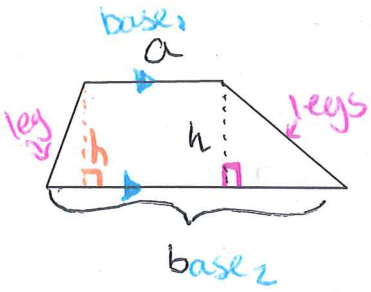
Geometry Notes; Lesson 8.6 ***Trapezoids*** *(+area)* Name 2nd hour Date _____

GOALS:
- Recognize and apply properties trapezoids and isosceles trapezoids.
- Recognize and apply properties of the median of a trapezoid.

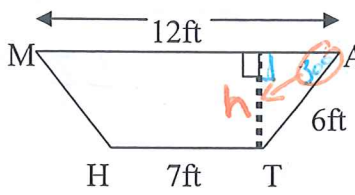
**Trapezoid:**

*Label the parts of this trapezoid:*




**Area of a trapezoid:** $A = \left(\frac{b_1+b_2}{2}\right)\cdot h$

*Find the area of this trapezoid if* $m\angle A = 30°$




$\text{Area} = \left(\frac{7+12}{2}\right)\cdot h$

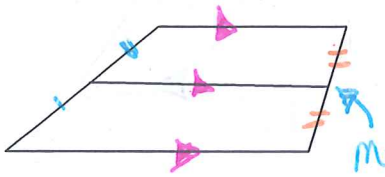
$= \left(\frac{19}{2}\right)\cdot h$

$= 9.5 \cdot h$

$= 9.5 \cdot 3$

$\text{Area}_{\triangle} = 28.5\ ft^2$

**median (midsegment) of a trapezoid:**



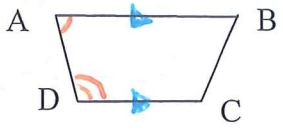
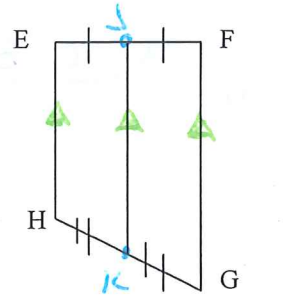

$1 : \sqrt{3} : 2$

$\times 3 \quad \times 3 \quad \times 3$

short : long : hypotenuse

$3 : 3\sqrt{3} : 6$

$h = 3$

| Properties of *ALL* Trapezoids | Example | Figure |
|---|---|---|
| 1. Bases are parallel (∥). | $\overline{AB} \parallel \overline{DC}$ |   |
| 2. Consecutive angles joined by the legs are Supplementary. | $\angle A + \angle D = 180$ <br> $\angle B + \angle C = 180$ | |
| 3. A trapezoid's median <br>• is parallel to bases (∥) <br>• has length = average of bases $\left(\frac{b_1+b_2}{2}\right)$ | $\overline{EH} \parallel \overline{FG} \parallel \overline{JK}$ <br> $\left(\frac{\overline{EH}+\overline{FG}}{2}\right) = \overline{JK}$ |   |

***Example 1:***

MATH is a trapezoid with bases $\overline{MA}$ and $\overline{TH}$ and median $\overline{PC}$.

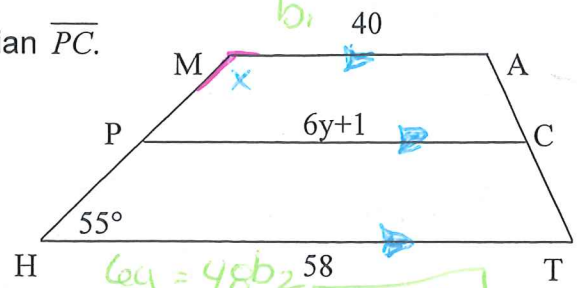
a. Find $m\angle M$.

$x + 55° = 180°$

$-55 \quad -55$

$x = 125°$

b. Find $y$.

