Module 13c: Rectangles

Math Practice(s):

-Model with mathematics.

-Attend to precision.

Learning Target(s):

-Prove & apply properties of special parallelograms.

-Derive & apply the formulas for the area of parallelograms.

Homework:

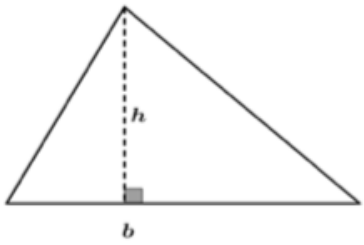
HW#16: 13c #1-7

Nov 20-12:32 PM

Warm-up

1. State the formula for determining the area of a triangle.

$A = \frac{1}{2}bh = \frac{bh}{2}$

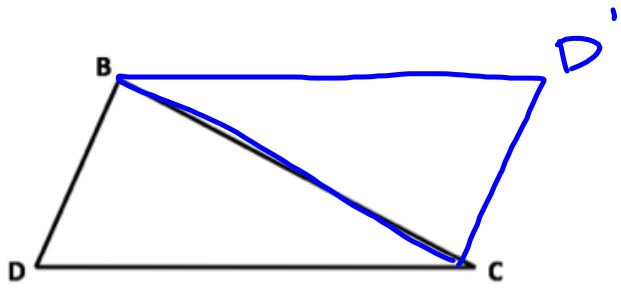


2. ΔBCD is shown to the right.

A. If $DC = 12$ inches and the height from vertex B to $\overline{DC}$ is 4 inches, what is the area of ΔBCD.

$A = \frac{4(12)}{2}$

$A = 24\ in^2$



B. Create parallelogram $DBD'C$ by creating a copy of ΔBCD:

- Rotate ΔBCD in the clockwise direction 180°.
- Then, connect the two triangles together by laying $\overline{BC}$ directly on top of the copy of itself to create parallelogram $DBD'C$.
- Draw parallelogram $DBD'C$ so that it perfectly overlaps ΔBCD in the diagram above.

C. Using your answer to question A (above), determine the area of parallelogram $DBD'C$.

$A = 2 \cdot 24$

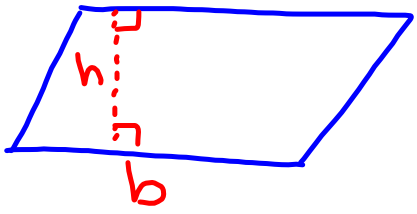
$A = 48\ in^2$

D. Use the formula for the area of triangle to state the formula for the area of a parallelogram.

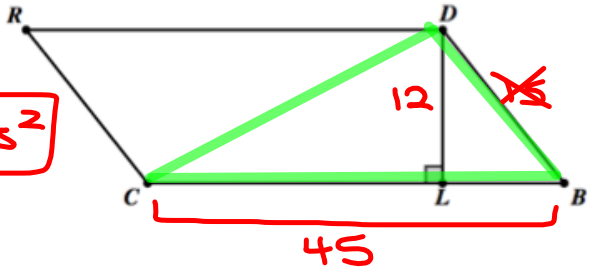
$A = 2 \cdot \frac{1}{2}bh$

$A = 2 \cdot \frac{bh}{2}$

$A = bh$



3. Parallelogram $RDBC$ shown to the right.



A. If $DB = 15$, $BC = 45$, and $DL = 12$, what is the area of parallelogram $RDBC$?

$A = 12 \cdot 45$ $A = 540 \text{ units}^2$

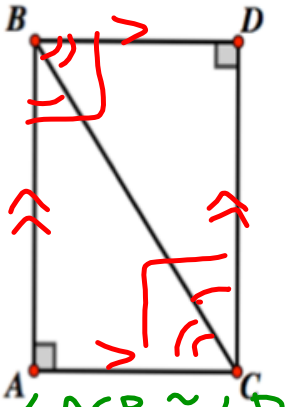
B. Use the same dimensions given in question A (above), to determine the area of $\triangle BCD$.

$A = \frac{540}{2}$ $A = 270 \text{ units}^2$

C. If the area of parallelogram $RDBC$ is 100 ft.^{2}, state three possible pairs of measurements for its base and height.

- $BC =$ 50 ft and $DL =$ 2 ft ; or,
- $BC =$ 5 ft and $DL =$ 20 ft ; or,
- $BC =$ 25 ft and $DL =$ 4 ft .

