

Applications

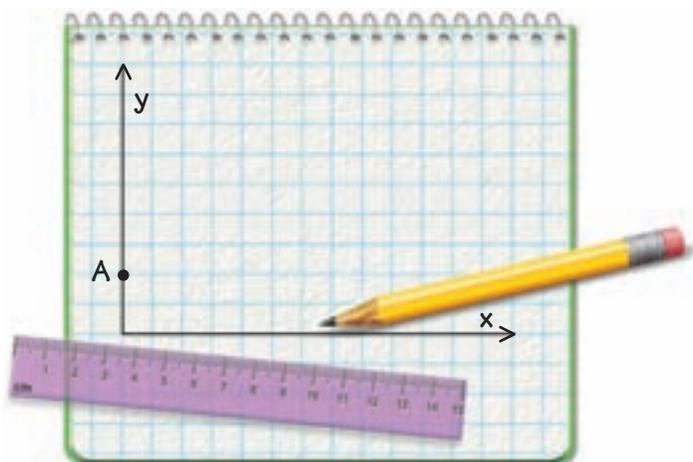
1. This table gives key coordinates for drawing the mouth and nose of Mug Wump. It also gives rules for finding the corresponding points for four other characters—some members of the Wump family and some impostors.

Coordinates of Characters

	Mug Wump	Glum	Sum	Tum	Crum
Rule	(x, y)	$(1.5x, 1.5y)$	$(3x, 2y)$	$(4x, 4y)$	$(2x, y)$
Point	Mouth				
<i>M</i>	(2, 2)				
<i>N</i>	(6, 2)				
<i>O</i>	(6, 3)				
<i>P</i>	(2, 3)				
<i>Q</i>	(2, 2) (connect <i>Q</i> to <i>M</i>)				
	Nose (Start Over)				
<i>R</i>	(3, 4)				
<i>S</i>	(4, 5)				
<i>T</i>	(5, 4)				
<i>U</i>	(3, 4) (connect <i>U</i> to <i>R</i>)				

- Before you find coordinates or plot points, predict which characters are the impostors.
- Copy and complete the table. Then plot the figures on grid paper. Label each figure.
- Which of the new characters (Glum, Sum, Tum, and Crum) are members of the Wump family, and which are impostors?
- Choose one of the new Wumps. How do the mouth and nose measurements (side lengths, perimeter, area, angle measures) compare with those of Mug Wump?
- Choose one of the impostors. How do the mouth and nose measurements compare with those of Mug Wump? What are the dimensions?

- f. Do your findings in parts (b)–(e) support your prediction from part (a)? Explain.
2. a. Design a Mug-like character of your own on grid paper. Give him/her eyes, a nose, and a mouth.
 b. Give coordinates so that someone else could draw your character.
 c. Write a rule for finding coordinates of a member of your character's family. Check your rule by plotting the figure.
 d. Write a rule for finding the coordinates of an impostor. Check your rule by plotting the figure.
3. a. On grid paper, draw triangle ABC with vertex coordinates $A(0, 2)$, $B(6, 2)$ and $C(4, 4)$.



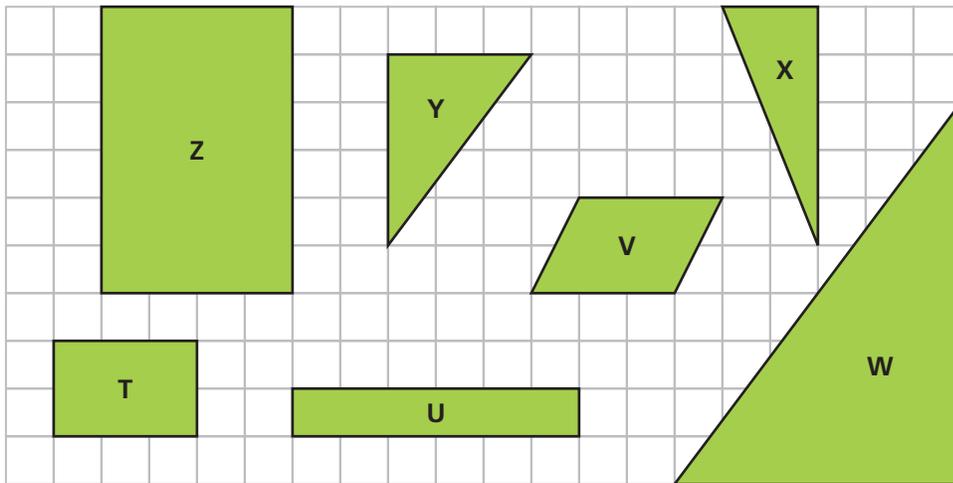
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Practice

