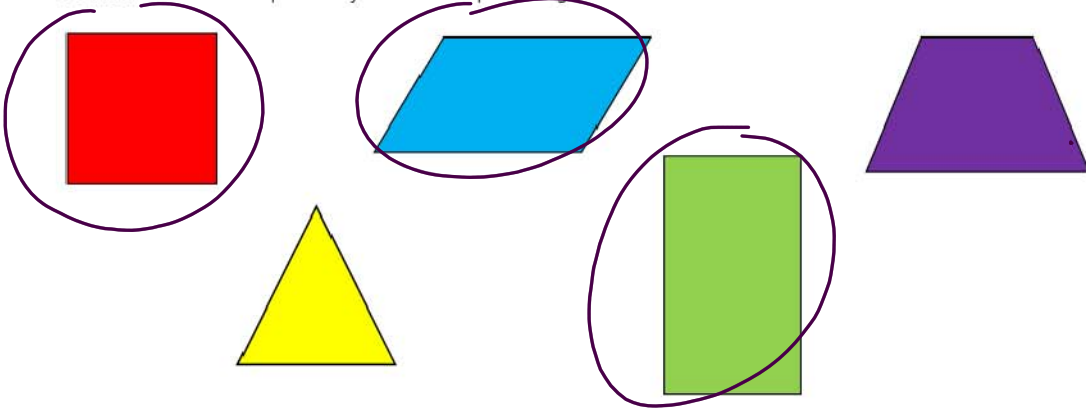


Geometry CC – Mr. Valentino

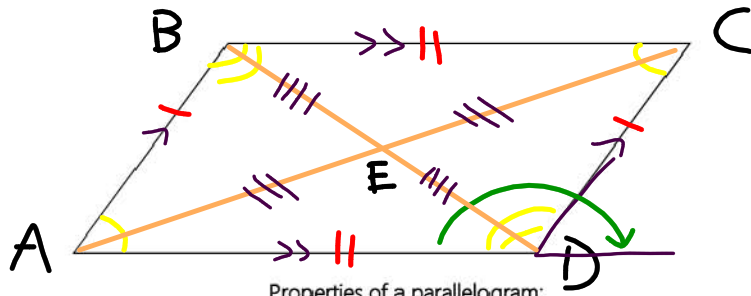
Name: \_\_\_\_\_

Unit 9 Lesson 1: What are Parallelograms (Mr. Valentino's favorite shape, of course)? Date: \_\_\_\_\_ Per: \_\_\_\_\_

Do Now: Circle the shapes that you think are parallelograms



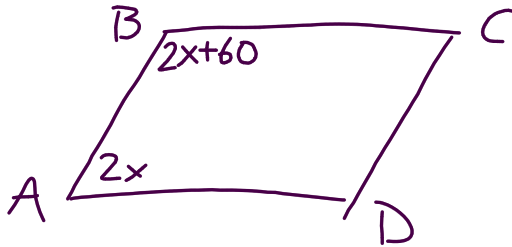
PARALLELOGRAM  
 - a quadrilateral whose opposite sides are parallel



Properties of a parallelogram:

- ★ 1) Opposite sides are parallel
- ★ 2) Opposite sides are congruent
- ★ 3) Opposite angles are congruent
- ★ 4) Consecutive angles are supplementary
- ★ 5) The diagonals bisect each other

1) In parallelogram  $ABCD$ , the degree measure of angle  $A$  is represented by  $2x$  and the degree measure of angle  $B$  by  $2x + 60$ . Find the value of  $x$ .



$$2x + 2x + 60 = 180$$

$$4x + 60 = 180$$

$$4x = 120$$

$$x = 30$$

AB

$$7x - 4$$

$$7(5) - 4$$

$$35 - 4$$

$$\textcircled{31}$$

CD

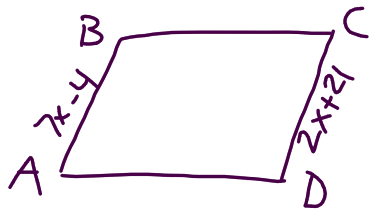
$$2x + 21$$

$$2(5) + 21$$

$$10 + 21$$

$$\textcircled{31}$$

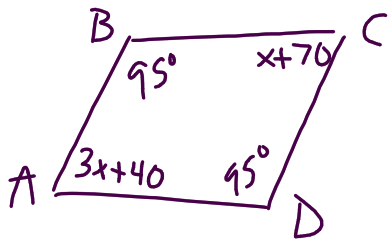
2) In parallelogram  $ABCD$ ,  $AB = 7x - 4$  and  $CD = 2x + 21$ . Find  $AB$  and  $CD$ .



