Module 5 - Lesson 3:

Classify parallelograms based on their properties.

CCSS Standard – 5.G.B.3 / 5.G.B.4

FLUENCY (10-min)

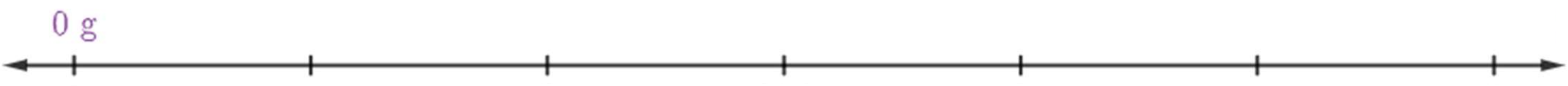
Whiteboard Exchange: Multiply Multi-Digit Whole Numbers

Write and complete the equation by using the standard algorithm.

$$\begin{array}{r}
\overset{2}{1} \\
416 \\
\times \quad 34 \\
\hline
{}^{1}\ \ {}^{1} \\
1664 \\
+\,12480 \\
\hline
14{,}144
\end{array}
\qquad\qquad
\begin{array}{r}
\overset{1}{2}\,\overset{1}{2} \\
857 \\
\times \quad 42 \\
\hline
1714 \\
+\,34280 \\
\hline
35{,}994
\end{array}$$

FLUENCY (10-min) **Counting on the Number Line by Grams and Kilograms**

Use the number line to count forward by 500 grams to 3,000 grams.
The first measurement you say is 0. Ready?



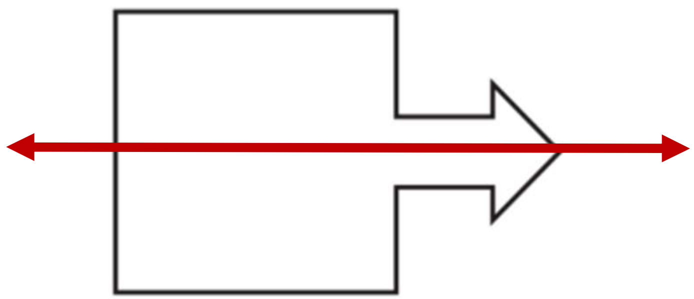
Now, count forward by 500 grams again. This time rename every 1,000 grams as a number of kilograms. The first measurement you say is 0 kilograms. Ready?

Now, count forward by 500 grams again. This time use mixed units, kilogram and grams, when possible. The first measurement you say is 0 kilograms. Ready?

FLUENCY (10-min) **Choral Response: Lines of Symmetry**

Raise your hand when you know the answer to each question.
Wait for my signal to say the answer.

Does this figure have a line of symmetry? **Yes**



If yes, how many total lines of symmetry does the figure have?

One line of symmetry

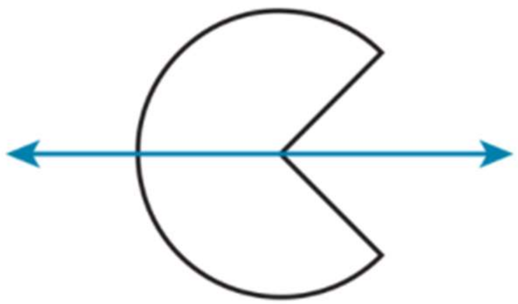
Does this figure have a line of symmetry? **No**

Zero lines of symmetry

FLUENCY (10-min) **Choral Response: Lines of Symmetry**

Raise your hand when you know the answer to each question.
Wait for my signal to say the answer.

Is the line shown a line of symmetry for the figure? **Yes**

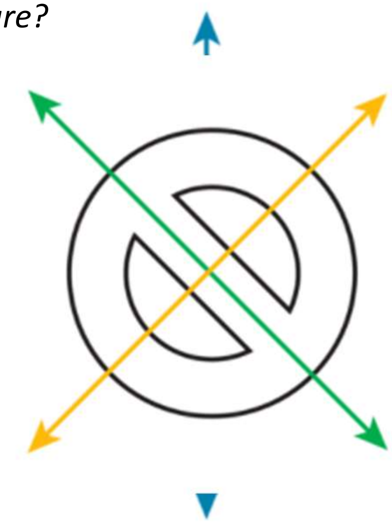


How many total lines of symmetry does the figure have?

