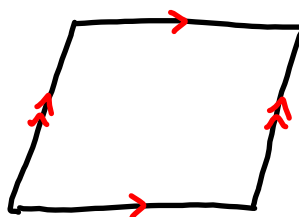


## Geometry 7.2: Parallelograms

A parallelogram is... a 4 sided polygon with 2 sets of parallel sides.

Draw an example:



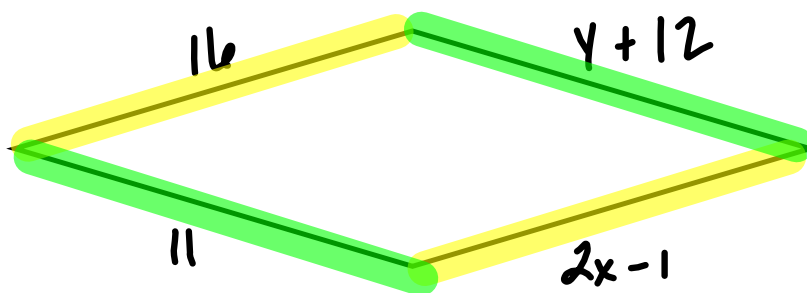
symbols :  
∧    ∨  
Parallel

Most of today is just learning facts about parallelograms. We'll solve problems using these facts.

## 7.2 Properties of Parallelograms

Parallelogram Fact #1: The sides that are **parallel** to each other will be the same length.

Ex: Solve for  $x$  and  $y$  in the parallelogram below.



$$\begin{aligned} 16 &= 2x - 1 \\ +1 & \quad +1 \\ \hline 17 &= 2x \\ \frac{17}{2} &= \frac{2x}{2} \\ \boxed{\frac{17}{2} = x} \end{aligned}$$

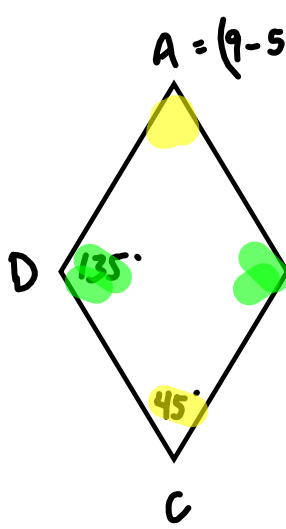
$$\begin{aligned} 11 &= y + 12 \\ -12 & \quad -12 \\ \hline -1 &= y \\ \boxed{-1 = y} \end{aligned}$$

Since we know the parallel sides are the same length, we can set them equal to each other.

## 7.2 Properties of Parallelograms

Parallelogram Fact #2: **Opposite Angles** are congruent.

Ex: Find the measure of angle A and B in the parallelogram below.



Set opposite angles Equal to each other, since they are the same.

$$\angle A \cong \angle C$$

$$9 - 5x = 45$$

$$\begin{array}{r} -9 \\ \hline -5x = 36 \\ \hline x = -\frac{36}{5} \end{array}$$

$$\angle B \cong \angle D$$

$$3y + 4 = 135$$

$$\begin{array}{r} -4 \\ \hline 3y = 131 \\ \hline y = \frac{131}{3} \end{array}$$

Parallelogram Fact #3: Consecutive interior angles are Supplementary. Any 2 consecutive Angles add to  $180^\circ$ .

Ex: Check the example above to confirm this. Are A and B supplementary?

is  $A + B = 180$  ?

$$9 - 5x + 3y + 4 \stackrel{?}{=} 180$$

$$9 - 5\left(\frac{-36}{5}\right) + 3\left(\frac{131}{3}\right) + 4 \stackrel{?}{=} 180$$

Enter in Calculator

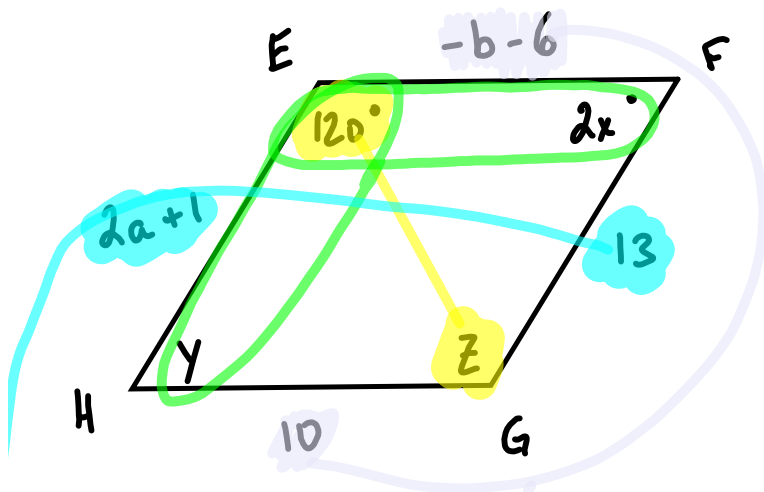
$$180 = 180$$



Yes. they are supplementary.

## 7.2 Properties of Parallelograms

Mixed Example: Solve for all missing variables in the parallelogram below.



Fact 2

$$\boxed{Z = 120^\circ}$$

Fact 3

$$\begin{array}{r} 120 + 2x = 180 \\ -120 \phantom{=} \\ \hline 2x = 60 \end{array}$$

$$\boxed{x = 30}$$

$$\begin{array}{r} 120 + y = 180 \\ -120 \phantom{=} \\ \hline y = 60 \end{array}$$

$$\boxed{y = 60^\circ}$$

Fact 1

$$\begin{array}{r} 2a + 1 = 13 \\ -1 \phantom{=} \\ \hline 2a = 12 \end{array}$$

$$\begin{array}{r} 2a = 12 \\ \phantom{=} \\ \hline a = 6 \end{array}$$

$$\boxed{a = 6}$$

$$\begin{array}{r} -b - 6 = 10 \\ +6 \phantom{=} \\ \hline -b = 16 \end{array}$$

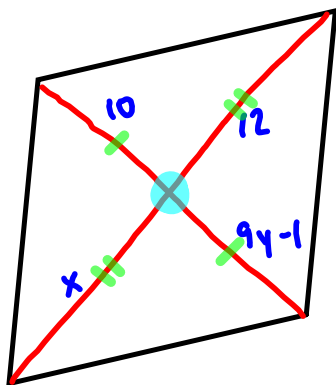
$$\begin{array}{r} -b = 16 \\ -1 \phantom{=} \\ \hline b = -16 \end{array}$$

$$\boxed{b = -16}$$

## 7.2 Properties of Parallelograms

Parallelogram Fact #4: The **intersection** of the diagonals **bisects** each diagonal.

Ex: Solve for  $x$  and  $y$  in the parallelogram below.



**Bisect**: means it cuts the line segments in Half. so Each half of the line segment is the same length.

so  $x = 12$

:

$$10 = 9y - 1$$

$$\frac{11}{9} = \frac{9y}{9}$$

$$\frac{11}{9} = y$$

## 7.2 Properties of Parallelograms

Homework:

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