Module 11b: Perimeter & Area of Similar Figures

Math Practice(s):

-Model with mathematics.

-Look for & make use of structure.

Learning Target(s):

- Explore & apply the relationship between perimeters & areas of similar figures.

Homework:

HW#8: 11b #1-6

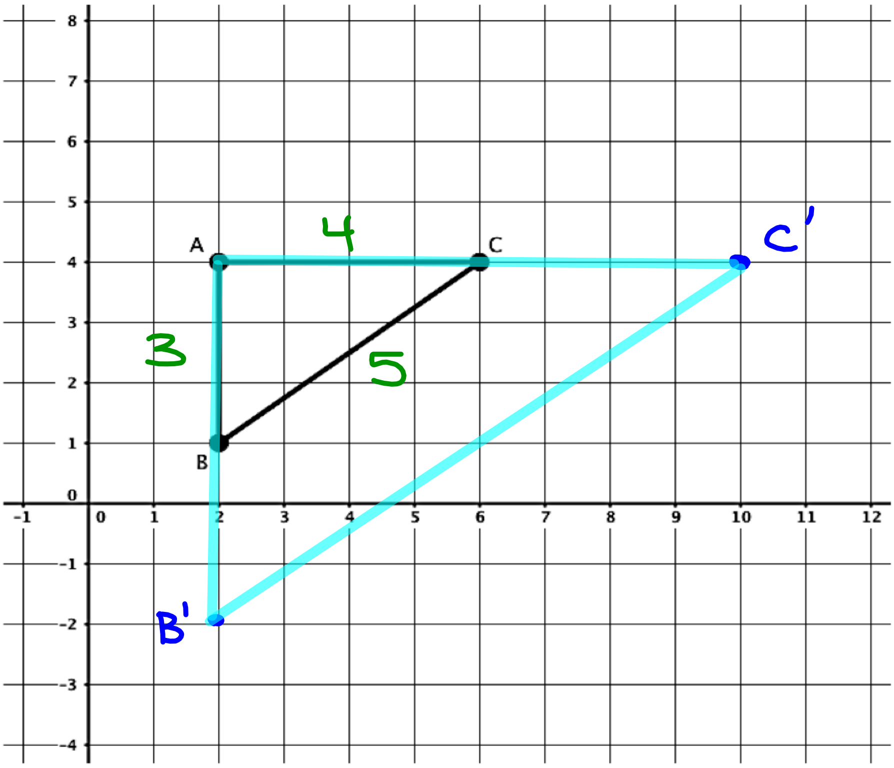
Nov 20-12:32 PM

Example 1: In the diagram below, $\overline{AB} \perp \overline{AC}$.