One line of symmetry

Is the line shown a line of symmetry for the figure? **No!**

Can other lines of symmetry be drawn for this figure? **Yes!**



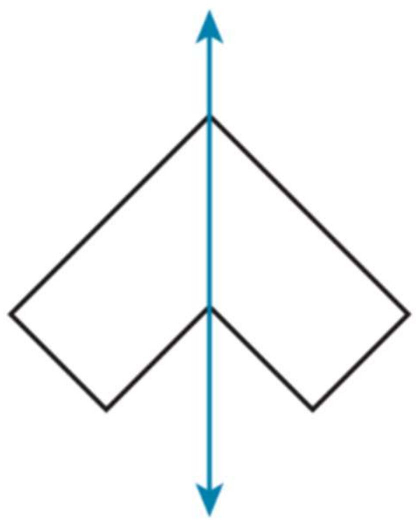
How many total lines of symmetry does the figure have?

Two lines of symmetry

FLUENCY (10-min) **Choral Response: Lines of Symmetry**

Raise your hand when you know the answer to each question.
Wait for my signal to say the answer.

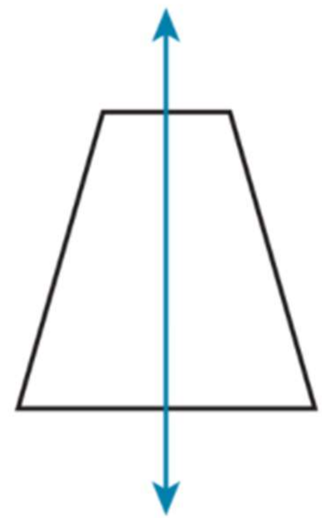
Is the line shown a line of symmetry for the figure? **Yes**



How many total lines of symmetry does the figure have?

One line of symmetry

Is the line shown a line of symmetry for the figure? **Yes**



How many total lines of symmetry does the figure have?

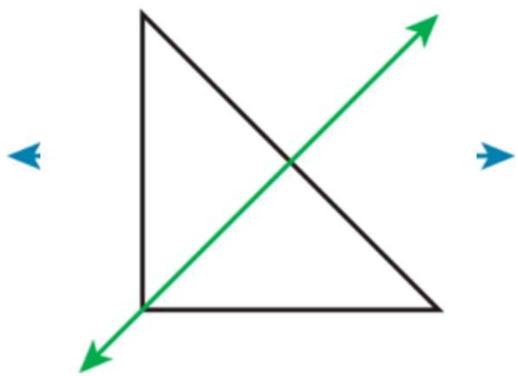
One line of symmetry

FLUENCY (10-min) **Choral Response: Lines of Symmetry**

Raise your hand when you know the answer to each question.
Wait for my signal to say the answer.

Is the line shown a line of symmetry for the figure? **No!**

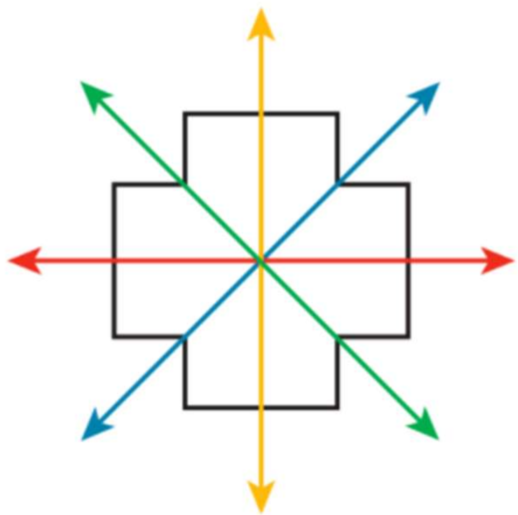
Can another line of symmetry be drawn for this figure? **Yes!**



How many total lines of symmetry does the figure have?

One line of symmetry

Does this figure have a line of symmetry? **Yes**



How many total lines of symmetry does the figure have?

