. rectangle
3. rhombus
4. isosceles trapezoid



1. parallelogram
2. isosceles trapezoid
3. 4 right angles
4. diagonals \cong



Organizing Quadrilaterals

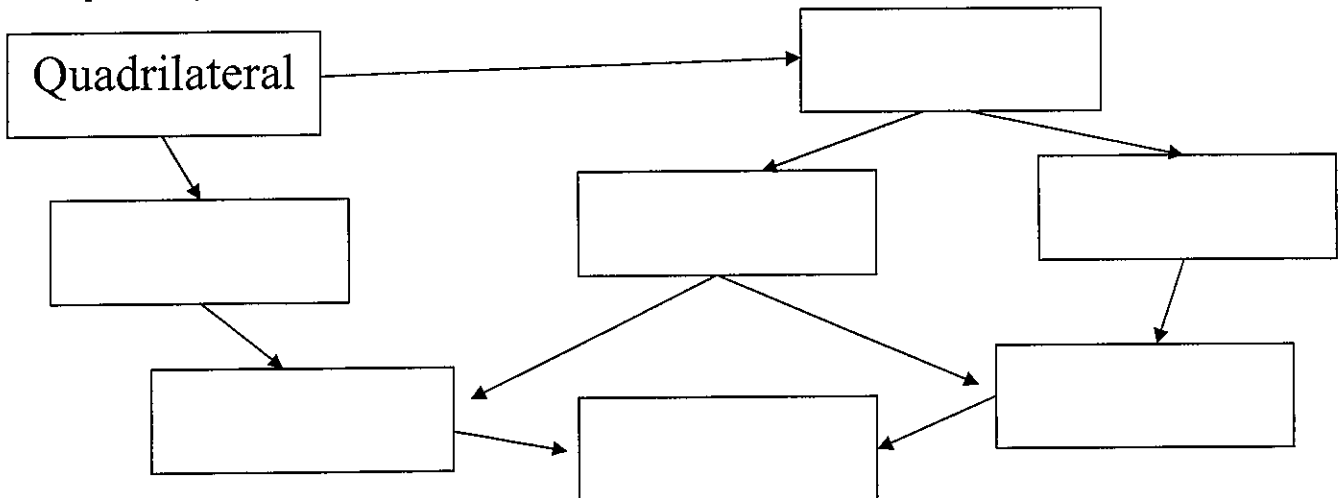
Directions: Check (or shade) each box where the property is true.

Name _____

A **trapezoid** is a quadrilateral with at least one pair of opposite sides parallel.

Property	Kite	Trapezoid	Isosceles Trapezoid	Parallelogram	Rectangle	Rhombus	Square
1 pair opposite sides \parallel							
2 pair opposite sides \parallel							
2 pair opposite sides \cong							
Opposite angles \cong							
Consecutive \angle 's suppl.							
Diag. bisect each other							
Diagonals form 2 $\cong \Delta$'s							
Four rt. \angle 's							
Diagonals \cong							
Four \cong sides							
Diagonals bisect \angle 's							
Diagonals are \perp							

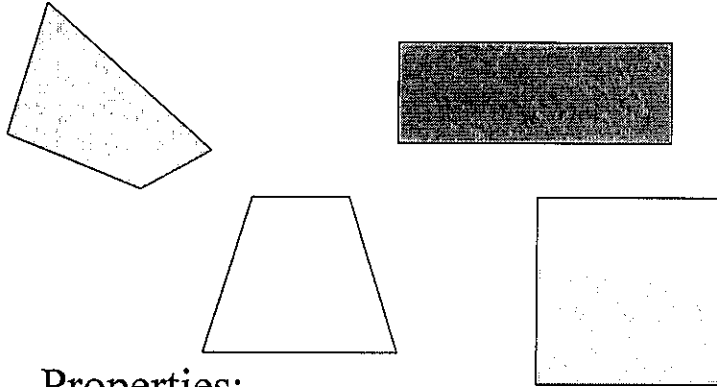
Complete the following chart to show the connection between the figures from general to more specific.



Unit 6 Lesson 1 Kites and Trapezoids

Quadrilateral

- a quadrilateral is a polygon with 4 sides.



Properties:

- Sum of the Interior angles = 360
- Sum of the Exterior angles = 360

- Two pairs of adjacent congruent sides.

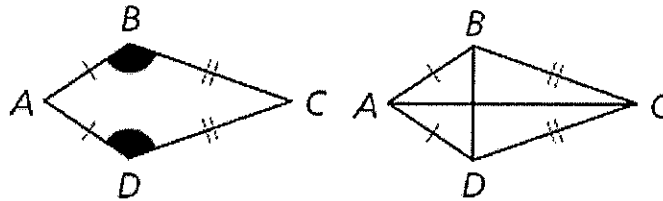
- One pair of opposite angles that are congruent.

- One of the diagonals bisects the other.

- One of the diagonals bisects the angles.

- The diagonals are perpendicular to each other.

Kites



$$\begin{aligned} \angle B &\cong \angle D \\ \angle A &\not\cong \angle C \end{aligned}$$

$$\overline{AC} \perp \overline{BD}$$

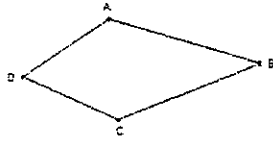
In kite $ABCD$, $m\angle BAC = 35^\circ$ and $m\angle BCD = 44^\circ$
For Exercises 1–3, find each measure.

1. $m\angle ABD$

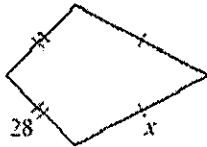
2. $m\angle DCA$

3. $m\angle ABC$

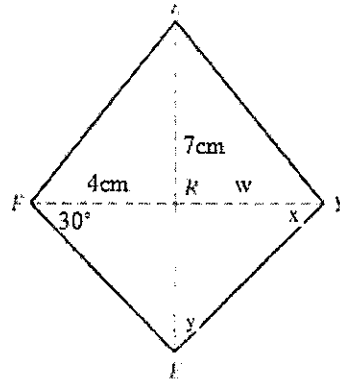
4. Polygon ABCD is a kite.
If $AB = 12$ and $AD = 4$ find BC, DC, and the perimeter of ABCD.



5. The perimeter of this kite is 116. Find x .

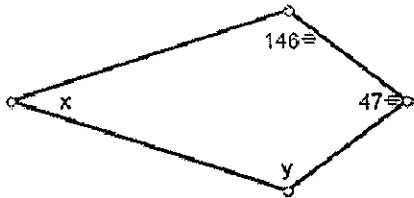


6. FLYE is a kite with $FL = LY$.
Find w , x , and FL .



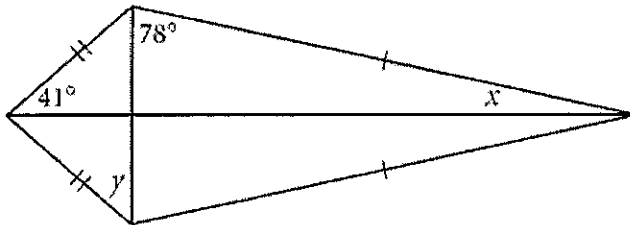
7.

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



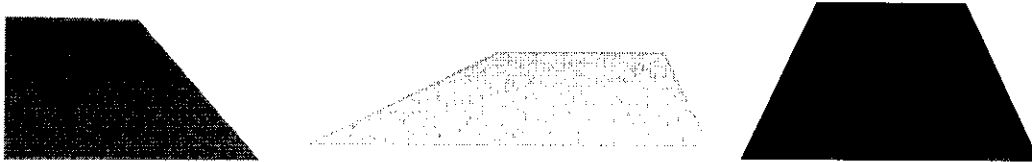
8.

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



Trapezoids

- A quadrilateral with at least one pair of opposite sides parallel sides.

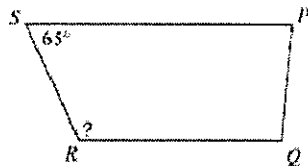


- Parallel sides are called bases
- Nonparallel sides are called legs.

