Unit 5, Lesson 9

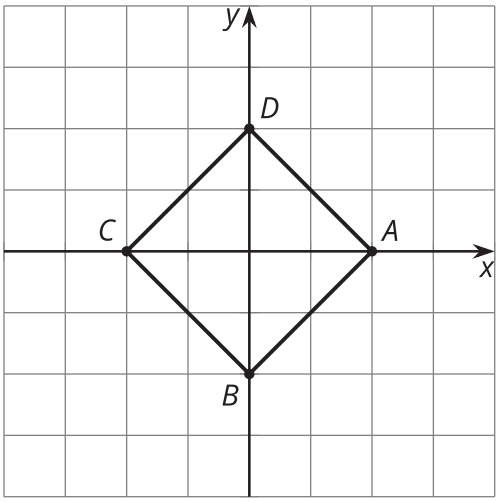
Classifying with Slope

Let's categorize some quadrilaterals and triangles.

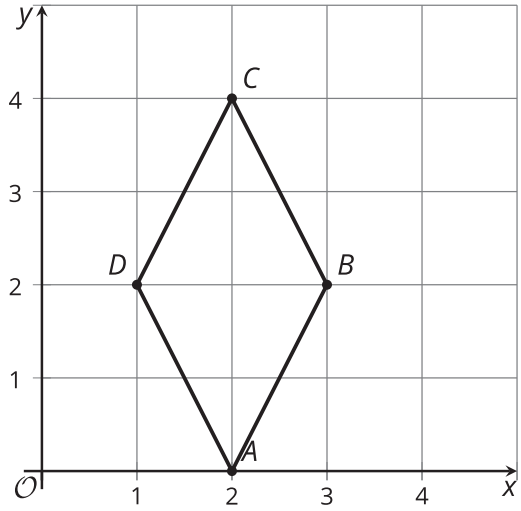
9.1 Which Three Go Together: Coordinate Quadrilaterals

Which three go together? Why do they go together?

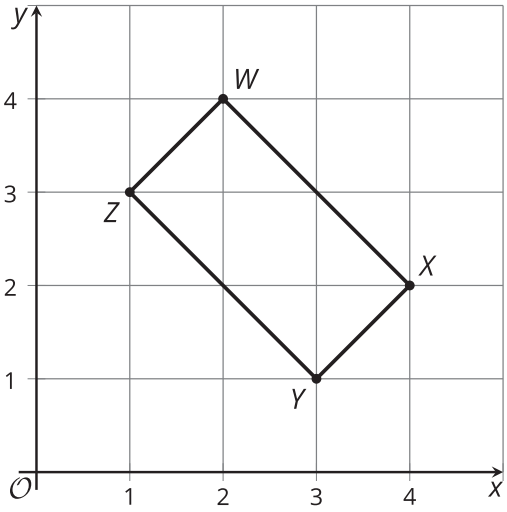
A



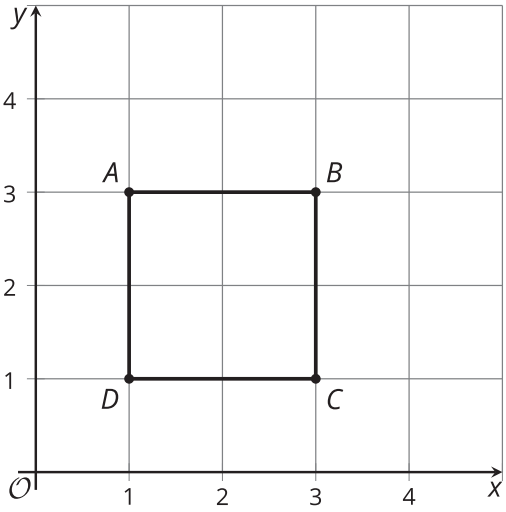
B



C



D



9.2 Name This Quadrilateral

A quadrilateral has vertices $(0, 0)$, $(4, 3)$, $(13, -9)$, and $(9, -12)$.

