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Adv Geo period 7

Note Title 4/18/2016

Areas of Parallelograms and Triangles

PRIOR KNOWLEDGE: $A_{RECT} = l \cdot w$ or $b \cdot h$

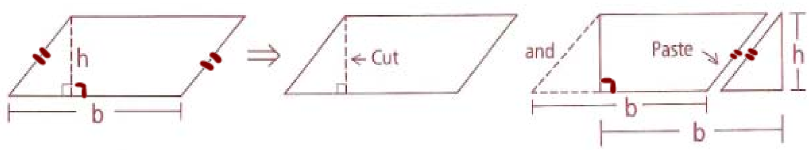
Objectives

After studying this section, you will be able to

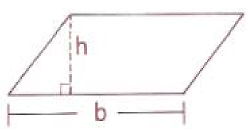
- Find the areas of parallelograms
- Find the areas of triangles

The Area of a Parallelogram

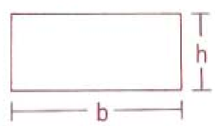
Many areas can be found by a "cut and paste" method. For example, to find the area of a parallelogram with base b and altitude h, we may do this:



Thus, the area of



= the area of



Theorem 100 ***The area of a parallelogram is equal to the product of the base and the height.***

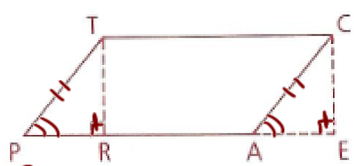
$$A = bh$$

where b is the length of the base and h is the height.

≅ △s: ~~SSS~~ ~~ASA~~ ~~SAS~~ ~~HL~~ AAS

Given: PACT is a ▱, $\overline{TR}$ & $\overline{CE} \perp \overleftrightarrow{PA}$

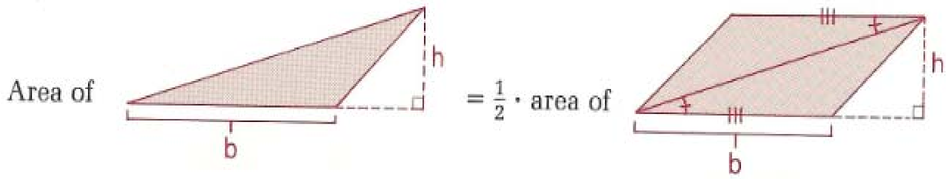
Prove: $A_{PACT} = (PA)(RT)$



1. ▱PACT, $\overline{TR}$ & $\overline{CE} \perp \overleftrightarrow{PA}$	1. GIVEN
2. ∠PRT & ∠AEC rt ∠s	2. ⊥ ⇒ RT ∠s
3. ∠PRT ≅ ∠AEC	3. RT ∠s ⇒ ≅ ∠s
4. $\overline{TP} \parallel \overline{CA}$	4. ▱ ⇒ OPP SDS ∥
5. ∠TPR ≅ ∠CAE	5. ∥ ⇒ CORRESPONDING ∠s ≅
6. $\overline{TP} \cong \overline{CA}$	6. ▱ ⇒ OPP SDS ≅
7. △TPR ≅ △CAE	7. AAS (3, 5, 6)
8. $A_{\triangle TPR} = A_{\triangle CAE}$	8. ≅ △s ⇒ = AREAS
9. $A_{TRAC} = A_{TRAC}$	9. REFLEXIVE
10. $A_{TPAC} = A_{TREC}$	10. ADD
11. $A_{PACT} = (RE)(TR)$	11. SUBSTITUTE
12. $A_{PACT} = PA \cdot TR$	12. SUBSTITUTE

The Area of a Triangle

The area of any triangle can be shown to be one half of the area of a parallelogram with the same base and height.



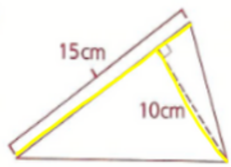
Theorem 101 *The area of a triangle is equal to one-half the product of a base and the height (or altitude) for that base.*

$$A_{\Delta} = \frac{1}{2}bh$$

where b is the length of the base and h is the altitude.