Properties

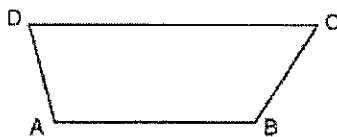
- Consecutive angles with different bases are supplementary.

9. What is the measure of $\angle R$?



10.

In the diagram below, \overline{AB} and \overline{CD} are bases of trapezoid $ABCD$.

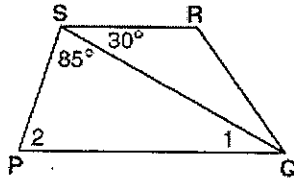


(Not drawn to scale)

If $m\angle B = 123$ and $m\angle D = 75$, what is $m\angle C$?

11.

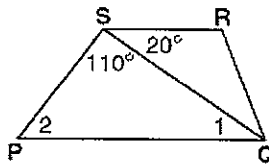
In the accompanying diagram, PQRS is a trapezoid with $\overline{PQ} \parallel \overline{SR}$.



Find $m\angle 1$ and $m\angle 2$.

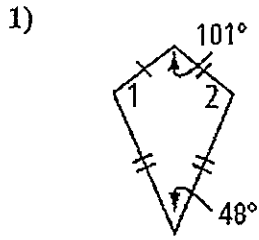
12.

In the accompanying diagram, PQRS is a trapezoid with $\overline{PQ} \parallel \overline{SR}$.

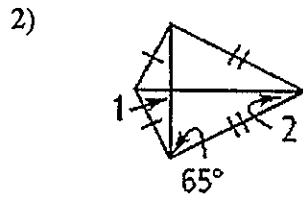


Find $m\angle 1$ and $m\angle 2$.

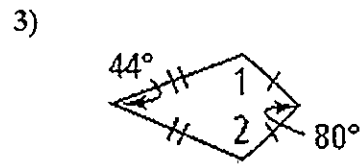
Find the measure of the missing angles in the kites.



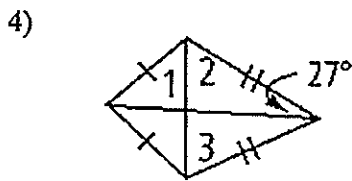
$\angle 1 = \underline{\hspace{2cm}}$ $\angle 2 = \underline{\hspace{2cm}}$



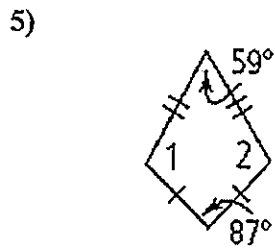
$\angle 1 = \underline{\hspace{2cm}}$ $\angle 2 = \underline{\hspace{2cm}}$



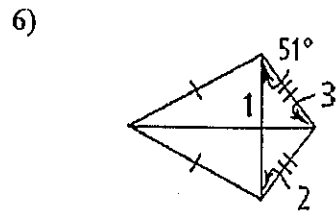
$\angle 1 = \underline{\hspace{2cm}}$ $\angle 2 = \underline{\hspace{2cm}}$



$\angle 1 = \underline{\hspace{2cm}}$ $\angle 2 = \underline{\hspace{2cm}}$
 $\angle 3 = \underline{\hspace{2cm}}$

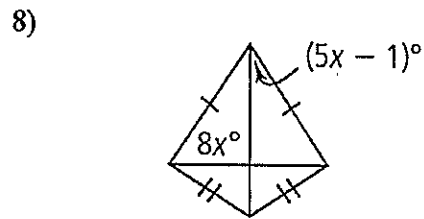
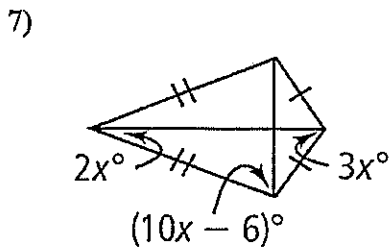


$\angle 1 = \underline{\hspace{2cm}}$ $\angle 2 = \underline{\hspace{2cm}}$

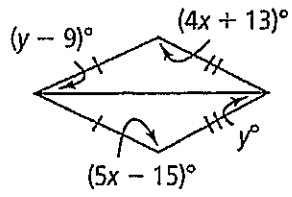


$\angle 1 = \underline{\hspace{2cm}}$ $\angle 2 = \underline{\hspace{2cm}}$
 $\angle 3 = \underline{\hspace{2cm}}$

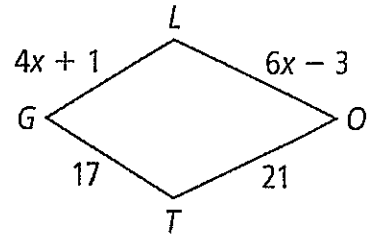
Find the value of the variable(s) in each kite.



9)

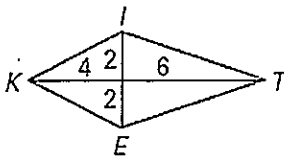


10)



Use Pythagorean theorem to find the lengths of the sides of the kite. Round to the tenths place.

11)



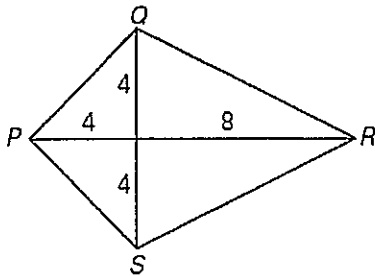
KI = _____

IT = _____

TE = _____

KE = _____

12)



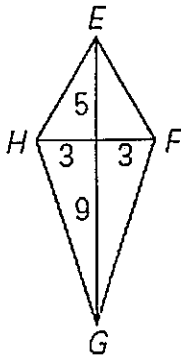
PQ = _____

QR = _____

RS = _____

PS = _____

13)



EH = _____

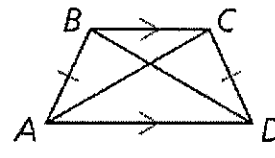
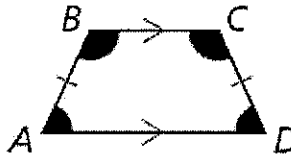
EF = _____

FG = _____

GH = _____

Unit 6 Lesson 2 Isosceles Trapezoid

- ★ If legs are congruent, then it is an isosceles trapezoid.



- ★ Both pairs of base angles of an isosceles trapezoid are congruent.

$$\begin{aligned}\angle A &\cong \angle D \\ \angle B &\cong \angle C\end{aligned}$$

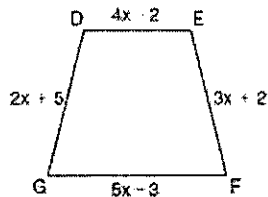
$$\overline{AC} \cong \overline{DB} \leftrightarrow ABCD \text{ is isosceles.}$$

- ★ Diagonals of an isosceles trapezoid are congruent.

- ★ Opposite angles are supplementary.

1.

In the diagram below of isosceles trapezoid $DEFG$, $\overline{DE} \parallel \overline{GF}$, $DE = 4x - 2$, $EF = 3x + 2$, $FG = 5x - 3$, and $GD = 2x + 5$. Find the value of x .

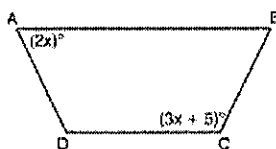


2.

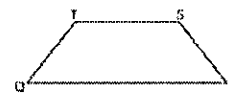
Isosceles trapezoid $ABCD$ has diagonals \overline{AC} and \overline{BD} . If $AC = 5x + 13$ and $BD = 11x - 5$, what is the value of x ?

3.

The diagram below shows isosceles trapezoid $ABCD$ with $\overline{AB} \parallel \overline{DC}$ and $\overline{AD} \cong \overline{BC}$. If $m\angle BAD = 2x$ and $m\angle BCD = 3x + 5$, find $m\angle BAD$.



