NOTES 7.5: TRAPEZOIDS & KITES

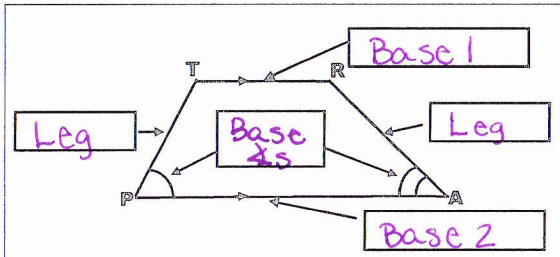
Objective: I can use properties of trapezoids & kites to find side lengths & ∡ measures.

TRAPEZOID: A quadrilateral with one pair of parallel sides

BASES: The parallel sides

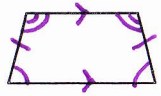
LEGS: The non-parallel sides

BASE ANGLES: The ∡s at the bases



- ∡ T & ∡ P are supplementary
- ∡ R & ∡ A are supplementary

ISOSCELES TRAPEZOID: A trapezoid in which the legs are ≅.

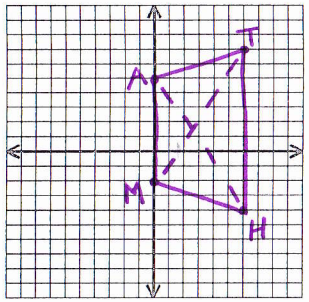


*The base angels of an isosceles trapezoid are congruent.

The diagonals of an isosceles trapezoid also have a special relationship...

Graph the isosceles trapezoid MATH by plotting the points:
M(0, −2); A(0, 5); T(6, 7); H(6, −4).

$d = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$



Name the diagonals of trapezoid MATH:

$\overline{MT}$ & $\overline{AH}$

Find the length of each diagonal:

$MT = \sqrt{(6-0)^2+(7+2)^2}$

$= \sqrt{36+81}$

$= \sqrt{117}$

$AH = \sqrt{(0-6)^2+(5+4)^2}$

$= \sqrt{36+81}$

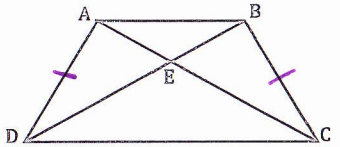
$= \sqrt{117}$

What can you say about the length of each diagonal? They are =.

What conclusion can you make? The diagonals of an isosceles trapezoid are ≅.

EXAMPLE 1:

ABCD is an isosceles trapezoid. Decide whether each statement is TRUE or FALSE and explain.



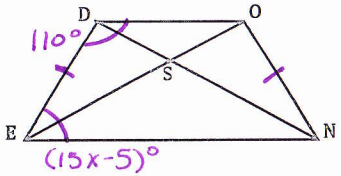
a) AC = BD True - Diagonals ≅

b) $\overline{AD} \cong \overline{BC}$ True - Legs ≅

c) $\overline{CA}$ and $\overline{BD}$ bisect each other False - Not a parallelogram

EXAMPLE 2:

DONE is an isosceles trapezoid. $m\angle EDO = 110°$ and $m\angle DEN = (15x - 5)°$. Find the value of 'x'.



Con These ∡s are supplementary!

$110 + 15x - 5 = 180$

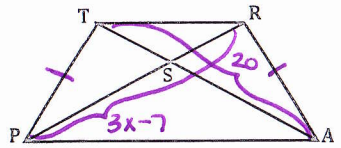
$15x + 105 = 180$

$15x = 75$

$x = 5$

EXAMPLE 3:

TRAP is an isosceles trapezoid. PR = $3x - 7$ and TA = 20. Find the value of 'x'.



Diagonals are ≅!