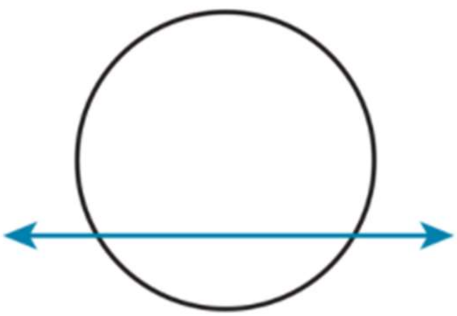
Four lines of symmetry!

FLUENCY (10-min) **Choral Response: Lines of Symmetry**

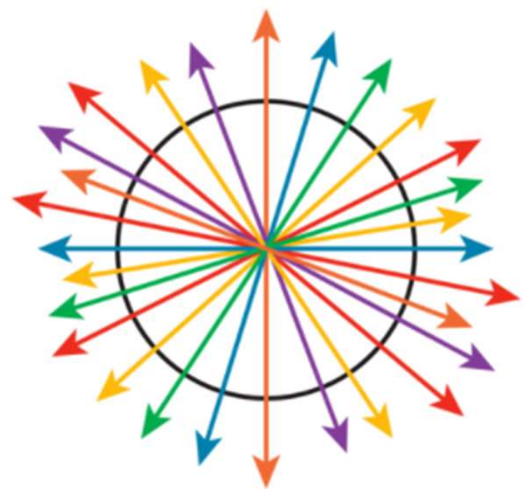
Raise your hand when you know the answer to each question.
Wait for my signal to say the answer.

Does this circle show a line of symmetry? **No!**

Can other lines of symmetry be drawn for this circle? **Yes!**



How many total lines of symmetry can the circle have?



A circle has an infinite number of lines of symmetry!

LAUNCH (5-min)

Make a conjecture (conclusion) about whether all parallelograms are trapezoids.

Read the statement below, then stand besides the sign that best describes YOUR thinking.
Do not follow others, decide based on what you already know of hierarchies.

All parallelograms are quadrilaterals,

but not all quadrilaterals are trapezoids.

Strongly Agree	Strongly Disagree	Undecided

If the statement had only said that all parallelograms are quadrilaterals, choosing might have been more straightforward. ALL parallelograms have 4 sides and have angle measures that sum to 360º, so all parallelograms are quadrilaterals.

Today, we will explore the second part of that statement. We will learn properties of parallelograms and compare their properties to the properties of other quadrilaterals.

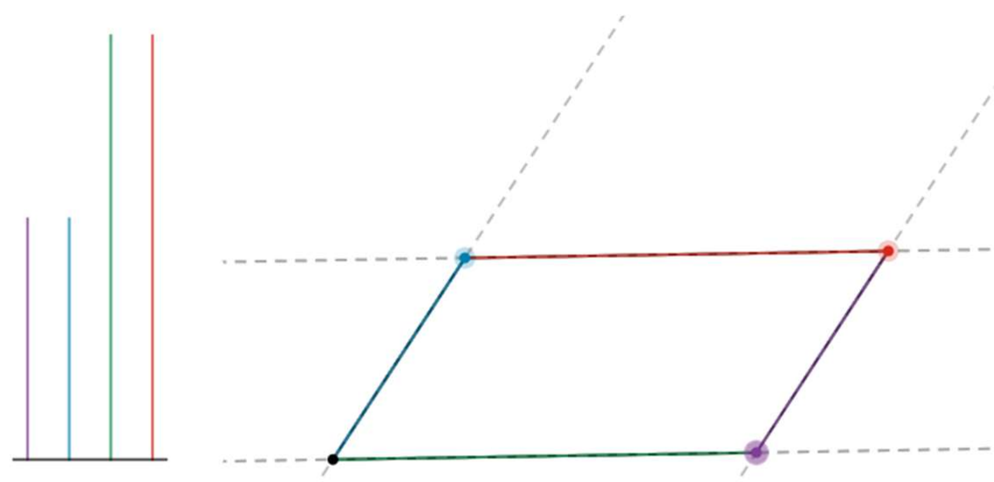
LEARN (35-min)

Construct a Parallelogram

Use interactive Geometry World on Digital Great Minds.

Let's construct parallelograms to identify properties of parallelograms. What must the figure include? How do you know?