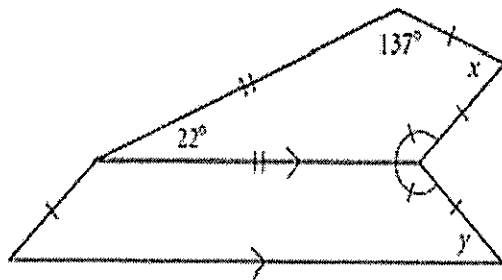
4. In isosceles trapezoid $QRST$ shown below, \overline{QR} and \overline{TS} are bases.



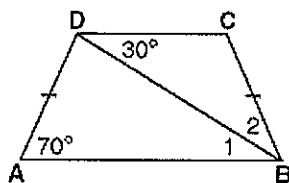
If $m\angle Q = 5x + 3$ and $m\angle R = 7x - 15$, what is $m\angle Q$?

5. Combo Problem

Find x and y .

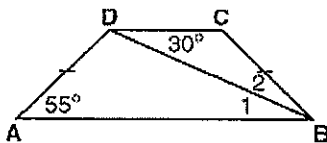


6. In the accompanying diagram, $ABCD$ is an isosceles trapezoid with $\overline{AB} \parallel \overline{CD}$ and $\overline{AD} \cong \overline{BC}$.



Find $m\angle 1$ and $m\angle 2$.

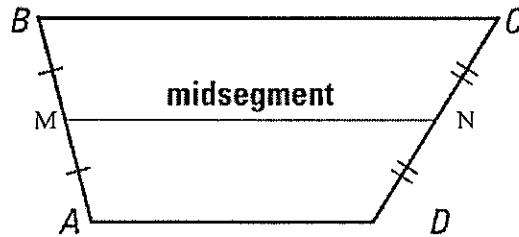
7.



$ABCD$ is an isosceles trapezoid with $\overline{AB} \parallel \overline{CD}$ and $\overline{AD} \cong \overline{BC}$. Find $m\angle 1$ and $m\angle 2$.

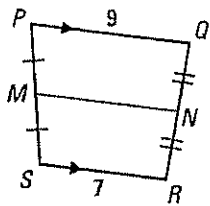
Midsegment of a Trapezoid

The **midsegment** of a trapezoid is the segment that connects the midpoints of its legs.

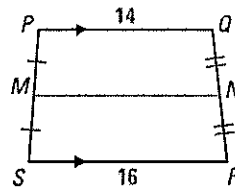


$$\overline{MN} \parallel \overline{AD}, \overline{MN} \parallel \overline{BC}, MN = \frac{1}{2}(AD + BC)$$

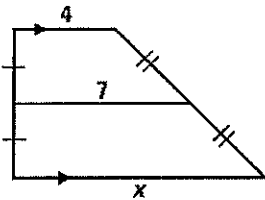
8.



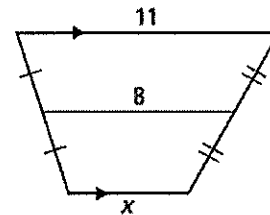
9.



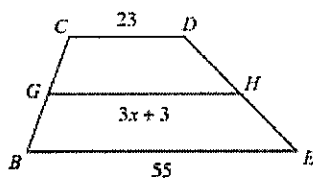
10.



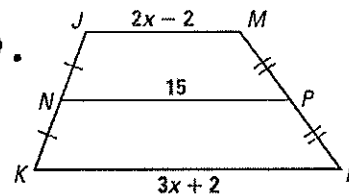
11.



12.

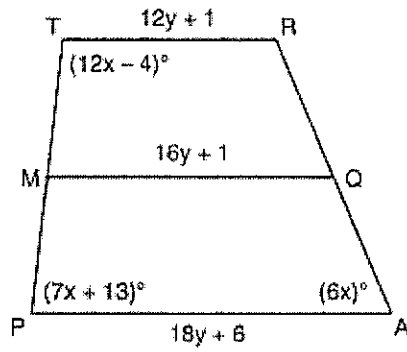


13.



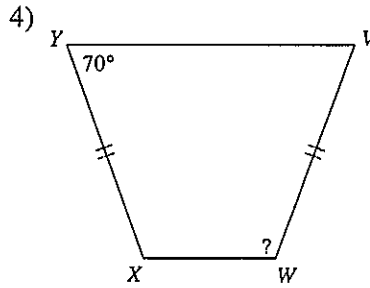
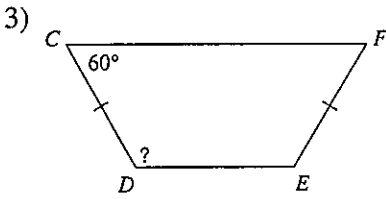
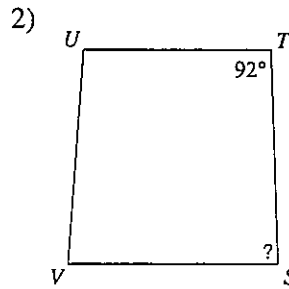
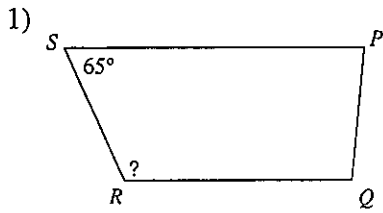
14. Combo Problem

Trapezoid $TRAP$, with median \overline{MQ} , is shown in the diagram below. Solve algebraically for x and y .



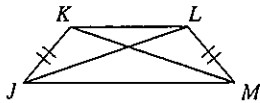
Properties of Trapezoids

Find the length of the angle indicated for each trapezoid.

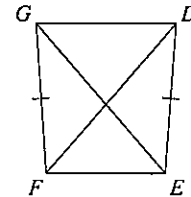


Find the length of the diagonal indicated for each trapezoid.

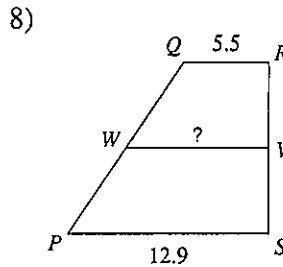
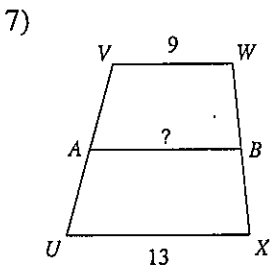
5) $KM = 22$
Find JL



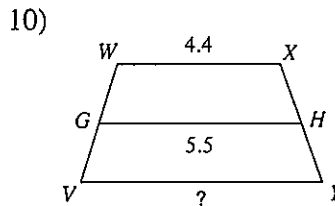
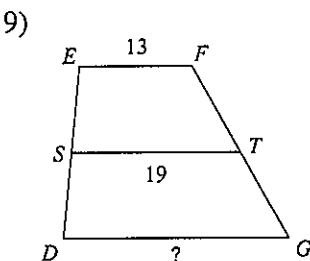
6) $DF = 8.7$
Find EG



Find the length of the median of each trapezoid.

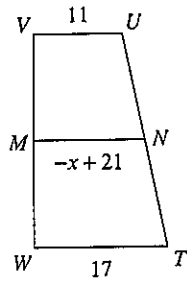


Find the length of the base indicated for each trapezoid.

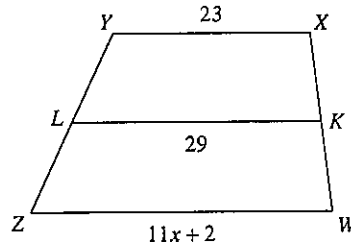


Solve for x . Each figure is a trapezoid.

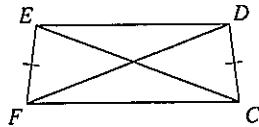
11)



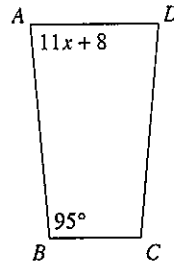
12)



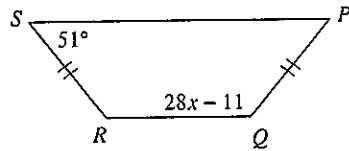
13) $EC = 20$
 $FD = 5x - 10$



14)

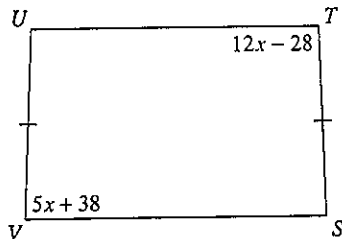


15)

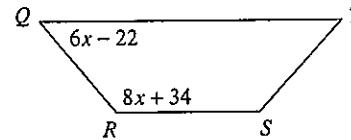


Find the length of the angle indicated for each trapezoid.

