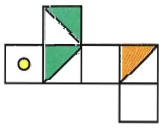
2. You've learned that an ordered pair rule such as $(x, y) \rightarrow (x + b, y + c)$ created a translation. You discovered in this lesson that an ordered pair rule such as $(x, y) \rightarrow (kx, ky)$ created a dilation in the coordinate plane, centered at the origin. What will the rule $(x, y) \rightarrow (kx + b, ky + c)$ yield? Investigate.

3. Use a geometry computer program to investigate dilations. What happens if you dilate by a scale factor less than 0?

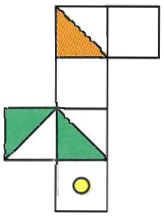
Exercise Set 12.2

For Exercises 1 and 2, identify any figure at right that is a reduction or an enlargement of a figure at left.

1.

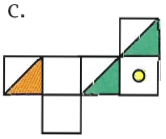


a.

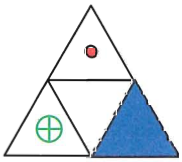


b.

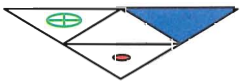
c.



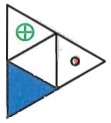
2.



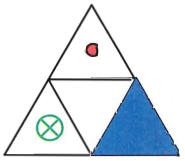
a.



b.

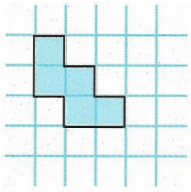


c.

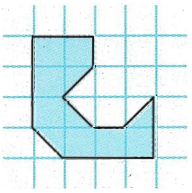


For Exercises 3–5, sketch on graph paper a figure similar, but not congruent to, each figure shown.

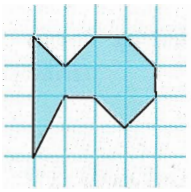
3.



4.



5.



For Exercises 6–8, use algebra to answer each proportion question.

6. If $\frac{15}{a} = \frac{20}{a + 12}$, then a = -?-.

7. If $\frac{a}{b} = \frac{c}{d}$, then ad = -?-.

8. If $\frac{a}{b} = \frac{c}{d}$, then $\frac{b}{a}$ = -?-.

9. Complete the statement: If figure A is similar to figure B and figure B is similar to figure C, then —?—. Draw and label figures to illustrate the statement.

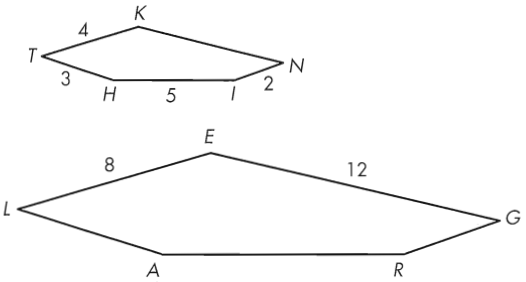
10. Jade and Omar each chipped in $1000 to buy an old boat to fix up. Jade spent $825 on materials, and Omar spent $1650 for parts. They worked an equal number of hours on the boat and eventually sold it for $6,800. How should they fairly divide the $6,800? Explain your reasoning.

11. Altar and Zenor are ambassadors from Titan, the largest moon of Saturn. The atmosphere on Titan is so dense that the Titans have evolved multiple antennae to pick out sound waves. Altar has revealed to the Biological Research Division that the sum of the lengths of a Titan's antennae is a direct measure of that Titan's age. Altar has antennae with lengths 8 cm, 10 cm, 13 cm, 16 cm, 14 cm, and 12 cm. Zenor is 130 years old, and her seven antennae have an average length of 17 cm. How old is Ambassador Altar?

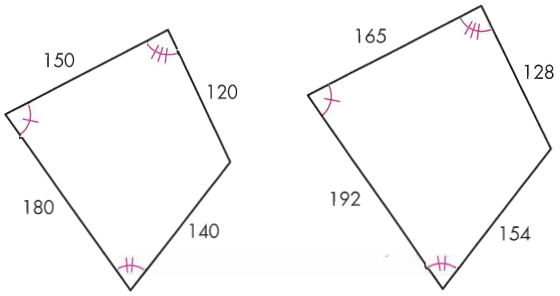
Altar and Zenor

Use the definition of similar polygons to solve Exercises 12–19. All measurements are in centimeters.