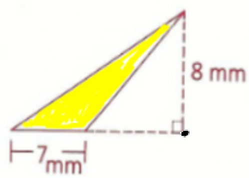
Problem 1 Find the area of each triangle.

a



$A = \frac{1}{2}(15)(10) = 75$

b



$A = \frac{1}{2}(8)(7) = 28$

Problem 2 Find the base of a triangle with altitude 15 and area 60.

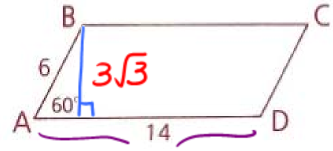
$A_{\Delta} = \frac{1}{2} b \cdot h$

$\frac{60}{15} = \frac{1}{2} b \cdot \frac{15}{15}$

$2 \cdot 4 = \frac{1}{2} b \cdot 2$

$8 = b$

Problem 3 Find the area of a parallelogram whose sides are 14 and 6 and whose acute angle is 60°.

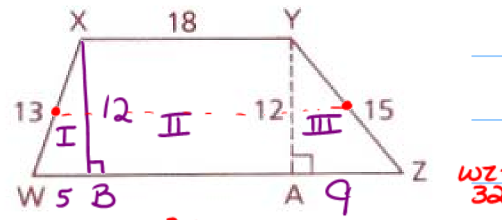


DROP ALTITUDE

30 – 60 – 90
$x \quad x\sqrt{3} \quad 2x$
$3 \quad 3\sqrt{3} \quad 6$
IF $2x = 6$ THEN $x = 3$
SUCH THAT ALT $= 3\sqrt{3}$

$$A_{ABCD} = b \cdot h$$
$$= (14)(3\sqrt{3}) = (14 \cdot 3)\sqrt{3} = 42\sqrt{3}$$

Problem 4 Find the area of a trapezoid WXYZ.



USING 11.1 & 11.2 } Sum of parts

I: $WB = 5 \because \Delta XWB = 5, 12, 13$
$\therefore A_{\Delta XWB} = \frac{1}{2}\, 5 \cdot 12 = 30$

II: $A_{ABXY} = 18(12) = 216$

III: 3(3 4 5)
$A_{\Delta AZY} = \frac{1}{2}\, 9 \cdot 12 = 54$
$\overline{\quad 300 \quad}$

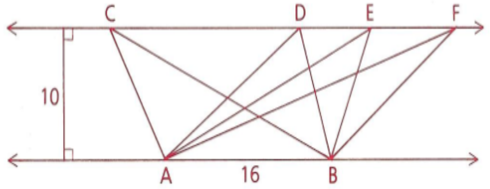
USING 11.3:

$$A_{TRAPEZOID} = Mh$$
$$= \left(\frac{b_1 + b_2}{2}\right) h$$
$$= \left(\frac{XY + WZ}{2}\right) \cdot AY$$
$$= \frac{18 + 32}{2} \cdot 12$$
$$= 25 \cdot 12$$
$$= 300$$

A.M.D.G.

Homework: 1-25
(14: completed in large group)

14 Lines $\overleftrightarrow{CF}$ and $\overleftrightarrow{AB}$ are parallel and 10 mm apart. Several triangles with base $\overline{AB}$ and a vertex on $\overleftrightarrow{CF}$ have been drawn below. Which triangle has the largest area? Explain.



$$A_\Delta = \frac{1}{2} b \cdot h$$

$$A_{ABC} = \frac{1}{2}\, 16 \cdot 10$$

$$A_{ABD} = \frac{1}{2}\, 16 \cdot 10$$

$$A_{ABE} = \frac{1}{2}\, 16 \cdot 10$$

$$A_{ABF} = \frac{1}{2}\, 16 \cdot 10$$

ALL THESE AREAS ARE EQUAL $\because$ SAME BASE (AB)
& $\overleftrightarrow{CF} \parallel \overleftrightarrow{AB}$. $\parallel \Rightarrow$ EQUIDIST $\therefore$ ALL HEIGHTS ARE =.