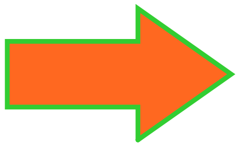
AGENDA - Unit 9 -2

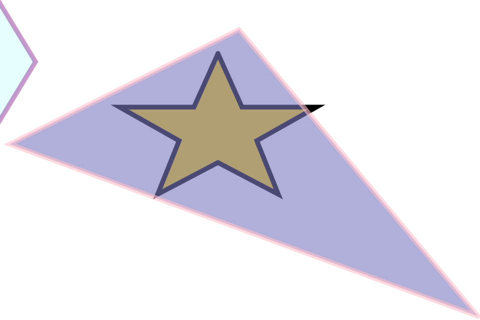
Perimeter and Area of Polygons

- Go over HW 9.1
- Notes 9.2

HW - 9.2

- Worksheet 9.2
- CR #8 - Due 4/7





Worksheet 9-1

1. Name the convex polygon whose interior angle measure sum is 2520°.

2. Each interior angle of a regular polygon measures 160°. How many sides does the polygon have?

3. Each exterior angle of a regular polygon measures 120°.
   a. How many sides does the polygon have?

   b. What is the measure of each interior angle?

4. Determine the number of sides of the regular polygon if:
    a. Each interior angle measure equals the measure of each exterior angle.

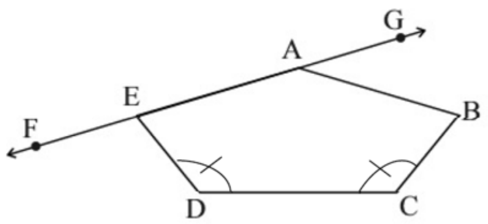
    b. Each interior angle measure is four times the measure of each exterior angle.

5. A pentagon has exterior angle measures of $(5a)°$, $(10a)°$, $(4a)°$, $(3a)°$, and $(8a)°$. Determine the value of a.

For questions 6-8, solve for the missing angles in the diagrams. Read carefully to see what information is given for each diagram. *(Problems from MathBits)*

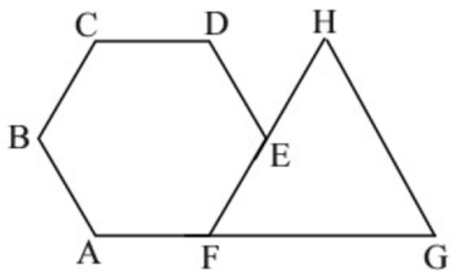
6. $m\angle B = 76$; $m\angle GAB = 44$; $m\angle FED = 96$
Find;

$m\angle D =$ ___________



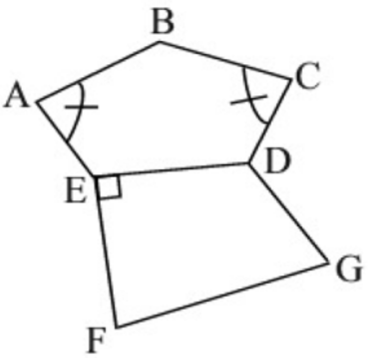
$ABCDEF$ is a regular hexagon. $\overline{HF} \cong \overline{HG}$
Find:
$m\angle A =$ ______ $m\angle HFG =$ ______

$m\angle DEH =$ ______ $m\angle H =$ _______



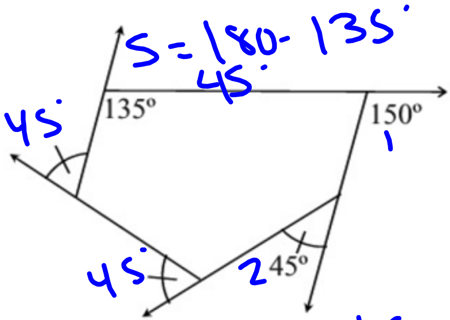
8. $m\angle B = 135$; $m\angle AED = 118$
$m\angle CDE = 117$; $m\angle G = 72$
$m\angle CDG = 129$
Find:
$m\angle A =$ ______