The figure must include **2 pairs of parallel sides**.
Opposite sides in a parallelogram **are parallel**.
Opposite sides have the **same length**.

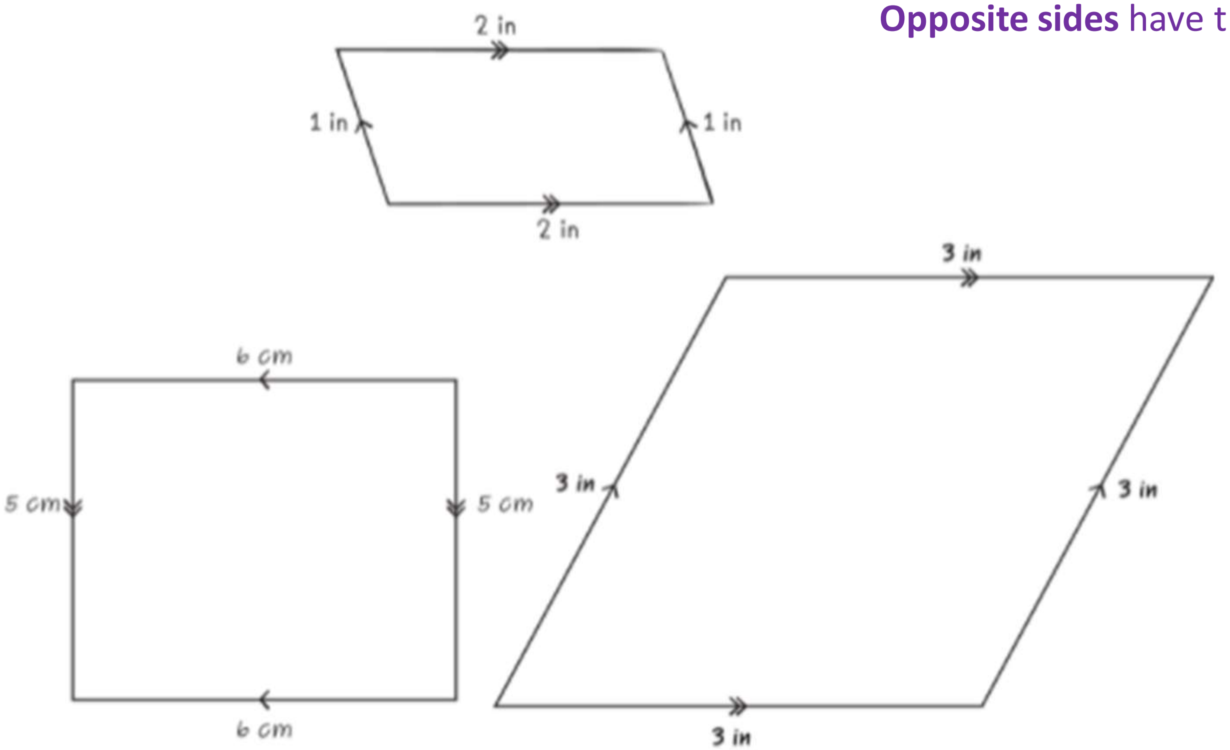


LEARN (35-min)

Sample Parallelograms

The figure must include **2 pairs of parallel sides**.
Opposite sides in a parallelogram **are parallel**.
Opposite sides have the **same length**.

