

G.G.61: Analytical Representations of Transformations: Investigate, justify, and apply the analytical representations for translations, rotations, reflections and dilations

- 1 A polygon is transformed according to the rule:
 $(x,y) \rightarrow (x+2,y)$. Every point of the polygon moves two units in which direction?
 - 1) up
 - 2) down
 - 3) left
 - 4) right
- 2 What is the image of point $(2,5)$ under the translation that shifts (x,y) to $(x+3,y-2)$?
 - 1) $(0,3)$
 - 2) $(0,8)$
 - 3) $(5,3)$
 - 4) $(5,8)$
- 3 What are the coordinates of P' , the image of $P(-4,0)$ under the translation $(x-3,y+6)$?
 - 1) $(-7,6)$
 - 2) $(7,-6)$
 - 3) $(1,6)$
 - 4) $(2,-3)$
- 4 The image of point $(3,-5)$ under the translation that shifts (x,y) to $(x-1,y-3)$ is
 - 1) $(-4,8)$
 - 2) $(-3,15)$
 - 3) $(2,8)$
 - 4) $(2,-8)$
- 5 What is the image of point $(-3,4)$ under the translation that shifts (x,y) to $(x-3,y+2)$?
 - 1) $(0,6)$
 - 2) $(6,6)$
 - 3) $(-6,8)$
 - 4) $(-6,6)$
- 6 What are the coordinates of the image of point $A(2,-7)$ under the translation $(x,y) \rightarrow (x-3,y+5)$?
 - 1) $(-1,-2)$
 - 2) $(-1,2)$
 - 3) $(5,-12)$
 - 4) $(5,12)$
- 7 Given the transformations:
 $R(x,y) \rightarrow (-x,y)$
 $S(x,y) \rightarrow (y,x)$
 What is $(R \circ S)(5,-1)$?
 - 1) $(1,5)$
 - 2) $(1,-5)$
 - 3) $(-1,5)$
 - 4) $(-1,-5)$
- 8 What is the image of (x,y) after a translation of 3 units right and 7 units down?
 - 1) $(x+3,y-7)$
 - 2) $(x+3,y+7)$
 - 3) $(x-3,y-7)$
 - 4) $(x-3,y+7)$
- 9 What are the coordinates of P' , the image of point $P(x,y)$ after translation $T_{4,4}$?
 - 1) $(x-4,y-4)$
 - 2) $(x+4,y+4)$
 - 3) $(4x,4y)$
 - 4) $(4,4)$
- 10 The coordinates of any point (x,y) after a reflection in the x -axis can *always* be represented by
 - 1) (x,y)
 - 2) $(-x,y)$
 - 3) $(x,-y)$
 - 4) $(-x,-y)$

11 Which transformation is *not* an isometry?

- 1) $(x,y) \rightarrow (x+6,y-2)$
- 2) $(x,y) \rightarrow (y,-x)$
- 3) $(x,y) \rightarrow \left(\frac{1}{2}x, \frac{1}{2}y\right)$
- 4) $(x,y) \rightarrow (-y,-x)$

12 Which transformation is an example of an opposite isometry?

- 1) $(x,y) \rightarrow (x+3,y-6)$
- 2) $(x,y) \rightarrow (3x,3y)$
- 3) $(x,y) \rightarrow (y,x)$
- 4) $(x,y) \rightarrow (y,-x)$

13 Which transformation represents a dilation?

- 1) $(8,4) \rightarrow (11,7)$
- 2) $(8,4) \rightarrow (-8,4)$
- 3) $(8,4) \rightarrow (-4,-8)$
- 4) $(8,4) \rightarrow (4,2)$

14 Which type of transformation is $(x,y) \rightarrow (x+2,y-2)$?

- 1) dilation
- 2) reflection
- 3) rotation
- 4) translation

15 The transformation $(x,y) \rightarrow (3x,3y)$ represents

- 1) a dilation
- 2) an isometry
- 3) a reflection
- 4) a translation

16 Under the transformation $(x,y) \rightarrow (2x,2y)$, which property is not preserved?

- 1) distance
- 2) orientation
- 3) parallelism
- 4) angle measure

17 Quadrilateral $ABCD$ undergoes a transformation, producing quadrilateral $A'B'C'D'$. For which transformation would the area of $A'B'C'D'$ *not* be equal to the area of $ABCD$?

