December 6, 2017

6-6 Trapezoids and Kites

Content Standard
G.SRT.5 Use congruence . . . criteria to solve problems and prove relationships in geometric figures.

Objective To verify and use properties of trapezoids and kites

A **trapezoid** is a quadrilateral with exactly one pair of parallel sides. 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.** A trapezoid has two pairs of base angles.

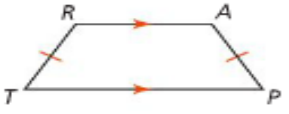
An **isosceles trapezoid** is a trapezoid with legs that are congruent. $ABCD$ at the right is an isosceles trapezoid. The angles of an isosceles trapezoid have some unique properties.

take note

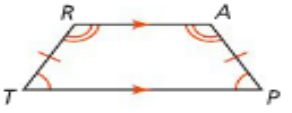
Theorem 6-19

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

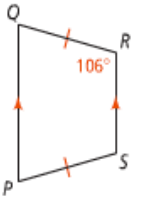
If . . .
$TRAP$ is an isosceles trapezoid with bases $\overline{RA}$ and $\overline{TP}$



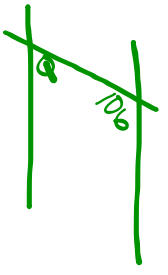
Then . . .
$\angle T \cong \angle P$, $\angle R \cong \angle A$



Got It? 1. a. In the diagram, $PQRS$ is an isosceles trapezoid and $m\angle R = 106$. What are $m\angle P$, $m\angle Q$, and $m\angle S$?



$\angle S = 106°$

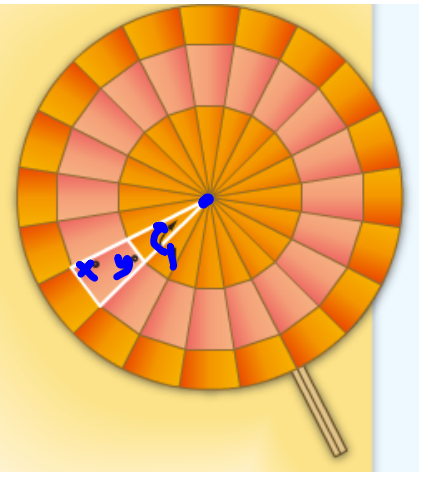


$m\angle Q + 106 = 180$

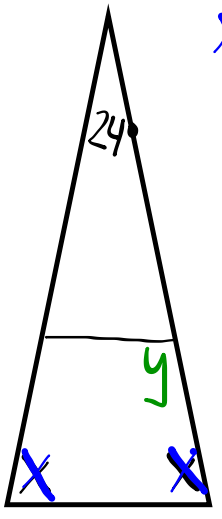
$m\angle Q = 74°$

$m\angle P = 74°$

Got It? **2.** A fan like the one in Problem 2 has 15 angles meeting at the center. What are the measures of the base angles of the trapezoids in its second ring?



$\angle 1 = \frac{360}{15} = 24°$



$x + x + 24 = 180$

$2x + 24 = 180$

$2x = 156$

$x = 78°$

$y + 78 = 180$

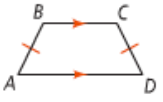
$y = 102°$

take note

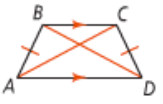
Theorem 6-20

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

If . . .
$ABCD$ is an isosceles trapezoid

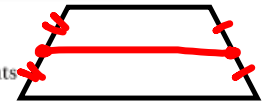


Then . . .
$\overline{AC} \cong \overline{BD}$



You will prove Theorem 6-20 in Exercise 54.

In Lesson 5-1, you learned about midsegments of triangles. Trapezoids also have midsegments. The **midsegment of a trapezoid** is the segment that joins the midpoints of its legs. The midsegment has two unique properties.

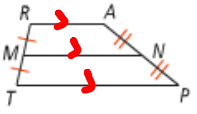


take note

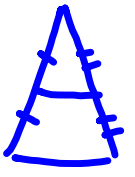
Theorem 6-21 Trapezoid Midsegment Theorem

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.

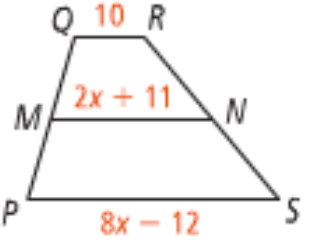
If . . .
$TRAP$ is a trapezoid with midsegment $\overline{MN}$



Then . . .
(1) $\overline{MN} \parallel \overline{TP}$, $\overline{MN} \parallel \overline{RA}$, and
(2) $MN = \frac{1}{2}(TP + RA)$



Got It? 3. a. **Algebra** $\overline{MN}$ is the midsegment of trapezoid $PQRS$. What is x? What is MN?