16) Find $m\angle V$

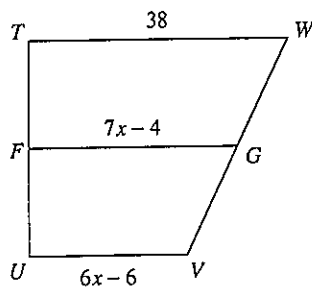


17) Find $m\angle R$



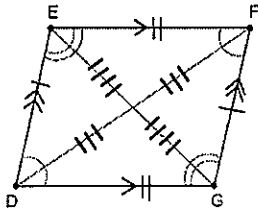
Find the length of the base indicated for each trapezoid.

18) Find VU



Unit 6 Lesson 3 Parallelograms

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



Sides	...its pairs of opposite sides are congruent.	
Angles	...its pairs of opposite angles are congruent.	
	...its consecutive angles are supplementary.	
Diagonals	...its diagonals bisect each other.	
	...its diagonals form two congruent triangles.	

Example 1

In parallelogram ABCD, $AB = 5x - 4$ and $CD = 2x + 14$. Find the value of x .

Example 2

In parallelogram ABCD, $m\angle B = (4x + 15)^\circ$ and $m\angle D = (6x - 27)^\circ$. Find $m\angle C$.

Example 3

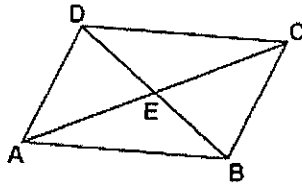
The measures of two consecutive angles of a parallelogram are in the ratio 3:7. Find the measure of an acute angle of the parallelogram.

Example 4

In parallelogram ABCD, $AB = 3x - 20$, $BC = x + 15$, $CD = 2x + 10$. Find AD.

Example 5

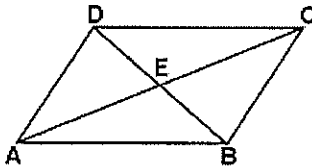
In the accompanying diagram of parallelogram $ABCD$, diagonals \overline{AC} and \overline{DB} intersect at E , $AE = 3x - 4$, and $EC = x + 12$.



What is the value of x ?

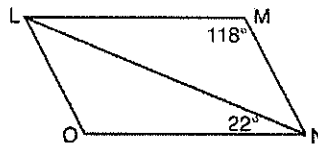
Example 6

In parallelogram $ABCD$ below, diagonals \overline{AC} and \overline{BD} intersect at E .



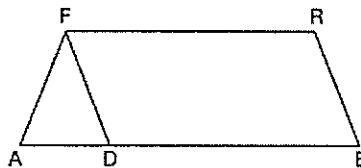
If $AC = 4x + 6$ and $AE = 3x - 1$, find the value of x .

Example 7 The diagram below shows parallelogram $LMNO$ with diagonal \overline{LN} , $m\angle M = 118^\circ$, and $m\angle LNO = 22^\circ$.



Explain why $m\angle NLO$ is 40 degrees.

Example 8 In the diagram of parallelogram $FRED$ shown below, \overline{ED} is extended to A , and \overline{AF} is drawn such that $\overline{AF} \cong \overline{DF}$.

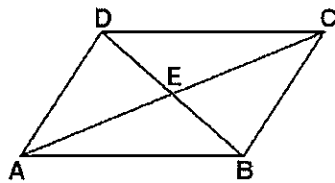


If $m\angle R = 124^\circ$, what is $m\angle AFD$?

- | | |
|-----------------|----------------|
| (1) 124° | (3) 68° |
| (2) 112° | (4) 56° |

TO ESTABLISH IF A QUADRILATERAL IS A PARALLELOGRAM

1. Both pairs of opposite sides are parallel.
2. Both pairs of opposite sides are congruent.
3. Both pairs of opposite angles are congruent.
4. Consecutive angles are supplementary.
5. Diagonals bisect each other.
6. One pair of opposite sides is both congruent and parallel.



- 9) If $\overline{AB} \cong \overline{DC}$ and $\overline{AD} \cong \overline{BC}$, determine whether quadrilateral ABCD is a parallelogram [Explain.]
- 10) If $\overline{AB} \parallel \overline{DC}$ and $\overline{AD} \parallel \overline{BC}$, determine whether quadrilateral ABCD is a parallelogram [Explain.]
- 11) If $\overline{AB} \parallel \overline{CD}$ and $\overline{AD} \cong \overline{BC}$, determine whether quadrilateral ABCD is a parallelogram [Explain.]
- 12) If $AE = EC$ and $DE = EB$, determine whether quadrilateral ABCD is a parallelogram [Explain.]
- 13) If $\angle DAB \cong \angle DCB$ and $\angle ABC \cong \angle ADC$, determine whether quadrilateral ABCD is a parallelogram [Explain.]
- 14) If $\overline{AD} \parallel \overline{BC}$ and $\overline{AD} \cong \overline{BC}$, determine whether quadrilateral ABCD is a parallelogram [Explain.]
- 15) If $\overline{AD} \cong \overline{DC}$ and $\overline{AB} \cong \overline{BC}$, determine whether quadrilateral ABCD is a parallelogram [Explain.]

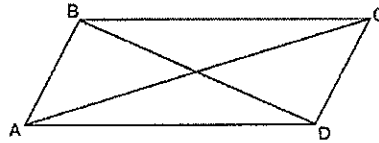
16.

Quadrilateral $ABCD$ has diagonals \overline{AC} and \overline{BD} . Which information is *not* sufficient to prove $ABCD$ is a parallelogram?

- (1) \overline{AC} and \overline{BD} bisect each other.
- (2) $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \cong \overline{AD}$
- (3) $\overline{AB} \cong \overline{CD}$ and $\overline{AB} \parallel \overline{CD}$
- (4) $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \parallel \overline{AD}$

17.

Quadrilateral $ABCD$ with diagonals \overline{AC} and \overline{BD} is shown in the diagram below.

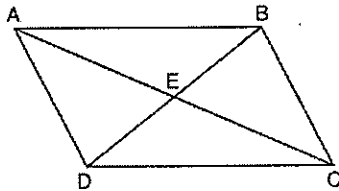


Which information is *not* enough to prove $ABCD$ is a parallelogram?

- (1) $\overline{AB} \cong \overline{CD}$ and $\overline{AB} \parallel \overline{DC}$
- (2) $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \cong \overline{DA}$
- (3) $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \parallel \overline{AD}$
- (4) $\overline{AB} \parallel \overline{DC}$ and $\overline{BC} \parallel \overline{AD}$

Example 18

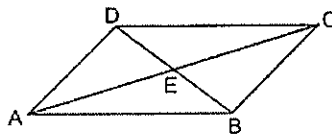
Given: Quadrilateral $ABCD$ is a parallelogram with diagonals \overline{AC} and \overline{BD} intersecting at E



Prove: $\triangle AED \cong \triangle CEB$

Example 19

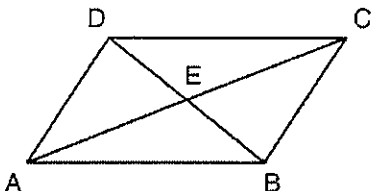
In parallelogram $ABCD$ shown below, diagonals \overline{AC} and \overline{BD} intersect at E .



Prove: $\angle ACD \cong \angle CAB$

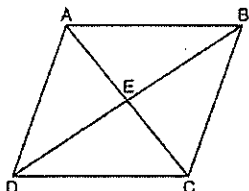
G.G.38: Parallelograms: Investigate, justify, and apply theorems about parallelograms involving their angles, sides, and diagonals

- 1 In the diagram below, parallelogram $ABCD$ has diagonals \overline{AC} and \overline{BD} that intersect at point E .



