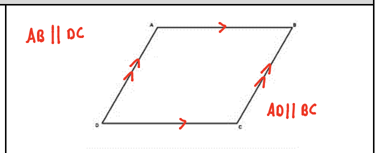
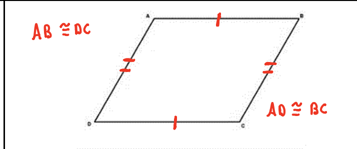
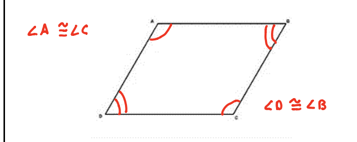
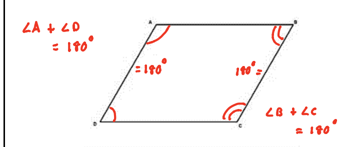
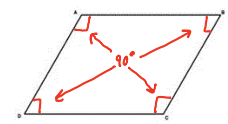
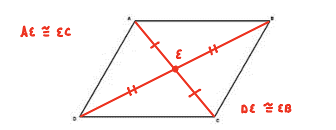
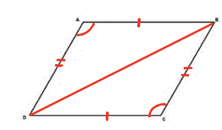
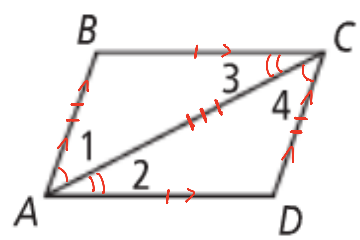
Math 3
Unit 6 Day 4 Notes – Parallelograms

Name: Key
Date: ______________

Properties of Parallelograms

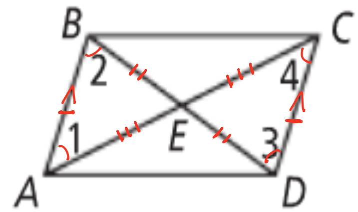
Sides	A parallelogram is a quadrilateral with both pairs of opposite sides parallel.	
	If a quadrilateral is a parallelogram, the 2 pairs of opposite sides are congruent.	
Angles	If a quadrilateral is a parallelogram, the 2 pairs of opposite angles are congruent.	
	If a quadrilateral is a parallelogram, the consecutive angles are supplementary. (Adds up to 180°)	
	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. ↳ splits into two equal parts	
	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. AB ≅ DC + BC ≅ AD / AB ∥ DC + BC ∥ AD	2. Definition of a parallelogram
3. <1 ≅ <4, <3 ≅ <2	3. Alternate Interior ∠'s
4. AC ≅ AC	4. Reflexive Prop.
5. ΔABC ≅ ΔCDA	5. ASA / SSS
6. AB ≅ CD + BC ≅ DA	6. CPCTC Congruent parts of a Congruent Triangle are Congruent

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

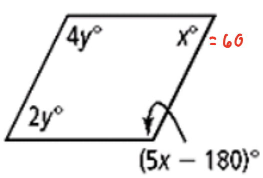


$\triangle AEB \cong \triangle CED$

Statement	Reason
1. ABCD is a parallelogram	1. Given
2. AB || DC	2. Defn. of ▱ (parallelogram)
3. <1 ≅ <4, <2 ≅ <3	3. Alternate Interior ∠'s
4. AB ≅ DC	4. Defn. of ▱ (parallelogram)
5. $\triangle AEB \cong \triangle CED$	5. ASA
6. AE ≅ CE, BE ≅ DE	6. CPCTC
7. AC + BD Bisect each other @ E	7. Definition of bisector

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

a)

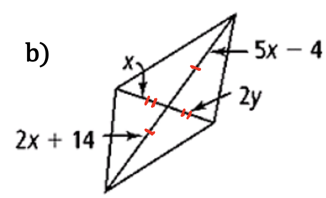


$5x - 180 + x = 180$
$6x - \cancel{180} = 180$
$+\cancel{180} \quad +180$
$\frac{\cancel{6}x}{\cancel{6}} = \frac{360}{6}$
$\boxed{x = 60}$

$4y + 2y = 180$
$\frac{\cancel{6}y}{\cancel{6}} = \frac{180}{6}$
$\boxed{y = 30}$

$\frac{2y}{2} = \frac{60}{2}$

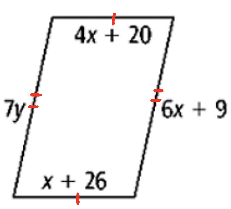
b)



$5x - 4 = \cancel{2x} + 14$
$-2x \quad -\cancel{2x}$
$3x - \cancel{4} = 14$
$+\cancel{4} \quad +4$
$\frac{\cancel{3}x}{\cancel{3}} = \frac{18}{3}$
$\boxed{x = 6}$

$\frac{2y}{2} = \frac{6}{2}$
$\boxed{y = 3}$

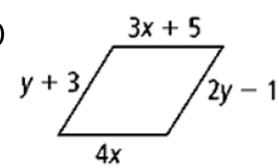
c)



$4x + 20 = \cancel{x} + 26$
$-x \quad -\cancel{x}$
$3x + \cancel{20} = 26$
$-\cancel{20} \quad -20$
$\frac{3x}{3} = \frac{6}{3}$
$\boxed{x = 2}$

$7y = 6x + 9$
$7y = 6(2) + 9$
$\frac{\cancel{7}y}{\cancel{7}} = \frac{21}{7}$
$\boxed{y = 3}$

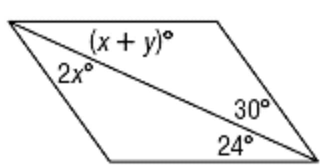
d)



$4x = 3\cancel{x} + 5$
$-3x \quad -\cancel{3x}$
$\boxed{x = 5}$

$\cancel{y} + 3 = 2y - 1$
$-\cancel{y} \quad -y$
$3 = y - 1$
$+1 \quad +1$
$\boxed{y = 4}$

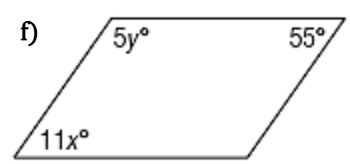
e)



$\frac{\cancel{2}x}{\cancel{2}} = \frac{30}{2}$
$\boxed{x = 15}$

$\cancel{15} + y = 24$
$-\cancel{15} \quad -15$
$\boxed{y = 9}$

f)



$\frac{\cancel{11}x}{\cancel{11}} = \frac{55}{11}$
$\boxed{x = 5}$

$5y + \cancel{55} = 180$
$-\cancel{55} \quad -55$
$\frac{\cancel{5}y}{\cancel{5}} = \frac{125}{5}$
$\boxed{y = 25}$