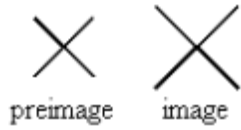


Name _____

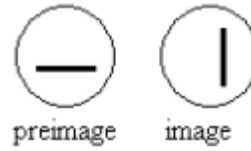
Transformations

_____ 1. Which of the following transformations represents an isometry?

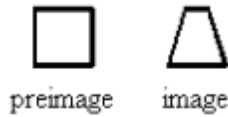
a.



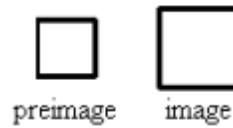
c.



b.



d.



_____ 2. An ISOMETRY is a transformation which does not have to preserve _____.

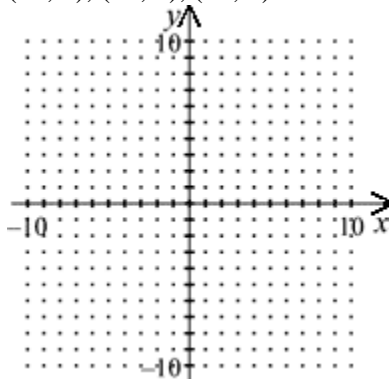
a. position

c. length

b. betweenness

d. angle measure

3. Graph the triangle whose vertices have the coordinates given below. Then draw its reflection in the x -axis.
 $(-6, 3), (-3, 3), (-5, 8)$



_____ 4. A reflection is always _____.

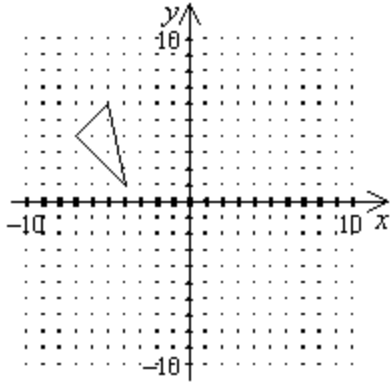
a. a rotation

c. an isometry

b. a translation

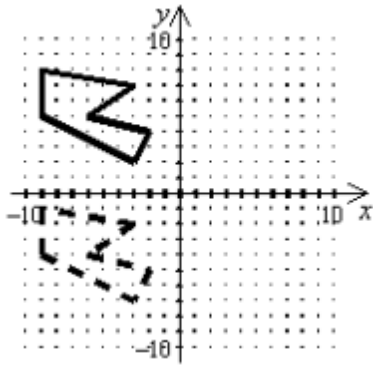
d. reflexive

5. Suppose the triangle in the figure below is reflected over the y -axis.



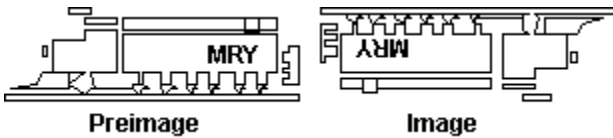
Draw the line of reflection and the image triangle.

6. The change in position from the solid figure to the dotted figure is best described as a _____.

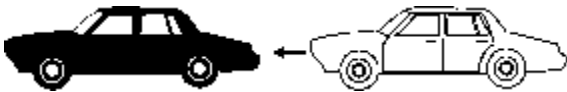


- a. translation
- b. reflection
- c. rotation
- d. translation

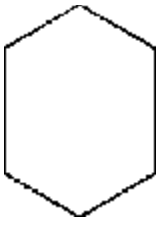
7. Name the transformation.



8. Name the transformation. (Preimages are unshaded; images are shaded.)



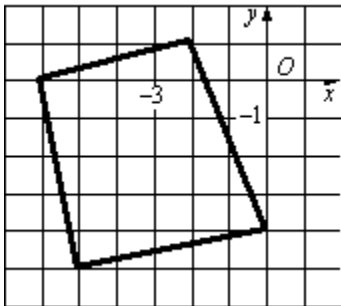
9. The hexagon shown below is equiangular. How many lines of symmetry does it have?