Example 1:



A. Analyze how the quadrilateral ABCD is made up of two congruent triangles.

Rotate $\triangle ABC$ 180° about the midpoint $\overline{BC}$.

B. How do we know $\angle ABD$ & $\angle ACD$ are right angles?

Since the acute $\angle$s in each $\triangle$ are complementary, & $\angle ABC \cong \angle DCB$ & $\angle ACB \cong \angle DBC$, $\angle ABD$ & $\angle ACD$ are 90°.

C. Using the fact that $m\angle A = 90°$ and $m\angle ABD = 90°$, argue that $\overline{AC}$ and $\overline{BD}$ are parallel line segments?
Using the fact that $m\angle A = 90°$ and $m\angle ACD = 90°$, argue that $\overline{AB}$ and $\overline{CD}$ are parallel line segments?

$\angle A$ & $\angle ABD$ are ss int $\angle$s & they are supplementary so $\overline{AC} \parallel \overline{BD}$.

$\angle A$ & $\angle ACD$ are ss int $\angle$s & they are supp., so $\overline{AB} \parallel \overline{CD}$.

erase to show

RECTANGLE

A parallelogram with 4 right ∠s.

Opposite sides are parallel & congruent.

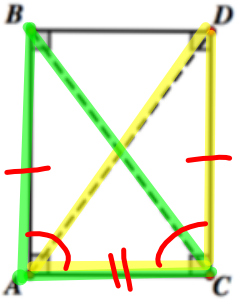
Measure of all four angles is 90°.

The DIAGONALS are congruent and bisect each other.

The formula for determining its area is *bh*.

Proof #1: proving that the **diagonals of a rectangle are congruent**:

Given: *ABDC* is a rectangle
Prove: $\overline{AD} \cong \overline{BC}$



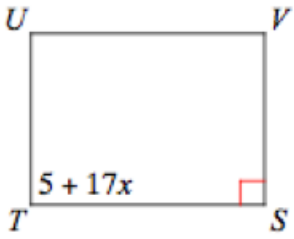
△ABC
△CDA

Statements	Reasons
~~ABDC~~ D is a ~~rectangle~~	Given
$\overline{AB} \cong \overline{CD}$	Opp. sides in rectangle are ≅
∠A & ∠C are rt ∠s	Def. of rectangle
∠A ≅ ∠C	All rt ∠s ≅
$\overline{AC} \cong \overline{CA}$	Reflexive property
△ABC ≅ △CDA	SAS
$\overline{AD} \cong \overline{BC}$	CPCTC

Practice

In each rectangle, state the relationship between the given parts, then find the value of x.

1.



(∠T is a rt ∠)

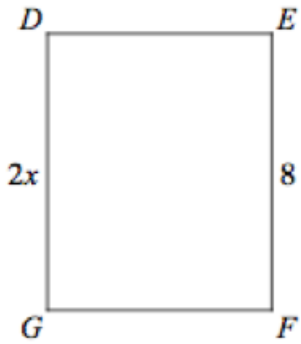
$5+17x=90$

$-5 \quad -5$

$\frac{17x}{17}=\frac{85}{17}$

$x=5$

2.

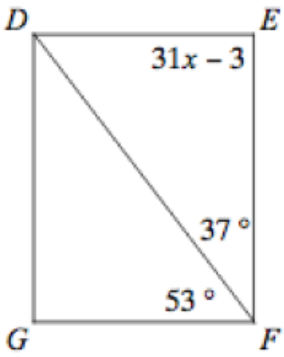


$\overline{DG} \cong \overline{EF}$ (opp sides of rect ≅)

$2x=8$

$x=4$

3.



(in rect. all ∠s are rt ∠s)

$m\angle E = 90°$

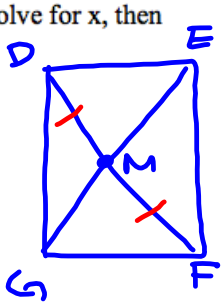
$31x-3=90$

$+3 \quad +3$

$31x=93$

$x=3$

4. The diagonals of rectangle DEFG intersect at M. $MD = 17$ cm & $FD = 33x + 1$. Solve for x, then find the length of each diagonal.



(diag. bisect each other)

$MD = FM$

$MD + FM = FD$

$17 + 17 = 33x + 1$

$34 = 33x + 1$

$-1 \quad -1$

$33 = 33x$

$x = 1$