

6-6

Trapezoids and Kites

To verify and use properties of trapezoids and kites.



Vocabulary

● Review

Underline the correct word to complete each sentence.

1. An *isosceles* triangle always has two three congruent sides.
2. An equilateral triangle is also a(n) isosceles right triangle.
3. Cross out the length(s) that can NOT be side lengths of an *isosceles* triangle.

~~2, 4, 5~~

8, 8, 10

3.6, 5, 3.6

7, 11, 11

Vocabulary Builder

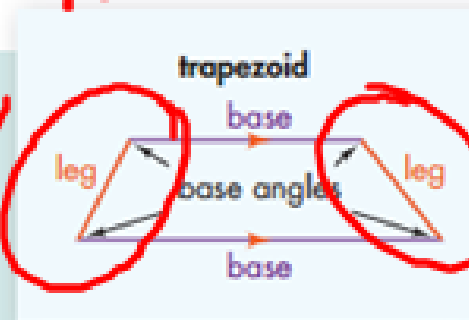
trapezoid (noun) TRAP ih zoyd

Related Words: base, leg

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

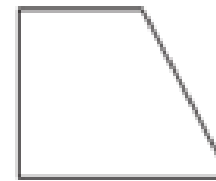
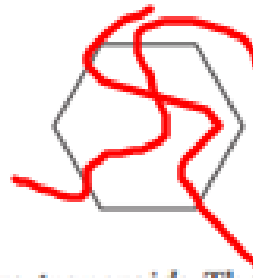
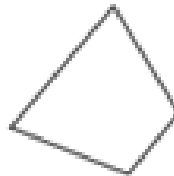
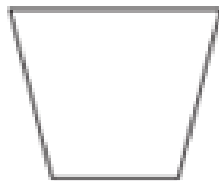
Main Idea: The parallel sides of a trapezoid are called *bases*. The nonparallel sides are called *legs*. The two angles that share a base of a trapezoid are called *base angles*.

Supp b/c SS - Int L's

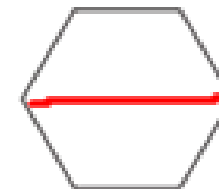
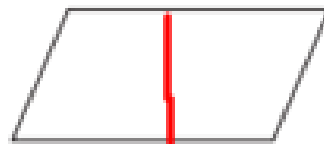
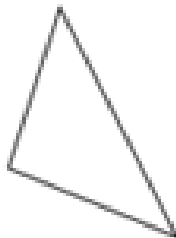


Use Your Vocabulary

4. Cross out the figure that is NOT a *trapezoid*.



5. Circle the figure(s) that can be divided into two *trapezoids*. Then divide each figure that you circled into two *trapezoids*.



take note

Theorems 6-19, 6-20, and 6-21

Props. of Trapezoids

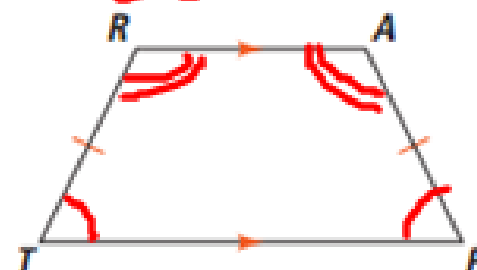
Isosceles

Theorem 6-19 If a quadrilateral is an isosceles trapezoid, then each pair of base angles is congruent.

Theorem 6-20 If a quadrilateral is an isosceles trapezoid, then its diagonals are congruent.

6. If $TRAP$ is an isosceles trapezoid with bases \overline{RA} and \overline{TP} , then $\angle T \cong \angle P$ and $\angle R \cong \angle A$.

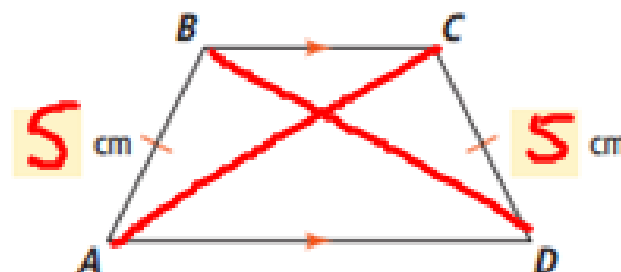
7. Use Theorem 6-19 and your answers to Exercise 6 to draw congruence marks on the trapezoid at the right.



8. If $ABCD$ is an isosceles trapezoid, then $\overline{AC} \cong \overline{BD}$.

* 9. If $ABCD$ is an isosceles trapezoid and $AB = 5$ cm, then $CD = 5$ cm. (\cong Legs)

10. Use Theorem 6-20 and your answer to Exercises 8 and 9 to label the diagram at the right.



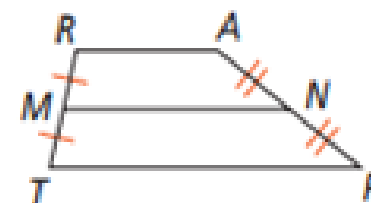
~~Theorem 6-21~~ **Trapezoid Midsegment Theorem** If a quadrilateral is a trapezoid, then

- (1) the midsegment is parallel to the bases, and
- (2) the length of the midsegment is half the sum of the lengths of the bases.