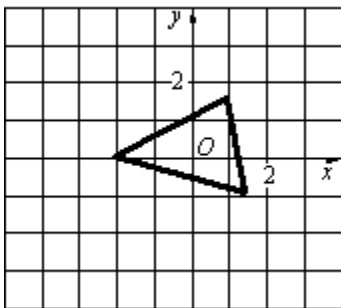
- a. 2 b. 1 c. 3 d. 6

Draw the image of the given figure after a dilation with center O and the given scale factor.

10. scale factor: $\frac{1}{2}$

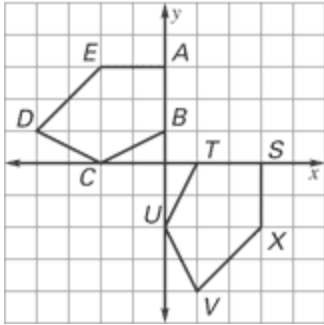


11. scale factor: 2



12. $\triangle ABC$ is mapped onto $\triangle A'B'C'$ by a dilation at D . Complete the statement. If $\frac{DB'}{DB} = \frac{4}{3}$, then $\triangle A'B'C'$ is _____ (larger, smaller) than $\triangle ABC$, and the dilation is _____ (a reduction, an enlargement).

Use the diagram.



13. Identify the transformation that maps figure $ABCDE$ onto figure $STUVX$.
14. What is the preimage of V ?
15. What is the image of A ?

The vertices of a polygon are given. Name the coordinates of the vertices of the image after a counterclockwise rotation of the given number of degrees about the origin.

16. $J(-2, 1), K(-1, 4), L(3, 4), M(3, 1); 90^\circ$
17. $D(1, -4), E(2, 0), F(5, -2); 270^\circ$
18. $J(-4, 3), K(4, 0), L(1, -2), M(-4, -3); 180^\circ$

Name the coordinates of the image of $\triangle PQR$ after a composition using the given transformations in the order they appear.

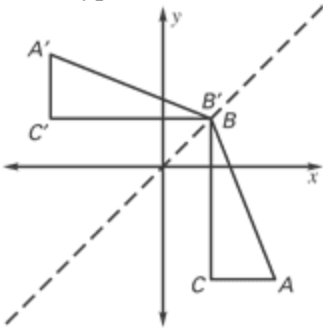
19. $P(4, 5), Q(7, 1), R(8, 8)$
Translation: $(x, y) \rightarrow (x, y - 7)$
Reflection: in the y -axis
20. $P(1, 1), Q(1, 7), R(9, 1)$
Translation: $(x, y) \rightarrow (x + 1, y + 3)$
Dilation: Use the origin as the center and use a scale factor of $\frac{1}{2}$.

Find the coordinates of the reflection without using a coordinate plane.

21. $A(1, 3)$ reflected in the x -axis
 22. $B(-2, -3)$ reflected in the y -axis
- _____ 23. The point $P(-3, 7)$ is reflected in the line $y = x$. What are the coordinates of P' ?
- a. $(-3, -7)$
 - b. $(3, -7)$
 - c. $(3, 7)$
 - d. $(-7, 3)$

