

Grade 8 · Congruence, Dilations and Similarity

· Worksheet Answer Key

Common Core 8.G.A.2, 8.G.A.3, 8.G.A.4 · mathovore.fr

Every problem has a full worked solution with the rule used and the final coordinates or length in bold. Check each step, not just the final answer, and redraw any figure you missed on graph paper.

Grade 8 Common Core: 8.G.A.2 · 8.G.A.3 · 8.G.A.4

Problem 1: Translate a point

Add 4 to the x -coordinate and 5 to the y -coordinate: $(3+4, -2+5)$.

$$A'(7,3)$$

Problem 2: Reflect over the x -axis

A reflection across the x -axis changes the sign of y : $(x,y) \rightarrow (x,-y)$.

$$B'(5,3)$$

Problem 3: Reflect over the y -axis

A reflection across the y -axis changes the sign of x : $(x,y) \rightarrow (-x,y)$.

$$C'(4,6)$$

Problem 4: Rotate 90 degrees

Use $(x,y) \rightarrow (-y,x)$: $(2,5) \rightarrow (-5,2)$.

$$D'(-5,2)$$

Problem 5: Rotate 180 degrees

Use $(x,y) \rightarrow (-x,-y)$: both signs change.

$$E'(3,-4)$$

Problem 6: Rotate 270 degrees

Use $(x,y) \rightarrow (y,-x) : (6,-1) \rightarrow (-1,-6)$.

$$F'(-1,-6)$$

Problem 7: Dilate a point

Multiply both coordinates by 3: $(3 \cdot 4, 3 \cdot (-6))$.

$$G'(12,-18)$$

Problem 8: Shrink a point

Multiply both coordinates by $\frac{1}{4}$: $12 \div 4 = 3$ and $8 \div 4 = 2$.

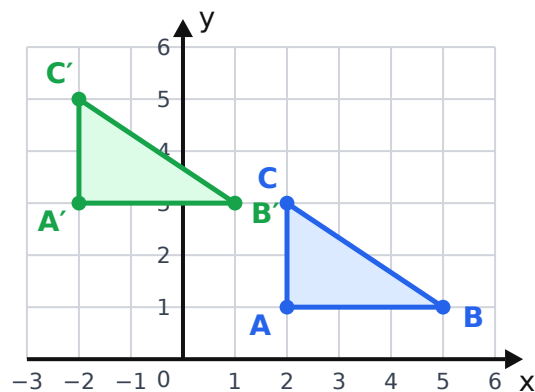
$$H'(3,2)$$

Problem 9: Translate a triangle

Subtract 4 from each x and add 2 to each y .

$$A(2,1) \rightarrow A'(-2,3), B(5,1) \rightarrow B'(1,3), C(2,3) \rightarrow C'(-2,5).$$

$$A'(-2,3), B'(1,3), C'(-2,5)$$



Triangle ABC and its translation $A'B'C'$.

Problem 10: Name the motion

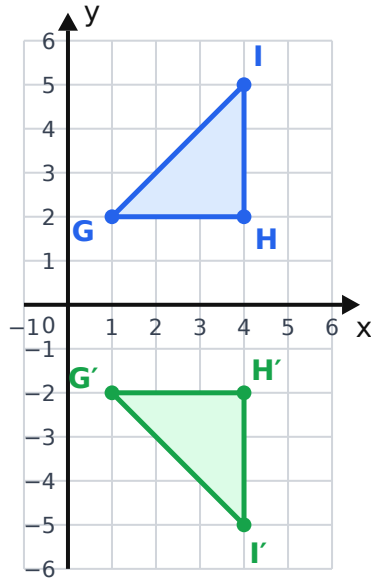
Each y -coordinate is unchanged and each x -coordinate changes sign: $D(1,1) \rightarrow D'(-1,1)$,
 $E(5,1) \rightarrow E'(-5,1)$, $F(1,3) \rightarrow F'(-1,3)$.

A reflection across the y -axis, $(x,y) \rightarrow (-x,y)$.

Problem 11: Reflect a triangle

Use $(x,y) \rightarrow (x,-y)$.

$$G'(1,-2), H'(4,-2), I'(4,-5)$$

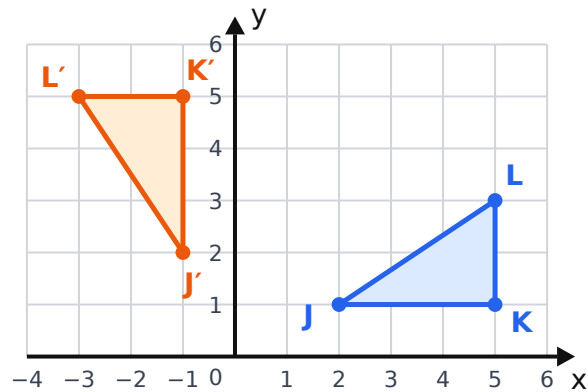


Triangle GHI and its reflection across the x -axis.

Problem 12: Rotate a triangle

Use $(x,y) \rightarrow (-y,x)$: $J(2,1) \rightarrow (-1,2)$, $K(5,1) \rightarrow (-1,5)$, $L(5,3) \rightarrow (-3,5)$.

$$J'(-1,2), K'(-1,5), L'(-3,5)$$

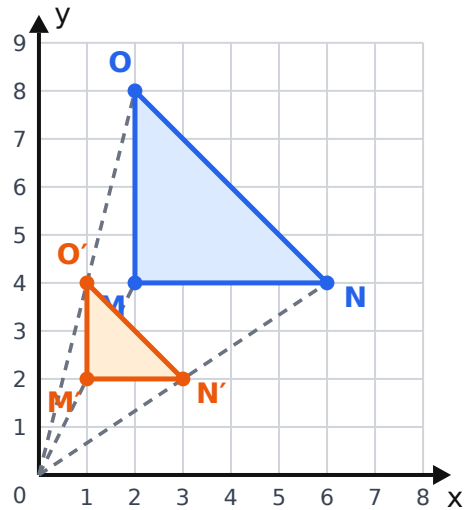


Triangle JKL and its 90° rotation about the origin.

