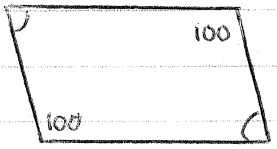
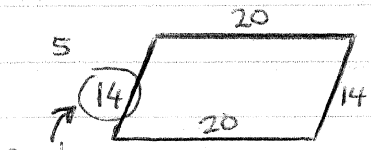
Geometry Ch 8-3 Exer., pg 520 #4-6, 8-13, 18-21, 25-28

What theorem proves the quadrilateral is a parallelogram?

4.



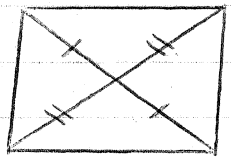
Opposite angles are congruent



Book Typo

Opp sides are congruent

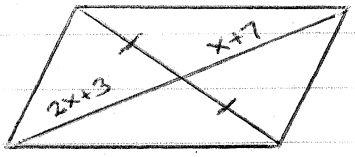
6.



Diagonals bisect each other

ALGEBRA: For what value of x is the quad. a parallelogram.
[Do Diagonals bisect each other?]

8.



$2x + 3 = x + 7$

$x = 4$

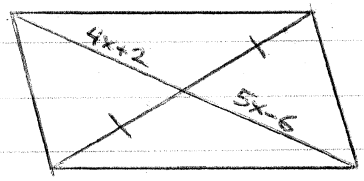
$2(4) + 3 = 11$

$(4) + 7 = 11$

When $x = 4$, the diagonals bisect each other, thus proving a parallelogram.

Note: Diagonals do not have to be congruent.

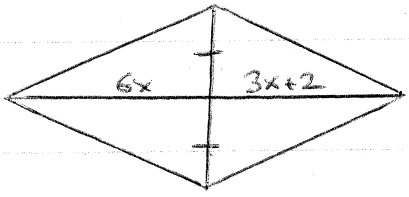
9.



$4x + 2 = 5x - 6$

$8 = x$

10.



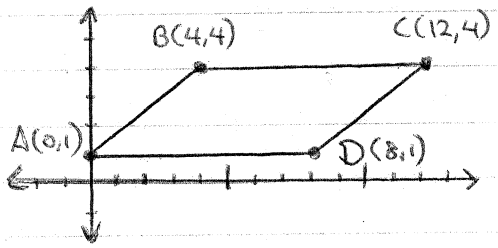
$6x = 3x + 2$

$3x = 2$

$x = \frac{2}{3}$

The vertices of quad. ABCD are given. Draw ABCD in a coordinate plane. Show that it is a parallelogram.

11.



① Slope Method:

slope AB $= \frac{4-1}{4-0} = \frac{3}{4}$

slope CD $= \frac{4-1}{12-8} = \frac{3}{4}$

Opp. sides are parallel

slope BC $= \frac{4-4}{12-4} = \frac{0}{8} = 0$

slope AD $= \frac{1-1}{8-0} = \frac{0}{8} = 0$

② Diagonal Mid-point Method:

mid-pt AC $= \left(\frac{0+12}{2}, \frac{1+4}{2}\right) = \left(6, \frac{5}{2}\right)$

mid-p BD $= \left(\frac{4+8}{2}, \frac{4+1}{2}\right) = \left(6, \frac{5}{2}\right)$

Diagonals have the same midpoint, meaning they bisect each other.

③ Distance Method:

$AB = \sqrt{(4-0)^2 + (4-1)^2} = \sqrt{16+9} = \sqrt{25}$

$CD = \sqrt{(12-8)^2 + (4-1)^2} = \sqrt{16+9} = \sqrt{25}$

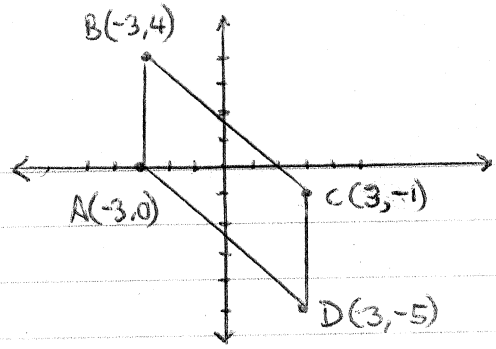
Opposite sides are Congruent.

$BC = 8$

$AD = 8$

ANY of these three methods will prove a parallelogram. You only need to use one of them. Which do you prefer? Which are you most confident with? Which is easiest?

12. A $(-3,0)$
B $(-3,4)$
C $(3,-1)$
D $(3,-5)$



① Slope Method:

slope AB = undefined, vertical line
slope CD = undefined, vertical line

Opposite sides are Parallel

$$\text{slope } BC = \frac{-1-4}{3-(-3)} = \frac{-5}{6}$$

$$\text{slope } AD = \frac{-5-0}{3-(-3)} = \frac{-5}{6}$$

② Diagonal Mid-point Method:

$$\text{mid-pt } AC = \left(\frac{-3+3}{2}, \frac{0+(-1)}{2}\right) = \left(0, -\frac{1}{2}\right)$$

$$\text{mid-pt } BD = \left(\frac{-3+3}{2}, \frac{4+(-5)}{2}\right) = \left(0, -\frac{1}{2}\right)$$

Diagonals bisect each other

③ Distance Method:

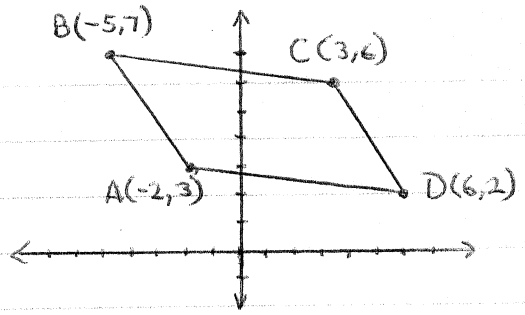
$AB = 4$
$CD = 4$

Opposite sides congruent

$$BC = \sqrt{(-3-3)^2 + (4-(-1))^2} = \sqrt{36+25} = \sqrt{61}$$

$$AD = \sqrt{(-3-3)^2 + (0-(-5))^2} = \sqrt{36+25} = \sqrt{61}$$

13. A(-2,3)
B(-5,7)
C(3,6)
D(6,2)



① Slope Method:

slope AB $= \frac{7-3}{-5-(-2)} = \frac{4}{-3}$

slope CD $= \frac{2-6}{6-3} = \frac{-4}{3}$

slope BC $= \frac{7-6}{-5-3} = -\frac{1}{8}$

slope AD $= \frac{3-2}{-2-6} = -\frac{1}{8}$

Opposite sides are Parallel

② Diagonal Mid-point Method:

mid-pt AC $= \left(\frac{-2+3}{2}, \frac{3+6}{2}\right) = \left(\frac{1}{2}, \frac{9}{2}\right)$

mid-pt BD $= \left(\frac{-5+6}{2}, \frac{7+2}{2}\right) = \left(\frac{1}{2}, \frac{9}{2}\right)$

Diagonals bisect each other

③ Distance Method:

$AB = \sqrt{(-5-(-2))^2 + (7-3)^2} = \sqrt{9+16} = \sqrt{25}$

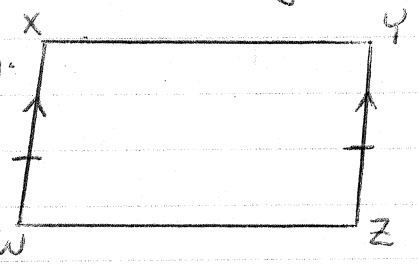
$CD = \sqrt{(3-6)^2 + (6-2)^2} = \sqrt{9+16} = \sqrt{25}$

$BC = \sqrt{(-5-3)^2 + (7-6)^2} = \sqrt{64+1} = \sqrt{65}$

$AD = \sqrt{(-2-6)^2 + (3-2)^2} = \sqrt{64+1} = \sqrt{65}$

Opposite sides are congruent

18. In quadrilateral WXYZ, $\overline{WZ}$ and $\overline{XY}$ are congruent and parallel. Which statement is not necessarily true?



A. $\angle Y + \angle W = 180°$ Congruent, not nec. supply.

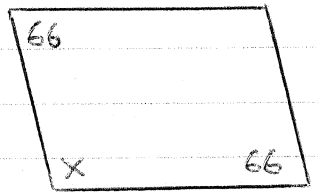
B. $\angle X \cong \angle Z$ Yes, opp angles $\cong$

C. $\overline{WX} \cong \overline{ZY}$ Yes, opp sides $\cong$

D. $\overline{WX} \parallel \overline{ZY}$ Yes, opp sides parallel

ALGEBRA: For what value of x is the quad. a parallelogram?

19.

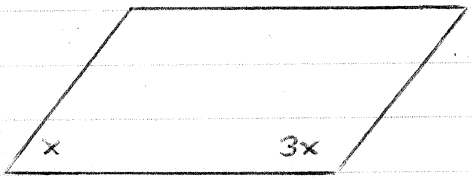


Remember: consecutive interior angles of a parallelogram must be supplementary.

$66 + x = 180$

$x = 114$

20.

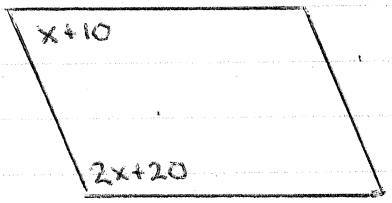


$x + 3x = 180$

$4x = 180$

$x = 45$

21.



$(x+10) + (2x+20) = 180$

$3x + 30 = 180$

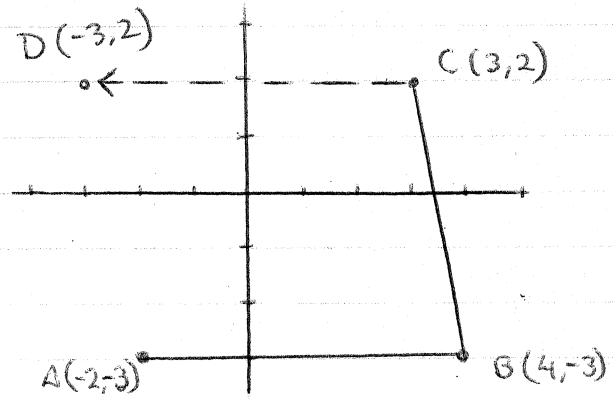
$3x = 150$

$x = 50$

Three of the vertices to parallelogram ABCD are given. Find the coordinates of the fourth vertex.

A diagram is drawn, but not necessary

25. A(-2,-3)
B(4,-3)
C(3,2)
D(x,y)



The path of B to A will match the path from C to D.

B to A is Left 6; Up/down 0

C(3,2) → D(3-6, 2+0) = D(-3,2)

26. A(-4,1), B(-1,5), C(6,5), D(x,y)

B to A is Left 3; Down 4

C(6,5) → D(6-3, 5-4) = D(3,1)

27. A(-4,4), B(4,6), C(3,-1), D(x,y)

B to A is Left 8; Down 2

C(3,-1) → D(3-8, -1-2) = D(-5,-3)

28. A(-1,0), B(0,-4), C(8,-6), D(x,y)

B to A is Left 1; Up 4

C(8,-6) → D(8-1, -6+4) = D(7,-2)