1. What type of quadrilateral is it? Explain or show your reasoning.

2. Find the perimeter of this quadrilateral.

3. Find the area of this quadrilateral.

Are you ready for more?

1. A parallelogram has vertices $(0, 0)$, $(5, 0)$, $(-2, 10)$, and $(3, 10)$. Find the area of this parallelogram.

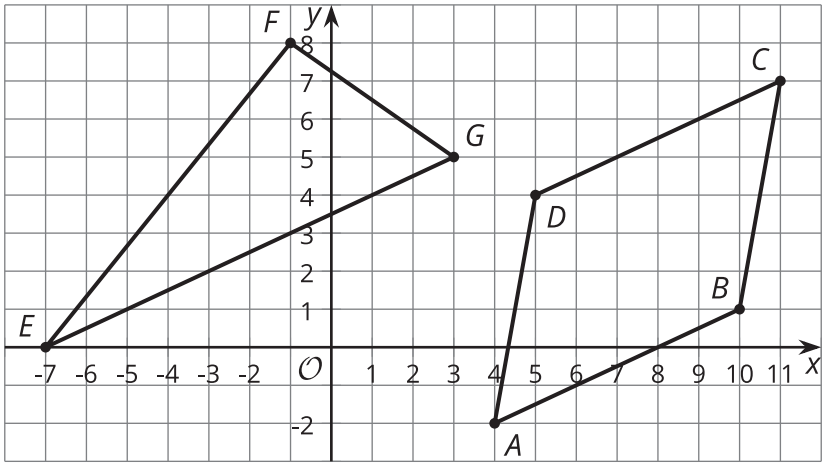
2. Consider a general parallelogram with vertices $(0, 0)$, (a, b), (kb, ka), and $(a - kb, b + ka)$, where a and b are positive, and a scale factor of k. Show that the parallelogram is a rectangle, then write an expression for its area in terms of a, b, and k.

9.3 Card Sort: Triangle Types

Your teacher will give you a set of cards. You and your partner will take turns sorting the cards, by categorizing the triangle on each card as either a right triangle or a non-right triangle.

1. For each card that you sort, explain to your partner how you know it belongs in that category.
2. For each card that your partner sorts, listen carefully to your partner's explanation. If you and your partner disagree, discuss your thinking, and work to reach an agreement.

Lesson 9 Summary



What can we tell about each of these shapes? We can use slopes to check whether or not quadrilateral $ABCD$ has two pairs of parallel line segments. Sides AB and CD each have a slope of $\frac{1}{2}$. Sides BC and DA both have a slope of 6. We can also tell that it does not have any right angles because $\frac{1}{2}$ and 6 are not opposite reciprocals. So, we can tell that it is a parallelogram but not a rectangle.

Next, we can use the Pythagorean Theorem to see the lengths of each side. The lengths of segments AB and CD are $\sqrt{45}$ units, and the lengths of segments BC and DA are $\sqrt{37}$ units. All side lengths are between 6 and 7 units long, but they are not exactly the same. This means that quadrilateral $ABCD$ is a parallelogram, but not a rhombus or a square.

Can we find the area of triangle EFG? That seems tricky, because we don't know the height of the triangle using EG as the base. However, angle EFG seems like it could be a right angle. In that case, we could use sides EF and FG as the base and height.

To see if EFG is a right angle, we can calculate slopes. The slope of EF is $\frac{8}{6}$ or $\frac{4}{3}$, and the slope of FG is $-\frac{3}{4}$. Since the slopes are opposite reciprocals, the segments are perpendicular, and angle EFG is indeed a right angle. This means that we can think of EF as the base and FG as the height. The length of EF is 10 units, and the length of FG is 5 units. So the area of triangle EFG is 25 square units because $\frac{1}{2} \cdot 10 \cdot 5 = 25$.