

Section 8.5: Use Properties of Trapezoids and Kites

Essential Question:

What are the main properties of trapezoids and kites?

VOCABULARY:

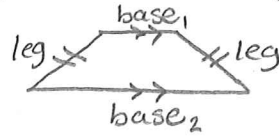
Trapezoid

A quadrilateral with exactly one pair of parallel sides called the bases



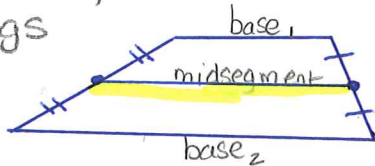
Isosceles trapezoid

A trapezoid with congruent legs



Midsegment of a trapezoid

connects the midpoints of the legs

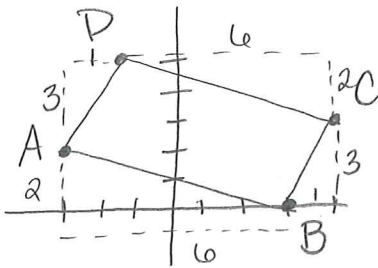


Kite

A quadrilateral that has 2 pairs of consecutive congruent sides, but opposite sides are NOT congruent



A1. Determine if ABCD is a trapezoid given: A(-3, 2), B(3, 0), C(4, 3), D(-2, 5)



Find the slope of each side

$$m = \frac{y_1 - y_2}{x_1 - x_2}$$

$$m(AB) = \frac{-2}{6} = -\frac{1}{3}$$

$$m(DC) = \frac{-2}{6} = -\frac{1}{3}$$

$$m(AD) = \frac{1}{3}$$

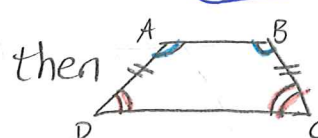
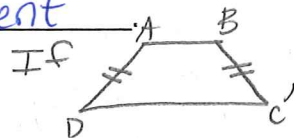
$$m(BC) = \frac{1}{3}$$

same

Theorem 8.14:

If a trapezoid is isosceles, then each

pair of base angles is congruent



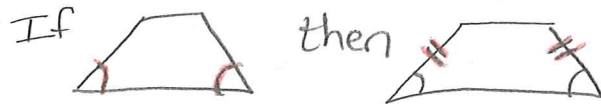
$$\angle A \cong \angle B$$

$$\angle D \cong \angle C$$

Theorem 8.15:

If a trapezoid has a pair of congruent base angles,

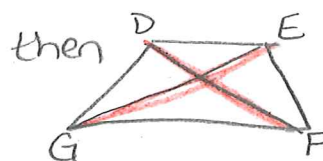
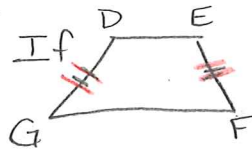
then it is an isosceles trapezoid.



Theorem 8.16:

A trapezoid is isosceles if and only if

its diagonals are congruent.



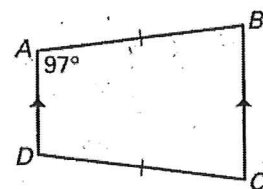
$$\overline{EG} \cong \overline{DF}$$

A2. Determine the measures of $\angle B$, $\angle C$, and $\angle D$.

$$m\angle D = 97^\circ \text{ (Thm 8.14)}$$

$$\angle A \ \& \ \angle B \text{ supp. } \angle B = 180 - 97 = m\angle B = 83^\circ$$

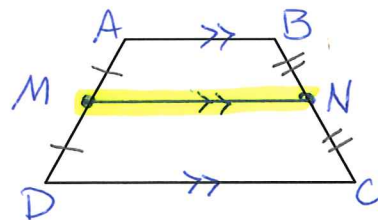
$$m\angle C = 83^\circ \text{ (Thm 8.14)}$$



$\angle A$ & $\angle B$ are consecutive int. angles \therefore supplementary

Theorem 8.17: Midsegment Theorem for Trapezoids

The midsegment of a trapezoid is parallel to each base and its length is the $\frac{1}{2}$ the sum of the base lengths.