Properties

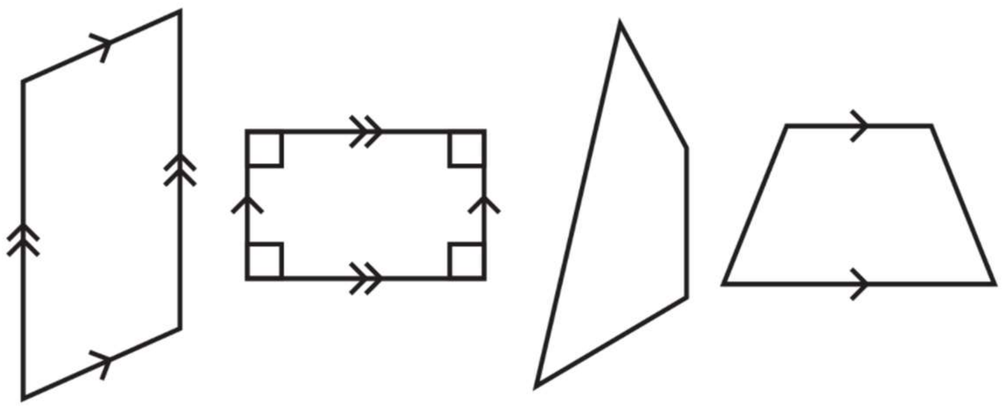


Today, all the quadrilaterals we constructed have 2 pairs of parallel sides, so they can be classified as parallelograms.

Now measure the sides of your parallelogram. Label the side lengths on your parallelogram.

LEARN (35-min) **Angle Measures in Parallelograms**

We know that <u>opposite sides</u> in a parallelogram <u>have the same length</u>.
Let's look at angle measures inside the parallelograms.



If a parallelogram has right angles, is that an <u>attribute</u> of the parallelogram or a <u>property</u>? Why?

An attribute. Not <u>all</u> parallelograms have right angles.

What do we know about the angles of <u>every quadrilateral</u>?

The measures of all angles inside a quadrilateral add up to 360 degrees.

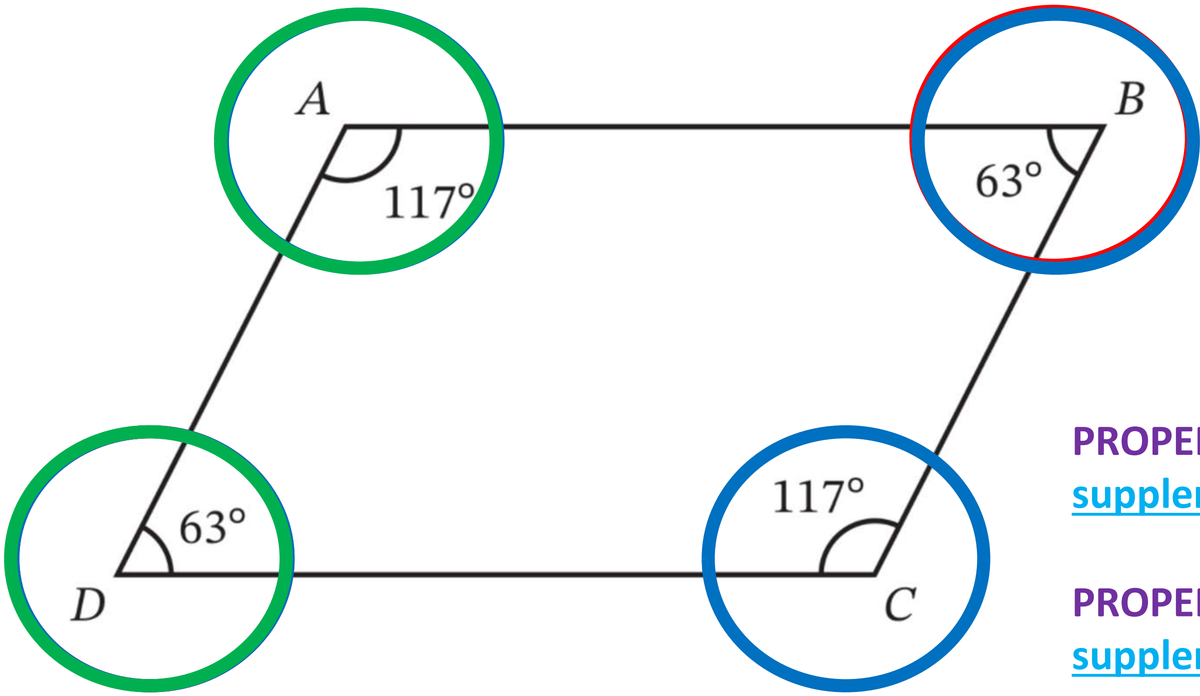
What do we know about the angles of <u>every trapezoid</u>?

