

Congruent and Similar Figures Through Dilations

Grade 8 math · Worksheet Answer Key · Standards: 8.G.A.2, 8.G.A.3, 8.G.A.4

Every solution shows the multiplication or ratio behind the answer. When you compare, check both the coordinates and the side ratios, because a correct scale factor must work for every pair of corresponding sides.

Standards: 8.G.A.2, 8.G.A.3, 8.G.A.4 · **Level:** Grade 8

Problem 1 Enlarge a point

Multiply both coordinates by 4: $(5 \cdot 4, -2 \cdot 4)$.

Image: **(20, -8)**

Problem 2 Shrink a point

Multiply both coordinates by $\frac{1}{4}$: $(28 \div 4, -20 \div 4)$.

Image: **(7, -5)**

Problem 3 Fractional factor

$(-6 \cdot \frac{2}{3}, 9 \cdot \frac{2}{3}) = (-4, 6)$.

Image: **(-4, 6)**

Problem 4 Find the scale factor

Divide an image coordinate by the pre-image coordinate: $15 \div 6 = 2.5$, and $-10 \div (-4) = 2.5$.

Scale factor: **2.5**

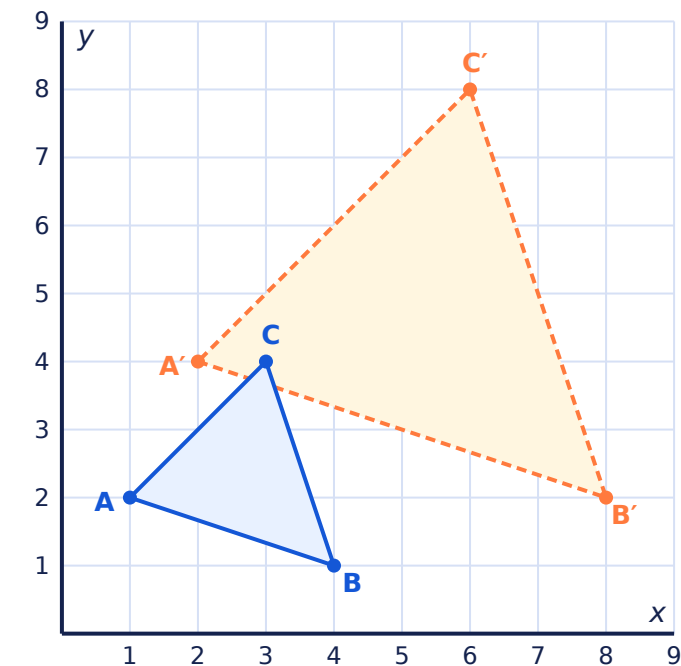
Problem 5 Rectangle sizes

$8 \cdot 2.5 = 20$ and $5 \cdot 2.5 = 12.5$.

Image: **20 cm by 12.5 cm**

Problem 6 Double a triangle

Multiply each coordinate by 2: $A(1, 2) \rightarrow (2, 4)$; $B(4, 1) \rightarrow (8, 2)$; $C(3, 4) \rightarrow (6, 8)$.

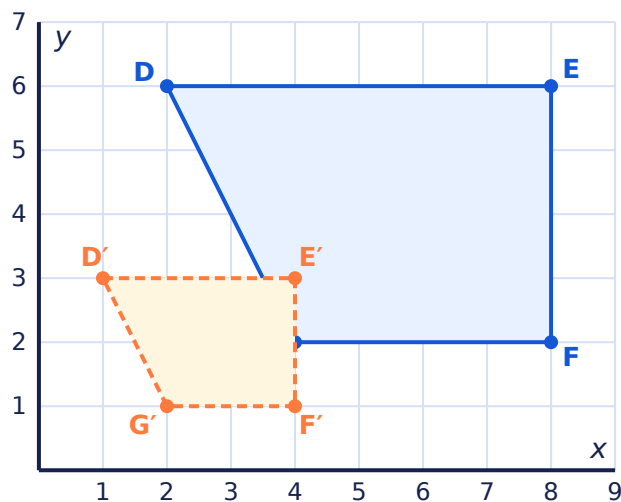


Triangle ABC (blue) and its image with $k = 2$ (orange, dashed).

Image: **$A'(2, 4)$, $B'(8, 2)$, $C'(6, 8)$**

Problem 7 Shrink a trapezoid

Halve every coordinate: $D(2, 6) \rightarrow (1, 3)$; $E(8, 6) \rightarrow (4, 3)$; $F(8, 2) \rightarrow (4, 1)$; $G(4, 2) \rightarrow (2, 1)$.



Trapezoid DEFG and its reduced copy (orange, dashed).

Image: **$D'(1, 3)$, $E'(4, 3)$, $F'(4, 1)$, $G'(2, 1)$**

Problem 8 Show congruence

Reflect across the y-axis: $A(-5, 1) \rightarrow (5, 1)$; $B(-1, 1) \rightarrow (1, 1)$; $C(-4, 4) \rightarrow (4, 4)$.

Translate 5 units down: $(5, -4)$, $(1, -4)$, $(4, -1)$, which are A' , B' , C' .

A reflection across the y-axis, then a translation 5 units down; the triangles are congruent

Problem 9 Check a dilation of sides

$12 \div 9 = 4/3$; $20 \div 15 = 4/3$; $28 \div 21 = 4/3$. All three ratios match.

The scale factor is $4/3$, so the triangles are similar

Problem 10 Similar rectangles?

$15 \div 10 = 3/2$ and $21 \div 14 = 3/2$. The ratios are equal, and all angles are 90° .