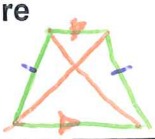
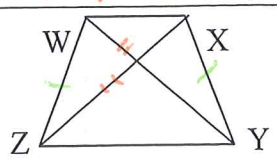
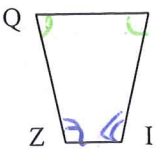



$\frac{(40+58)}{2} = 6y+1$ $\quad \frac{98}{2} = 6y+1$

$49 = 6y+1$

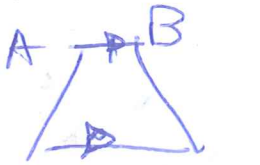
$\frac{6y}{6} = \frac{48}{6}$ $\quad b_2$

$y = 8$

| **Properties of ISOSCELES Trapezoids** *In addition to those listed above for all trapezoids, these are "special" properties for Isosceles Trapezoids:* | **Example** Isosceles Trapezoids have ≅ legs | **Figure**  |
|---|---|---|
| **1. Legs are** Congruent (≅). **2. Diagonals are** Congruent (≅). | $\overline{WY} \cong \overline{XZ}$ $\overline{WZ} \cong \overline{XY}$ |   |
| **3. Both *pairs* of** base **angles are** Congruent (≅). | $\angle Q \cong \angle U$ $\angle Z \cong \angle I$ |   |

***Example 2:***

***a.*** Verify that Quadrilateral ABCD is a trapezoid, given the following coordinates (*hint: think of the definition of trapezoid ☺*): A(5, 1), B(-3, -1), C(-2, 3), and D(2, 4)




| | x | y |
|---|---|---|
| A | 5 | 1 |
| B | -3 | -1 |

$\frac{\Delta y}{\Delta x} = \frac{-2}{-8} = \frac{1}{4}$

| | x | y |
|---|---|---|
| C | -2 | 3 |
| D | 2 | 4 |

$\frac{\Delta y}{\Delta x} = \frac{1}{4}$

***b.*** Is it an isosceles trapezoid? (Find the length of the legs or diagonals to find out!)

AC: $d = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ $\sqrt{53}$

$= \sqrt{(-2-5)^2+(3-1)^2}$

$\sqrt{(-7)^2+(2)^2}$

$\sqrt{49+4}$

$\sqrt{(2+3)^2+(4+1)^2}$

$\sqrt{(5)^2+(5)^2}$

$\sqrt{25+25}$ $\sqrt{50}$

Not Isosceles

***Example 3:*** DEFG is an isosceles trapezoid with median $\overline{MN}$.

***a.*** Find DG.

$\frac{2(20+z)}{2} = 30 \cdot 2$

DG = 40

***b.*** Find DE.

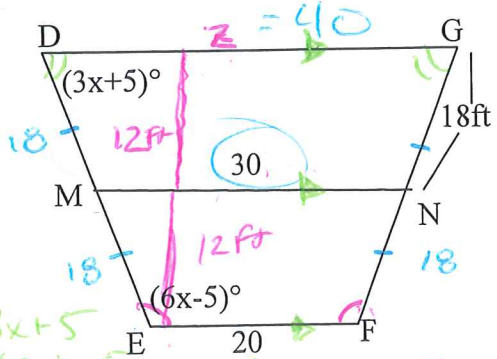
18 + 18

36

$20 + z = 60$

$-20 \quad -20$

$z = 40$




***c.*** Find $m\angle$'s G and F.

$3x+5+6x-5 = 180$

$9x = 180 \quad x = 20$

$\angle D = 3x+5$

$= 3(20)+5$

$\angle G = 60+5$

$= 65$

$\angle E = 6x-5$

$= 6(20)-5$

$= 120-5$

$\angle F = 115$

***d.*** Find the area of Trapezoid DEFG if its median is 12 feet from its bases.

$h = 24 \cdot 30$

$720 ft^2$