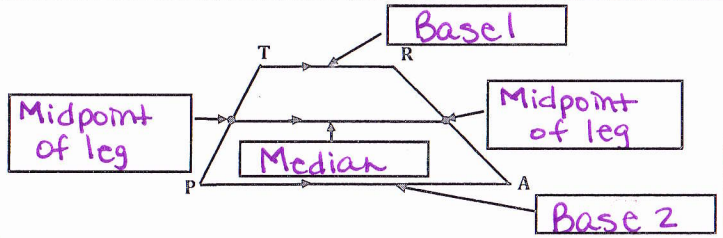
$3x - 7 = 20$

$3x = 27$

$x = 9$

Notes 7.5 (Continued)

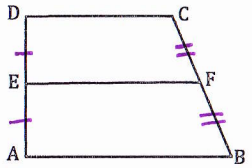
MEDIAN: The segment that joins the midpoints of the legs



MEDIAN = $\frac{\text{Base 1} + \text{Base 2}}{2}$

EXAMPLE 4:

In trapezoid ABCD, $\overline{EF}$ is a median. Find each of the following.



a) AB = 25, DC = 13, EF = 19 (Base 2, Base 1)

$\frac{13+25}{2} = \frac{38}{2} = 19$

b) AE = 11, FB = 8, AD = 22, BC = 16

c) AB = 29, EF = 24, DC = 19 (Base 2, Median)

$24 = \frac{DC+29}{2}$ $\quad 48 = DC+29$ $\quad 19 = DC$

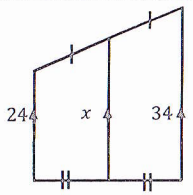
d) $AB = 7y+6$, $EF = 5y-3$, $DC = y-2$, $y =$ 5 (Base 2, Median, Base 1)

$5y-3 = \frac{7y+6+y-2}{2}$ $\quad 2(5y-3) = 7y+6+y-2$ $\quad 10y-6 = 8y+4$ $\quad 2y = 10$ $\quad y = 5$

EXAMPLE 5:

Find the value of 'x' for the trapezoid.

$x = \frac{24+34}{2} = \frac{58}{2} = 29$

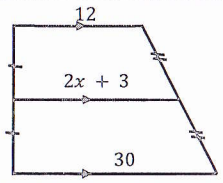


EXAMPLE 6:

Find the value of 'x' for the trapezoid.

$2x+3 = \frac{12+30}{2}$ $\quad 2x = 18$ $\quad x = 9$

$2x+3 = 21$



To summarize, what can we say about all trapezoids?

1) One pair of parallel sides

2) Median = $\frac{\text{Base 1} + \text{Base 2}}{2}$

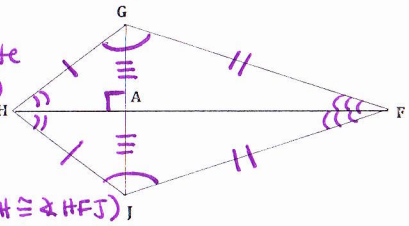
In addition to these, what can we say about isosceles trapezoids?

1) Legs are $\cong$

2) Diagonals are $\cong$

3) Base $\angle$s are $\cong$ (2 pairs)

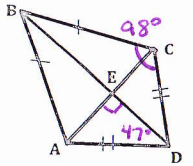
KITE: A quadrilateral that has 2 pairs of consecutive $\cong$ sides



* Exactly one pair of opposite $\angle$s is $\cong$. ($\angle HGF \cong \angle HJF$)
* Diagonals are $\perp$. ($\overline{GJ} \perp \overline{HF}$)
* Long diagonal bisects short diagonal & opposite $\angle$s. ($\overline{GA} \cong \overline{AJ}$ & $\angle GHF \cong \angle FHJ$ & $\angle GFH \cong \angle HFJ$)

Example 1:

In kite ABCD, $m\angle BCD = 98°$ and $m\angle ADE = 47°$. Find each measure.



$m\angle DAE =$ 43°

$m\angle BCE =$ 55°

$m\angle ABC =$ 70°

Diagonals are $\perp$.

$m\angle DAE = 90-47$

$m\angle DAE = m\angle DCE$

$m\angle BCD - m\angle DCE = m\angle BCE$

$98-43 = m\angle BCE$

$m\angle BCE = m\angle BAE$

$180 = m\angle BCE + m\angle BAE + m\angle ABC$

$180 = 55+55+m\angle ABC$