$m\angle F =$ ______



9. What is wrong with this picture?

$S = 180 - 135°$
$45°$

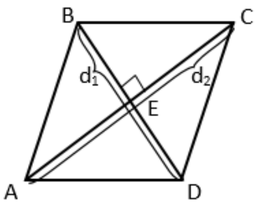


Sum EXT ∠'s = 360°
$150° + 45° + 45° + 45° + 45° = 360°$

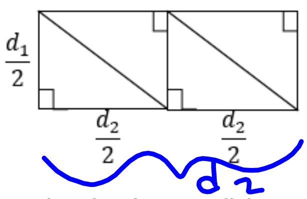
9-2 Notes: Perimeter and Area Formulas of Simple Polygons and Composite Figures

USING DISSECTION TO GENERATE AREA FORMULAS – Rhombus, Parallelogram, Triangle, Trapezoid

In the bridge, we just discussed how to find the area of a rhombus by using it as a composite of two congruent isosceles triangles. Could we also generate the formula by rearranging the 4 smaller congruent right triangles to form a figure whose area formula we already know? This is called dissection and may be helpful for finding the area of polygons.

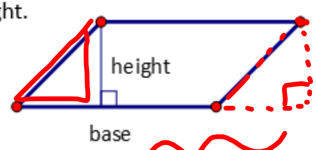


RECTANGLE



Area = bh
$= (d_2)\frac{d_1}{2}$
$= \frac{d_1 d_2}{2}$

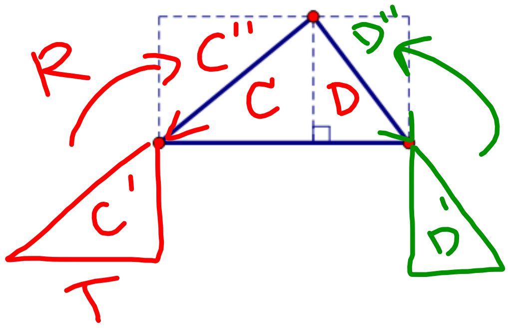
Demonstrate how by using dissection you can show that the given parallelogram has an area equal to a rectangle with the same base and height.



$A_{▱} = bh$

Which transformation moved the dissected piece into its new location to form the rectangle? TRANSLATION Were all the transformations rigid motions for the rhombus dissection? YES So distance and therefore area were preserved.

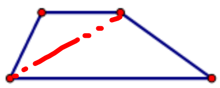
Explain through rigid motions and dissection how the rectangle area is exactly double the area of the triangle and therefore the area of a triangle is A = ½ bh.



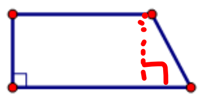
Let the area of the triangle equal the AreaC+AreaD. Since the smaller triangles C and D can be mapped onto triangles C" and D" by translations followed by rotations to create the rectangle, then the areas of the triangles are preserved AreaC=AreaC" and AreaD=AreaD". Therefore the total area of the rectangle is 2(AreaC)+2(AreaD)=bh. By the division property of equality, AreaC+AreaD=bh/2. By substitution, the area of the triangle is equal to bh/2.

A trapezoid can be thought of as a composite shape (a shape made up of smaller more basic shapes). Dissect the trapezoid into the required shapes:

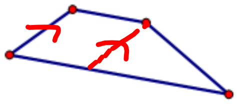
a) Two Triangles



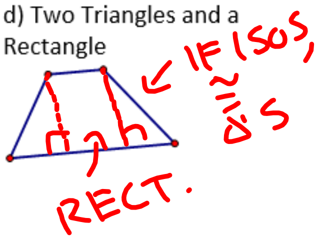
b) Rectangle & Triangle



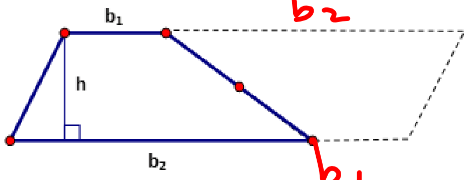
c) Parallelogram and Triangle



d) Two Triangles and a Rectangle



One way to demonstrate that the area formula for a trapezoid is A = ½ (b_1 + b_2)h is using a DOUBLING TECHNIQUE. Rotating a trapezoid on the midpoint of one of its non-base sides helps us discover its formula for area by creating a simple polygon whose are formula we know:



$$\underbrace{}_{b_1+b_2}$$

$$A = bh$$

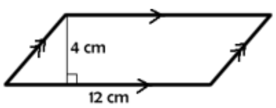
$$A_{\square} = (b_1+b_2)(h)$$

$$A_T = \frac{(b_1+b_2)h}{2}$$

Remember: the base must always be PERPENDICULAR to the height (altitude).

Finding Area of Simple Planar Polygons

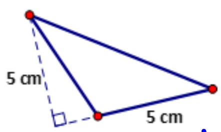
Find the area of the quadrilateral



$$A_{\square} = bh = (12)(4)$$
cm cm

$$\boxed{A = 48 \text{ cm}^2}$$

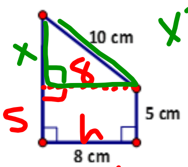
Find the area of the triangle



$$A_{\Delta} = \frac{bh}{2} = \frac{(5)(5)}{2} = 25/2$$

$$\boxed{A = 12.5 \text{ cm}^2}$$

Find the area of the trapezoid



$x^2 + 8^2 = 10^2$

$x = 6$

$b_2 = 11$

$5 = b_1$

$$A = \frac{(b_1+b_2)h}{2} = \frac{(5+11)8}{2} = \frac{16(8)}{2}$$

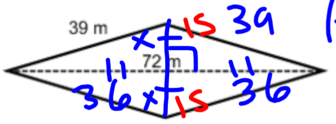
$$\boxed{A = 64 \text{ cm}^2}$$

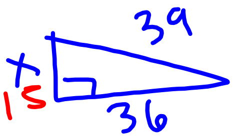
Finding Missing Dimensions/Multi-Step Area & Perimeter– *Round to the nearest tenth*

Some figures will be missing the height or a side length. Dissect off triangles in order to use:

- RIGHT Δ'S w/Pythag Thm, Geom Mean, Trig, or ~~Special Rt Δ's~~
- PROPORTIONAL SIDES from similar triangles *
- CPCTC from congruent triangles
- PROPERTIES of isosceles triangles