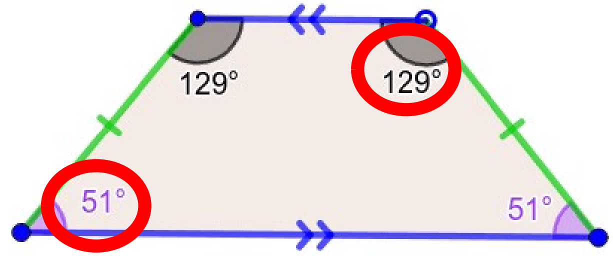
The measures of all angles inside any trapezoid add up to 360 degrees.

Trapezoids have at least 2 pairs of supplementary angles (adding up to 180 degrees).

LEARN (35-min) **Angle Measures in Parallelograms**

PROPERTY: **Opposite angles in a parallelogram have the measure.**





This property is not necessarily true with trapezoids.

PROPERTY: **The bottom angles in a parallelogram are <u>supplementary angles</u> (adding to 180 degrees).**

PROPERTY: **The top angles in a parallelogram are <u>supplementary angles</u> (adding to 180 degrees).**

PROPERTY: **The angles on the sides in a parallelogram are <u>supplementary angles</u> (adding to 180 degrees).**

LEARN (35-min)

Explore Diagonals of Parallelograms

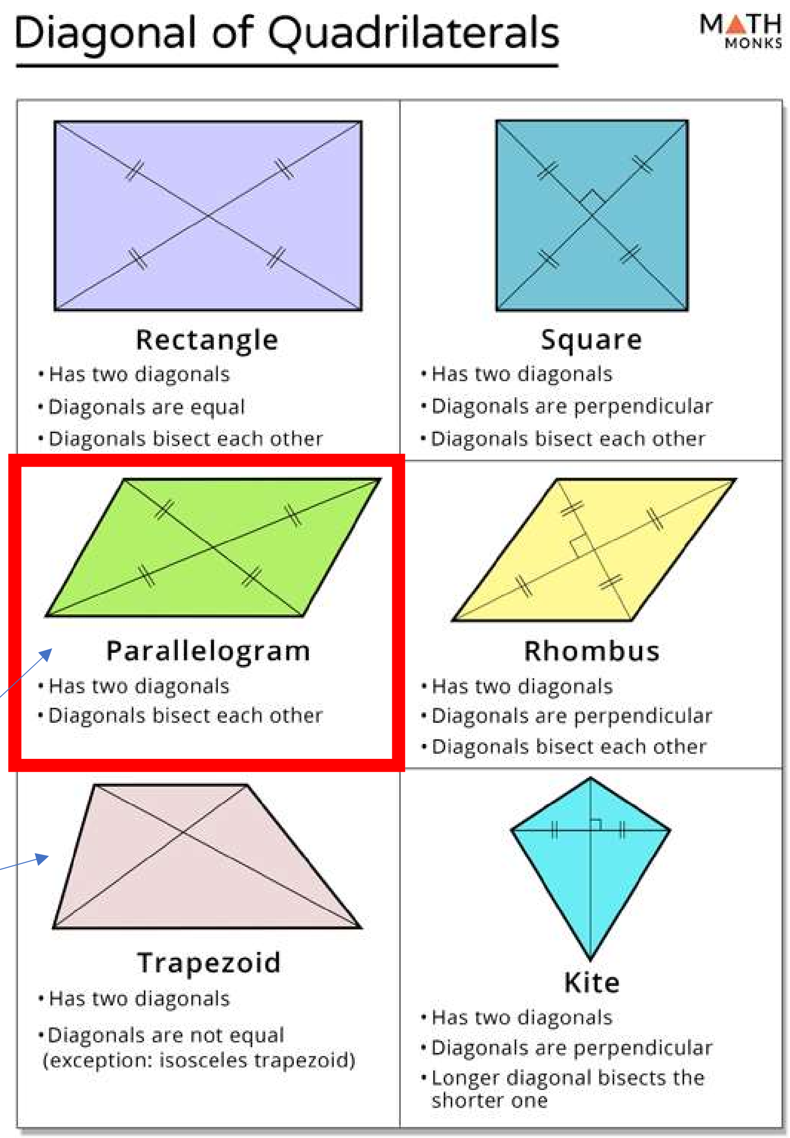
What is a diagonal of a quadrilateral?