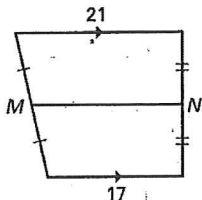


midsegment = $\frac{1}{2}(\text{base}_1 + \text{base}_2)$

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

A3. Is \overline{MN} the midsegment of the trapezoid? If so, find its length.

yes, M and N are midpts because bisect the legs



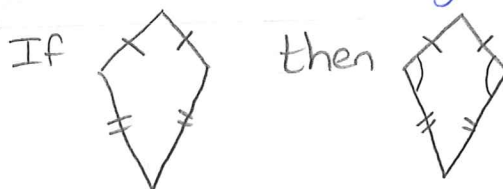
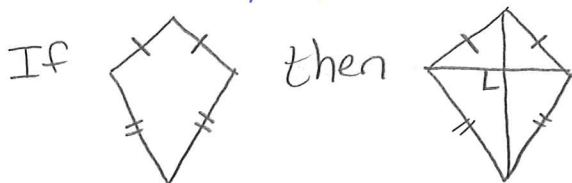
$MN = \frac{1}{2}(21 + 17)$

$MN = \frac{1}{2}(38) = 19$

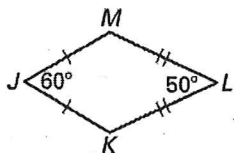
$MN = 19 \text{ un}$

Theorem 8.18:

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



A4. Find $m\angle K$ and $m\angle M$.



Quad int \angle sum = 360

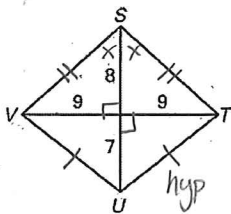
$$\begin{array}{r} 360 \\ - 60 \\ - 50 \\ \hline 250 \end{array}$$

$\angle K \cong \angle M$

$\frac{250}{2} = 125$

$m\angle K = m\angle M = 125^\circ$

A5. Find $m\angle VST$ and UT .

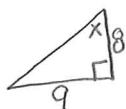


$7^2 + 9^2 = (UT)^2$

$130 = (UT)^2$

$UT = \sqrt{130}$

$UT \approx 11.4 \text{ un}$



$\tan x = \frac{9}{8}$

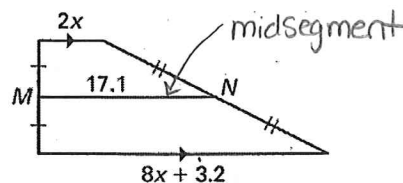
$m\angle x = \tan^{-1}(\frac{9}{8})$

$m\angle x = 48.37$

$\frac{48.37}{2}$

$m\angle VST = 96.73^\circ$

A6. Find the value of x.



midseg = $\frac{1}{2}(\text{base}_1 + \text{base}_2)$

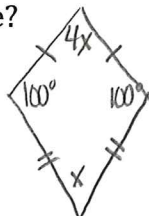
$17.1 = \frac{1}{2}(2x + 8x + 3.2)$

$17.1 = \frac{1}{2}(10x + 3.2)$

$34.2 = 10x + 3.2$

$x = 3.1$

A7. You cut a piece of fabric in the shape of a kite so that the congruent angles of the kite are 100° . Of the remaining angles, one is 4 times larger than the other. What is the measure of the larger angle?



$100 + 100 + x + 4x = 360$ ← all Quads have sum of 360°

$200 + 5x = 360$

$\frac{5x}{5} = \frac{160}{5} \quad x = 32$

$x = 32^\circ$
 $4x = 4(32) = 128^\circ$ (large)

Summary 8.5:

Trapezoids have one pair of \parallel sides called bases.

Isosceles trapezoids have \cong legs, \cong base angles, \cong diagonals

Kites have 2 pairs of consecutive \cong sides, \perp diagonals, and one pair of \cong opposite angles.