

Rigid Motions and Transformations: math practice, Grade 10 – download the PDF

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

1 Translating points

★ ★ ★

Translate each point by the vector $\langle -4, 5 \rangle$.

- a. $P(3, -2)$
- b. $Q(0, 6)$

2 Three reflections

★ ★ ★

- a. Reflect $A(4, 7)$ in the x-axis.
- b. Reflect $B(-3, 2)$ in the y-axis.
- c. Reflect $C(5, 5)$ in the line $y = x$. What do you notice?

3 Turning about the origin

★ ★ ★

Rotate about the origin: (a) $A(3, 1)$ by 90° counterclockwise; (b) $B(-2, 4)$ by 180° ; (c) $C(5, -2)$ by 270° counterclockwise.

4 True or false?



Decide whether each statement is true or false and justify.

- a. A translation can make a figure bigger.
- b. A reflection reverses the orientation of a figure.
- c. A rotation of 360° maps every figure onto itself.
- d. A dilation with scale factor 2 is a rigid motion.

5 Counting symmetries



For each figure, give the number of lines of symmetry and the smallest angle of rotational symmetry (write “none” if only 360° works): (a) a rectangle that is not a square; (b) an equilateral triangle; (c) a regular hexagon; (d) an isosceles trapezoid; (e) a parallelogram that is not a rectangle or a rhombus.

6 Finding the translation



A translation maps $A(2, 5)$ to $A'(-1, 9)$.

- a. Find its vector.
- b. Find the image of $B(0, 0)$.
- c. Find the preimage of $C'(7, -2)$.

7 Lengths do not change



Let $P(1, 2)$ and $Q(5, 5)$. Translate the segment by $\langle 3, -4 \rangle$. Compute PQ and $P'Q'$ and compare.

8 A vertical mirror line



The line of reflection is $x = 3$. Find the images of $(7, 2)$, $(1, -4)$ and $(3, 6)$, then write the rule for any point (x, y) .

9 A horizontal mirror line

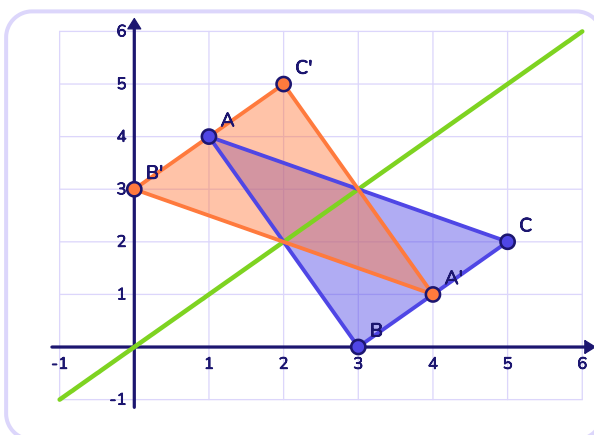


The line of reflection is $y = -1$. Show that the rule is $(x, y) \rightarrow (x, -2 - y)$, then reflect $(2, 3)$, $(-4, -1)$ and $(0, -6)$.

10 Reflecting a triangle in $y = x$



Triangle ABC has $A(1, 4)$, $B(3, 0)$, $C(5, 2)$. Reflect it in the line $y = x$ and compare the areas of the two triangles.



11 Order matters



Let T be the translation by $\langle 2, 3 \rangle$ and M the reflection in the y -axis. Find the image of $P(4, -1)$ when you (a) apply T then M ; (b) apply M then T . Are the results equal?

12 A clockwise quarter turn



Rotate $D(2, 0)$, $E(4, 1)$, $F(3, 3)$ by 90° clockwise about the origin. Which counterclockwise angle gives the same image?

13 Drone on a grid map



A drone starts at $(2, 3)$ on a grid map (units: meters). It makes three moves, which are translations: $\langle 4, 1 \rangle$, then $\langle -6, 2 \rangle$, then $\langle 1, -7 \rangle$.

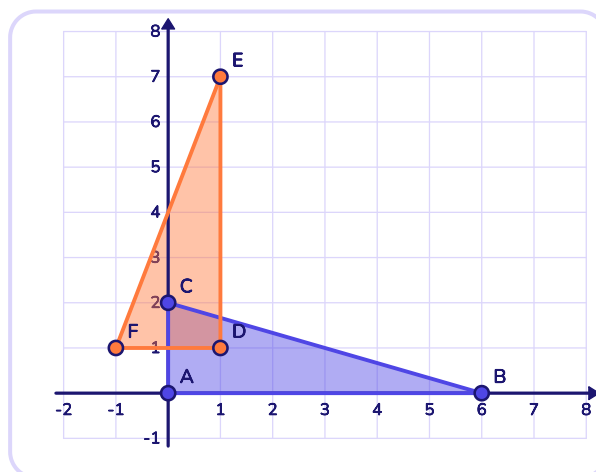
- Where does it finish?
- Which single translation replaces the three moves?

