

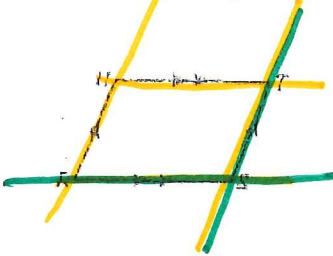
# Parallelogram Properties Notes

## Properties of Parallelograms

- Opposite sides of a parallelogram are congruent
- Opposite angles of a parallelogram are equal
- Consecutive angles of a parallelogram are supplementary
- The sum of the angles of a parallelogram are  $180(4-2) = 180 \cdot 2 = 360^\circ$
- The diagonals of a parallelogram bisect each other

Example Proof:

Given: Parallelogram URST  
 Prove:  $\angle R \cong \angle T$

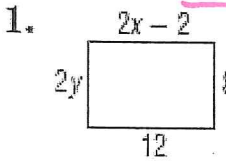


$$\begin{array}{l}
 \text{Parall. URST} \\
 UT \parallel RS \\
 \angle T + \angle S = 180 \\
 \angle R + \angle S = 180 \\
 \angle T + \angle S = \angle R + \angle S \\
 \underline{-\angle S \quad -\angle S} \\
 \angle T = \angle R
 \end{array}$$

Given  
 Def of Paralle.  
 consec. Int Supp.  
 "  
 Trans/Subst  
 Subtrac.

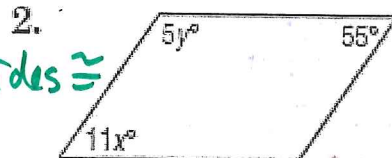
Find  $x$  and  $y$  so that each quadrilateral is a parallelogram.

Make sure you justify each step!



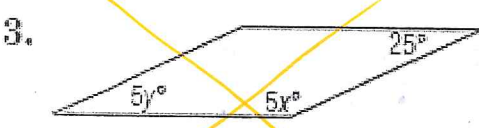
$2x-2=12$  Opposites  $\cong$   
 $+2 \quad +2$   
 $\frac{2x=14}{2 \quad 2}$   
 $x=7$

$\frac{2y=8}{2 \quad 2}$  Opposites  $\cong$   
 $y=4$

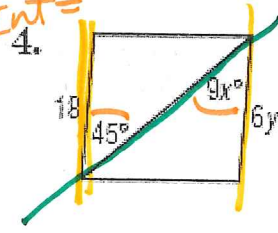


$\frac{11x=55}{11 \quad 11}$  oppo.  $\angle$ 's  $\cong$   
 $x=5$

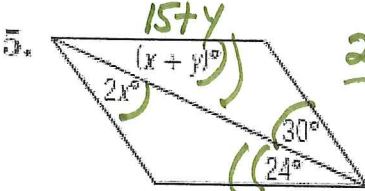
$\frac{5y+55=180}{-55 \quad -55}$  consec.  $\angle$ 's Supp  
 $\frac{5y=125}{5 \quad 5}$   
 $y=25$



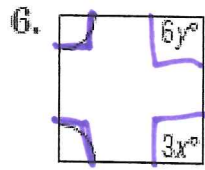
$\frac{9x=45}{9 \quad 9}$  Alt. Int.  $\cong$   
 $x=5$



$\frac{6y=18}{6 \quad 6}$  oppo. sides  $\cong$   
 $y=3$



$\frac{2x=30}{2 \quad 2}$  Alt. Int.  $\cong$   
 $x=15$



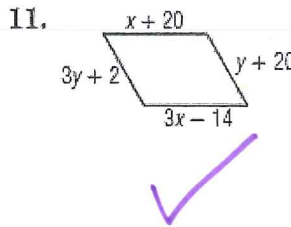
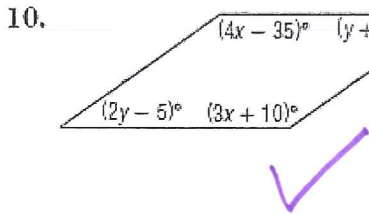
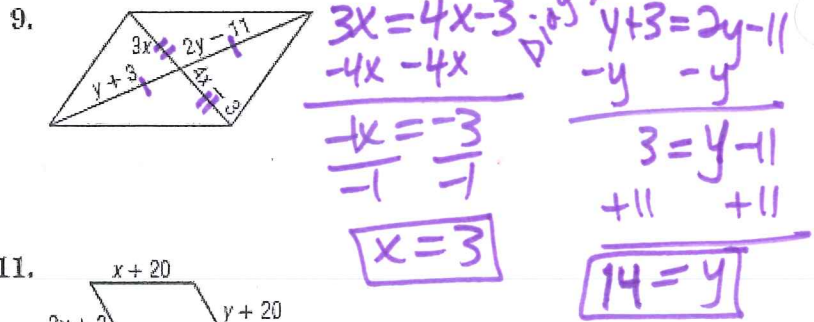
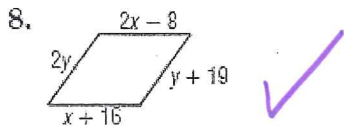
$\frac{6y=90}{6 \quad 6}$  consec.  $\angle$ 's Supp  
 $y=15$

$\frac{3x=90}{3 \quad 3}$   
 $x=30$

$\frac{15+y=24}{-15 \quad -15}$  Alt Int  $\cong$   
 $y=9$

Yes, I know we are missing 7....

