

Dilations, Scale Factor and Similar Figures

Grade 10 – Geometry math · Worksheet · Standards: G-SRT.A.1, G-SRT.A.2, G-SRT.A.3

Name: _____ Date: _____ Class: _____

These problems cover G-SRT.A.1, G-SRT.A.2 and G-SRT.A.3: dilations with a center and scale factor, how they change lines and segments, similarity defined by transformations, and the AA criterion.

Early problems dilate points and find scale factors. Later problems combine dilations with translations, scale models and a proof of AA similarity.

Standards: G-SRT.A.1, G-SRT.A.2, G-SRT.A.3 · **Level:** Grade 10 Geometry

Problem 1 Dilate a point (easy)

Dilate $A(2, 3)$ about the origin with scale factor 3. Find A' .

Problem 2 Shrink a point (easy)

Dilate $B(8, -6)$ about the origin with scale factor $\frac{1}{2}$. Find B' .

Problem 3 Find the scale factor (easy)

A dilation about the origin maps $P(4, 6)$ to $P'(10, 15)$. Find the scale factor and verify it with both coordinates.

Problem 4 Length under a dilation (easy)

Segment AB is 7 centimeters long. Find the length of its image under a dilation with scale factor (a) 4 and (b) $\frac{1}{2}$.

Problem 5 Distances from the center (easy)

The center of a dilation is C , and $CP = 6$. The scale factor is 2.5. Find CP' . If another dilation sends P to a point P'' with $CP'' = 9$, find its scale factor.



Figure for Problem 5: $CP = 6$.

Problem 6 Dilate a triangle (medium)

Triangle ABC has $A(1, 1)$, $B(4, 1)$ and $C(4, 3)$. Dilate it about the origin with $k = 2$. Find the image vertices, and compare the perimeters.

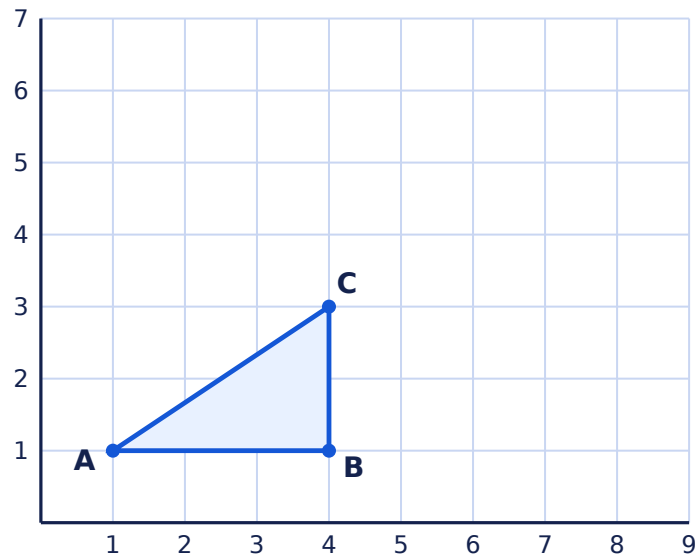


Figure for Problem 6 (preimage only).

Problem 7 Dilation about another center (medium)

Dilate $P(5, 4)$ about the center $C(2, 1)$ with scale factor 2. Find P' .

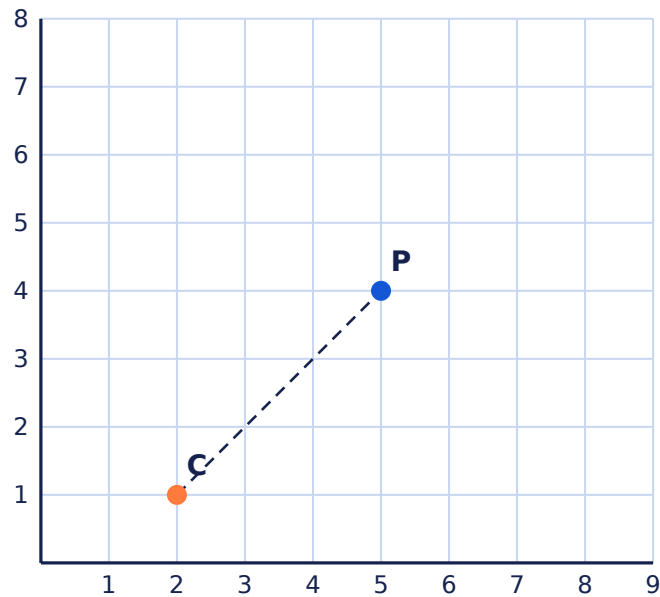


Figure for Problem 7.

Problem 8 A line not through the center (medium)

The line $y = 2x + 3$ is dilated about the origin with scale factor 3. Find the image of the points $(0, 3)$ and $(1, 5)$, and the equation of the image line. Compare it with the original line.

Problem 9 A line through the center (medium)

The line $y = 3x$ passes through the origin. Dilate the point $(1, 3)$ about the origin with scale factor 4. Show that the image is on the same line.

Problem 10 Perimeter and area (medium)

A triangle has perimeter 20 and area 15. It is dilated with scale factor 4. Find the perimeter and the area of the image.

Problem 11 Write the similarity statement (medium)

$\triangle ABC$ has $m\angle A = 52^\circ$ and $m\angle B = 61^\circ$. $\triangle DEF$ has $m\angle D = 52^\circ$ and $m\angle E = 67^\circ$. Are the triangles similar? If so, write the similarity statement with matching vertices.

Problem 12 Proportional sides (medium)

$\triangle ABC \sim \triangle DEF$, with $AB = 6$, $BC = 9$ and $DE = 10$. Find the scale factor from $\triangle ABC$ to $\triangle DEF$ and the length of EF .