14 Are these triangles congruent?



Triangle ABC has $A(0, 0)$, $B(6, 0)$, $C(0, 2)$; triangle DEF has $D(1, 1)$, $E(1, 7)$, $F(-1, 1)$.

- Show that $\triangle ABC \cong \triangle DEF$ with $A \rightarrow D$, $B \rightarrow E$, $C \rightarrow F$.
- Describe a sequence of rigid motions that maps one onto the other.



15 Two parallel mirrors

★★★

Reflect $P(-2, 3)$ in the line $x = 1$, then reflect the image in the line $x = 5$.

- Find the final image.
- Show that the composition is a translation and give its vector. Test it on $(0, -2)$.

16 Two mirrors that meet

★★★

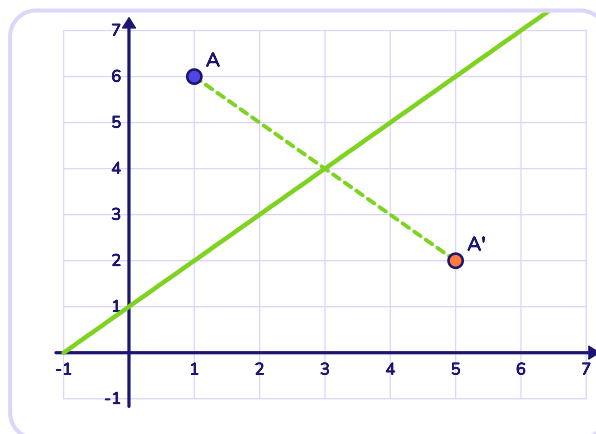
- Reflect (x, y) in the x -axis, then in the y -axis. Which rotation is this?
- Reflect in the line $y = x$, then in the y -axis. Find the rule and the rotation. Test it on $(3, 4)$.

17 Finding the mirror line

★★★

A reflection maps $A(1, 6)$ to $A'(5, 2)$.

- Find the equation of the line of reflection.
- Is $B(0, 1)$ moved by this reflection?



18 Glide reflection and orientation



Triangle RST has $R(-4, 2)$, $S(-1, 2)$, $T(-3, 5)$. Reflect it in the x -axis, then translate by $\langle 6, 1 \rangle$.

- Find the final vertices.
- Compute the signed quantity $x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)$ before and after. What does the sign change show?

19 Rotating about another center



Let $C(2, 1)$ be the center. Find the image of (a) $P(5, 4)$ by a 90° counterclockwise rotation; (b) $Q(2, -3)$ by a 180° rotation; (c) $R(6, 1)$ by a 270° counterclockwise rotation.

20 Why reflections keep distances



Let $P(a, b)$ and $Q(c, d)$ be any two points. Reflect them in the y -axis and prove that $P'Q' = PQ$. Then check with $P(2, 3)$ and $Q(-1, 7)$.

21 Symmetry detective



- How many lines of symmetry does a regular octagon have, and what is its smallest rotation angle?
- A logo has rotational symmetry of order 5. List all rotation angles (up to 360°) that map it onto itself.
- A regular polygon has smallest rotation angle 24° . How many sides does it have?

22

The Ferris wheel



A Ferris wheel has 12 equally spaced cars, numbered 1 to 12 going counterclockwise.

- What is the smallest angle of rotation that maps the wheel onto itself?
- Car 5 is moved by a 210° counterclockwise rotation. Which car position does it reach?
- Where does car 10 go after a 90° counterclockwise rotation?



Test yourself: quick challenge for Grade 10

[Change level](#)

Level : **Grade 10**

6 random questions, instant feedback.

[Start the challenge](#)

Speed drill for Grade 10: how many in 60 seconds?



Keep exploring with Zyro

✓ **Practice solutions**

Rigid Motions and Transformations:
practice solutions, Grade 10

■ **Math lessons**

Rigid Motions and Transformations:
math lesson, Grade 10

🎯 **Math quizzes**

Rigid Motions and Transformations:
math quiz, Grade 10

✓ **Practice solutions**

Congruent Triangles: practice solutions,
Grade 10

✓ **Practice solutions**

Relationships in Triangles: practice
solutions, Grade 10

■ **Math lessons**

Congruent Triangles: math lesson, Grade
10

Zyro vous emmène sur nos sites partenaires

Embarquez pour d'autres planètes du savoir et leurs applis.

Décollage