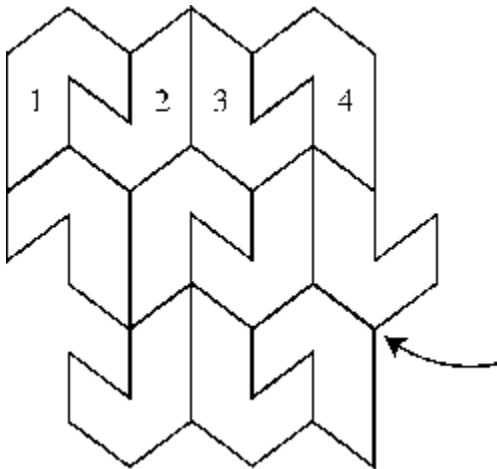
e. none of these

___ 24. What type of transformation is shown in the diagram?



- a. slide
- b. translation
- c. reflection
- d. rotation
- e. isometry

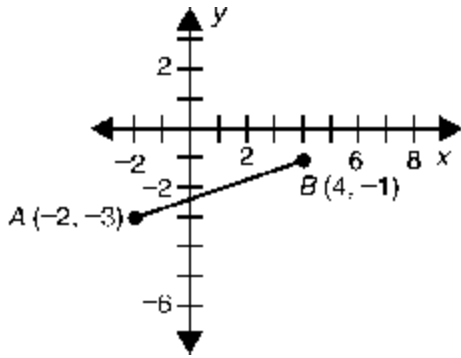
25. **SHORT RESPONSE** Write your answer on a separate piece of paper.



Part A Which transformation(s) are used in the tessellation above?

Part B Which shape, 1, 2, 3, or 4, belongs in the location indicated by the arrow?

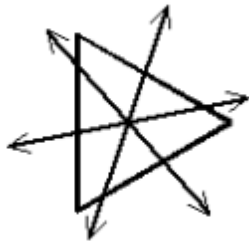
Use the diagram.



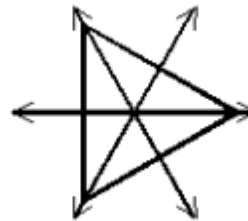
26. Segment \overline{AB} is translated so that $(x, y) \rightarrow (x + 4, y - 3)$.
Find the coordinates of the endpoints of the image $\overline{A'B'}$.

27. Which figure shows all lines of symmetry?

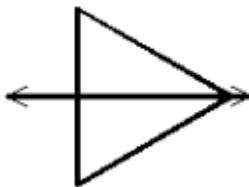
a.



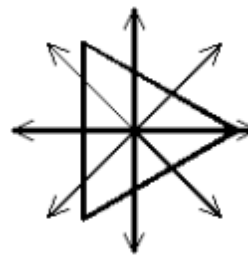
c.



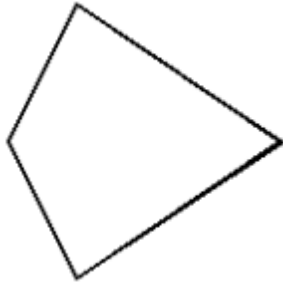
b.



d.

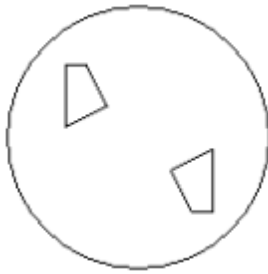


28. State whether the following figure has line symmetry, rotational symmetry, both kinds of symmetry, or neither kind of symmetry.

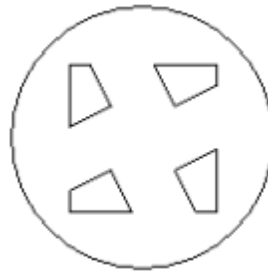


___ 29. Which figure has rotational symmetry for an angle of rotation of 240° ?

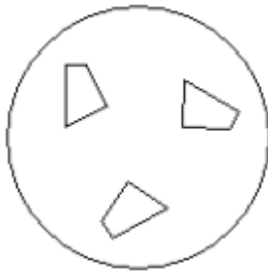
a.



c.



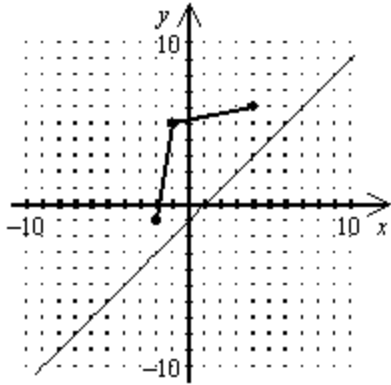
b.



d.