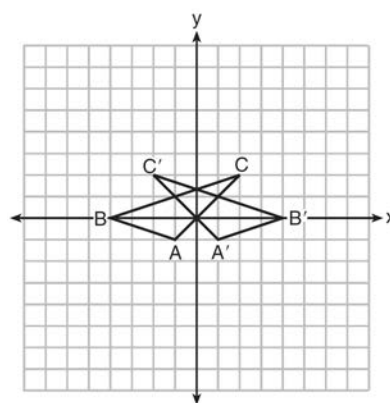
- 1) a rotation of 90° about the origin
- 2) a reflection over the y -axis
- 3) a dilation by a scale factor of 2
- 4) a translation defined by $(x,y) \rightarrow (x+4,y-1)$

18 Translation T is defined by $(x,y) \rightarrow (x+2,y-1)$. Find the image of $(-1,5)$ under translation T .

19 If point P with coordinates (a,b) is reflected in the line $y = x$, what are the coordinates of the image of P ?

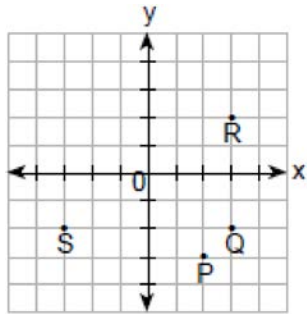
20 A translation maps $P(x,y)$ onto $P'(x+3,y-2)$. Find the coordinates of Q , whose image under the same transformation is $Q'(6,2)$

21 In the diagram below, under which transformation is $\triangle A'B'C'$ the image of $\triangle ABC$?



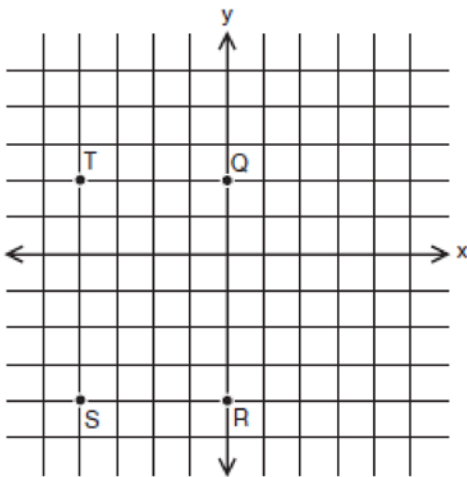
- 1) D_2
- 2) $r_{x\text{-axis}}$
- 3) $r_{y\text{-axis}}$
- 4) $(x,y) \rightarrow (x-2,y)$

- 22 If $x = -3$ and $y = 2$, which point on the accompanying graph represents $(-x, -y)$?



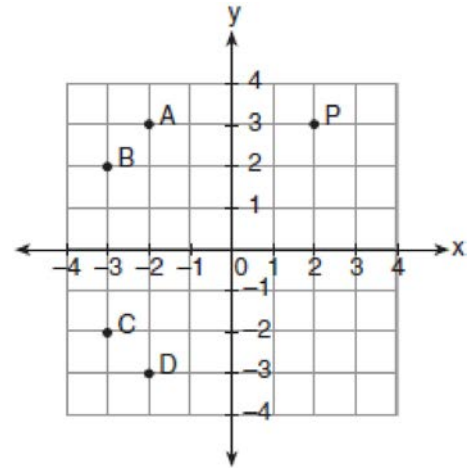
- 1) P
- 2) Q
- 3) R
- 4) S

- 23 If $x = -2$ and $y = -1$, which point on the accompanying set of axes represents the translation $(x, y) \rightarrow (x + 2, y - 3)$?