Which expression is *not* always true?

- 1) $\angle DAE \cong \angle BCE$
 - 2) $\angle DEC \cong \angle BEA$
 - 3) $\overline{AC} \cong \overline{DB}$
 - 4) $\overline{DE} \cong \overline{EB}$
- 2 Parallelogram $ABCD$ with diagonals \overline{AC} and \overline{BD} intersecting at E is shown below.



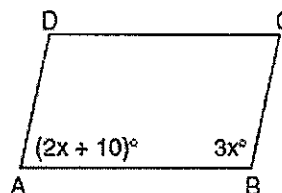
Which statement must be true?

- 1) $\overline{BE} \cong \overline{CE}$
 - 2) $\angle BAE \cong \angle DCE$
 - 3) $\overline{AB} \cong \overline{BC}$
 - 4) $\angle DAE \cong \angle CBE$
- 3 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.
- 4 Which statement is true about every parallelogram?
- 1) All four sides are congruent.
 - 2) The interior angles are all congruent.
 - 3) Two pairs of opposite sides are congruent.
 - 4) The diagonals are perpendicular to each other.

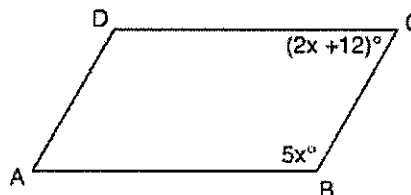
- 5 In parallelogram $QRST$, diagonal \overline{QS} is drawn. Which statement must always be true?

- 1) $\triangle QRS$ is an isosceles triangle.
- 2) $\triangle STQ$ is an acute triangle.
- 3) $\triangle STQ \cong \triangle QRS$
- 4) $\overline{QS} \cong \overline{QT}$

- 6 In the accompanying diagram of parallelogram $ABCD$, $m\angle A = (2x + 10)$ and $m\angle B = 3x$. Find the number of degrees in $m\angle B$.



- 7 In the accompanying diagram of parallelogram $ABCD$, $m\angle B = 5x$, and $m\angle C = 2x + 12$. Find the number of degrees in $\angle D$.



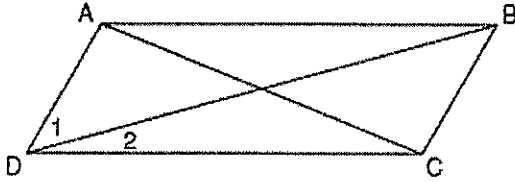
- 8 In parallelogram $JKLM$, $m\angle L$ exceeds $m\angle M$ by 30 degrees. What is the measure of $m\angle J$?

- 1) 75°
- 2) 105°
- 3) 165°
- 4) 195°

- 9 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?

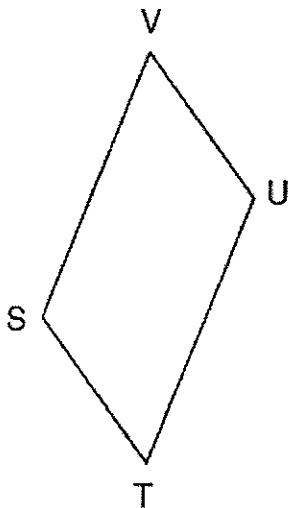
- 1) 20°
- 2) 80°
- 3) 100°
- 4) 160°

- 10 In the diagram below of parallelogram $ABCD$ with diagonals \overline{AC} and \overline{BD} , $m\angle 1 = 45$ and $m\angle DCB = 120$.



What is the measure of $\angle 2$?

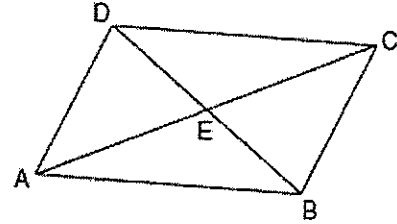
- 1) 15°
 - 2) 30°
 - 3) 45°
 - 4) 60°
- 11 In parallelogram $ABCD$, with diagonal \overline{AC} drawn, $m\angle BCA = 4x + 2$, $m\angle DAC = 6x - 6$, $m\angle BAC = 5y - 1$, and $m\angle DCA = 7y - 15$. Determine $m\angle B$.
- 12 In the diagram below of parallelogram $STUV$, $SV = x + 3$, $VU = 2x - 1$, and $TU = 4x - 3$.



What is the length of \overline{SV} ?

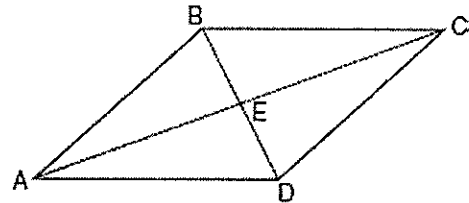
- 1) 5
- 2) 2
- 3) 7
- 4) 4

- 13 In the accompanying diagram of parallelogram $ABCD$, diagonals \overline{AC} and \overline{DB} intersect at E , $AE = 3x - 4$, and $EC = x + 12$.



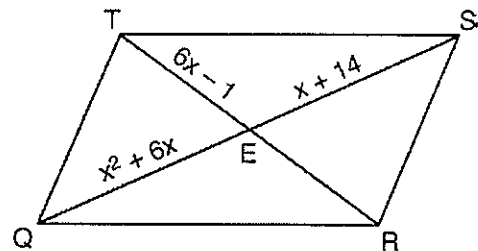
What is the value of x ?

- 1) 8
 - 2) 16
 - 3) 20
 - 4) 40
- 14 In the accompanying diagram of parallelogram $ABCD$, diagonals \overline{AC} and \overline{BD} intersect at E , $BE = \frac{2}{3}x$, and $ED = x - 10$.



What is the value of x ?

- 1) -30
 - 2) 30
 - 3) -6
 - 4) 6
- 15 As shown in the diagram below, the diagonals of parallelogram $QRST$ intersect at E . If $QE = x^2 + 6x$, $SE = x + 14$, and $TE = 6x - 1$, determine TE algebraically.



Unit 6 Lesson 4

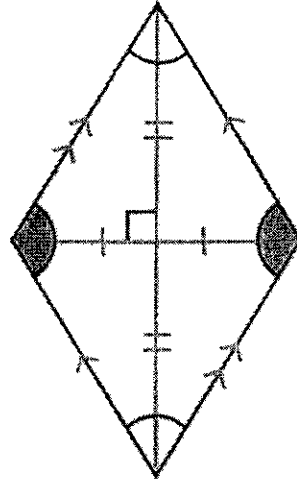
Rhombus

A parallelogram with 4 \cong sides

- All properties of a parallelogram apply

A kite with 4 \cong sides

- All properties of a kite apply



NEW: Each diagonal bisects the two angles

Example 1

In rhombus ABCD, $AB = 2x - 2$ and $BC = x + 8$. Find the length of BC.

Example 2

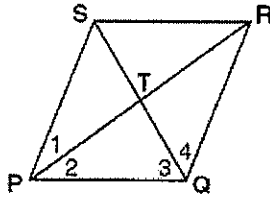
Find the length of a side of a rhombus whose diagonals measure 10 and 24.

Example 3

The diagonals of a rhombus measure 6 meters and 8 meters. Find the number of meters in the perimeter of the rhombus.

Example 4

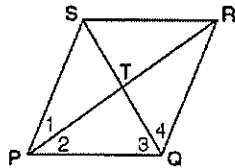
In the diagram below, PQRS is a rhombus with diagonals \overline{PR} and \overline{SQ} .



If $m\angle SPQ = (8x - 14)^\circ$ and $m\angle 1 = (3x + 3)^\circ$, find the value of x .

Example 5

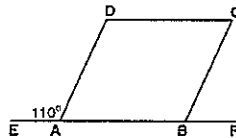
In the diagram below, PQRS is a rhombus with diagonals \overline{PR} and \overline{SQ} .



If $m\angle 2 = (7x - 6)^\circ$ and $m\angle 3 = (11x - 12)^\circ$, find the value of x .