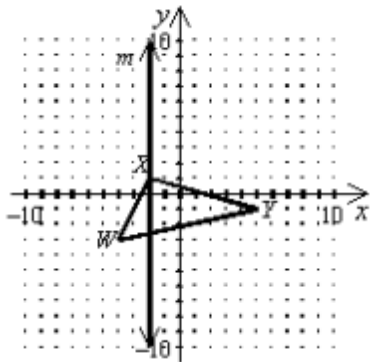
___ 30. The line shown in the figure below is the only line of symmetry for a hexagon. The figure shows three of the hexagon's vertices.



What are the coordinates of the other three vertices of the hexagon?

- | | |
|--------------------------------|-------------------------------|
| a. $(7, 3), (6, -2), (0, -3)$ | c. $(7, 3), (7, -1), (0, -2)$ |
| b. $(7, 3), (6, -2), (-1, -2)$ | d. $(3, 7), (-2, 6), (-3, 0)$ |

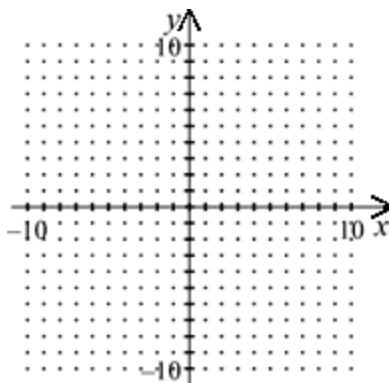
31. What are the coordinates of the vertices when the figure is reflected in line m ?



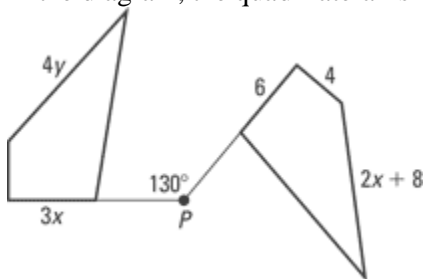
- | |
|---|
| a. $W' (4, -3), X' (-2, -1), Y' (-5, -1)$ |
| b. $W' (4, 3), X' (2, -1), Y' (-5, 1)$ |
| c. $W' (0, -3), X' (-2, 1), Y' (-9, -1)$ |
| d. $W' (-3, 0), X' (1, -2), Y' (-1, -9)$ |

Tell what type of transformation is described.

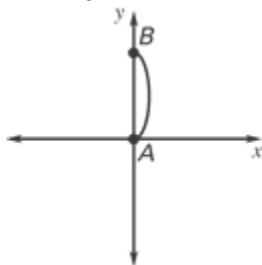
32. Each image point has the same x -coordinate, but the opposite y -coordinate of the corresponding point on the original figure.
33. Graph the figure with vertices $(4, -4), (2, -2), (-1, -5),$ and $(1, -7)$. Rotate the figure 180° about the origin.

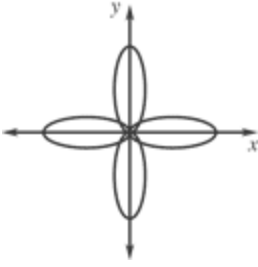


34. $\triangle ABC$ has vertices $A(1, 1)$, $B(1, 5)$, and $C(4, 5)$. Don transformed the triangle by $(x, y) \rightarrow (2x, 2y)$, Vanessa transformed the triangle by $(x, y) \rightarrow (-x, y)$, and Elise transformed the triangle by $(x, y) \rightarrow (x - 3, y + 4)$.
- Sketch $\triangle ABC$ and each student's transformation.
 - What type of transformation did each student perform?
 - Are any of the transformations isometries? If a transformation is an isometry, explain how you can prove it. Otherwise, explain why the transformation is not an isometry.
35. A triangle has vertices $P(-5, -4)$, $Q(-5, 0)$, $R(0, 0)$. $\triangle PQR$ is rotated counterclockwise 270° about the origin. Find the coordinates of the vertices of the image $\triangle P'Q'R'$.
36. In the diagram, the quadrilateral is rotated about P . What is the value of y ?