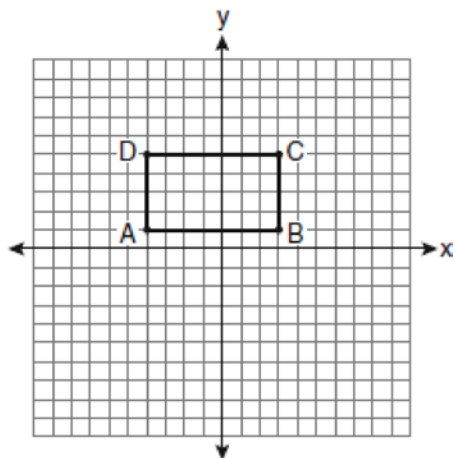
- 1) Q
- 2) R
- 3) S
- 4) T

- 24 In the accompanying graph, if point P has coordinates (a, b) , which point has coordinates $(-b, a)$?



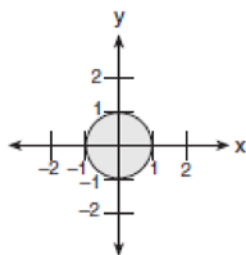
- 1) A
- 2) B
- 3) C
- 4) D

- 25 On the set of axes below, Geoff drew rectangle $ABCD$. He will transform the rectangle by using the translation $(x,y) \rightarrow (x+2,y+1)$ and then will reflect the translated rectangle over the x -axis.

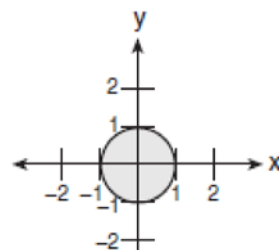


What will be the area of the rectangle after these transformations?

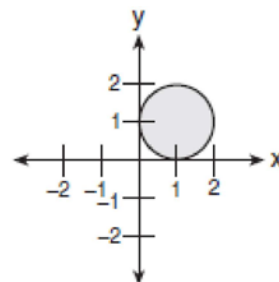
- 1) exactly 28 square units
 - 2) less than 28 square units
 - 3) greater than 28 square units
 - 4) It cannot be determined from the information given.
- 26 In the accompanying graph, the shaded region represents set A of all points (x,y) such that $x^2 + y^2 \leq 1$. The transformation T maps point (x,y) to point $(2x,4y)$.



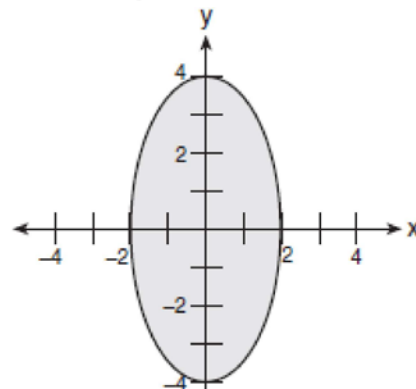
Which graph shows the mapping of set A by the transformation T ?



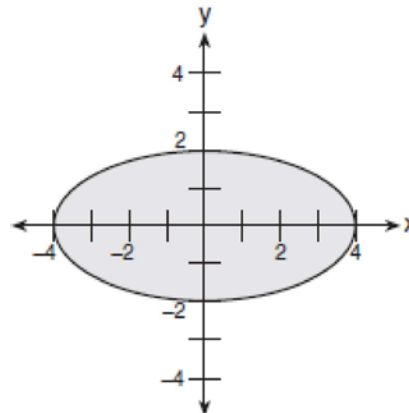
1)



2)

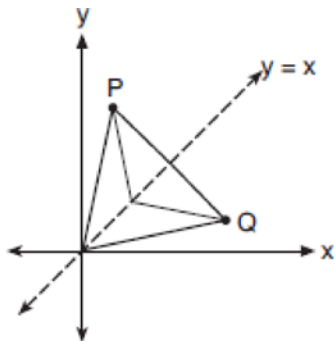


3)