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

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

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

$2x+11 = 4x-1$

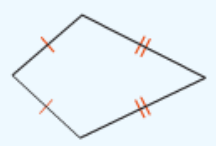
$11 = 2x-1$

$12 = 2x$

$6 = x$

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

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

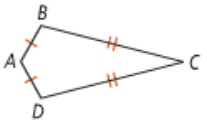


take note

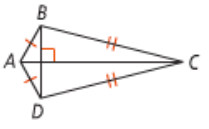
Theorem 6-22

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

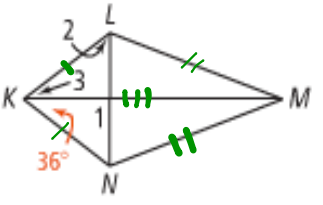
If . . .
ABCD is a kite



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



Got It? 4. Quadrilateral *KLMN* is a kite. What are $m\angle 1$, $m\angle 2$, and $m\angle 3$?



$\angle 1 = 90°$

$\angle 3 = 36°$

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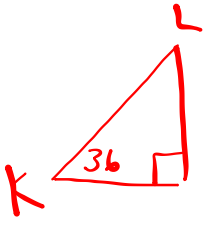

$36 + 90 + m\angle 2 = 180$

$126 + m\angle 2 = 180$

$m\angle 2 = 54°$

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Name

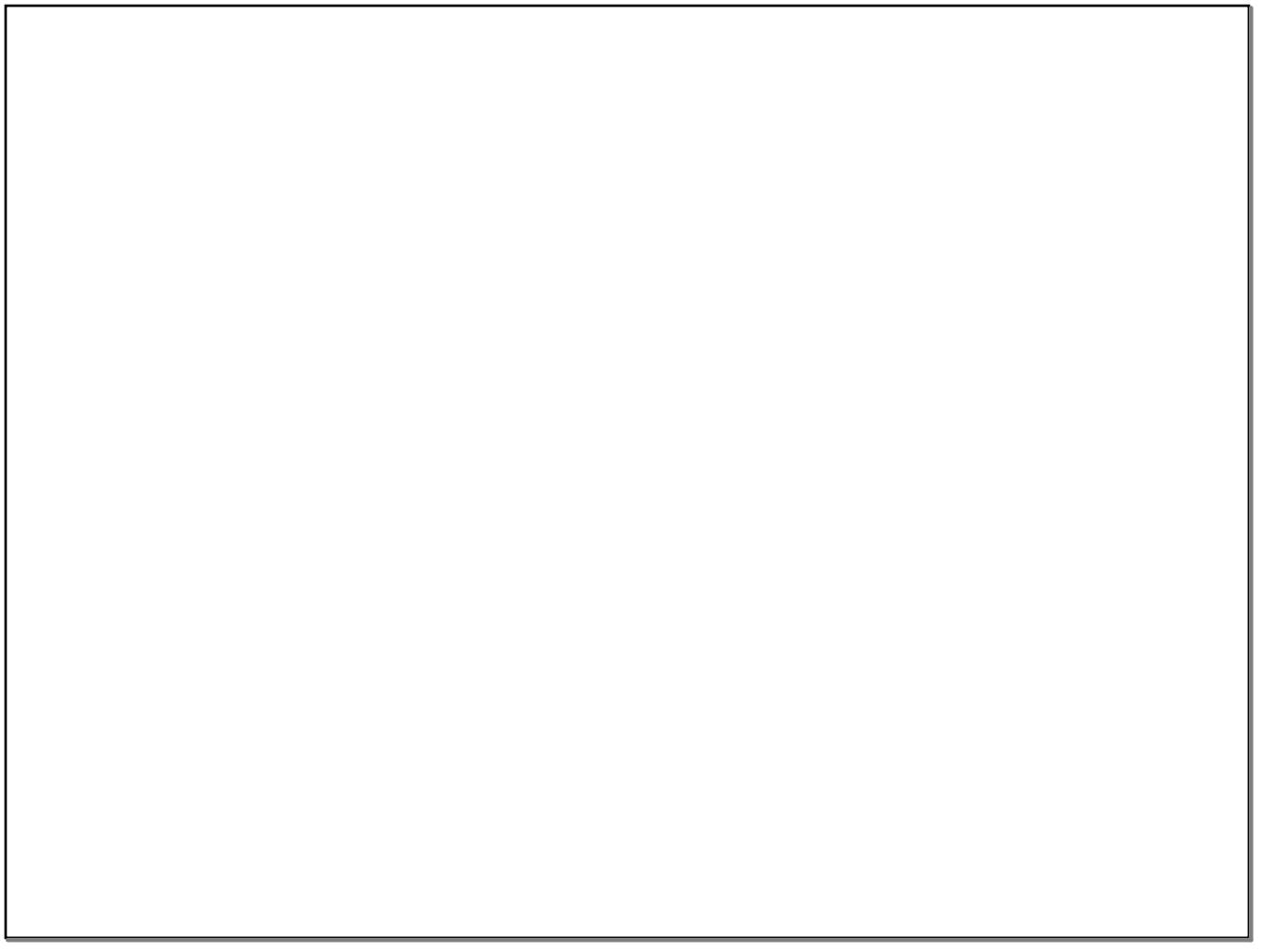
6.6

pg. 394-396 # 8-24 even

28-36 even

39-44

47-52

57-62

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