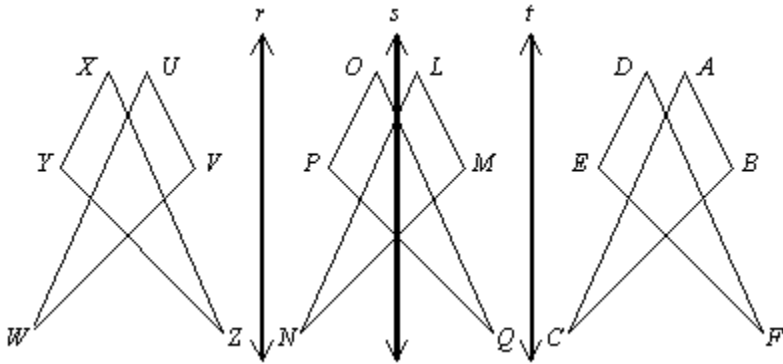


37. The composition of two (or more) isometries is always _____.
- an isometry
 - a translation
 - a rotation
 - a reflection
38. Explain whether or not, in a composition of two or more isometries, the order of applying them matters.
39. Use Figure 1 below to describe the transformation needed to create Figure 2.



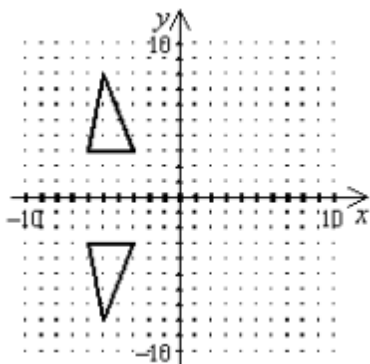


40. Each triangle is an image of $\triangle UVW$. Which triangle is the image of $\triangle UVW$ after a reflection over line r and then a reflection over line s ?

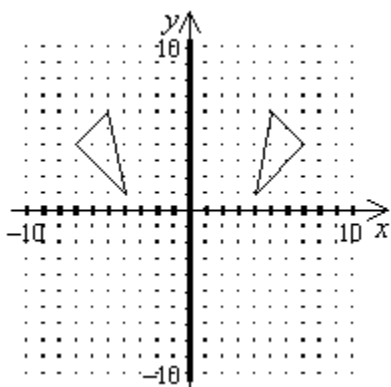


Transformations Answer Section

1. ANS: C PTS: 1 DIF: Level A REF: PHGM0003
 TOP: Lesson 9.1 Translate Figures and Use Vectors KEY: identify | transformation | isometry
 BLM: Knowledge NOT: 978-0-618-65613-4
2. ANS: A PTS: 1 DIF: Level A REF: MLGE0332
 TOP: Lesson 9.1 Translate Figures and Use Vectors KEY: transformation | isometry
 BLM: Knowledge NOT: 978-0-618-65613-4
3. ANS:



- PTS: 1 DIF: Level A REF: MLGE0335
 NAT: NCTM 9-12.GEO.4.a | NCTM 9-12.GEO.2.a | NCTM 9-12.GEO.3.a
 TOP: Lesson 9.3 Perform Reflections KEY: graph | triangle | vertices | coordinate | reflection
 BLM: Knowledge NOT: 978-0-618-65613-4
4. ANS: C PTS: 1 DIF: Level A REF: HLGM0524
 TOP: Lesson 9.3 Perform Reflections KEY: reflection | isometry
 BLM: Knowledge NOT: 978-0-618-65613-4
5. ANS:



- PTS: 1 DIF: Level A REF: MC100305 NAT: NCTM 9-12.GEO.3.a
 TOP: Lesson 9.3 Perform Reflections KEY: line | graph | triangle | reflection | transformation | grid
 BLM: Knowledge NOT: 978-0-618-65613-4
6. ANS: D PTS: 1 DIF: Level A REF: MLGE0331
 TOP: Lesson 9.4 Perform Rotations KEY: reflection | rotation | translation | transformation