4)

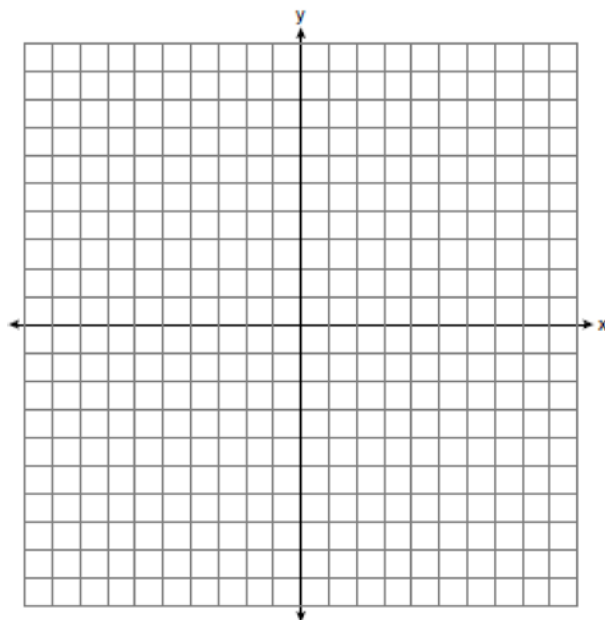
- 27 Matthew is a fan of the Air Force's Thunderbirds flying team and is designing a jacket patch for the team, as shown in the accompanying diagram.



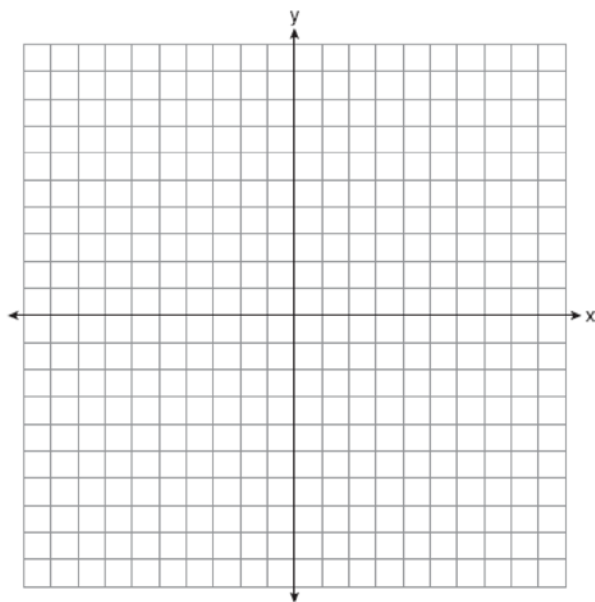
If P has the coordinates (a,b) , what are the coordinates of Q , the reflection of P in the line $y = x$?

- 1) (a,b)
- 2) (b,a)
- 3) $(-a,b)$
- 4) (y,x)

- 28 On the accompanying set of axes, draw $\triangle ABC$, whose coordinates are $A(-7,9)$, $B(-2,8)$ and $C(-3,4)$. Then draw, label, and state the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$ after the transformation that maps (x,y) to $(-x,-y)$. Based on your diagram, identify the type of transformation that was performed.



- 29 Triangle TAP has coordinates $T(-1,4)$, $A(2,4)$, and $P(2,0)$. On the set of axes below, graph and label $\triangle T'A'P'$, the image of $\triangle TAP$ after the translation $(x,y) \rightarrow (x-5,y-1)$.