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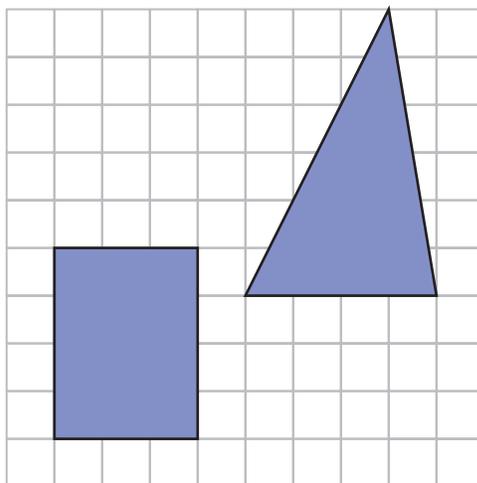
- b. Apply the rule $(1.5x, 1.5y)$ to the vertices of triangle ABC to get triangle PQR . Compare the corresponding measurements (side lengths, perimeter, area, angle measures) of the two triangles.
 c. Apply the rule $(2x, 0.5y)$ to the vertices of triangle ABC to get triangle FGH . Compare the corresponding measurements (side lengths, perimeter, area, angle measures) of the two triangles.
 d. Which triangle, PQR or FGH , seems similar to triangle ABC ? Why?
4. a. On grid paper, draw parallelogram $ABCD$ with vertex coordinates $A(0, 2)$, $B(6, 2)$, $C(8, 6)$, and $D(2, 6)$.
 b. Write a rule to find the vertex coordinates of a parallelogram $PQRS$ that is larger than, but similar to, $ABCD$. Test your rule to see if it works.
 c. Write a rule to find the vertex coordinates of a parallelogram $TUVW$ that is smaller than, but similar to, $ABCD$. Test your rule.

For Exercises 5–6, study the size and shape of the polygons shown on the grid below.



5. **Multiple Choice** Choose the pair of similar figures.
A. Z and U **B.** U and T **C.** X and Y **D.** Y and W
6. Find another pair of similar figures. How do you know they are similar?
7. Copy the figures below accurately onto your own grid paper.

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- a. Draw a rectangle that is similar, but not identical, to the given rectangle.
- b. Draw a triangle that is similar, but not identical, to the given triangle.
- c. How do you know the figures you drew are similar to the original figures?