$$\begin{array}{r} 7x - 4 = 2x + 21 \\ -2x \quad -2x \\ \hline 5x - 4 = 21 \\ +4 \quad +4 \\ \hline 5x = 25 \end{array}$$

$$x = 5$$

3) The degree measures of two opposite angles of a parallelogram are represented by  $3x + 40$  and  $x + 70$ . Find the measure of each angle.



$$\begin{array}{r} 3x + 40 = x + 70 \\ -x \quad -40 \quad -x \quad -40 \\ \hline 2x = 30 \\ \hline x = 15 \end{array}$$

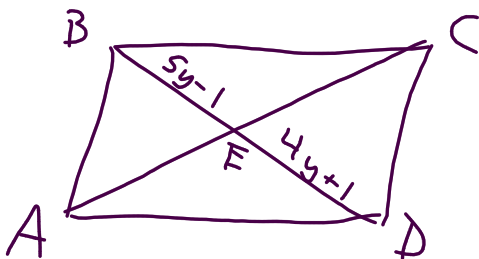
$$2x = 30$$

$$x = 15$$

$\sphericalangle A$  and  $\sphericalangle C$  are  $85^\circ$

$\star$  the angles in a quad. add up to  $360^\circ$

4) Parallelogram  $ABCD$  is given with diagonals intersecting at  $E$ . If  $DE = 4y + 1$  and  $EB = 5y - 1$ , find  $DB$ .



$$5y - 1 = 4y + 1$$

$$\begin{array}{r} y - 1 = 1 \\ +1 \quad +1 \\ \hline y = 2 \end{array}$$

$$y = 2$$

$$\begin{array}{l} ED \\ 4y + 1 \\ 4(2) + 1 \\ 8 + 1 \\ \downarrow \\ 9 \times 2 = \textcircled{18} \end{array}$$

5) Parallelogram  $ABCD$  is given with diagonals intersecting at  $E$ . If  $m\angle DAB = 4x - 60$  and  $m\angle DCB = 30 - x$ , find  $m\angle DAB$ ,  $m\angle DCB$ , and  $m\angle ABC$ .

6) If the diagonals of parallelogram  $ABCD$  are  $\overline{AC}$  and  $\overline{BD}$ , which is *always* true? (Circle all that apply)

(1)  $\overline{AC} \cong \overline{BD}$

(3)  $\overline{AD} \perp \overline{BD}$

(2)  $\angle DAC \cong \angle BAC$

(4)  $\triangle DAC \cong \triangle BCA$

7) In parallelogram  $ABCD$ ,  $m\angle ABC = 3x - 12$  and  $m\angle CDA = x + 40$ . Find  $m\angle ABC$ ,  $m\angle CDA$ ,  $m\angle BCD$ , and  $m\angle DAB$ .

8) The measures of angles  $A$  and  $B$  of parallelogram  $ABCD$  are in the ratio of 2:7. Find the degree measure of angle  $D$ .

9) In parallelogram  $ABCD$ , the diagonals meet at  $E$ . Which is *always* true? (Circle all that apply)

(1)  $\triangle AED$  is an isosceles triangle.

(3)  $\triangle ABD$  is a right triangle.

(2)  $\triangle ABD \cong \triangle CDB$

(4)  $\triangle AEB$  is a right triangle.

10) In parallelogram  $ABCD$ , the measure of angle  $A$  exceeds the measure of angle  $B$  by 30 degrees. Find the degree measure of angle  $C$ .

11) In parallelogram  $ABCD$ ,  $BC = 9y + 10$ ,  $AD = 6y + 40$ , and  $AB = \frac{1}{2}y + 50$ . Find  $BC$ ,  $AD$ ,  $AB$ , and  $DC$ .

12) Parallelogram  $ABCD$  is given with diagonals intersecting at  $E$ . If  $m\angle DCB = a + 12$ , and  $m\angle CDA = 4a + 18$ , find the degree measures of all 4 angles of the parallelogram.

13) Parallelogram  $ABCD$  is given with diagonals intersecting at  $E$ . If  $AE = 5x - 3$ , and  $EC = 15 - x$ , find  $AC$ .

14) In parallelogram  $ABCD$ , which is *always* true? (Circle all that apply)

(1)  $AB = AD$

(3)  $\overline{AB} \parallel \overline{AD}$

(2)  $AB = DC$

(4)  $\angle A \cong \angle B$