

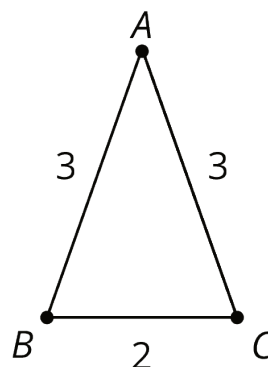
Lesson 9: Composing Figures

Let's use reasoning about rigid transformations to find measurements without measuring.

9.1: Angles of an Isosceles Triangle

Here is a triangle.

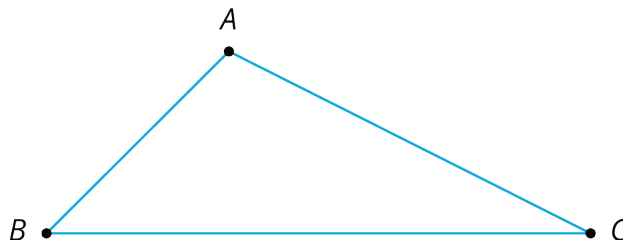
1. Reflect triangle ABC over line AB .
Label the image of C as C' .
2. Rotate triangle ABC' around A so that C' matches up with B .
3. What can you say about the measures of angles B and C ?



9.2: Triangle Plus One

Here is triangle ABC .

1. Draw midpoint M of side AC .
2. Rotate triangle ABC 180 degrees using center M to form triangle CDA . Draw and label this triangle.
3. What kind of quadrilateral is $ABCD$?
Explain how you know.

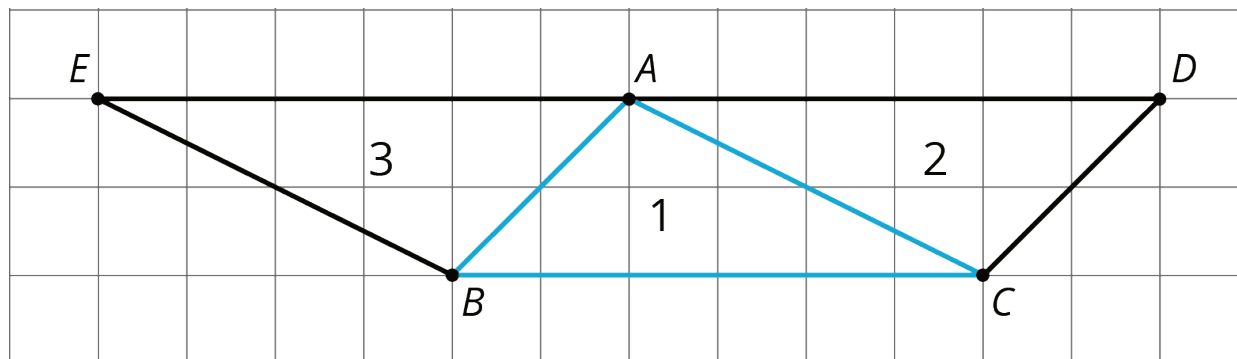


Are you ready for more?

In the activity, we made a parallelogram by taking a triangle and its image under a 180-degree rotation around the midpoint of a side. This picture helps you justify a well-known formula for the area of a triangle. What is the formula and how does the figure help justify it?

9.3: Triangle Plus Two

The picture shows 3 triangles. Triangle 2 and Triangle 3 are images of Triangle 1 under rigid transformations.



- Describe a rigid transformation that takes Triangle 1 to Triangle 2. What points in Triangle 2 correspond to points A , B , and C in the original triangle?

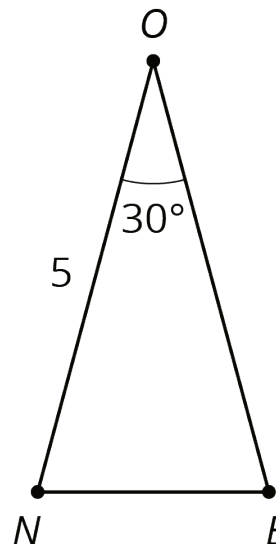
- Describe a rigid transformation that takes Triangle 1 to Triangle 3. What points in Triangle 3 correspond to points A , B , and C in the original triangle?

- Find two pairs of line segments in the diagram that are the same length, and explain how you know they are the same length.

- Find two pairs of angles in the diagram that have the same measure, and explain how you know they have the same measure.

9.4: Triangle ONE Plus

Here is isosceles triangle ONE . Its sides ON and OE have equal lengths. Angle O is 30 degrees. The length of ON is 5 units.

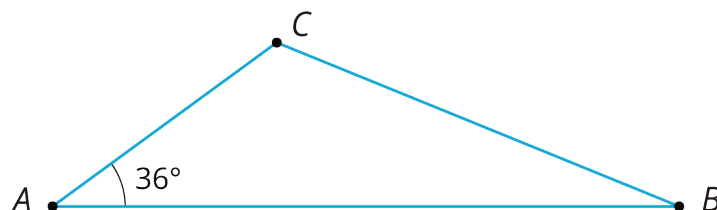


1. Reflect triangle ONE across segment ON . Label the new vertex M .
2. What is the measure of angle MON ?
3. What is the measure of angle MOE ?
4. Reflect triangle MON across segment OM . Label the point that corresponds to N as T .
5. How long is \overline{OT} ? How do you know?
6. What is the measure of angle TOE ?
7. If you continue to reflect each new triangle this way to make a pattern, what will the pattern look like?

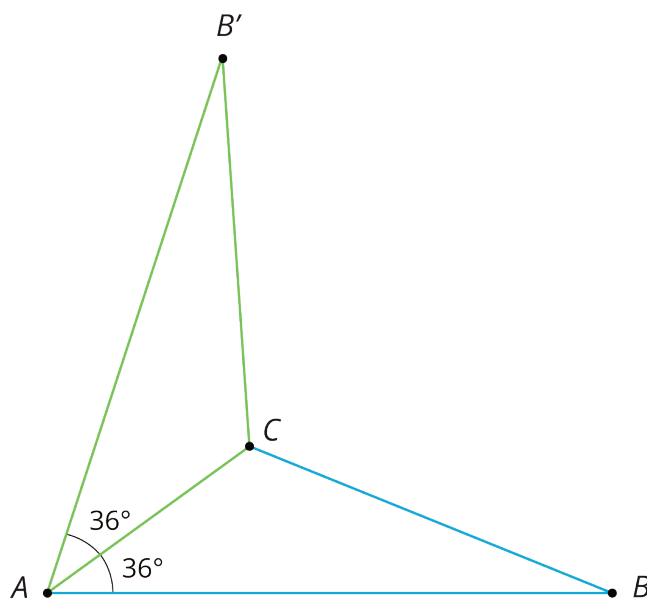
Lesson 9 Summary

Earlier, we learned that if we apply a sequence of rigid transformations to a figure, then corresponding sides have equal length and corresponding angles have equal measure. These facts let us figure out things without having to measure them!

For example, here is triangle ABC .



We can reflect triangle ABC across side AC to form a new triangle:



Because points A and C are on the line of reflection, they do not move. So the image of triangle ABC is $AB'C$. We also know that:

- Angle $B'AC$ measures 36° because it is the image of angle BAC .
- Segment AB' has the same length as segment AB .

When we construct figures using copies of a figure made with rigid transformations, we know that the measures of the images of segments and angles will be equal to the measures of the original segments and angles.