

Scale and Slide

Use dilations and rigid motions to analyze similar figures.

HIGH SCHOOL • HSG-SRT.A

CCSS.Math.Content.HSG-SRT.A "Understand similarity in terms of similarity transformations"

NAME _____

DATE _____

SIMILARITY TRANSFORMATIONS

A similarity transformation can use a dilation and any rotations, reflections, or translations. A dilation multiplies every distance from its center by the scale factor k . Rotations, reflections, and translations preserve lengths and angle measures, so corresponding angles stay equal and corresponding lengths have one common scale factor.

WORKED EXAMPLE

Triangle PQR has $P(11,17)$, $Q(13,17)$, and $R(11,19)$. Dilate it about the origin with scale factor 5. Find P' , Q' , and R' .

1. For a dilation centered at the origin, multiply each coordinate by 5.
2. $P' = (11 \times 5, 17 \times 5) = (55, 85)$.
3. $Q' = (13 \times 5, 17 \times 5) = (65, 85)$.
4. $R' = (11 \times 5, 19 \times 5) = (55, 95)$.

Answer: $P'(55,85)$, $Q'(65,85)$, $R'(55,95)$

PRACTICE 6 problems

- 1** A dilation has scale factor 3. A segment is 8 units long before the dilation. What is its image length?

ANSWER _____

- 2** Point $A(28,-12)$ is dilated about the origin with scale factor $1/4$. What are the coordinates of A' ?

ANSWER _____

- 3** Triangles ABC and DEF are similar. $AB = 9$ corresponds to $DE = 12$. If $BC = 15$ corresponds to EF , find EF .

ANSWER _____

- 4** Point $B(6,-4)$ is rotated 90 degrees counterclockwise about the origin. Then it is translated 10 units right and 8 units down. What are the final coordinates?

ANSWER _____

- 5** Point $C'(36,-28)$ is the image of point C after a dilation about the origin with scale factor 4. What are the coordinates of C?

ANSWER _____

- 6** Triangle JKL has $J(4,6)$, $K(10,6)$, and $L(4,14)$. Its image has $J'(12,18)$, $K'(30,18)$, and $L'(12,42)$. What scale factor, centered at the origin, maps triangle JKL to its image?

ANSWER _____

APPLY IT Show your work

- 1** A robotics club designs a triangular team patch with side lengths 14 cm, 21 cm, and 28 cm. A similar triangle is printed on a banner, and the side corresponding to 14 cm is 18 cm. What is the scale factor from the patch to the banner, and what are the other two banner side lengths?

WORK SPACE

ANSWER _____

- 2** In a game design, a character marker is at $(8, -6)$. The game rotates the marker 90 degrees clockwise about the origin, then translates it 9 units right and 14 units up. Where does the marker end?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Triangle ABC has $A(-4, 3)$, $B(2, 3)$, and $C(-4, 9)$. Triangle $A'B'C'$ has $A'(8, 3)$, $B'(26, 3)$, and $C'(8, 21)$. Describe a sequence of transformations that maps triangle ABC to triangle $A'B'C'$. Explain why the triangles are similar.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A dilation has scale factor 3. A segment is 8 units long before the dilation. What is its image length?	24 units
2	Point A(28,-12) is dilated about the origin with scale factor $\frac{1}{4}$. What are the coordinates of A'?	A'(7,-3)
3	Triangles ABC and DEF are similar. $AB = 9$ corresponds to $DE = 12$. If $BC = 15$ corresponds to EF, find EF.	20
4	Point B(6,-4) is rotated 90 degrees counterclockwise about the origin. Then it is translated 10 units right and 8 units down. What are the final coordinates?	(14,-2)
5	Point C'(36,-28) is the image of point C after a dilation about the origin with scale factor 4. What are the coordinates of C?	C(9,-7)
6	Triangle JKL has J(4,6), K(10,6), and L(4,14). Its image has J'(12,18), K'(30,18), and L'(12,42). What scale factor, centered at the origin, maps triangle JKL to its image?	3

PART 2 • APPLY IT

- Scale factor: $\frac{9}{7}$. Other banner side lengths: 27 cm and 36 cm.** Divide 18 by 14 to get $\frac{9}{7}$. Multiply 21 and 28 by $\frac{9}{7}$ to get 27 and 36.
- (3,6)** A 90-degree clockwise rotation maps (8,-6) to (-6,-8). Translating by (9,14) gives (3,6).

CHALLENGE

Dilate triangle ABC about the origin with scale factor 3, then translate it 20 units right and 6 units down. The dilation produces a figure with all corresponding lengths multiplied by 3, and the translation preserves lengths and angles, so the triangles are similar.

Accept equivalent scale-factor forms, such as $\frac{12}{9}$ for $\frac{4}{3}$, when the corresponding sides are matched correctly. For the challenge, accept either vector notation (20,-6) or the description 20 units right and 6 units down.