Example 1: Find the area of the rhombus





$a^2+b^2=c^2$

$x^2+36^2=39^2$

$x^2=225$

$x=\pm\sqrt{225}$

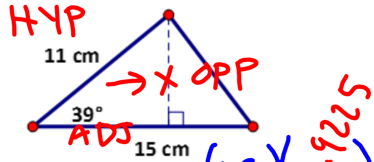
$x=15$

$A=\frac{d_1 d_2}{2}$

$=\frac{(72)(30)}{2}$

$\boxed{A = 1080.0 \text{ m}^2}$

Example 2: Find the area of the triangle



$A_\Delta=\frac{bh}{2}=\frac{(15)(6.9225)}{2}$

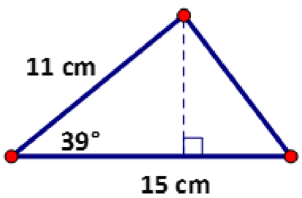
$\boxed{= 51.9 \text{ cm}^2}$

$\frac{\sin 39°}{1}=\frac{x}{11}$

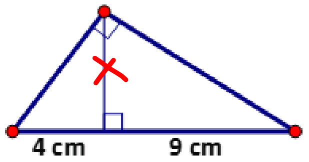
$11(\sin 39°)=x$

$6.9225...=x$

Example 2: Find the area of the triangle



Example 3: Find the area of the triangle



$$\underbrace{4 + 9}_{13}$$

$$\frac{\Delta I}{\Delta II} \qquad \frac{4}{x} = \frac{x}{9}$$

$$x^2 = 36$$

$$x = \pm 6$$

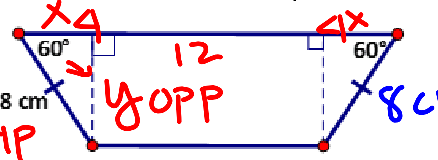
$$A_\Delta = \frac{bh}{2}$$

$$= \frac{13(6)}{2}$$

$$\boxed{A_\Delta = 39.0\ cm^2}$$

ADJ ISOS

Example 4: Find the area of the trapezoid



b_1

$$b_2 = x + 12 + x$$

$$\sin 60° = \frac{y}{8} \qquad \cos 60° = \frac{x}{8}$$

$$8(\sin 60°) = y \qquad 8(\cos 60°) = x$$

$$6.9282\ldots = y \qquad 4 = x$$

$$A_{TRAP} = \frac{(b_1 + b_2)h}{2}$$

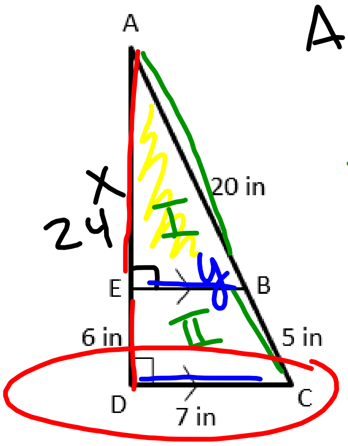
$$= \frac{(12 + 20)(6.9282)}{2}$$

$$= \frac{(32)(6.9282)}{2}$$

$$= 110.8512$$

$$\boxed{A = 110.9\ cm^2}$$

Example 5: Find the area of triangle AEB



$A_{\Delta AEB} = \frac{bh}{2}$

$b = EB = 5.6$

$h = AE = 24$

$\frac{I}{II}: \frac{26}{5} = \frac{AE}{6}$

$120 = 5x$

$24 = x$

~Δ's

$\frac{\Delta I}{\Delta II}: \frac{y}{7} = \frac{20}{25}$

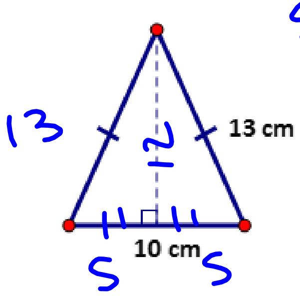
$25y = 140$

$y = 5.6$

$A = \frac{(5.6)(24)}{2}$

$\boxed{A = 67.2 \text{ in}^2}$

Example 6: Find the area of the isosceles triangle



{5-12-13}

OR

$5^2 + x^2 = 13^2$

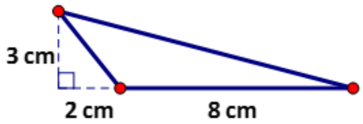
$A = \frac{bh}{2} = \frac{(10)(12)}{2}$

$\boxed{A = 60.0 \text{ cm}^2}$

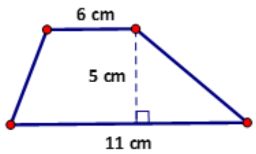
Geometry LAB Worksheet 9-1 Name: ______________________________ Due: _________ Section: _________

Find the area of the given figures to the nearest tenth:

A)

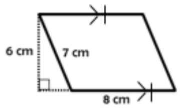


B)

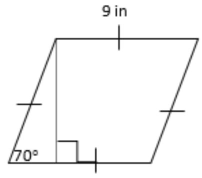


Find the area and perimeter of the given figures to the nearest tenth:

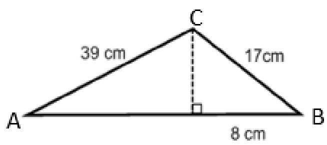
C)



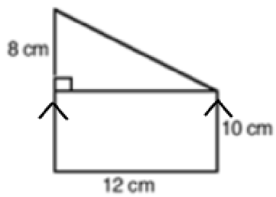
D)



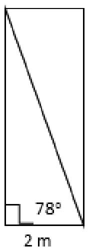
E)



F)



G) Rectangle



H)