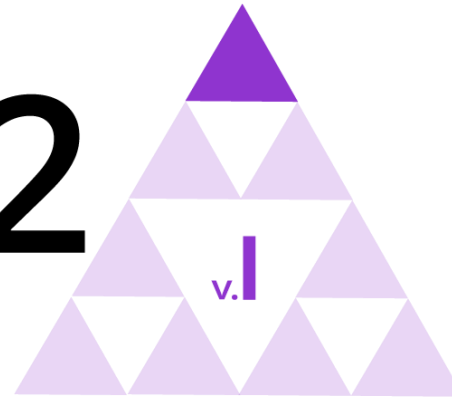


IM 9–12 MATH



Unit 2 Congruence



Lesson 13

Proofs about Parallelograms

Learning Goal

Let's prove theorems about
parallelograms.

Geometry

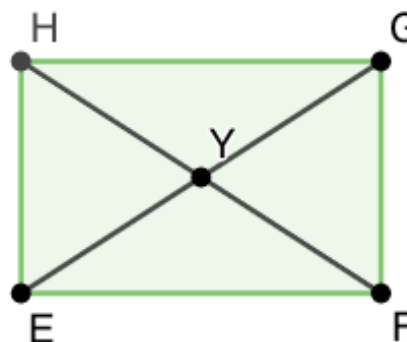
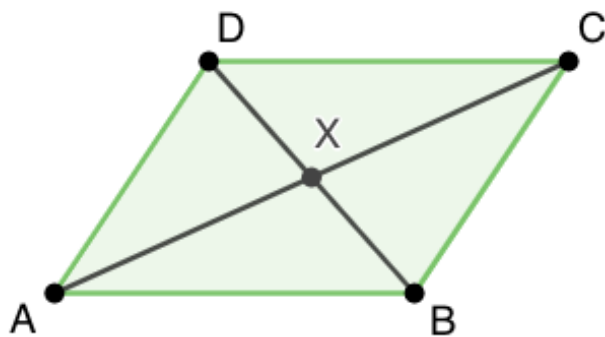


Diagonals



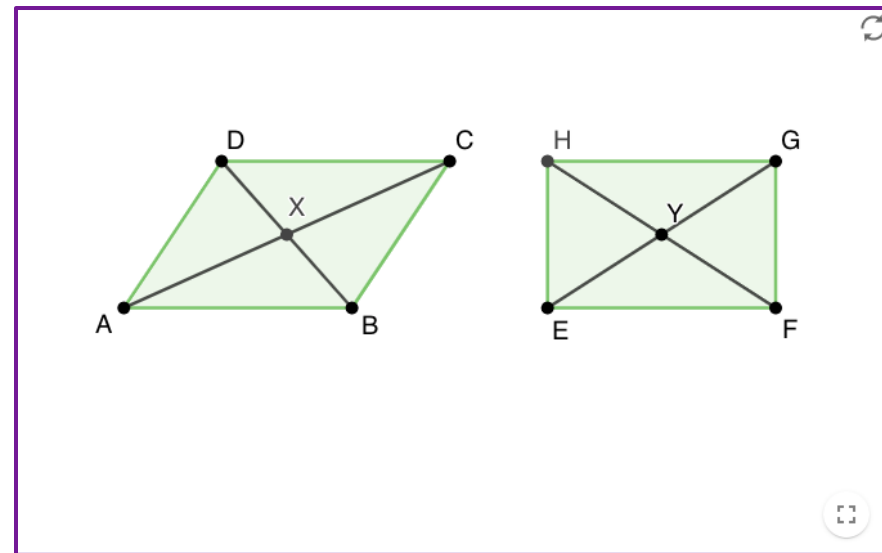
Warm-up: Notice and Wonder

Here is parallelogram $ABCD$ and rectangle $EFGH$. What do you notice? What do you wonder?



Diagonals

Warm-up



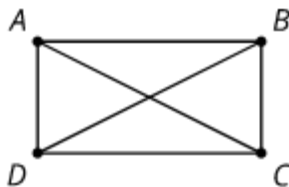
The Diagonals of a Parallelogram



Conjecture: The diagonals of a parallelogram bisect each other.

1. Use the tools available to convince yourself the conjecture is true.
2. Convince your partner that the conjecture is true for any parallelogram. Can the 2 of you think of different ways to convince each other?
3. What information is needed to prove that the diagonals of a parallelogram bisect each other?
4. Prove that segment AC bisects segment BD , and that segment BD bisects segment AC .

Work Backwards to Prove



Given: $ABCD$ is a parallelogram with AB parallel to CD and AD parallel to BC . Diagonal AC is congruent to diagonal BD .

Prove: $ABCD$ is a rectangle (angles A , B , C , and D are right angles).

With your partner, you will work backwards from the statement to the proof until you feel confident that you can prove that $ABCD$ is a rectangle using only the given information.

Start with this sentence: I would know $ABCD$ is a rectangle if I knew _____.

Then take turns saying this sentence: I would know [what my partner just said] if I knew _____.

Write down what you each say. If you get to a statement and get stuck, go back to an earlier statement and try to take a different path.



What is the converse of “If a quadrilateral is a parallelogram, then its diagonals bisect each other”?

1. A quadrilateral is a parallelogram if its diagonals bisect each other.
2. A quadrilateral is a parallelogram only if its diagonals bisect each other.

I can prove theorems about the diagonals of a parallelogram.

**Learning
Targets**

Geometry





Use your notes from the Work Backwards to Prove activity to write a proof that if the diagonals of a parallelogram are congruent, that parallelogram must be a rectangle.

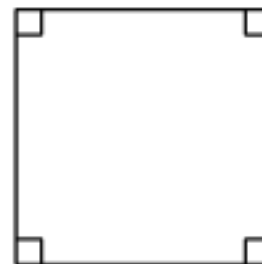
Given: $ABCD$ is a parallelogram with AB parallel to CD and AD parallel to BC .
Diagonal AC is congruent to diagonal BD .

Prove: $ABCD$ is a rectangle (angles A , B , C and D are right angles).



rectangle

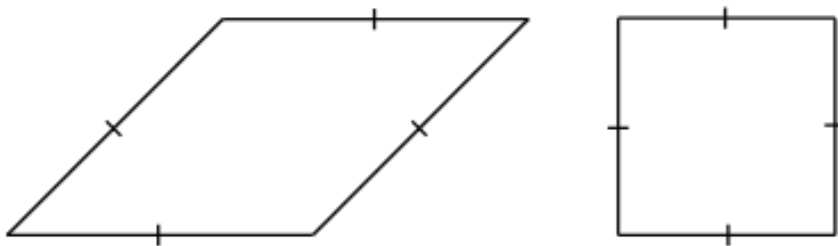
A quadrilateral with four right angles.





rhombus

A quadrilateral with four congruent sides.





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