Problem 13 Is it a dilation (medium)

The rule $(x, y) \rightarrow (2x + 1, 2y)$ is applied to the points $(0, 0)$ and $(3, 0)$. Is this a dilation about the origin? Describe the transformation.

Problem 14 A similarity sequence (hard)

Triangle ABC has $A(0, 0)$, $B(2, 0)$ and $C(0, 3)$. Triangle $A'B'C'$ has $A'(4, 1)$, $B'(8, 1)$ and $C'(4, 7)$. Describe a dilation followed by a translation that maps one onto the other.

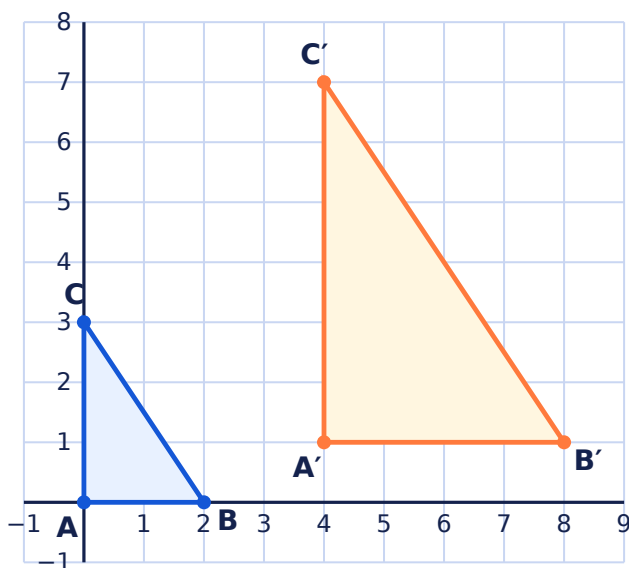


Figure for Problem 14.

Problem 15 Scale model of a statue (hard)

A scale model of a statue is 18 centimeters tall. The real statue is 4.5 meters tall. Find the scale factor from the statue to the model. The statue's base is 120 centimeters wide. How wide is the model's base? By what factor is the surface area of the model smaller than the statue's?

Problem 16 Projector enlargement (hard)

A slide measures 3.5 centimeters by 2.4 centimeters. A projector enlarges it with scale factor 18. Find the dimensions and the area of the image on the screen, and the factor by which the area grew.

Problem 17 Resizing a photo (hard)

A photo is 8 inches wide and 10 inches tall. It is shrunk by a dilation so that its width becomes 5

inches. Find the scale factor, the new height and the new perimeter.

Problem 18 Dilation with a center off the origin (hard)

Dilate $A(2, 0)$ and $B(4, 1)$ about the center $(1, -2)$ with scale factor 3. Find A' and B' , and compare the lengths AB and $A'B'$.

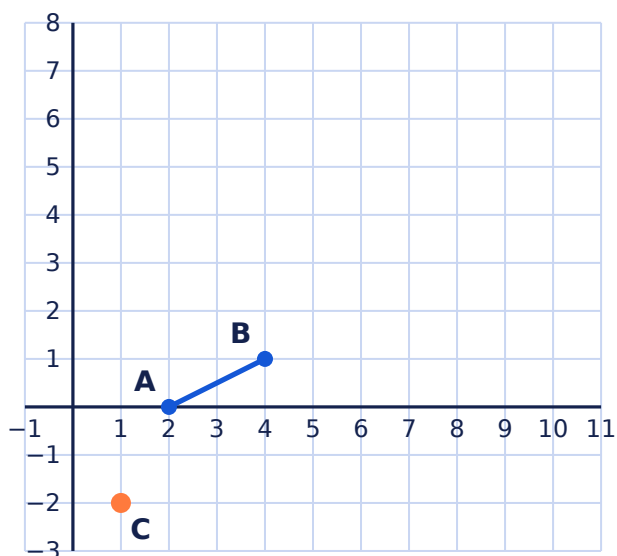


Figure for Problem 18.

Problem 19 Prove the AA similarity (hard)

Given: In $\triangle ABC$ and $\triangle DEF$, $\angle A \cong \angle D$ and $\angle B \cong \angle E$. Prove that $\triangle ABC \sim \triangle DEF$ by showing a dilation and a rigid motion map $\triangle ABC$ onto $\triangle DEF$.

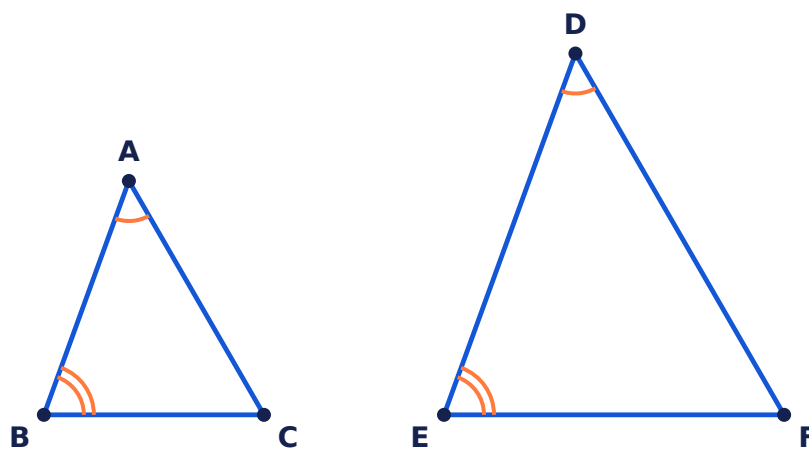


Figure for Problem 19.

Problem 20 Shadow measurement (hard)

A person who is 1.7 meters tall casts a shadow of 2.55 meters. At the same moment a tree casts a shadow of 12 meters. Explain why the triangles are similar and find the height of the tree.