

Dilations and Similarity: math practice, Grade 8 – download the PDF

22 problems graded by difficulty (★ easy, ★★ medium, ★★★ hard). Try first, without looking at the solutions!

1 Enlargement, reduction, or neither?



For each scale factor, say whether the dilation is an enlargement, a reduction, or leaves the size unchanged.

- a. $k = 3$
- b. $k = 0.4$
- c. $k = 1$
- d. $k = \frac{5}{4}$
- e. $k = 0.9$

2 Distance from the center



A dilation has center O .

- a. $OP = 5$ cm and $k = 3$. Find OP' .
- b. $OQ = 12$ cm and $k = \frac{1}{4}$. Find OQ' .
- c. $OR = 8$ in and $OR' = 20$ in. Find k .

3 Dilating points from the origin



Find the image of each point under the dilation with center $(0, 0)$ and the given scale factor.

- a. $(3, 4)$, $k = 2$
- b. $(-5, 2)$, $k = 3$
- c. $(8, -6)$, $k = \frac{1}{2}$
- d. $(-9, 12)$, $k = \frac{1}{3}$

4 Resizing a photo



A photo measures 4 in by 6 in.

- a. It is enlarged with scale factor **2.5**. Find the new dimensions in inches.
- b. Give the new dimensions in centimeters (1 in = **2.54** cm).
- c. A wallet-size copy is made with scale factor **0.5**. What are its dimensions?

5 Angles in a triangle



Find the missing angle.

- a. A triangle has angles **38°** and **74°** .
- b. A right triangle has an angle of **35°** .
- c. An isosceles triangle has a top angle of **40°** . Find each base angle.

6 True or false?



Say whether each statement is true or false and justify your answer.

- a. A dilation changes the measure of the angles.
- b. The center of a dilation stays in place.
- c. A dilation with $k = 2$ doubles the perimeter of a figure.
- d. A dilation with $k = \frac{1}{2}$ makes the figure larger.

7 Exterior angles



Use the Exterior Angle Theorem.

- a. The remote interior angles of a triangle measure 35° and 85° . Find the exterior angle.
- b. An exterior angle measures 140° and one remote interior angle measures 90° . Find the other remote interior angle.

8 Dilating a right triangle



Triangle PQR has vertices $P(2, 3)$, $Q(5, 3)$, and $R(2, 7)$.

- a. Find the image under the dilation with center $(0, 0)$ and $k = 1.5$.
- b. Find the lengths PQ , PR , $P'Q'$, and $P'R'$.

9 Find the scale factor



Triangle $A(2, 4)$, $B(6, 4)$, $C(6, 8)$ is dilated about the origin and its image is $A'(3, 6)$, $B'(9, 6)$, $C'(9, 12)$. Find the scale factor and check it with all three vertices.

10 Are these rectangles similar?



Decide whether the two rectangles are similar. If they are, give the scale factor from the first to the second.

- a. 12 in by 18 in and 8 in by 12 in
- b. 5 cm by 9 cm and 15 cm by 27 cm
- c. 6 ft by 10 ft and 9 ft by 14 ft

11 Missing sides



$\triangle ABC \sim \triangle DEF$ with $A \leftrightarrow D$, $B \leftrightarrow E$, $C \leftrightarrow F$. We know $AB = 6$, $BC = 9$, $AC = 12$, and $DE = 10$. Find EF and DF .

12 A post and a tower



At noon, a 1.2 m post casts a 1.8 m shadow. At the same time, a radio tower casts a 27 m shadow. How tall is the tower in meters? In feet (1 ft = 0.3048 m, round to the nearest foot)?

13 Parallel lines and a transversal



Two parallel lines l and m are cut by a transversal (line l is above line m). An interior angle at l , on the left of the transversal, measures 112° . Find:

- a. its vertical angle;
- b. the alternate interior angle at m ;
- c. the same-side interior angle at m ;
- d. the corresponding angle at m .

14 Solve for x in a triangle

The angles of a triangle measure $3x^\circ$, $(4x + 5)^\circ$, and $(5x - 17)^\circ$. Find x and each angle.

15 Exterior angle with algebra

In a triangle, an exterior angle measures $(5x + 10)^\circ$ and the two remote interior angles measure $(2x + 20)^\circ$ and $(x + 50)^\circ$. Find x , the exterior angle, and the interior angle next to the exterior angle.

16 A dilation with a different center

A dilation has center $C(1, 1)$ and scale factor 3 . Triangle PQR has $P(2, 3)$, $Q(4, 1)$, $R(2, 1)$. Find P' , Q' , R' using $(x, y) \rightarrow (1 + 3(x - 1), 1 + 3(y - 1))$, then check that $P'R' = 3 \cdot PR$.

17 Reflect, then dilate

Triangle T has vertices $(1, 1)$, $(3, 1)$, $(3, 2)$. It is reflected across the x -axis, then dilated by $k = 2$ from the origin.

- Find the vertices of the final image.
- Would you get the same image if you dilated first and reflected second?
- Are T and its image similar? Congruent?

18 Prove similarity with a sequence

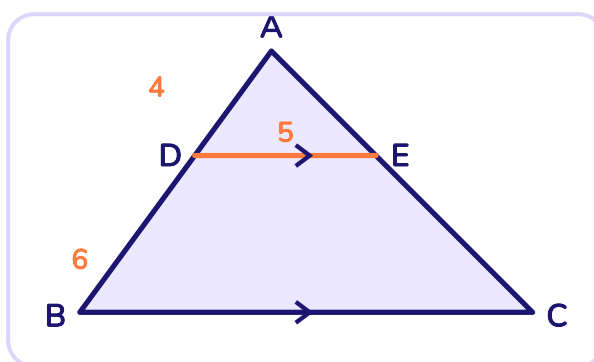
Triangle X has vertices $(0, 0)$, $(3, 0)$, $(0, 4)$. Triangle Y has vertices $(0, 0)$, $(0, 6)$, $(-8, 0)$. Describe a sequence of a rotation and a dilation that sends X to Y , and explain why the triangles are similar.

19 A line parallel to a side

★★★

In triangle ABC , point D is on $[AB]$ and point E is on $[AC]$, with $DE \parallel BC$. We know $AD = 4$, $DB = 6$, $DE = 5$, and $AE = 3$.

- Explain why $\triangle ADE \sim \triangle ABC$.
- Find BC and AC .



20 The mirror on the ground

★★★

To measure a tree, Maya places a small mirror flat on the ground and steps back until she sees the top of the tree in it. Her eyes are 1.5 m above the ground, she is 2.4 m from the mirror, and the mirror is 14.4 m from the base of the tree. How tall is the tree? Justify the similarity.

21 Why the exterior angle theorem works

★★★

In triangle ABC , $\angle A = 52^\circ$ and $\angle B = 66^\circ$. Side BC is extended to a point D . A line through C is drawn parallel to BA , and E is a point on this line on the same side of BD as A .

- Find $\angle ACB$.
- Explain why $\angle ACE = 52^\circ$ and $\angle ECD = 66^\circ$.
- Show that the exterior angle $\angle ACD$ equals $\angle A + \angle B$.

22

Perimeter and area after a dilation

A rectangular garden measures 5 m by 8 m. A scale drawing is built by a dilation with scale factor 3.

- Find the perimeter of both rectangles. By what number is the perimeter multiplied?
- Find the area of both rectangles. By what number is the area multiplied?
- Make a conjecture for scale factor k .

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