A. Determine the perimeter of ΔABC.

3+4+5

12 units



B. In the coordinate plane above, dilate ΔABC about point A, using a scale factor of 2, to create $\Delta A'B'C'$.

C. Determine the perimeter of $\Delta A'B'C'$.

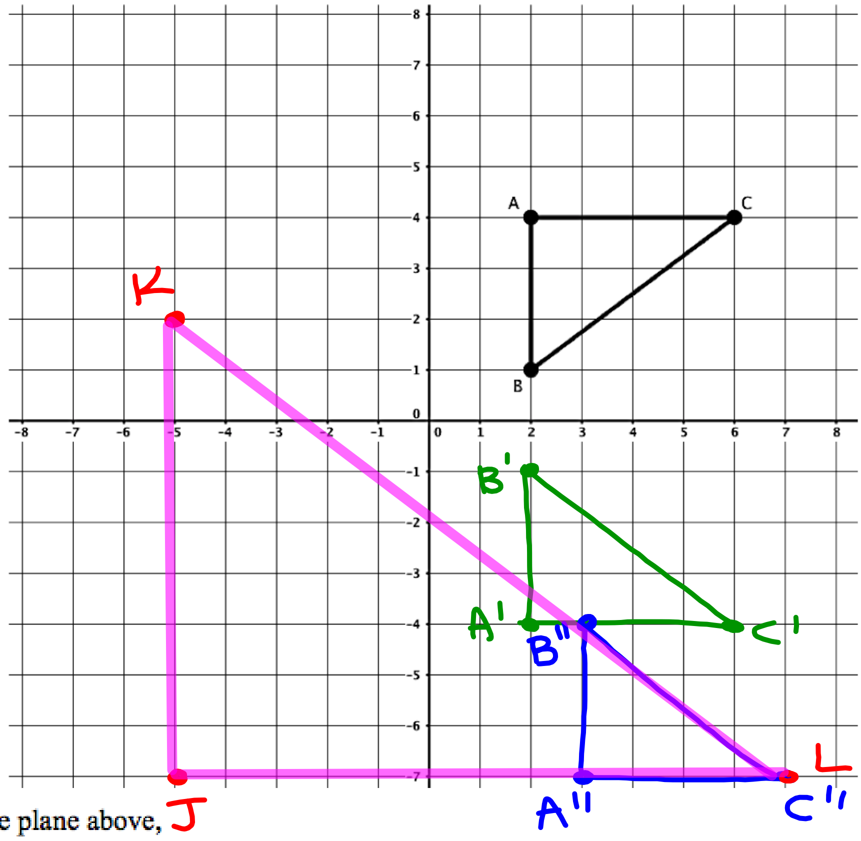
6 + 8 + 10

24 units

D. Compare the perimeter of ΔABC to the perimeter of $\Delta A'B'C'$. What do you notice?

The perimeter of ΔA'B'C' is exactly 2 times the perimeter of ΔABC.

Example 2: In the diagram below, $\overline{AB} \perp \overline{AC}$.



A. Determine the perimeter of ΔABC.

3+4+5

12 units

B. In the coordinate plane above,

- Reflect ΔABC over the x-axis to create $\Delta A'B'C'$.
- Then, translate the result such that T(x, y) = (x + 1, y – 3) to create $\Delta A''B''C''$.
- Then, dilate the result about C'', using a scale factor of 3, to create ΔJKL such that $\Delta JKL \sim \Delta ABC$.

C. Determine the perimeter of ΔJKL.

12 + 9 + 15

36 units

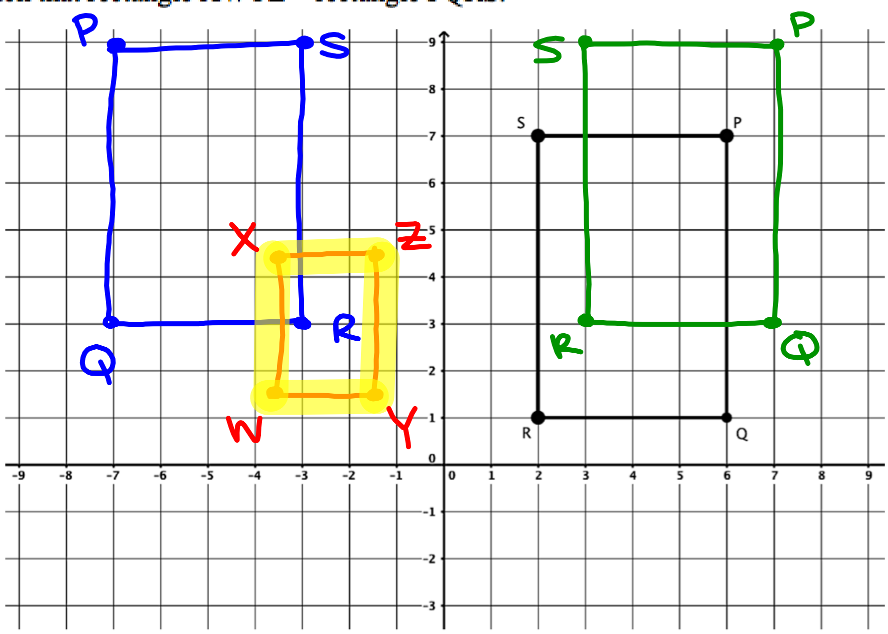
D. Compare the perimeter of ΔABC to the perimeter of ΔJKL. What do you notice?

The perimeter of ΔJKL is 3 times larger than the perimeter of ΔABC.

Example 3: Rectangle PQRS is shown in the coordinate plane below.

A. In the coordinate plane below,

- Translate PQRS such that T(x, y) = (x + 1, y + 2).
- Then, reflect the result over the *y*-axis.
- Then, dilate the result about the origin, using a scale factor of $\frac{1}{2}$, to create rectangle XWYZ such that rectangle XWYZ ~ rectangle PQRS.