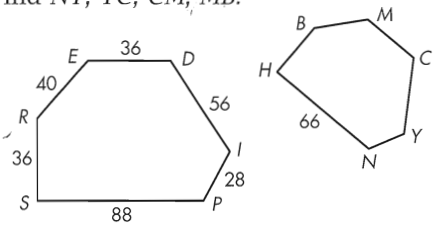
12.* *THINK* ~ *LARGE*
Find *AL, RA, RG, KN.*



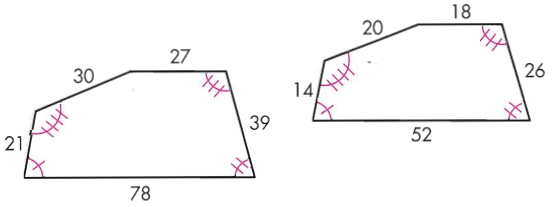
13. Are the polygons similar?



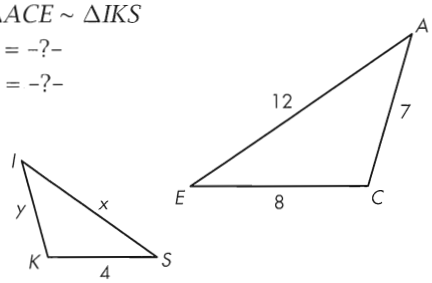
14. *SPIDER* ~ *HNYCMB*
Find *NY, YC, CM, MB.*



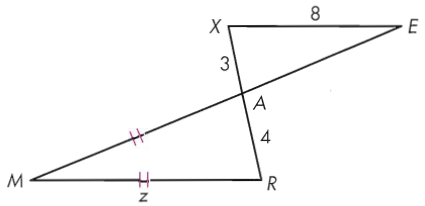
15.* Are the polygons similar?



16. $\Delta ACE \sim \Delta IKS$
x = -?-
y = -?-

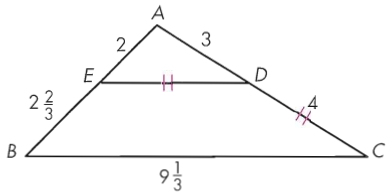


17. $\Delta RAM \sim \Delta XAE$
z = -?-



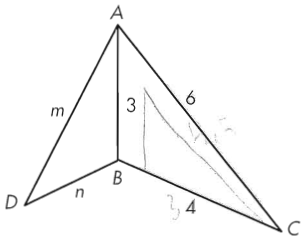
18.* $\overline{DE} \parallel \overline{BC}$

Are corresponding angles congruent?
Are corresponding sides proportional?
Is $\Delta AED \sim \Delta ABC$?

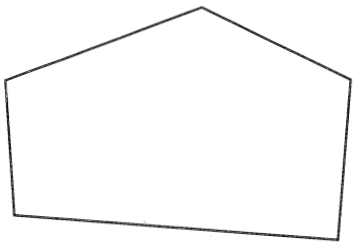


19. $\Delta ABC \sim \Delta DBA$

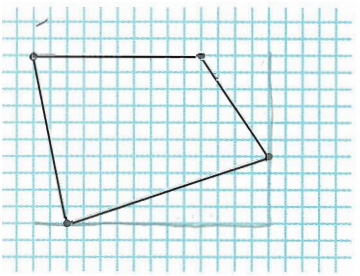
m = -?-
n = -?-



20. Use patty papers or a compass and a straightedge to construct a pentagon similar to the pentagon shown below. Make each side of your pentagon three times as large as its corresponding side in the original pentagon.



21. Copy the quadrilateral shown below onto your graph paper. Draw a similar quadrilateral with each side half the length of its corresponding side in the original quadrilateral.



22. The world's largest sculpture carved out of a granite cliff face is that of four United States presidents at Mount Rushmore, located in the Black Hills of South Dakota. Each face is about 60 feet high. If an arm had been carved, how long would it be? Explain how you get your answer. By the way, who are the four presidents?