A line segment connecting **opposite corners** of the quadrilateral.

Draw diagonals in your parallelogram.

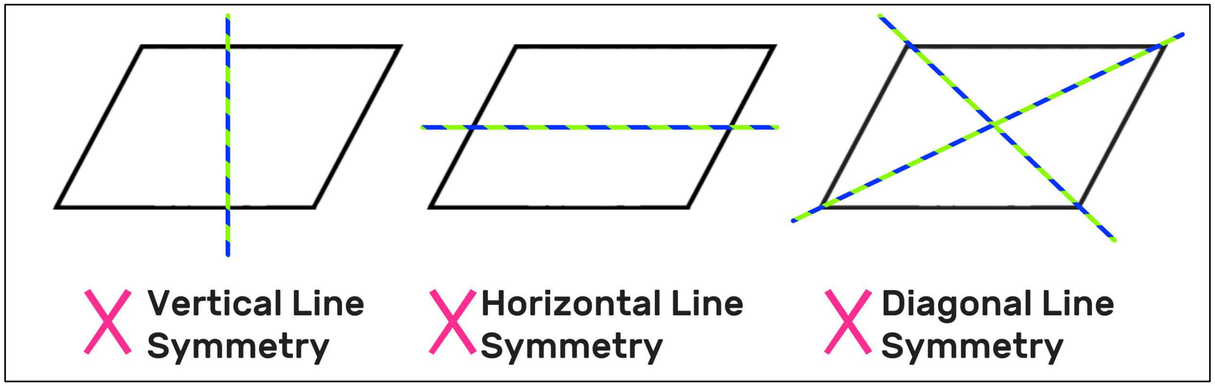
Each diagonal splits the other diagonal into 2 equal-length segments. We can say that the diagonals of a parallelogram intersect at their midpoints. A midpoint is the point on a line segment that divides a line segment into 2 line segments of equal length.

NOTICE: Diagonals intersect at their midpoints for parallelograms, but not for trapezoids. Therefore, this is another property of parallelograms because it is true of ALL parallelograms.



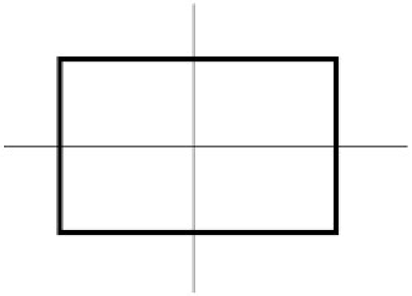
LEARN (35-min) **Explore Symmetry of Parallelograms**

Not all parallelograms have a line of symmetry.

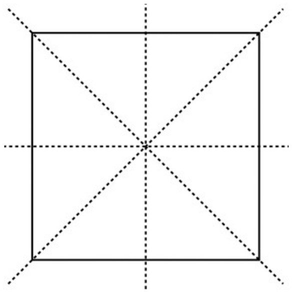


Some parallelograms may have symmetry:

A **rectangle** is a quadrilateral in which all angles are right angles. **A rectangle is a parallelogram**, so its opposite sides are equal.