ALGEBRA Find  $x$  and  $y$  so that each quadrilateral is a parallelogram.

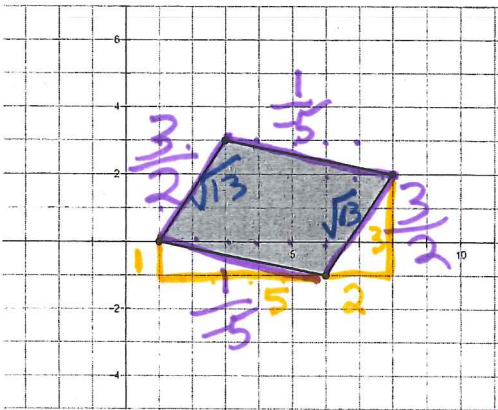


## Quadrilateral Coordinate Examples:

1. Determine whether the figure with vertices  $A(3,3)$ ,  $B(8,2)$ ,  $C(6,-1)$ ,  $D(1,0)$  is a parallelogram.

*Def of //gram: oppo sides //*

To be a parallelogram, you must test for same slope for oppo sides



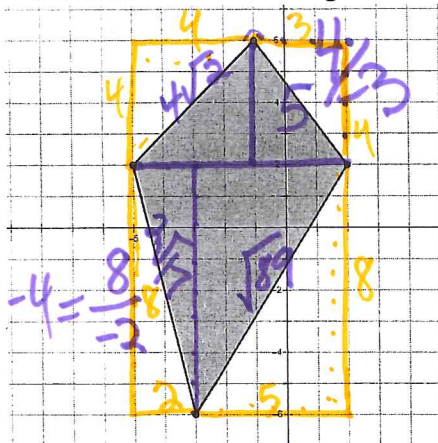
*yes, b/c oppo sides have same slope.*

Perimeter = ?  $\sqrt{13} + \sqrt{13} + \sqrt{26} + \sqrt{26} = 2\sqrt{13} + 2\sqrt{26}$

$1^2 + 5^2 = c^2$   
 $1 + 25 = c^2$   
 $\sqrt{26} = \sqrt{c^2}$   
 $\sqrt{26} = c$

$2^2 + 3^2 = c^2$   
 $4 + 9 = c^2$   
 $\sqrt{13} = \sqrt{c^2}$   
 $\sqrt{13} = c$

2. Determine whether the figure with vertices A(-3,-6), B(2,2), C(-1,6), D(-5,2) is a parallelogram.



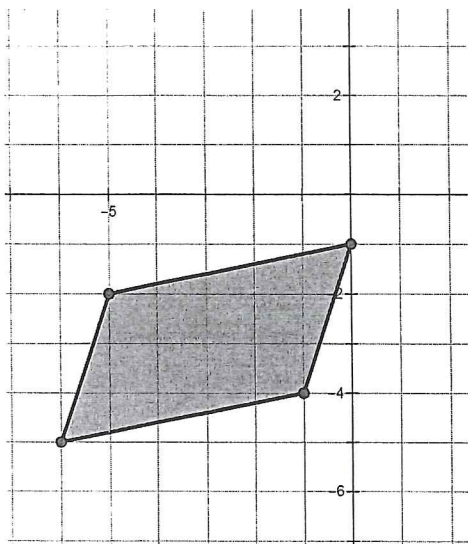
NO, b/c they don't have same slope.

$$\text{Area} = \frac{1}{2} \cdot 7 \cdot 4 + \frac{1}{2} \cdot 7 \cdot 8 = 14 + 28 = \boxed{42 \text{ u}^2}$$

$$\text{perimeter} = \sqrt{89} + 2\sqrt{17} + 4\sqrt{2} + 5 \text{ u}$$

$5^2 + 8^2 = c^2$	$2^2 + 8^2 = c^2$	$4^2 + 4^2 = c^2$	$3^2 + 4^2 = c^2$
$25 + 64 = c^2$	$4 + 64 = c^2$	$16 + 16 = c^2$	$9 + 16 = c^2$
$\sqrt{89} = \sqrt{c^2}$	$\sqrt{68} = \sqrt{c^2}$	$\sqrt{32} = \sqrt{c^2}$	$\sqrt{25} = \sqrt{c^2}$
$\sqrt{89} = c$	$\sqrt{4} \sqrt{17} = c$	$\sqrt{16} \sqrt{2} = c$	$\boxed{5 = c}$
	$\boxed{2\sqrt{17} = c}$	$\boxed{4\sqrt{2} = c}$	

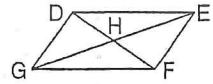
3. Determine whether the figure with vertices A(-6,-5), B(-1,-4), C(0,-1), D(-5,-2) is a parallelogram.