BLM: Knowledge NOT: 978-0-618-65613-4

7. ANS:
Rotation

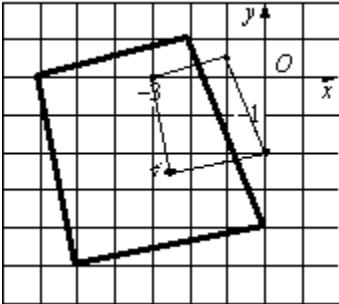
PTS: 1 DIF: Level A REF: HLGM0540 TOP: Lesson 9.4 Perform Rotations
KEY: rotation BLM: Knowledge NOT: 978-0-618-65613-4

8. ANS:
Translation

PTS: 1 DIF: Level A REF: HLGM0549 TOP: Lesson 9.4 Perform Rotations
KEY: identify | translation BLM: Knowledge NOT: 978-0-618-65613-4

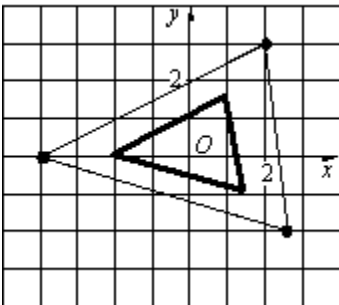
9. ANS: A PTS: 1 DIF: Level A REF: HLGM0525
TOP: Lesson 9.6 Identify Symmetry KEY: line | symmetry | hexagon | equiangular
BLM: Knowledge NOT: 978-0-618-65613-4

10. ANS:



PTS: 1 DIF: Level A REF: BS022334 NAT: NCTM 9-12.GEO.3.a
TOP: Lesson 9.7 Identify and Perform Dilations KEY: quadrilateral | scale factor | dilation
BLM: Knowledge NOT: 978-0-618-65613-4

11. ANS:



PTS: 1 DIF: Level A REF: BS022335 NAT: NCTM 9-12.GEO.3.a
TOP: Lesson 9.7 Identify and Perform Dilations KEY: triangle | scale factor | dilation
BLM: Knowledge NOT: 978-0-618-65613-4

12. ANS: larger; an enlargement

PTS: 1 DIF: Level A REF: Geo.09.TestA.Eng.17
TOP: Ch. 9 Test, Level A KEY: Pre-made Test | map | dilation
BLM: Comprehension NOT: 978-0-618-65613-4

13. ANS:
reflection

PTS: 1 DIF: Level A REF: Geo.09.TestA.Eng.04
NAT: NCTM 9-12.GEO.3.a TOP: Ch. 9 Test, Level A
KEY: Pre-made Test | transformations BLM: Knowledge NOT: 978-0-618-65613-4

14. ANS:
D

PTS: 1 DIF: Level A REF: Geo.09.TestA.Eng.05
TOP: Ch. 9 Test, Level A KEY: Pre-made Test | preimage
BLM: Knowledge NOT: 978-0-618-65613-4

15. ANS:
S

PTS: 1 DIF: Level A REF: Geo.09.TestA.Eng.06
TOP: Ch. 9 Test, Level A KEY: Pre-made Test | image
BLM: Knowledge NOT: 978-0-618-65613-4

16. ANS:

$J'(-1, -2), K'(-4, -1), L'(-4, 3), M'(-1, 3)$

PTS: 1 DIF: Level A REF: Geo.09.TestA.Eng.15
TOP: Ch. 9 Test, Level A KEY: Pre-made Test | vertices | image | rotations
BLM: Application NOT: 978-0-618-65613-4

17. ANS:

$D'(-4, -1), E'(0, -2), F'(-2, -5)$

PTS: 1 DIF: Level A REF: Geo.09.TestA.Eng.16
TOP: Ch. 9 Test, Level A KEY: Pre-made Test | vertices | image | rotations
BLM: Application NOT: 978-0-618-65613-4

18. ANS:

$J'(4, -3), K'(-4, 0), L'(-1, 2), M'(4, 3)$

PTS: 1 DIF: Level C REF: Geo.09.TestC.Eng.15
NAT: NCTM 9-12.GEO.3.a TOP: Ch. 9 Test, Level C
KEY: Pre-made Test | vertices | image | rotations BLM: Application
NOT: 978-0-618-65613-4