11. If $TRAP$ is a trapezoid with midsegment \overline{MN} , then

$$(1) \overline{MN} \parallel \overline{RA} \parallel \overline{TP}$$

$$(2) MN = \frac{1}{2} (\overline{RA} + \overline{TP})$$





Problem 2 Finding Angle Measures in Isosceles Trapezoids

Got It? A fan has 15 angles meeting at the center. What are the measures of the base angles of the congruent isosceles trapezoids in its second ring?

Use the diagram at the right for Exercises 12-16.

12. Circle the number of isosceles triangles in each wedge. Underline the number of isosceles trapezoids in each wedge.

one two three four

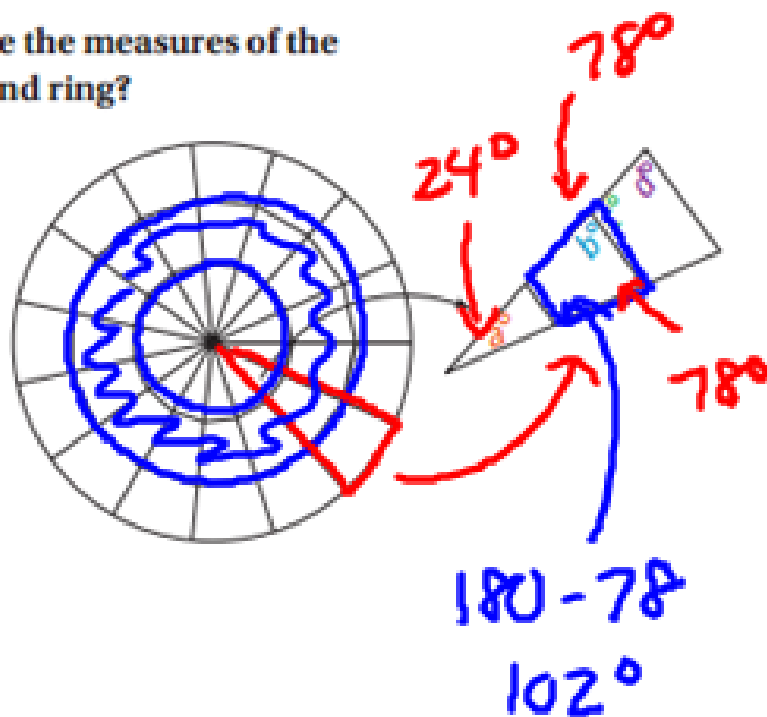
13. $a = 360 \div 15 = 24$ $\odot = 360^\circ$

14. $b = \frac{180 - 24}{2} = 78$ $\text{Isos } \Delta$

15. $c = 180 - \square = \square$

16. $d = 180 - \square = \square$

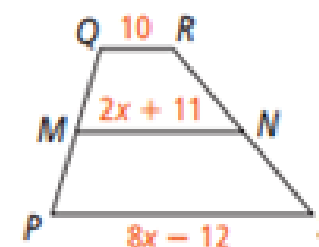
17. The measures of the base angles of the isosceles trapezoids are 78° and 102°





Problem 3 Using the Midsegment Theorem

Got It? Algebra \overline{MN} is the midsegment of trapezoid $PQRS$. What is x ? What is MN ?



18. The value of x is found below. Write a reason for each step.

$$MN = \frac{1}{2}(QR + PS)$$

$$2x + 11 = \frac{1}{2}[10 + (8x - 12)]$$

$$2x + 11 = \frac{1}{2}(8x - 2)$$

$$2x + 11 = 4x - 1$$

$$2x + 12 = 4x$$

$$12 = 2x$$

$$6 = x$$

Trap Midseg. Thm

19. Use the value of x to find MN .

$$MN = 2(6) + 11 \quad MN = 23$$

A kite is a quadrilateral with two pairs of consecutive sides congruent and no opposite sides ~~congruent~~ parallel.

take note

~~Theorem 6-22~~

Prop. of Kite

Theorem 6-22 If a quadrilateral is a kite, then its diagonals are perpendicular.

20. If $ABCD$ is a kite, then $\overline{AC} \perp \overline{BD}$.

21. Use Theorem 6-22 and Exercise 20 to draw congruence marks and right angle symbol(s) on the kite at the right.





Problem 4 Finding Angle Measures in Kites

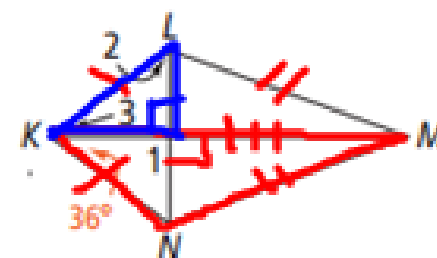
Got It? Quadrilateral $KLMN$ is a kite. What are $m\angle 1$, $m\angle 2$, and $m\angle 3$?

