ALBERT

Name _____ Date _____

Defining Rigid Motions Worksheet

Geometry · Common Core HSG-CO.A.4

> Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

Practice

Builds the skill step by step.

1. A reflection across line ℓ maps point P to P′ (P is not on ℓ). How is ℓ related to segment PP′?
   A. ℓ is twice as long as PP′.
   B. ℓ is parallel to PP′.
   C. ℓ is the perpendicular bisector of PP′.
   D. ℓ passes through P.

2. A rotation of θ° about point O maps P to P′. Which is true?
   A. P, O and P′ are always on a line
   B. $OP' = 2 \times OP$
   C. $PP' = \theta$
   D. $OP = OP'$ and angle POP′ measures θ°

3. How does a translation move every point?
   A. the same distance in the same direction
   B. the same distance in different directions
   C. around a fixed point
   D. across a line

4. Point P is 4 cm from line ℓ. P is reflected across ℓ to P′. What is PP′?

5. A rotation about O maps P to P′. OP = 7. What is OP′?

6. A translation maps P to P′ and Q to Q′. PP′ = 10. What is QQ′?

7. A translation maps P to P′ and Q to Q′, and P, Q are not on line PP′. How are segments PP′ and QQ′ related?

   A. They have different lengths.

   B. They are parallel and congruent.

   C. They intersect at their midpoints.

   D. They are perpendicular.

8. A 90° rotation about O maps P to P′. What is the measure of angle POP′?

9. Point P is on line ℓ. Where does the reflection across ℓ send P?

   A. nowhere

   B. to P itself

   C. to the closest point not on ℓ

   D. to the opposite side of ℓ

10. Reflect P(3, 5) across the line y = 1. What is the image?

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On Level

Grade-level practice.

1. Reflect (6, 2) across the line x = 1. What is the image?

2. A 180° rotation about O maps P to P′. Which is true?

   A. P, O and P′ are on one line, and O is the midpoint of PP′.

   B. PP′ is perpendicular to OP.

   C. P′ = P.

   D. O is not on PP′.

3. A reflection maps P(1, 2) to P′(5, 6). The line of reflection passes through the midpoint of PP′. What is that midpoint?

4. A reflection maps P to P′, and segment PP′ has slope 1. What is the slope of the line of reflection?

5. Which is the definition of a translation along a directed segment AB?

   A. Each point turns around A by the length of AB.

   B. Each point moves to the midpoint of AB.

   C. Each point reflects across AB.

   D. Each point P moves to P′ so that PP′ is the same length as AB and in the same direction.

6. A 60° rotation about O maps P to P′, and OP = 9. What is PP′?

7. Reflect P(2, 7) across the line y = x. What is the image?

8. A point is 5 units from line ℓ. It is translated 3 units in a direction parallel to ℓ. How far is the image from ℓ?

9. Which points stay fixed under a reflection across line ℓ?

   A. every point

   B. only one point

   C. exactly the points on ℓ

   D. no points

10. A 90° rotation about O maps P to P′, and OP = 6. What is the exact length of PP′?

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Challenge

Multi-step and word problems that stretch it.

1. A 120° rotation about O maps P to P′, and OP = 4. What is the exact length of PP′?

2. A reflection maps (2, 1) to (6, 1). What is the equation of the line of reflection?

3. A figure is reflected across line m and then across line n. Lines m and n are parallel and 3 units apart. The result is the same as which single transformation?

   A. a reflection across a line halfway between m and n

   B. a rotation of 180°

   C. a translation of 3 units

   D. a translation of 6 units, perpendicular to the lines

4. Two reflections across parallel lines 5 units apart are combined. How far does every point move?

5. Two reflections across lines that meet at a 40° angle are combined. The result is a rotation about the intersection point. What is the angle of rotation?

6. Write a precise definition of a 90° rotation about point O.

7. Reflect $(4, -1)$ across the line $y = -x$. What is the image?

8. A reflection maps $P(-2, 3)$ to $P'(4, 3)$. The line of reflection is $x = \square$. What number goes in the box?

9. A 180° rotation about point O is the same as which transformation?

   A. a 90° rotation done once

   B. a reflection across a line through O

   C. a reflection through the point O (a point reflection)

   D. a translation

10. A translation maps $(0, 0)$ to $(3, -4)$. How far does every point move?