# 6-2 Skills Practice

## Parallelograms

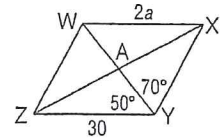
Complete each statement about  $\square DEFG$ . Justify your answer.



1.  $\overline{DG} \parallel$      ?
2.  $\overline{DE} \cong$      ?
3.  $\overline{GH} \cong$      ?
4.  $\angle DEF \cong$      ?
5.  $\angle EFG$  is supplementary to     ?
6.  $\triangle DGE \cong$      ?

ALGEBRA Use  $\square WXYZ$  to find each measure or value.

7.  $m\angle XYZ =$  \_\_\_\_\_
8.  $m\angle WZY =$  \_\_\_\_\_
9.  $m\angle WXY =$  \_\_\_\_\_
10.  $a =$  \_\_\_\_\_

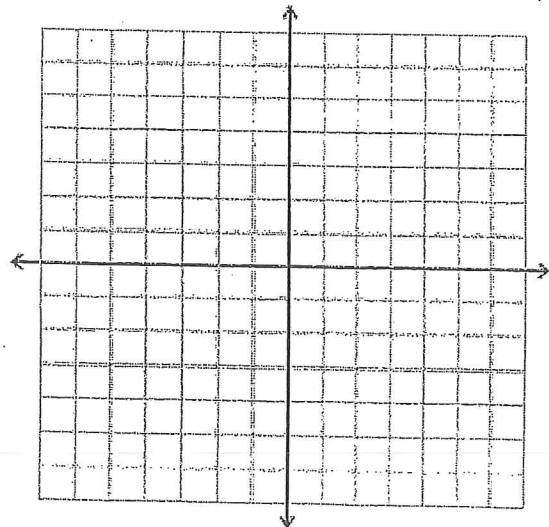
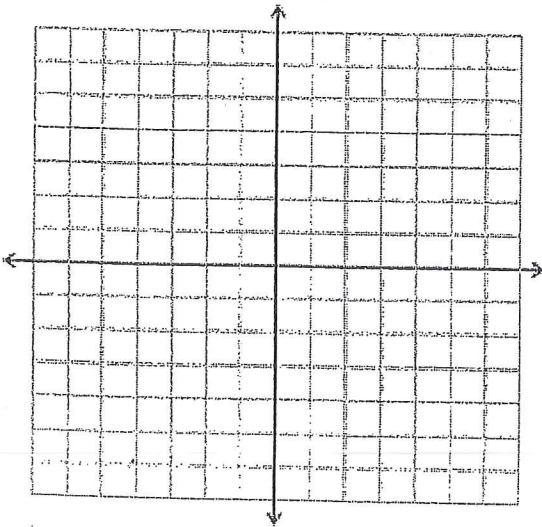


COORDINATE GEOMETRY

Is the shape a parallelogram? Explain.  
*add*  
*Perimeter = ?*

11.  $H(1, 1), J(2, 3), K(6, 3), L(5, 1)$

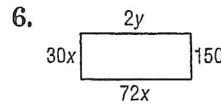
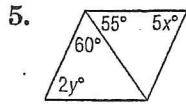
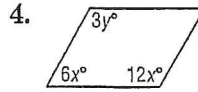
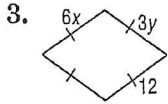
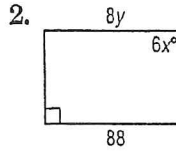
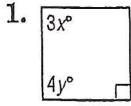
12.  $H(-1, 4), J(3, 3), K(3, -2), L(-1, -1)$



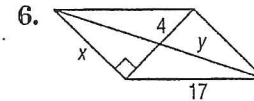
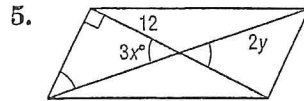
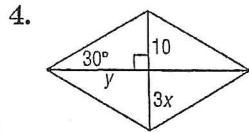
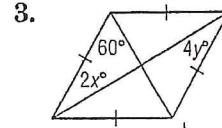
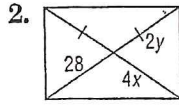
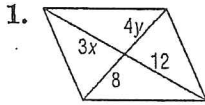
# 6-2 Study Guide and Intervention *(continued)*

## Exercises

Find  $x$  and  $y$  in each parallelogram.



Find  $x$  and  $y$  in each parallelogram.



Complete each statement about  $\square ABCD$ .  
Justify your answer.

7.  $\angle BAC \cong$

8.  $\overline{DE} \cong$

9.  $\triangle ADC \cong$

10.  $\overline{AD} \parallel$