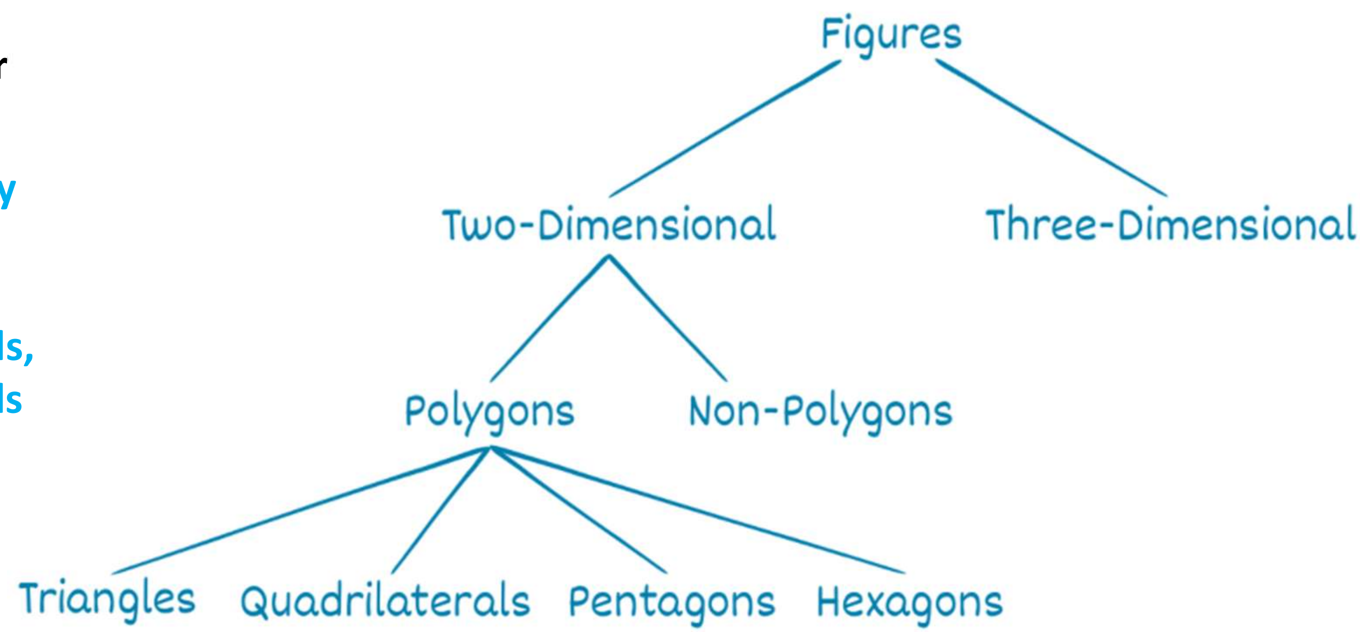
A square is a parallelogram. This is always true. Squares are quadrilaterals with 4 congruent sides and 4 right angles, and they also have two sets of parallel sides.



LEARN (30-min) **Hierar**

Now we can EXPAND on our hierarchy from the last lesson.

Because parallelograms are trapezoids, we can classify them below trapezoids in the hierarchy.



Trapezoids

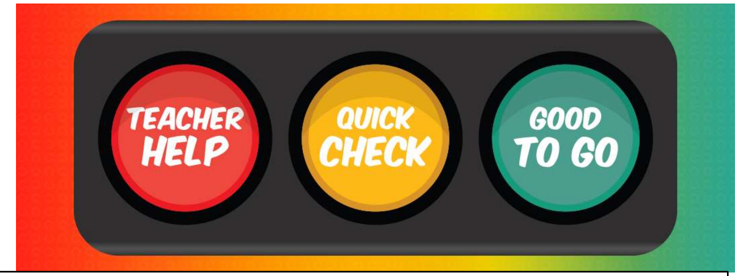
Properties:
At least 1 pair of parallel sides.
At least 2 pairs of supplementary angles.

Parallelograms

Properties:
Opposite sides that are parallel.
Opposite sides that have the same length.
Opposite angles that have the same measure.
Diagonals intersecting at midpoints.

LAND (10-min)

Exit Ticket



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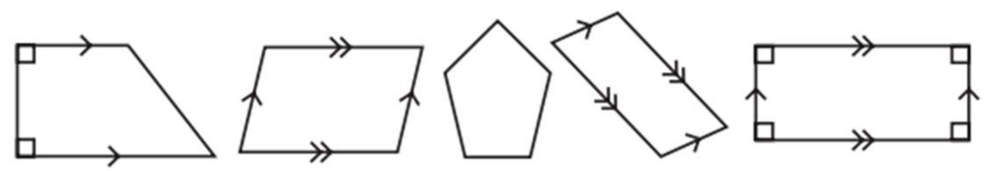
Name ____________________ Date __________

1. Consider the polygons shown.



   a. Circle each polygon that is a quadrilateral.

   b. Write the letter T in each polygon that is a trapezoid.

   c. Write the letter P in each polygon that is a parallelogram.

2. When can a trapezoid be classified as a parallelogram?

Exit Ticket – PAGE 23

Small Group Time:
Problem Set Pages 19 - 21

Homework:
Page 23 APPLY BOOK