Example 6

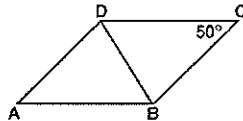
In the accompanying diagram, ABCD is a rhombus and $m\angle EAD = 110^\circ$.



Find $m\angle CBF$.

Example 7

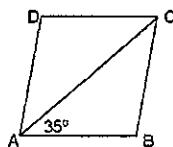
In the accompanying diagram of rhombus ABCD, diagonal \overline{BD} is drawn and $m\angle C = 50^\circ$.



Find $m\angle ADB$.

Example 8

In the accompanying diagram of rhombus ABCD, diagonal \overline{AC} is drawn.



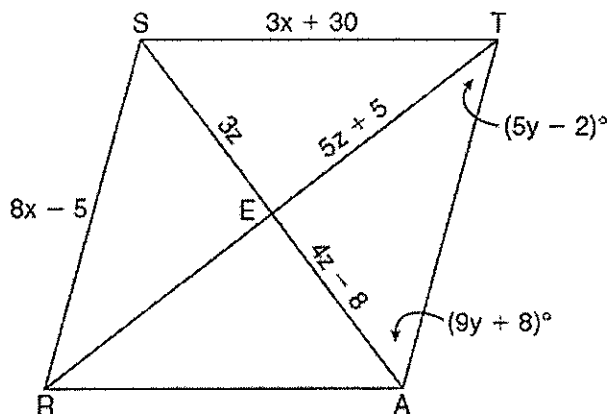
If $m\angle CAB = 35^\circ$, find $m\angle ADC$.

Example 9: System of Equations

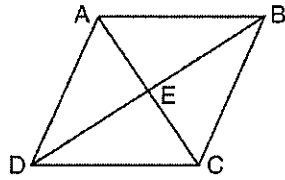
In rhombus $ABCD$, $m\angle A = 120$, $m\angle B = 60$,
 $m\angle C = x + y$, $m\angle D = x - y$. Find x and y .

Example 10: Combo Problem

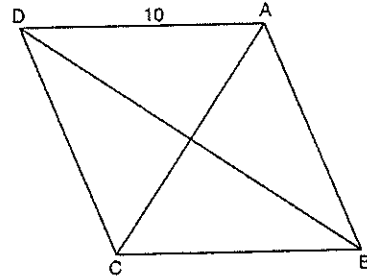
In the diagram below, quadrilateral $STAR$ is a rhombus with diagonals SA and TR intersecting at E . $ST = 3x + 30$, $SR = 8x - 5$, $SE = 3z$, $TE = 5z + 5$, $AE = 4z - 8$, $m\angle RTA = 5y - 2$, and $m\angle TAS = 9y + 8$. Find SR , RT , and $m\angle TAS$.



1. In the diagram below of rhombus $ABCD$, the diagonals \overline{AC} and \overline{BD} intersect at E . If $AC = 18$ and $BD = 24$, what is the length of one side of rhombus $ABCD$?



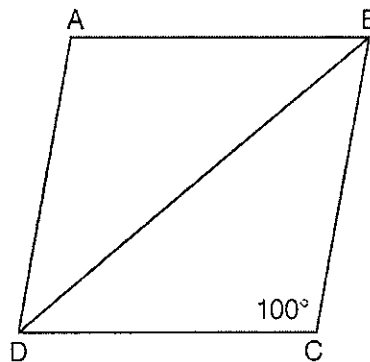
2. In rhombus $ABCD$, with diagonals \overline{AC} and \overline{DB} , $AD = 10$. If the length of diagonal \overline{AC} is 12, what is the length of \overline{DB} ?



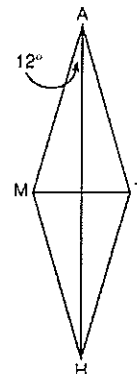
3. In rhombus $ABCD$, the diagonals \overline{AC} and \overline{BD} intersect at E . If $AE = 5$ and $BE = 12$, what is the length of \overline{AB} ?

4. What is the perimeter of a rhombus whose diagonals are 16 and 30?

5. In the diagram below of rhombus $ABCD$, $m\angle C = 100$. What is $m\angle DBC$?



6. In the diagram below, $MATH$ is a rhombus with diagonals \overline{AH} and \overline{MT} . If $m\angle HAM = 12$, what is $m\angle AMT$?

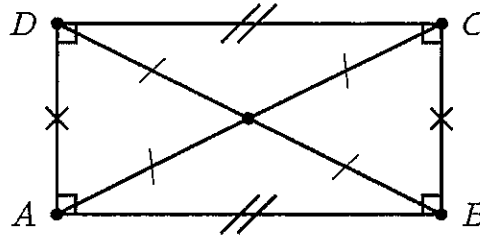


Unit 6 Lesson 5

Rectangle

A Parallelogram with 4 RIGHT ANGLES

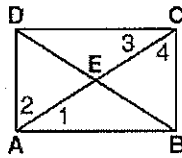
- Has all of the properties of the parallelogram



IMPORTANT NEW PROPERTY: Diagonals are CONGRUENT!!

Example 1

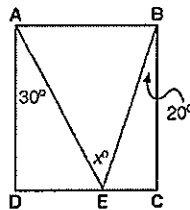
In the diagram below, ABCD is a rectangle with diagonals \overline{AC} and \overline{BD} .



If $m\angle 4 = 59^\circ$, find $m\angle CEB$.

Example 2

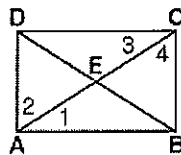
In the accompanying diagram, ABCD is a rectangle. E is a point on \overline{CD} , $m\angle DAE = 30^\circ$, and $m\angle CBE = 20^\circ$.



What is $m\angle x$?

Example 3

In the diagram below, ABCD is a rectangle with diagonals \overline{AC} and \overline{BD} .



If $m\angle 1 = (3x + 14)^\circ$ and $m\angle 4 = (2x - 9)^\circ$, find the value of x .

Example 4

In rectangle ABCD, $AC = 2x + 15$ and $BD = 4x - 5$. Find x .

Example 5

In rectangle ABCD, diagonals \overline{AC} and \overline{BD} intersect at point E. If $AE = 20$ and $BD = 2x + 30$, find x .

Example 6

In rectangle BOAT, $m\angle B = 2x + 10$. Find x .

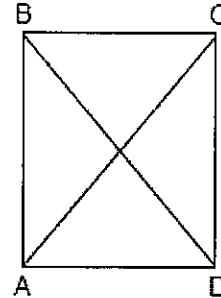
Example 7

In rectangle ABCD, $AB = 5$, $BC = 12$. Find BD .

1. A builder is building a rectangular deck with dimensions of 16 feet by 30 feet. To ensure that the sides form 90° angles, what should each diagonal measure?
- 1) 16 ft
 - 2) 30 ft
 - 3) 34 ft
 - 4) 46 ft

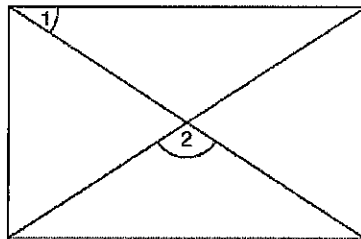
2. In the accompanying diagram of rectangle $ABCD$, $m\angle BAC = 3x + 4$ and $m\angle ACD = x + 28$. What is $m\angle CAD$?

- 1) 12
- 2) 37
- 3) 40
- 4) 50



3. In rectangle $ABCD$, $AC = 3x + 15$ and $BD = 4x - 5$. Find the length of \overline{AC} .

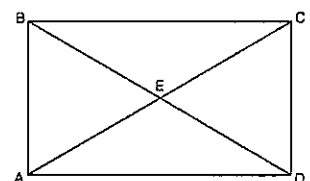
4. As shown in the accompanying diagram, a rectangular gate has two diagonal supports. If $m\angle 1 = 42$, what is $m\angle 2$?



5. Al says, "If $ABCD$ is a parallelogram, then $ABCD$ is a rectangle." Sketch a quadrilateral $ABCD$ that shows that Al's statement is *not* always true. Your sketch must show the length of each side and the measure of each angle for the quadrilateral you draw.

