

Lesson 11.6- SWBAT use slope, midpoint and distance to prove properties of parallelograms.
 Kick off:
 Directions: Simplify each of the following.

1) Factor completely: $10x^3 - 40x^2 - 20x$


① GCF $10x(x^2 - 4x - 2)$
 ② MP $(x^2 - 6x)(2x - 12)$
 $X(X-6)2(x-6)$
 $10x(X+2)(X-6)$

2) $(x-2)^2$
 $(x-2)(x-2)$
 $X^2 - 2x - 2x + 4$
 $X^2 - 4x + 4$

① $\sqrt{85}$ ⑤ 4 ⑨ 20
 ② $\sqrt{82}$ ⑥ $5\sqrt{2}$ ⑩ $\sqrt{85}$
 ③ $\sqrt{5}$ ⑦ $5\sqrt{5}$ ⑪ $\sqrt{68}$
 ④ 6 ⑧ $\sqrt{178}$ ⑫ 4

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What are the properties of a parallelogram?



Length

- * Opposite Sides are Congruent
- * Opposite Sides are Parallel
- * Opposite angles are Congruent
- * Consecutive angles are Supplementary
- * Diagonals bisect each other.
 - ↳ cross in the middle.

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Properties of a Parallelogram that can shown on a coordinate plane are:

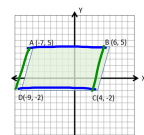
Properties	Formula to Use!
Opposite Sides are Congruent.	Distance are equal! $\sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$
Opposite Sides are parallel.	Slopes are equal $\frac{y_2-y_1}{x_2-x_1}$
Diagonals bisect each other	Mid points are the same! $(\frac{x_1+x_3}{2}, \frac{y_1+y_3}{2})$

↳ Middles

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1) Opposite sides are parallel.

SLOPE $\frac{y_2-y_1}{x_2-x_1}$



AB: $\frac{5-5}{6-(-7)} = \frac{0}{13} = 0$
 DC: $\frac{-2+2}{4-(-9)} = \frac{0}{13} = 0$ ✓

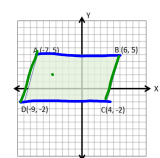
AD: $\frac{-2-5}{-9-(-7)} = \frac{-7}{-2} = \frac{7}{2}$
 BC: $\frac{-2-5}{4-6} = \frac{-7}{-2} = \frac{7}{2}$ ✓

Proved parallel! ✓

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2) Opposite sides are congruent.

distance $\sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$



AB = 13
 CD = 13

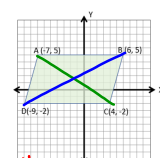
AD: $\sqrt{(-9-(-7))^2 + (-2-5)^2} = \sqrt{4+49} = \sqrt{53}$
 BC: $\sqrt{(4-6)^2 + (-2-5)^2} = \sqrt{4+49} = \sqrt{53}$

Proved congruent!

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3) Diagonals bisect each other.

mid-point $(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2})$



AC: $(\frac{-7+4}{2}, \frac{5+(-2)}{2}) = (-\frac{3}{2}, \frac{3}{2}) = (-1.5, 1.5)$
 BD: $(\frac{6+(-9)}{2}, \frac{5+(-2)}{2}) = (-\frac{3}{2}, \frac{3}{2}) = (-1.5, 1.5)$

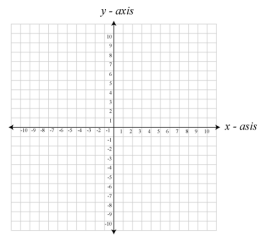
Mid point (-1.5, 1.5)
 Proved bisecting! ✓

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Examples:

1) The points A (3, 4), B (8, 6), C (9, 9) and D (4, 7) are the vertices of a parallelogram. Prove the following:

a. Opposite sides are parallel.



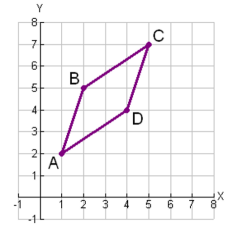
b. Opposite sides are congruent.

c. Diagonals bisect each other.

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2) For the parallelogram below. Prove the following:

a. Opposite sides are parallel.



b. Opposite sides are congruent.

c. Diagonals bisect each other.

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