Yes; the scale factor from R to S is $3/2$

Problem 11 Missing side

Scale factor: $6 \div 9 = 2/3$.

$12 \cdot 2/3 = 8$ and $15 \cdot 2/3 = 10$.

The other sides are **8 and 10**.

Problem 12 Shrink to a third

Divide each coordinate by 3: $(-3, 6) \rightarrow (-1, 2)$; $(9, -3) \rightarrow (3, -1)$; $(0, -6) \rightarrow (0, -2)$.

Image: **$(-1, 2)$, $(3, -1)$, $(0, -2)$**

Problem 13 Reduce or enlarge?

$4.5 \div 9 = 0.5$; $6 \div 12 = 0.5$; $7.5 \div 15 = 0.5$.

Scale factor $1/2$; the dilation reduces the triangle

Problem 14 Lengths scale too

$A' = (5, 7.5)$ and $B' = (15, 7.5)$.

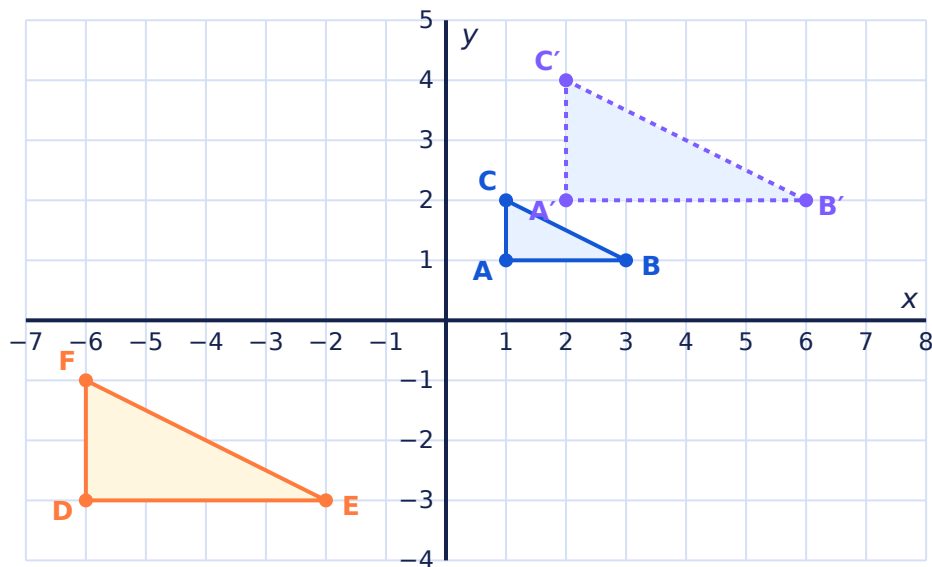
$AB = 6 - 2 = 4$ and $A'B' = 15 - 5 = 10$, and $10 \div 4 = 2.5$.

$A'(5, 7.5)$, $B'(15, 7.5)$; $A'B'$ is 2.5 times AB

Problem 15 Similar by two moves

$AB = 2$ and $DE = 4$, $AC = 1$ and $DF = 2$, so $k = 2$. Dilate: $A(1, 1) \rightarrow (2, 2)$; $B(3, 1) \rightarrow (6, 2)$; $C(1, 2) \rightarrow (2, 4)$.

Translate 8 left and 5 down: $(2, 2) \rightarrow (-6, -3)$; $(6, 2) \rightarrow (-2, -3)$; $(2, 4) \rightarrow (-6, -1)$, which are D, E, F.



Dilate $\triangle ABC$ (violet, dashed), then translate to $\triangle DEF$ (orange).

Dilation with $k = 2$, then a translation 8 units left and 5 units down

Problem 16 Poster enlargement

$4 \cdot 3.5 = 14$ and $6 \cdot 3.5 = 21$.

Both dimensions are multiplied by the same factor and the angles stay 90° , so the shapes are similar.

Poster: **14 in. by 21 in.**

Problem 17 Model airplane

$36\text{ m} = 3,600\text{ cm}$, so the scale factor is $24 \div 3,600 = 1/150$.

$31.5\text{ m} = 3,150\text{ cm}$ and $3,150 \div 150 = 21$.

Scale factor 1/150; the model fuselage is 21 cm long

Problem 18 Shadow measurement

Scale factor from student shadow to tree shadow: $33 \div 8.25 = 4$.

Heights are scaled the same way: $5.5 \cdot 4 = 22$.

The tree is **22 ft tall**.

Problem 19 Garden map

Multiply by 1.5: $(4, 2) \rightarrow (6, 3)$; $(10, 2) \rightarrow (15, 3)$; $(10, 10) \rightarrow (15, 15)$.

Original sides: 6, 8, and $\sqrt{(36 + 64)} = 10$, perimeter 24 m. New sides: 9, 12, 15, perimeter 36 m, and $36 \div 24 = 1.5$.

New vertices (6, 3), (15, 3), (15, 15); the perimeter grows from 24 m to 36 m, by the scale factor 1.5

Problem 20 Three moves

Dilate: $(4, 4)$, $(12, 4)$, $(4, 10)$.

Reflect across the y-axis: $(-4, 4)$, $(-12, 4)$, $(-4, 10)$.

Translate $(x + 3, y - 1)$: $(-1, 3)$, $(-9, 3)$, $(-1, 9)$.

The sides grow from 4, 3, 5 to 8, 6, 10, so the scale factor is 2, not 1.

Final vertices $(-1, 3)$, $(-9, 3)$, $(-1, 9)$; similar but not congruent