19. ANS:

$P ?(-4, -2), Q ?(-7, -6), R ?(-8, 1)$

PTS: 1 DIF: Level A REF: Geo.09.TestA.Eng.18
TOP: Ch. 9 Test, Level A
KEY: Pre-made Test | image | composition | transformations | translations | reflections
BLM: Application NOT: 978-0-618-65613-4

20. ANS:

$P ?(1, 2), Q ?(1, 5), R ?(5, 2)$

PTS: 1 DIF: Level A REF: Geo.09.TestA.Eng.19
TOP: Ch. 9 Test, Level A

KEY: Pre-made Test | image | composition | transformations | translations | dilation
BLM: Application NOT: 978-0-618-65613-4

21. ANS:

$(1, -3)$

PTS: 1 DIF: Level A REF: Geo.09.Quiz1.Eng.09
TOP: Quiz 1 KEY: reflections | coordinates BLM: Knowledge
NOT: 978-0-618-65613-4

22. ANS:

$(2, -3)$

PTS: 1 DIF: Level A REF: Geo.09.Quiz1.Eng.10
TOP: Quiz 1 KEY: reflections | coordinates | y-axis BLM: Knowledge
NOT: 978-0-618-65613-4

23. ANS: E PTS: 1 DIF: Level A REF: G1.09.EN.ST.01

TOP: SAT/ACT Chapter Test KEY: SAT/ACT | Reflections

BLM: Knowledge NOT: 978-0-618-65613-4

24. ANS: C PTS: 1 DIF: Level A REF: G1.09.EN.ST.03

TOP: SAT/ACT Chapter Test KEY: SAT/ACT | Transformations

BLM: Knowledge NOT: 978-0-618-65613-4

25. ANS:

Part A rotation of 180° , reflection, and translation

Part B shape 1

PTS: 1 DIF: Level B REF: MCT80356
TOP: Lesson 9.5 Apply Compositions of Transformations
KEY: reflection | rotation | translation | tessellation BLM: Application
NOT: 978-0-618-65613-4

26. ANS:

$A'(2, -6)$; $B'(8, -4)$

PTS: 1 DIF: Level B REF: MLGE0342 NAT: NCTM 9-12.GEO.2.a
TOP: Lesson 9.1 Translate Figures and Use Vectors KEY: translate | segment | motion
BLM: Knowledge NOT: 978-0-618-65613-4

27. ANS: C PTS: 1 DIF: Level B REF: MLP10253

TOP: Lesson 9.6 Identify Symmetry KEY: line | symmetry

BLM: Knowledge NOT: 978-0-618-65613-4

28. ANS:

line

PTS: 1 DIF: Level B REF: MDGW0705
TOP: Lesson 9.6 Identify Symmetry KEY: identify | symmetry | reflection | rotation
BLM: Knowledge NOT: 978-0-618-65613-4

29. ANS: B PTS: 1 DIF: Level B REF: AXGM0163

TOP: Lesson 9.6 Identify Symmetry KEY: symmetry | reflection | rotation

BLM: Knowledge NOT: 978-0-618-65613-4

30. ANS: A PTS: 1 DIF: Level B REF: MC100232

TOP: Lesson 9.6 Identify Symmetry

KEY: line | graph | symmetry | coordinate | hexagon | symmetric | grid

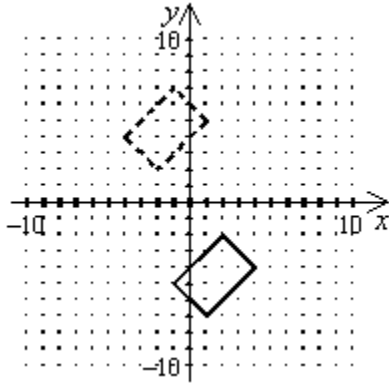
BLM: Synthesis NOT: 978-0-618-65613-4

31. ANS: C PTS: 1 DIF: Level B REF: MHGM0140
TOP: Lesson 9.3 Perform Reflections KEY: reflection BLM: Knowledge
NOT: 978-0-618-65613-4