B. Without computing the actual perimeters, make a conjecture about how the perimeter of XWYZ will compare to PQRS.

The perimeter of XWYZ will be half the perimeter of PQRS.

C. Compute the perimeters of XWYZ and PQRS to determine if your conjecture was accurate.

PQRS

6+4+6+4

20 units

XWYZ

3+2+3+2

10 units

Let M be a rigid motion transformation, D be a dilation about a point with scale factor k, and S be the similarity transformation defined as M followed by D.

If P is a polygon with perimeter p and Q = S(P), then Q has perimeter $\boldsymbol{kp}$.

In other words, …

The perimeter of the preimage is multiplied by the scale factor to get the perimeter of the image.

Example 4: Refer back to example 1 and compare the **area** of $\Delta A'B'C'$ to the **area** of ΔABC. What do you notice?

ΔABC

$A = \frac{1}{2}(4)(3)$

$A = 6 \text{ units}^2$

$\Delta A'B'C'$

$A = \frac{1}{2}(8)(6)$

$A = 24 \text{ units}^2$

The area of A'B'C' is 4 (2^2) times the area of ABC.

Example 5: Refer back to example 2 and compare the **area** of ΔJKL to the **area** of ΔABC. What do you notice?

ΔABC

$A = 6 \text{ units}^2$

ΔJKL

$A = \frac{1}{2}(12)(9)$

$A = 54 \text{ units}^2$

The area of JKL is 9 (3^2) times the area of ABC.

Example 6: Refer back to example 3 and compare the **area** of WXYZ to the **area** of PQRS. What do you notice?

PQRS

$A = 6(4)$

$A = 24 \text{ units}^2$

WXYZ

$A = 3(2)$

$A = 6 \text{ units}^2$

The area of WXYZ is $\frac{1}{4}$ $\left(\frac{1}{2}\right)^2$ the area of PQRS.

Let M be a rigid motion transformation, D be a dilation about a point with scale factor k, and S be the similarity transformation defined as M followed by D.

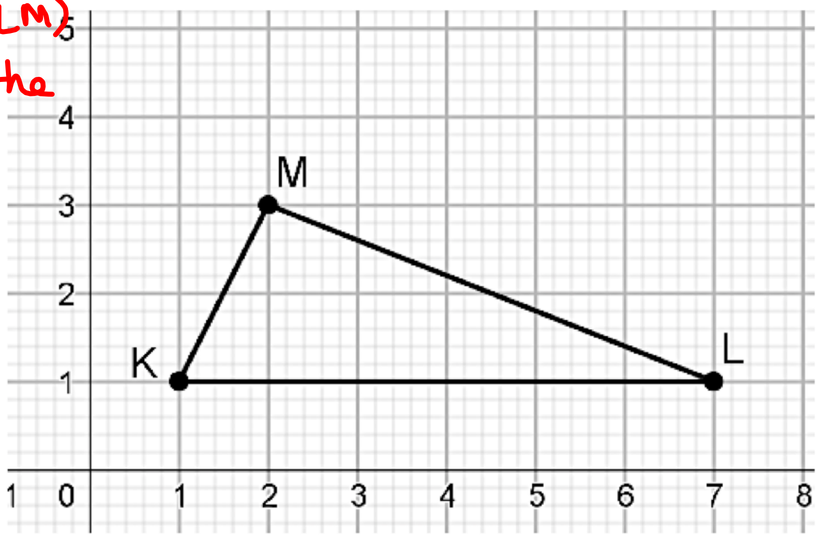
If P is a polygon with area r and Q = S(P), then Q has area k^2r.

In other words, …

The area of the preimage is multiplied by the square of the scale factor to get the area of the image.

Example 7: Let S be a similarity transformation determined by a rigid motion transformation M followed by a dilation D about an arbitrary point with scale factor 3. Compare the area of ΔKLM below with its image S(ΔKLB).

The area of S(ΔKLM) will be 3^2 times the area of ΔKLM.



ΔKLM

$A = \frac{1}{2}(6)(2)$

$A = 6$ units^2

S(ΔKLM)

$A = 6(3^2)$

$A = 6(9)$

$\boxed{A = 54 \text{ units}^2}$