Problem 13: Dilate a triangle

Multiply each coordinate by $\frac{1}{2}$: $M(2,4) \rightarrow (1,2)$, $N(6,4) \rightarrow (3,2)$, $O(2,8) \rightarrow (1,4)$.

$$M'(1,2), N'(3,2), O'(1,4)$$



Triangle MNO and its image after a dilation with $k = \frac{1}{2}$.

Problem 14: Rigid motions keep size

A reflection is a rigid motion, so it keeps lengths and angle measures.

$$A'B' = 6 \text{ in and } \angle B' = 52^\circ.$$

Problem 15: Dilation and lengths

Lengths are multiplied by 3: $4 \cdot 3 = 12$, $7 \cdot 3 = 21$, $9 \cdot 3 = 27$. Angle measures do not change in a dilation.

Sides 12 in, 21 in, 27 in; **angle** 38° .

Problem 16: Find the scale factor

Divide: $10 \div 2 = 5$ and $15 \div 3 = 5$, so $k = 5$.

$$B(-4, 1) \rightarrow (5 \cdot (-4), 5 \cdot 1).$$

$$k = 5 \text{ and } B'(-20, 5).$$

Problem 17: A reducing dilation

Divide: $-2 \div (-6) = \frac{1}{3}$ and $3 \div 9 = \frac{1}{3}$, so $k = \frac{1}{3}$.

$$Q(12, -3) \rightarrow \left(\frac{12}{3}, \frac{-3}{3}\right).$$

$$k = \frac{1}{3} \text{ and } Q'(4, -1).$$

Problem 18: Two moves in a row

Reflect across the x -axis: $(1,-1)$, $(4,-1)$, $(4,-3)$.

Translate 3 units left (subtract 3 from each x): $(-2,-1)$, $(1,-1)$, $(1,-3)$.

Final vertices $(-2,-1)$, $(1,-1)$, $(1,-3)$. Both moves are rigid motions, so the final triangle is congruent to RST .

Problem 19: Similar rectangles

Widths: $10 \div 4 = \frac{5}{2}$. Heights: $15 \div 6 = \frac{5}{2}$. Both ratios match, and all angles are 90° .

Yes, the rectangles are similar with scale factor $\frac{5}{2} = 2.5$.

Problem 20: Missing side of a triangle

Scale factor: $12 \div 8 = \frac{3}{2}$ and $9 \div 6 = \frac{3}{2}$.

The hypotenuse grows by the same factor: $x = 10 \cdot \frac{3}{2} = 15$.

$k = \frac{3}{2}$ and $x = 15$ in.

Problem 21: Enlarging a photo

Scale factor: $10 \div 4 = \frac{5}{2}$.

Height: $6 \cdot \frac{5}{2} = 15$.

Scale factor $\frac{5}{2}$; the photo is 15 inches tall.

Problem 22: Logo on a screen

Banner: $4.5 \div 3 = 1.5$, so $k = 1.5$ and the height is $2 \cdot 1.5 = 3$ inches.

Sticker: height scale $1.5 \div 2 = 0.75$, so the width is $3 \cdot 0.75 = 2.25$ inches.

Banner: $k = 1.5$, height 3 in. Sticker width: 2.25 in.

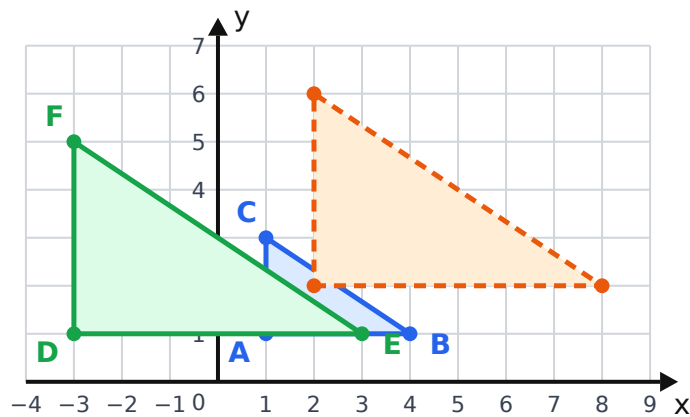
Problem 23: Describe a sequence

Lengths: $AB = 3$ and $DE = 6$, $AC = 2$ and $DF = 4$, so $k = 2$. Dilate:

$(1,1), (4,1), (1,3) \rightarrow (2,2), (8,2), (2,6)$.

Then $(2,2) \rightarrow (-3,1)$ needs 5 units left and 1 unit down; check $(8,2) \rightarrow (3,1)$ and $(2,6) \rightarrow (-3,5)$.

Dilate by $k=2$, then translate 5 left and 1 down. The triangles are similar, not congruent.



Dilation by 2 (dashed), then translation 5 units left and 1 unit down.

Problem 24: Game character

Dilate by 1.5: $(3,6)$, $(9,6)$, $(3,15)$.

Reflect across the y -axis: $(-3,6)$, $(-9,6)$, $(-3,15)$.

The horizontal side runs from $x = -9$ to $x = -3$: 6 units. Check: $4 \cdot 1.5 = 6$.

Vertices $(-3,6)$, $(-9,6)$, $(-3,15)$; horizontal side 6 units.