8. Use the diagram of two similar polygons.

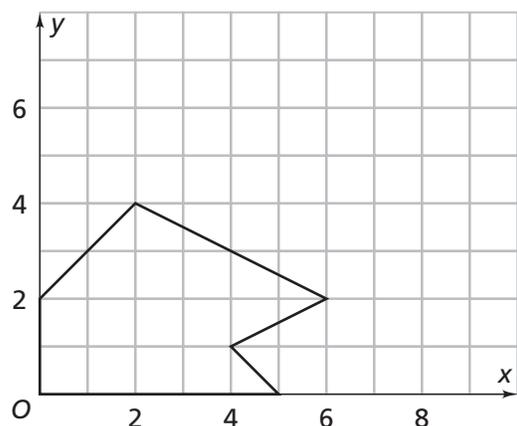


Figure A

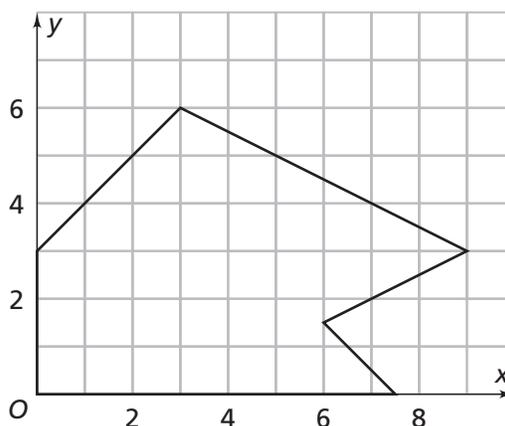


Figure B

- a. Write a rule for finding the coordinates of a point on Figure B from the corresponding point on Figure A.
 - b. Write a rule for finding the coordinates of a point on Figure A from the corresponding point on Figure B.
 - c.
 - i. What is the scale factor from Figure A to Figure B?
 - ii. Use the scale factor to describe how the perimeter and area of Figure B are related to the perimeter and area of Figure A.
 - d.
 - i. What is the scale factor from Figure B to Figure A?
 - ii. Use the scale factor to describe how the perimeter and area of Figure A are related to the perimeter and area of Figure B.
9. a. Suppose you make Figure C by applying the rule $(2x, 2y)$ to the points on Figure A in Exercise 8. Find the coordinates of the vertices of Figure C.
- b.
 - i. What is the scale factor from Figure A to Figure C?
 - ii. Use the scale factor to describe how the perimeter and area of Figure C are related to the perimeter and area of Figure A.
 - c.
 - i. What is the scale factor from Figure C to Figure A?
 - ii. Use the scale factor to describe how the perimeter and area of Figure A are related to the perimeter and area of Figure C.
 - iii. Write a coordinate rule in the form (mx, my) that can be used to find the coordinates of any point in Figure A from the corresponding points of Figure C.

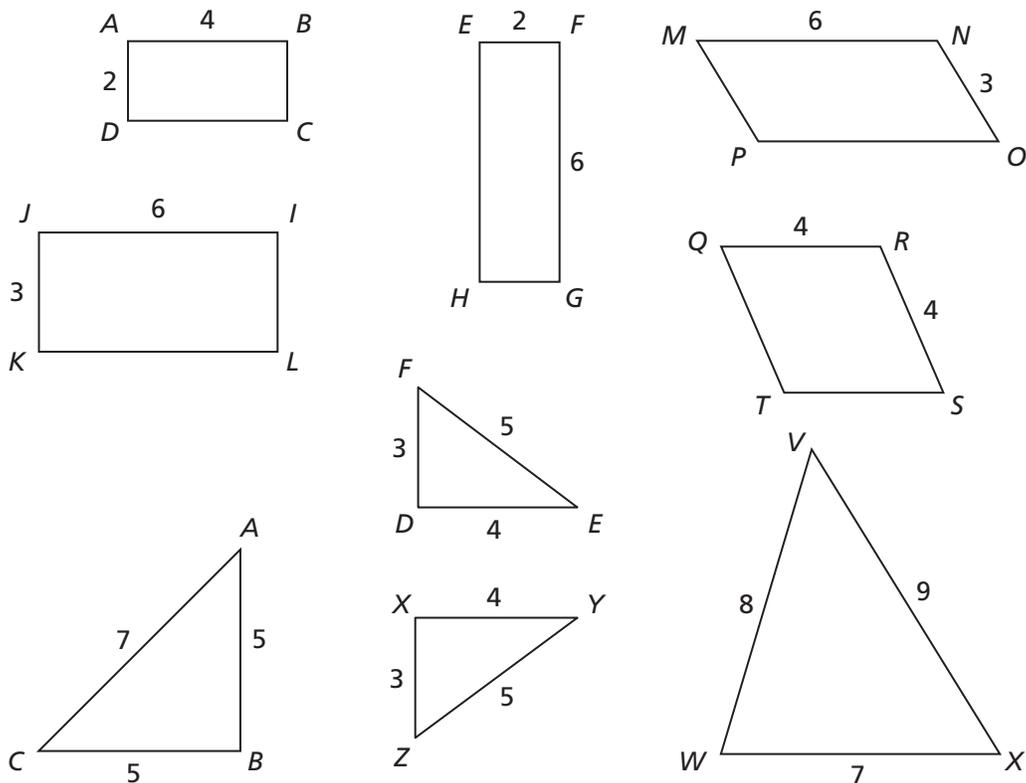
10. What is the scale factor from an original figure to its image if the image is made using the given method?

