

## Quadrilaterals and Their Properties

### A 4-gon Hypothesis

## ACTIVITY 15

continued

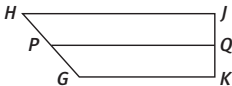
### ACTIVITY 15 PRACTICE

Write your answers on notebook paper.  
Show your work.

#### Lesson 15-1

- Tell whether each statement about kites is *always*, *sometimes*, or *never* true.
  - Exactly two pairs of consecutive sides are congruent.
  - The diagonals divide the kite into four congruent triangles.
  - The diagonals are perpendicular.
  - A kite is a parallelogram.
  - One diagonal bisects a pair of opposite angles.
  - A kite is a rhombus.

#### Lesson 15-2

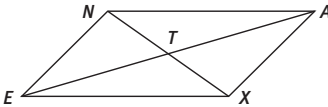
- Make a true statement by filling in each blank with *always*, *sometimes*, or *never*.
  - A trapezoid is \_\_\_\_\_ isosceles.
  - A trapezoid is \_\_\_\_\_ a quadrilateral.
  - The length of the median of a trapezoid is \_\_\_\_\_ equal to the sum of the lengths of the bases.
  - Trapezoids \_\_\_\_\_ have a pair of parallel sides.
  - Trapezoids \_\_\_\_\_ have two pairs of supplementary consecutive angles.
- Given quad  $GHJK$  is a trapezoid.  $\overline{PQ}$  is the median.
 

- If  $HJ = 40$  and  $PQ = 28$ , find  $GK$ .
- If  $HJ = 5x$ ,  $PQ = 5x - 9$ , and  $GK = 3x + 2$ , then solve for  $x$ .

- Given quad  $JONE$  is a trapezoid.
 

- $\angle ONJ \cong$  \_\_\_\_\_
- If  $\overline{OJ} \cong \overline{NE}$ , then  $\overline{OE} \cong$  \_\_\_\_\_.
- If  $\overline{OJ} \cong \overline{NE}$ , then  $\angle NEJ \cong$  \_\_\_\_\_.

#### Lesson 15-3

- Quadrilateral  $XENA$  is a parallelogram.  $T$  is the point of intersection of the diagonals. For each situation, write an equation and solve for  $y$ .
 

- $EN = 5y + 1$  and  $AX = 8y - 5$
- $m\angle ANX = 3y - 1$  and  $m\angle NXE = 2y + 1$
- $ET = y - 1$  and  $EA = 3y - 10$
- $m\angle ANE = 7y - 5$  and  $m\angle NEX = 3y + 5$

- $M$  is the fourth vertex of a parallelogram. The coordinates of the other vertices are  $(6, 4)$ ,  $(8, 1)$ , and  $(2, 0)$ .  $M$  can have any of the following coordinates except:
 

A. $(6, -2)$	B. $(12, 5)$
C. $(4, -3)$	D. $(0, 3)$
- Given quad  $QRST$  with coordinates  $Q(0, 0)$ ,  $R(2, 6)$ ,  $S(12, 6)$ , and  $T(12, 0)$ .
  - What is the best name for quad  $QRST$ ? Explain.
  - Find the coordinates of the midpoint for each side of quad  $QRST$  and label them  $M$ ,  $N$ ,  $O$ , and  $P$ . What is the best name for quad  $MNOP$ ? Explain.

## ACTIVITY 15 Continued

### ACTIVITY PRACTICE

- always
  - never
  - always
  - never
  - always
  - never
- sometimes
  - always
  - never
  - always
  - always
- 16
  - $x = 10$
- $\angle NJE$
  - $\overline{NJ}$
  - $\angle OJE$
- $5y + 1 = 8y - 5$ ;  $y = 2$
  - $3y - 1 = 2y + 1$ ;  $y = 2$
  - $2(y - 1) = 3y - 10$ ;  $y = 8$
  - $7y - 5 + 3y + 5 = 180$ ;  $y = 18$
- A
- trapezoid; Quad  $QRST$  has only one pair of parallel sides.
  - parallelogram; Both pairs of opposite sides are parallel (or congruent).

## ACTIVITY 15 Continued

8. D  
 9.  $m\angle 1 = 32^\circ$ ;  $m\angle 2 = 90^\circ$ ;  
 $m\angle 3 = 58^\circ$ ;  $m\angle 4 = 32^\circ$   
 10. a. 36  
 b. 4.5  
 11. Sample proof:  $\overline{PQ} \parallel \overline{SR}$  and  $\overline{PS} \parallel \overline{QR}$   
 (definition of parallelogram);  
 $\angle PRS \cong \angle RPQ$  and  $\angle RPS \cong \angle QRP$   
 (if lines are parallel, alternate interior angles are congruent);  
 $\overline{PR} \cong \overline{PR}$  (reflexive property);  
 $\triangle PQR \cong \triangle RSP$  (ASA).

12.

Statements	Reasons
1. Quad $WIND$ is a rhombus	1. Assumption
2. $WI = IN$	2. Definition of a rhombus
3. $\triangle WIN$ is isosceles	3. Def of isosceles triangle
4. $\triangle WIN$ is not isosceles	4. Given
5. Quad $WIND$ is not a rhombus	5. The assumption led to a contradiction between steps 3 and 4.

13. Sample answer: The legs of Ginger's piano stand are congruent and connected at the midpoint of each leg. Therefore, the four vertices form a rectangle, which would guarantee the keyboard to be parallel to the floor and centered over the diagonals (legs).

### ADDITIONAL PRACTICE

If students need more practice on the concepts in this activity, see the Teacher Resources at SpringBoard Digital for additional practice problems.

## ACTIVITY 15

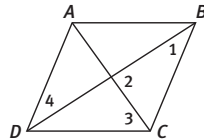
continued

## Quadrilaterals and Their Properties

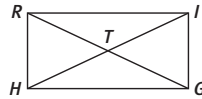
A 4-gon Hypothesis

### Lesson 15-4

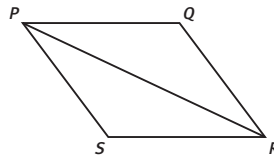
8. Given quad  $WHAT$  with vertices  $W(2, 4)$ ,  $H(5, 8)$ ,  $A(9, 5)$ , and  $T(6, 1)$ . What is the best name for this quadrilateral?  
 A. parallelogram      B. rhombus  
 C. rectangle          D. square  
 9. Given quad  $ABCD$  is a rhombus and  $m\angle ABD = 32^\circ$ . Find the measure of each numbered angle.



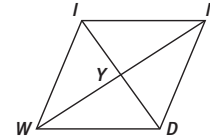
10. Given quad  $RIGH$  is a rectangle.



- a. If  $RT = 18$ , then  $RG = \underline{\hspace{2cm}}$ .  
 b. If  $RG = 4x + 12$  and  $HI = 10x - 15$ , then  $x = \underline{\hspace{2cm}}$ .  
 11. Given: Parallelogram  $PQRS$  with diagonal  $PR$ .  
 Prove:  $\triangle PQR \cong \triangle RSP$



12. Write an indirect proof.  
 Given:  $\triangle WIN$  is not isosceles.  
 Prove: Quad  $WIND$  is not a rhombus.



### MATHEMATICAL PRACTICES

#### Reason Abstractly and Quantitatively

13. Ginger noticed that no matter the height of the adjustable stand for her electric piano, the keyboard remains level and centered over the stand. What has to be true about the legs of the stand? Explain.

