



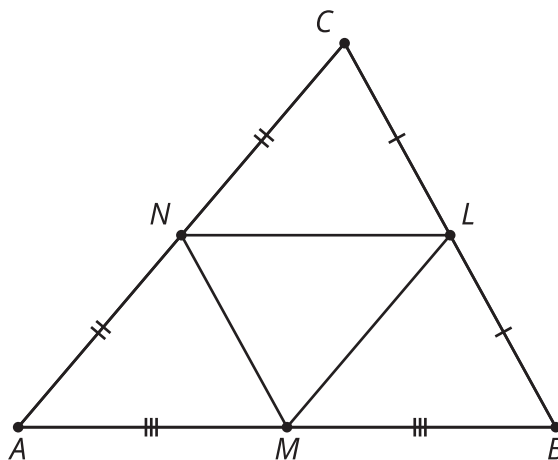
Splitting Triangle Sides with Dilation (Part 1)

Let's draw segments connecting midpoints of the sides of triangles.

5.1 Notice and Wonder: Midpoints

Here's a triangle ABC with midpoints L , M , and N . What do you notice? What do you wonder?

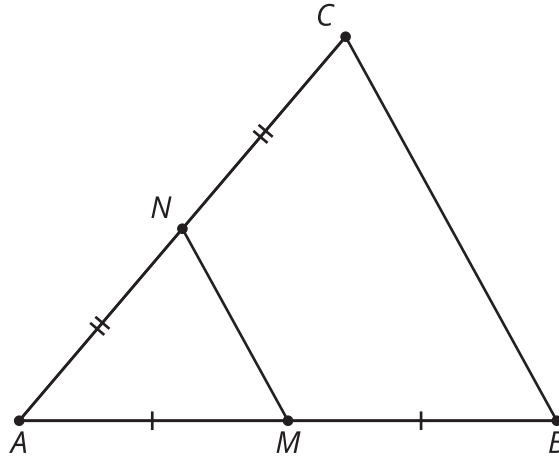
$$\overline{BL} \cong \overline{CL}, \overline{AN} \cong \overline{CN}, \overline{AM} \cong \overline{BM}$$



5.2 Dilation or Violation?

Here's a triangle ABC . Points M and N are the midpoints of 2 sides.

$$\overline{AM} \cong \overline{BM}, \overline{AN} \cong \overline{CN}$$

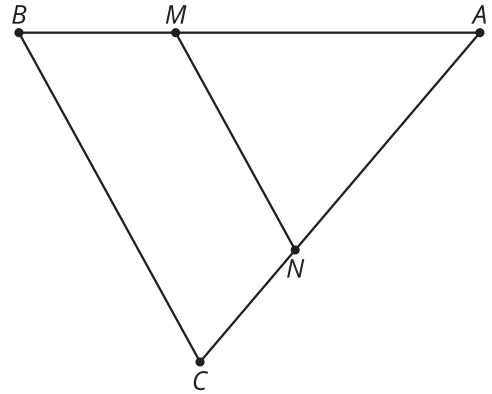


1. Convince yourself that triangle ABC is a dilation of triangle AMN . What is the center of the dilation? What is the scale factor?
2. Convince your partner that triangle ABC is a dilation of triangle AMN , with the center and scale factor that you found.
3. With your partner, check the definition of dilation on your reference chart, and make sure both of you could convince a skeptic that ABC definitely fits the definition of dilation.
4. Convince your partner that segment BC is twice as long as segment MN .
5. Prove that $BC = 2 \cdot MN$. Convince a skeptic.

5.3 A Little Bit Farther Now

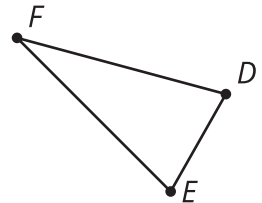
Here's a triangle, ABC . M is $\frac{2}{3}$ of the way from A to B .
 N is $\frac{2}{3}$ of the way from A to C .

What can you say about segment MN , compared to segment BC ? Provide a reason for each of your conjectures.



Are you ready for more?

1. What do you think a negative scale factor could mean? Think about what happens to the point E after dilating with scale factors $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}$, and so on getting closer to 0. Then think about what might happen with a zero or negative scale factor.
2. Dilate triangle DEF using a scale factor of -1 and center F .
3. How does DF compare to $D'F'$?
4. Are E, F , and E' collinear? Explain or show your reasoning.

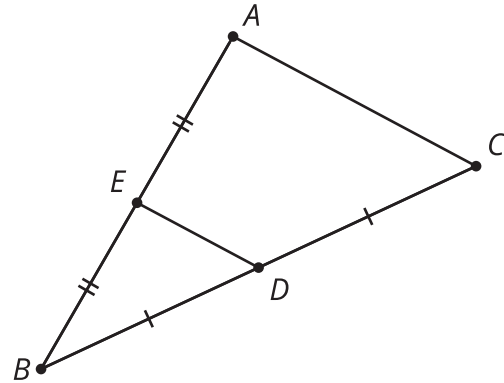


Lesson 5 Summary

Let's examine a segment whose endpoints are the midpoints of 2 sides of the triangle. If D is the midpoint of segment BC and E is the midpoint of segment BA , then what can we say about ED and triangle ABC ?

Segment ED is parallel to the third side of the triangle and half the length of the third side of the triangle. For example, if $AC = 10$, then $ED = 5$. This happens because the entire triangle EBD is a dilation of triangle ABC , with a scale factor of $\frac{1}{2}$.

$$\overline{BD} \cong \overline{DC}, \overline{BE} \cong \overline{EA}$$



In triangle ABC , segment FG divides segments AB and CB proportionally. In other words, $\frac{BG}{GA} = \frac{BF}{FC}$. Again, there is a dilation that takes triangle ABC to triangle GBF , so GF is parallel to AC , and we can calculate its length using the same scale factor.

$$\overline{FG} \parallel \overline{AC}$$