- a. a two-rubber-band stretcher
- b. a copy machine with size factor 150%
- c. a copy machine with size factor 250%
- d. the coordinate rule $(0.75x, 0.75y)$

11. a. Study the polygons below. Which pairs seem to be similar figures?

b. For each pair of similar figures, list the corresponding sides and angles.

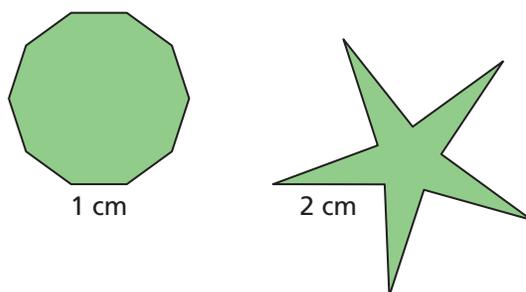
c. For each pair of similar figures, estimate the scale factor that relates side lengths in the larger figure to the corresponding side lengths in the smaller figure.



12. On grid paper, draw a rectangle with an area of 14 square centimeters. Label it $ABCD$.

- a. Write and use a coordinate rule that will make a rectangle similar to rectangle $ABCD$ that is three times as long and three times as wide. Label it $EFGH$.

- b. How does the perimeter of rectangle $EFGH$ compare to the perimeter of rectangle $ABCD$?
- c. How does the area of rectangle $EFGH$ compare to the area of rectangle $ABCD$?
- d. How do your answers to parts (b) and (c) relate to the scale factor from rectangle $ABCD$ to rectangle $EFGH$?
13. Suppose a student draws the figures below. The student says the two shapes are similar because there is a common scale factor for all of the sides. The sides of the larger figure are twice as long as those of the smaller figure. What do you say to the student to explain why they are *not* similar?



Connections

For Exercises 14–15, the rule $(x, \frac{3}{4}y)$ is applied to a polygon.

14. Is the image similar to the original polygon? Explain.
15. The given point is on the original polygon. Find the image of the point.
- a. $(6, 8)$ b. $(9, 8)$ c. $(\frac{3}{2}, \frac{4}{3})$

Multiple Choice For Exercises 16–17, what is the scale factor as a percent that will result if the rule is applied to a point (x, y) on a coordinate grid?

16. $(1.5x, 1.5y)$
- A. 150% B. 15% C. 1.5% D. None of these
17. $(0.7x, 0.7y)$
- F. 700% G. 7% H. 0.7% J. None of these

18. The rule $(x + \frac{2}{3}, y - \frac{3}{4})$ is applied to a polygon. Find the coordinates of the point on the image that corresponds to each of these points on the original polygon.

- a. (5, 3) b. $(\frac{1}{6}, \frac{11}{12})$ c. $(\frac{9}{12}, \frac{4}{5})$

19. A good map is similar to the place it represents. Below is a map of South Africa.



- a. Use the scale to estimate the distance from Cape Town to Port Elizabeth.
- b. Use the scale to estimate the distance from Johannesburg to East London.
- c. What is the relationship between the scale for the map and a “scale factor”?