32. ANS:
reflection over the x -axis

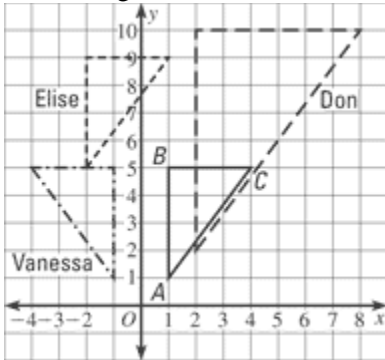
PTS: 1 DIF: Level B REF: MIM20310 TOP: Lesson 9.3 Perform Reflections
KEY: identify | reflection | transformation BLM: Comprehension
NOT: 978-0-618-65613-4

33. ANS:



PTS: 1 DIF: Level B REF: MGEO0013
NAT: NCTM 9-12.GEO.2.a | NCTM 9-12.GEO.4.a | NCTM 9-12.GEO.3.a
TOP: Lesson 9.4 Perform Rotations KEY: graph | rotation
BLM: Knowledge NOT: 978-0-618-65613-4

34. ANS:
a. See diagram below.



- b. Don: dilation, Vanessa: reflection, Elise: translation
c. Vanessa and Elise's transformations are isometries. You can use the distance formula to prove that the distances between the vertices of $\triangle ABC$ are the same as the distances between the corresponding vertices in Vanessa and Elise's triangles. Since Don's triangle is not the same size as $\triangle ABC$, Don's transformation is not isometric.

PTS: 1 DIF: Level B REF: GE0.09.01.ER.01
NAT: NCTM 9-12.GEO.2.a STA: GA MM3G3.a
TOP: Lesson 9.7 Identify and Perform Dilations

KEY: Extended Response | isometry | dilation | reflection | translation | transformation
BLM: Application NOT: 978-0-618-65613-4

35. ANS:

$P'(4, 5)$, $Q'(0, 5)$, $R'(0, 0)$

PTS: 1 DIF: Level B REF: HLG M0537 TOP: Lesson 9.4 Perform Rotations
KEY: coordinates | origin | rotation BLM: Comprehension
NOT: 978-0-618-65613-4

36. ANS:

$y = 3$

PTS: 1 DIF: Level B REF: GEO.09.04.FR.09
NAT: NCTM 9-12.GEO.3.a TOP: Lesson 9.4 Perform Rotations
KEY: Free Response | rotation | quadrilateral | equation BLM: Application
NOT: 978-0-618-65613-4

37. ANS: A PTS: 1 DIF: Level B REF: HLG M0568
TOP: Lesson 9.5 Apply Compositions of Transformations KEY: composition | isometry
BLM: Knowledge NOT: 978-0-618-65613-4

38. ANS:

For many compositions, different results are obtained when the order is altered. Each case must be examined individually.

PTS: 1 DIF: Level B REF: HLG M0566
TOP: Lesson 9.5 Apply Compositions of Transformations KEY: composition | isometry
BLM: Comprehension NOT: 978-0-618-65613-4

39. ANS:

The arc \widehat{AB} is rotated about the x -axis at angles of 90° , 180° , and 270° . The arc \widehat{AB} is also reflected in the y -axis and the new arc $\widehat{A'B'}$ is rotated also at angles of 90° , 180° , and 270° .

PTS: 1 DIF: Level C REF: Geo.09.Quiz2.Eng.01
TOP: Quiz 2 KEY: transformations | rotations | reflections
BLM: Comprehension NOT: 978-0-618-65613-4

40. ANS:

$\triangle LMN$

PTS: 1 DIF: Level C REF: MCT90017
TOP: Lesson 9.5 Apply Compositions of Transformations
KEY: composition | reflection | translation | image BLM: Application
NOT: 978-0-618-65613-4