5. As shown in the diagram of rectangle $ABCD$ below, diagonals \overline{AC} and \overline{BD} intersect at E . If $AE = x + 2$ and $BD = 4x - 16$, then the length of \overline{AC} is

- 1) 6
- 2) 10
- 3) 12
- 4) 24



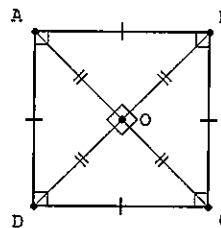
Unit 6 Lesson 6

Squares

Rhombus with a RIGHT angle

OR

Rectangle with 4 \cong sides



Example 1

If the side of a square is 5,
find the length of the diagonal to the nearest tenth.

Example 2

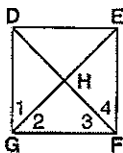
What is the length of a side of a square whose diagonal measures $4\sqrt{2}$?

Example 3

The perimeter of a square is 56.
Express the length of a diagonal of
the square in simplest radical form.

Example 4

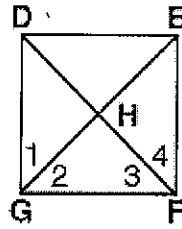
In the diagram below, DEFG is a square with diagonals \overline{GE} and \overline{DF} .



If $DE = 5x - 14$ and $EF = 3x - 6$, find the value of x .

Example 5

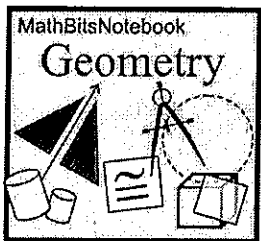
In the diagram below, DEFG is a square with diagonals \overline{GE} and \overline{DF} .



Find $m\angle 2$.

SUMMARY QUESTIONS

6. Which statement about a figure ABCD would *always* be true? (2 answers)
- A) If ABCD is a parallelogram, then it must be a quadrilateral.
 - B) If ABCD is a rectangle, then it must be a square.
 - C) If ABCD is a parallelogram, then it must be a trapezoid.
 - D) If ABCD is a quadrilateral, then it must be a parallelogram.
7. A parallelogram must be a **kite** if the
- A) diagonals are perpendicular
 - B) opposite angles are congruent
 - C) diagonals are congruent
 - D) opposite sides are congruent
8. Which figure does *not always* have congruent diagonals?
- A) rhombus
 - B) square
 - C) rectangle
 - D) isosceles trapezoid
9. Which statement is *always* true?
- A) A rectangle is a parallelogram.
 - B) A quadrilateral is a trapezoid.
 - C) A rhombus is a square.
 - D) A trapezoid is a parallelogram.
10. A parallelogram must be a rectangle when its
- 1 diagonals are perpendicular
 - 2 diagonals are congruent
 - 3 opposite sides are parallel
 - 4 opposite sides are congruent

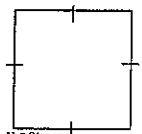


Numerical Practice with Quadrilaterals

Name _____

Directions: Read carefully.

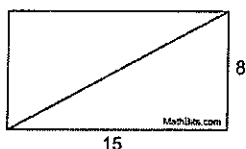
1. The area of a square is 100 square inches. What is the perimeter of the square in inches?



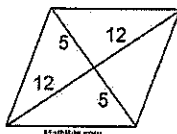
2. If one angle of a parallelogram is 70° , find the degrees in the remaining three angles.



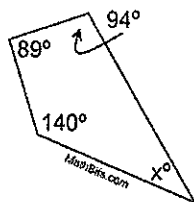
3. The length and width of a rectangle are 15 cm. and 8 cm. What is the length of the diagonal in centimeters?



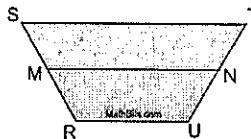
4. The diagonals of a rhombus are 10 units and 24 units. Find the perimeter of the rhombus.



5. Three angles of a quadrilateral measure 89° , 94° , and 140° . What is the measure of the fourth angle?



6. MN is the median of trapezoid $RSTU$. $MN = 42$ inches and $ST = 54$ inches. Find RU in inches.



ANSWERS

1. _____

2. _____

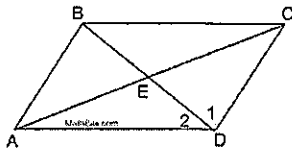
3. _____

4. _____

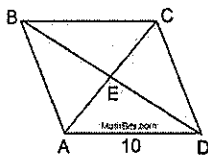
5. _____

6. _____

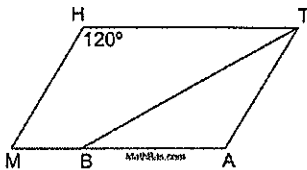
7. Given parallelogram $ABCD$ with diagonals \overline{AC} , \overline{BD} . If $m\angle 1 = 78^\circ$ and $m\angle BAD = 60^\circ$, find $m\angle 2$.



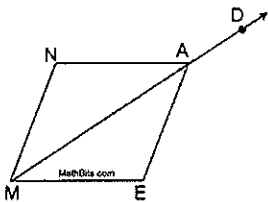
9. Given rhombus $ABCD$ with diagonals \overline{AC} , \overline{BD} . If $AD = 10$, and $AC = 12$, what is BD ?



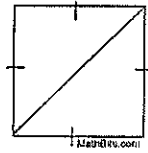
11. Given parallelogram $MATH$ with \overline{BT} bisecting $\angle HTA$. Find $m\angle MBT$.



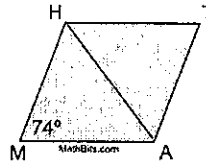
13. Given rhombus $MEAN$ with diagonal \overline{MA} extended through point D , and $m\angle E = 135^\circ$. Find $m\angle DAN$?



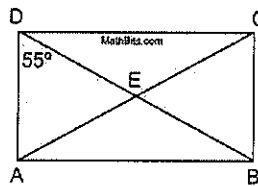
8. What is the perimeter of a square whose diagonal is $3\sqrt{2}$?



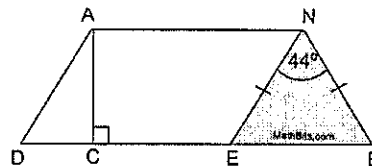
10. Given rhombus $MATH$ with $m\angle M = 74^\circ$. What is $m\angle MHA$?



12. Given rectangle $ABCD$, $m\angle ADB = 55^\circ$ and diagonals \overline{AC} and \overline{BD} . Find $m\angle AEB$.



14. Given parallelogram $DANE$ and isosceles $\triangle BEN$. $m\angle ENB = 44^\circ$ and \overline{AC} is an altitude. Find $m\angle DAC$.



ANSWERS

7. _____

8. _____

9. _____

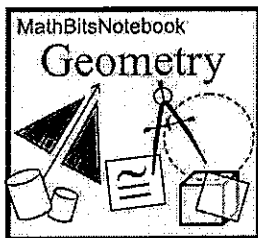
10. _____

11. _____

12. _____

13. _____

14. _____

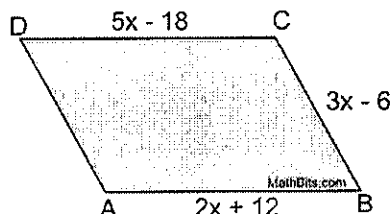


Algebraic Practice with Quadrilaterals

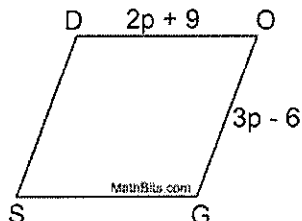
Name _____

Directions: Read carefully. Show your work.