22. Diagonals of a kite are perpendicular, so $m\angle 1 = 90^\circ$

23. $\triangle KNM \cong \triangle KLM$ by SSS, so $m\angle 3 = m\angle NKM = 36^\circ$

24. $m\angle 2 = m\angle 1 - m\angle$ by the Triangle Exterior Angle Theorem.

25. Solve for $m\angle 2$.



$$\angle 2 + 36 + 90 = 180$$

$$\angle 2 + 126 = 180$$

$$\begin{array}{r} -126 \\ -126 \\ \hline \end{array}$$

$$\angle 2 = 54^\circ$$



Lesson Check • Do you UNDERSTAND?

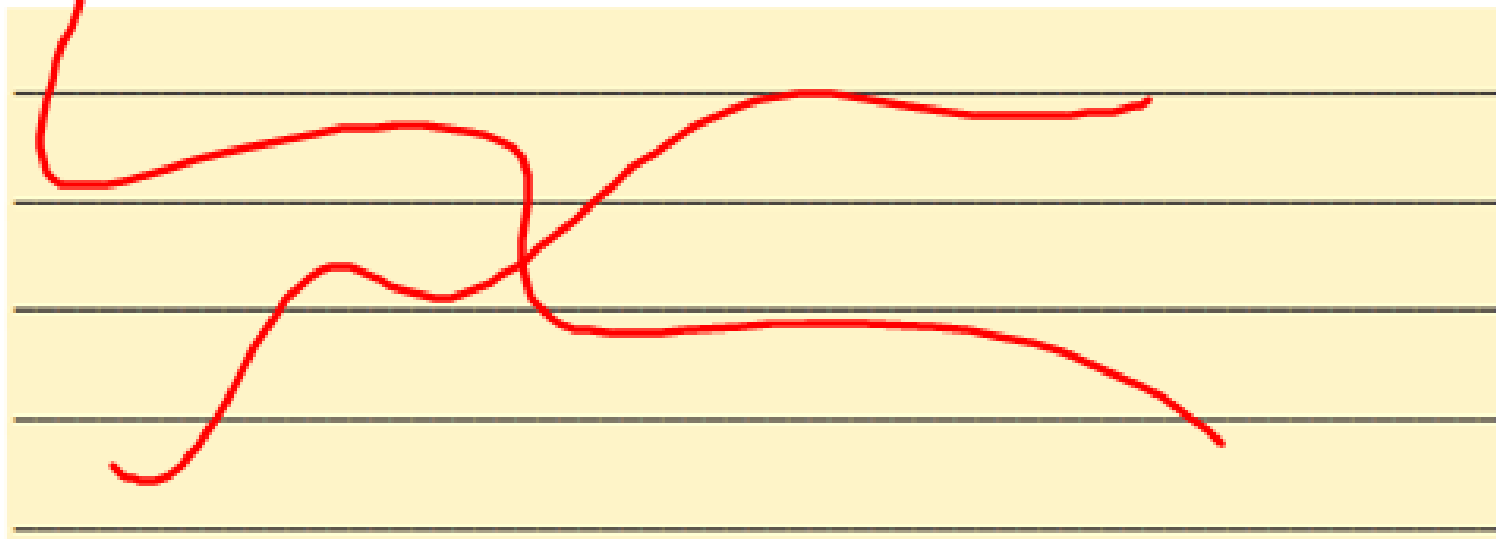
Compare and Contrast How is a kite similar to a rhombus? How is it different? Explain.

26. Place a ✓ in the box if the description fits the figure. Place an ✗ if it does not.

Kite	Description	Rhombus
<input checked="" type="checkbox"/>	Quadrilateral	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Perpendicular diagonals	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Each diagonal bisects a pair of opposite angles.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Congruent opposite sides	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Two pairs of congruent consecutive sides	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Two pairs of congruent opposite angles	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Supplementary consecutive angles	<input checked="" type="checkbox"/>

(All 4 \cong)

27. How is a kite similar to a rhombus? How is it different? Explain.

A yellow notepad with horizontal lines. A red squiggle is drawn across the lines, starting from the top left, curving down, then up, then down again, and finally curving up towards the right. The squiggle is a continuous, fluid line that does not form any specific geometric shape.



Math Success

Check off the vocabulary words that you understand.

☐

trapezoid

☐

kite

☐

base

☐

leg

☐

midsegment

Rate how well you can use *properties of trapezoids and kites*.

Need to
review

0

2

4

6

8

10

Now I
get it!

HOMEWORK

BASIC: p. 394 #7-24, 26-34even, 46-49, 74

AVERAGE: p. 394 #7-23odd, 25-62, 74

Interactmath.com