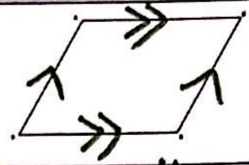
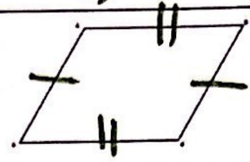
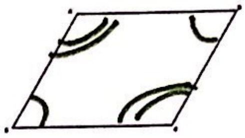
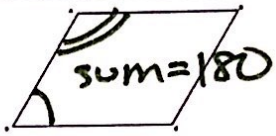
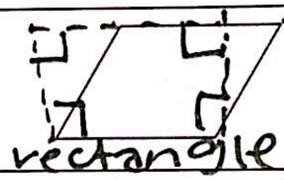
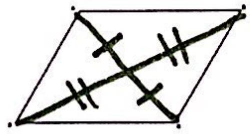
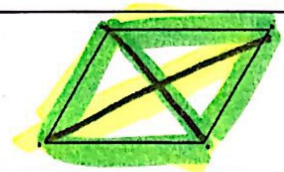
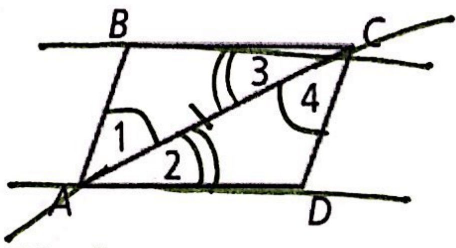
Math 3

5.4 Parallelograms

SWBAT prove a figure to be a parallelogram and solve for variables in a parallelogram.

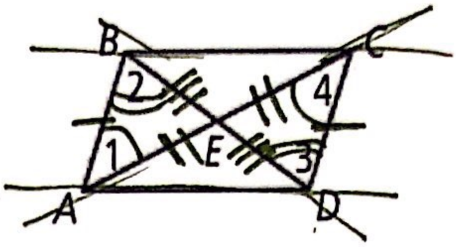
Properties of Parallelograms		
Sides	A **parallelogram** is a quadrilateral with both pairs of opposite sides parallel.	
	If a quadrilateral is a parallelogram, the 2 pairs of opposite sides are congruent.	
Angles	If a quadrilateral is a parallelogram, the 2 pairs of opposite angles are congruent.	
	If a quadrilateral is a parallelogram, the consecutive angles are supplementary.	
	If a quadrilateral is a parallelogram and one angle is a right angle, then all angles are right angles.	
Diagonals	If a quadrilateral is a parallelogram, the diagonals bisect each other.	
	If a quadrilateral is a parallelogram, the diagonals form two congruent triangles.	

Example 1: Given: ▱ABCD is a parallelogram.
Prove: AB = CD and BC = DA.



Statement	Reason
1. ABCD is a parallelogram	1. given
2. $\overline{AB} \parallel \overline{CD}$, $\overline{BC} \parallel \overline{AD}$	2. Definition of a parallelogram
3. <1 = <4, <3 = <2	3. alternate interior angles
4. AC = AC	4. reflexive
5. ΔABC = ΔCDA	5. ASA
6. $\overline{AB} \cong \overline{CD}$ & $\overline{BC} \cong \overline{DA}$	6. CPCTC

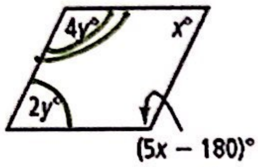
Example 2: Given: ▱ABCD is a parallelogram.
Prove: AC and BD bisect each other at E.

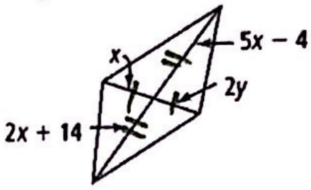


Statement	Reason
1. ABCD is a parallelogram	1. Given
2. AB || DC	2. defn of parallelogram
3. <1 = <4, <2 = <3	3. alternate interior angles
4. AB = DC	4. defn of parallel. → opposite sides of ▱ are ≅
5. $\triangle BAE \cong \triangle DCE$	5. ASA
6. AE = CE, BE = DE	6. CPCTC
7. $\overline{AC}$ & $\overline{BD}$ bisect each other at E.	7. Definition of bisector

Example 3: For what values of x and y must each figure be a parallelogram?

a)
b)
c)





$2y+4y=180$

$\boxed{y=30}$

$5x-180+x=180$

$\boxed{x=60}$

$2x+14=5x-4$

$3x=18$

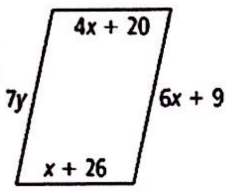
$\boxed{x=6}$

$x=2y$

$6=2y$

$\boxed{y=3}$

d)
e)
f)



$4x+20=x+26$

$3x=6$

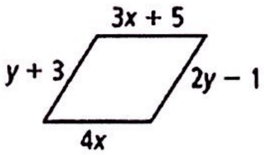
$\boxed{x=2}$

$7y=6x+9$

$7y=6(2)+9$

$7y=21$

$\boxed{y=3}$



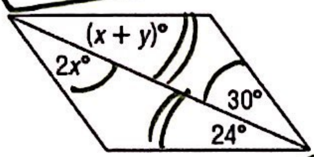
$y+3=2y-1$

$\boxed{y=4}$

$3x+5=4x$

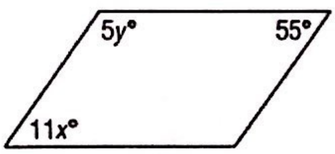
$\boxed{x=5}$

g)
h)
i)



$2x=30$

$24=x+y$



$11x=55$

$x=5$

$11(5)+5y=180$