1. The sides of parallelogram $ABCD$ are represented as shown. Find DA .

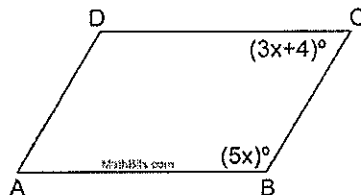


2. In rhombus $DOGS$, $DO = 2p + 9$ and $OG = 3p - 6$. Find GS .

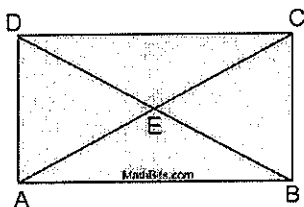


3. The perimeter of quadrilateral $ABCD$ is 46 inches. $AB = x + 8$, $BC = 2x + 1$, $CD = 3x - 6$, and $DA = 4x - 7$. Find the length of the shortest side of the quadrilateral.

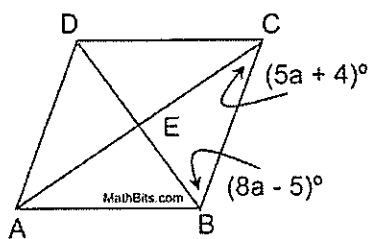
4. Given parallelogram $ABCD$ with $m\angle B = 5x$ and $m\angle C = 3x + 4$. Find the number of degrees in $\angle D$.



5. The diagonals of rectangle $ABCD$ intersect at E . $AE = x + 4$ and $CE = 3x - 12$. Find BD .



6. In rhombus $ABCD$, $m\angle ECB = 5a + 4$ and $m\angle EBC = 8a - 5$. Find $m\angle EBC$.



ANSWERS

1. _____

2. _____

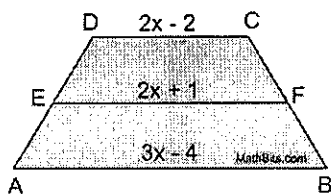
3. _____

4. _____

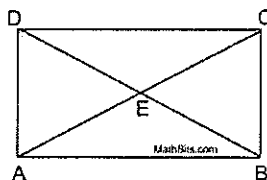
5. _____

6. _____

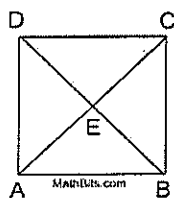
7. Given trapezoid $ABCD$ with median \overline{EF} (labeled as shown). Find EF .



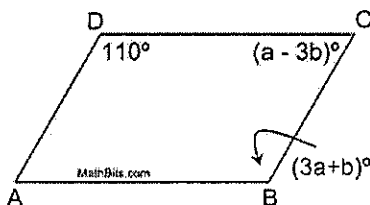
8. In rectangle $ABCD$, $AE = 3x + y$, $EC = 2x + y + 7$ and $DE = 2y + 3x - 1$. Find the values of x and y .



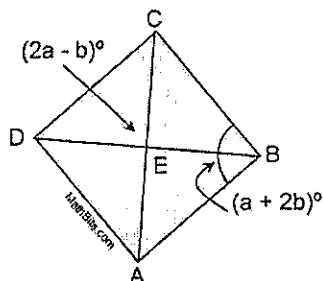
9. Given square $ABCD$ with diagonals \overline{AC} , \overline{BD} . If $DB = 7x + 1$ and $AE = 2x + 11$, find EB .



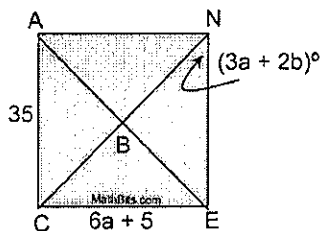
10. Given parallelogram $ABCD$, labeled as shown. Find a and b .



11. Given square $ABCD$ with diagonals \overline{AC} , \overline{BD} . The $m\angle DEC = 2a + b$ and $m\angle ABC = a + 2b$. Find a and b .



12. Given square $CANE$ with diagonals intersecting at B . $AC = 35$, $CE = 6a + 5$, and $m\angle CNE = 3a + 2b$. Find the value of $a + b$.



ANSWERS

7. _____

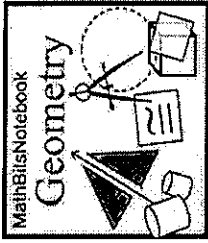
8. _____

9. _____

10. _____

11. _____

12. _____



Quadrilateral Properties Quiz

Name _____

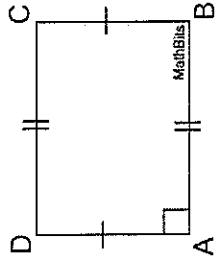
Directions: Read carefully and choose the best answer(s).

1. Which statement is true about every parallelogram?
 - a. The consecutive angles are congruent.
 - b. Two pairs of opposite sides are congruent.
 - c. The diagonals are perpendicular to each other.
 - d. All four sides are congruent.
2. Which reason can be used to prove that a parallelogram is a rhombus?
 - a. The opposite angles are congruent.
 - b. The diagonals are perpendicular.
 - c. The diagonals are congruent.
 - d. The opposite sides are parallel.
3. For which quadrilateral are the diagonals congruent but do not bisect each other?
 - a. rhombus
 - b. isosceles trapezoid
 - c. rectangle
 - d. parallelogram
4. For which quadrilaterals are the diagonals congruent? (Select ALL that apply.)
 - a. rhombus
 - b. square
 - c. rectangle
 - d. isosceles trapezoid
 - e. parallelogram
5. If the diagonals of a quadrilateral do NOT bisect each other, then the quadrilateral could be a
 - a. rectangle
 - b. trapezoid
 - c. square
 - d. rhombus

6. Which quadrilateral has diagonals that always bisect each other and also bisect its angles?
 - a. rhombus
 - b. isosceles trapezoid
 - c. rectangle
 - d. parallelogram
7. For which quadrilaterals are all of its angles congruent. (Select ALL that apply.)
 - a. rhombus
 - b. square
 - c. rectangle
 - d. trapezoid
 - e. parallelogram
8. The diagonals of a square ...
 - a. bisect each other.
 - b. are congruent.
 - c. are perpendicular.
 - d. bisect the angles.
9. The diagonals of a trapezoid are ____ congruent.
 - a. always
 - b. sometimes
 - c. never
10. The diagonals of a rectangle ____ bisect each other.
 - a. always
 - b. sometimes
 - c. never
11. Which statements describe the properties of a rhombus? (Select ALL that apply.)
 - a. The diagonals bisect the angles.
 - b. The diagonals bisect each other.
 - c. The opposite sides are parallel.
 - d. The opposite angles are congruent.
 - e. The diagonals are congruent.
 - f. The diagonals are perpendicular.

Answers
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____

12. Which of the following "names" can be appropriately applied to the diagram at the right? (Select ALL that apply.)



- a. quadrilateral
- b. parallelogram
- c. rhombus
- d. rectangle
- e. square
- f. trapezoid

13. Which statement does NOT guarantee that a quadrilateral is a square.

- a. The quadrilateral is both a rhombus and a rectangle.
- b. The quadrilateral has 4 right angles and 4 congruent sides.
- c. The quadrilateral is a parallelogram with perpendicular diagonals.
- d. The quadrilateral has 4 congruent sides and 4 congruent angles.

14. Which of the following quadrilaterals have at least one pair of opposite sides parallel? (Select ALL that apply.)

- a. rhombus
- b. square
- c. rectangle
- d. trapezoid
- e. parallelogram

15. A quadrilateral must be a parallelogram if one pair of opposite sides is ...

- a. congruent only.
- b. parallel only.
- c. both congruent and parallel.
- d. parallel and the other pair of opposite sides is congruent.

16. Which property is true for all trapezoids?

- a. The consecutive angles are supplementary.
- b. The base angles are congruent.
- c. The diagonals are congruent.
- d. One pair of opposite sides are parallel.

17. Which of the following statements is NOT true for a parallelogram?

- a. Its opposite sides are congruent.
- b. Its opposite angles are congruent.
- c. Its diagonals bisect each other.
- d. Its opposite angles are bisected by the diagonals.

18. A rectangle is a square.

- a. True
- b. False

19. A square is a trapezoid.

- a. True
- b. False

20. Which of the following statements is false?

- a. All parallelograms are quadrilaterals.
- b. All squares are rectangles.
- c. All rhombuses are trapezoids.
- d. All rectangles are rhombuses.

Answers
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____