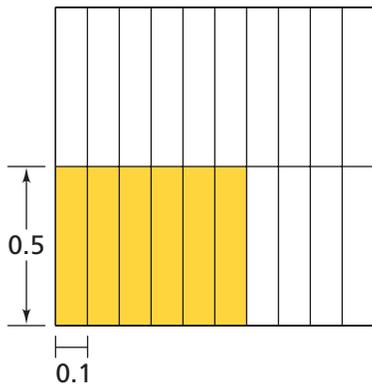
Find each quotient.

20. $\frac{1}{2} \div \frac{1}{4}$ 21. $\frac{1}{4} \div \frac{1}{2}$ 22. $\frac{3}{7} \div \frac{4}{7}$
23. $\frac{4}{7} \div \frac{3}{7}$ 24. $\frac{3}{2} \div \frac{3}{5}$ 25. $1\frac{1}{2} \div \frac{3}{8}$

26. At a bake sale, 0.72 of a pan of corn bread has not been sold. A serving is 0.04 of a pan.

- a. How many servings are left?
- b. Use a hundredths grid to show your reasoning.

27. Each pizza takes 0.3 of a large block of cheese. Charlie has 0.8 of a block of cheese left.
- How many pizzas can he make?
 - Use a diagram to show your reasoning.
28. Use the grid for parts (a)–(c).

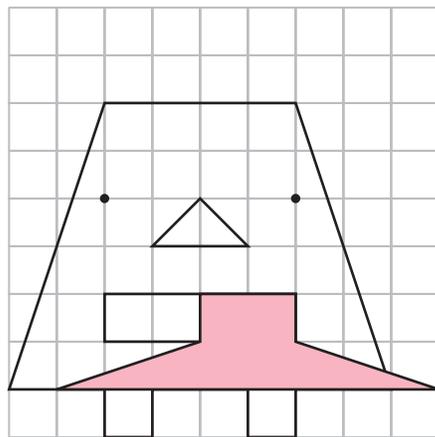


- What part of the grid is shaded?
- If the grid shows the part of a pan of spinach appetizers left, how many servings are left if a serving is 0.04?
- Use the grid picture to confirm your answer.

Extensions

29. Select a drawing of a comic strip character from a newspaper or magazine. Draw a grid over the figure or tape a transparent grid on top of the figure. Identify key points on the figure and then enlarge the figure by using each of these rules. Which figures are similar? Explain.
- $(2x, 2y)$
 - $(x, 2y)$
 - $(2x, y)$
30. Suppose you use the rule $(3x + 1, 3y - 4)$ to transform Mug Wump into a new figure.
- How will the angle measures in the new figure compare to corresponding angle measures in Mug?
 - How will the side lengths of the new figure compare to corresponding side lengths of Mug?
 - How will the area and perimeter of this new figure compare to the area and perimeter of Mug?

- 31.** The vertices of three similar triangles are given.
- triangle ABC : $A(1, 2)$, $B(4, 3)$, $C(2, 5)$
 - triangle DEF : $D(3, 6)$, $E(12, 9)$, $F(6, 15)$
 - triangle GHI : $G(5, 9)$, $H(14, 12)$, $I(8, 18)$
- a. Find a rule that changes the vertices of triangle ABC to the vertices of triangle DEF .
 - b. Find a rule that changes the vertices of triangle DEF to the vertices of triangle GHI .
 - c. Find a rule that changes the vertices of triangle ABC to the vertices of triangle GHI .
- 32.** If you drew Mug and his hat on the same grid, his hat would be at his feet instead of on his head.



- a. Write a rule that puts Mug's hat centered on his head.
 - b. Write a rule that changes Mug's hat to fit Zug and puts the hat on Zug's head.
 - c. Write a rule that changes Mug's hat to fit Lug and puts the hat on Lug's head.
- 33.** Films are sometimes modified to fit a TV screen. Find out what that means. What exactly is modified? If Mug is in a movie that has been modified, is he still a Wump when you see him on the TV screen?