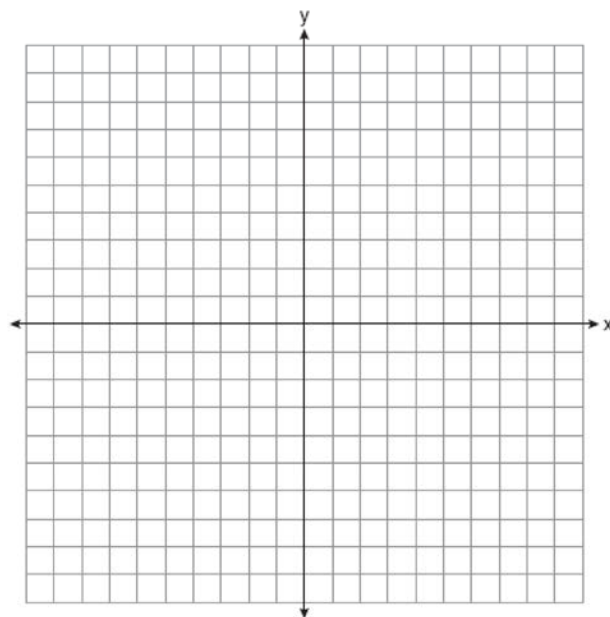
- 30 Given $A(8,5)$ and $B(6,1)$ and the transformations T , R , and S described below:

$$T: (x,y) \rightarrow (x+1,y-5)$$

$$R: (x,y) \rightarrow (y,x)$$

$$S: (x,y) \rightarrow (-x,y)$$

- Graph \overline{AB} and its image $\overline{A'B'}$ after the transformation T .
- Graph $\overline{A''B''}$, the image of \overline{AB} after the transformation R .
- Sketch $\overline{A'''B'''}$, the image of \overline{AB} after the transformation S .
- Compare the slopes of the pairs of segments listed below and indicate whether these slopes are *equal*, *reciprocals*, *additive inverses*, or *negative reciprocals*.
 - \overline{AB} and $\overline{A'B'}$
 - \overline{AB} and $\overline{A''B''}$
 - \overline{AB} and $\overline{A'''B'''}$



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Answer Section

- 1 ANS: 4 REF: fall0818ge
 2 ANS: 3 REF: 069903a
 3 ANS: 1 REF: 080409a
 4 ANS: 4 REF: 010509a
 5 ANS: 4 REF: 080609a
 6 ANS: 1
 $(2, -7) \rightarrow (2 - 3, -7 + 5) = (-1, -2)$

REF: 061504ge

- 7 ANS: 1 REF: 088724siii
 8 ANS: 1 REF: 060402a
 9 ANS: 2 REF: 081504ge
 10 ANS: 3 REF: 088722siii
 11 ANS: 3 REF: 089031siii
 12 ANS: 3 REF: 010507b
 13 ANS: 4 REF: 010719b
 14 ANS: 4 REF: 080908b
 15 ANS: 1 REF: 088518siii
 16 ANS: 1 REF: 080810b
 17 ANS: 3 REF: 061501ge
 18 ANS:
 $(1, 4)$

REF: 018601siii

- 19 ANS:
 (b, a)

REF: 068605siii

- 20 ANS:
 $(3, 4)$

REF: 018709siii

- 21 ANS: 3 REF: 011304ge
 22 ANS: 2 REF: 069908a
 23 ANS: 2 REF: 080211a
 24 ANS: 2 REF: 010418a
 25 ANS: 1

Translations and reflections do not affect distance.

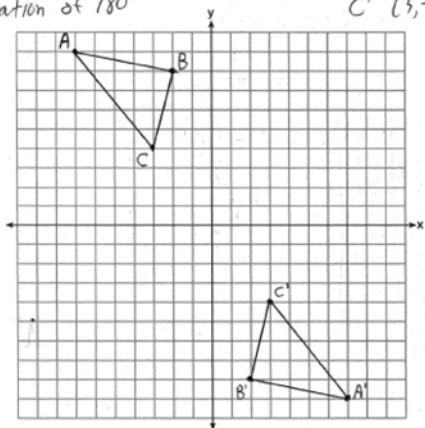
REF: 080908ge

- 26 ANS: 3 REF: 060405b
 27 ANS: 2 REF: 010804b

28 ANS:

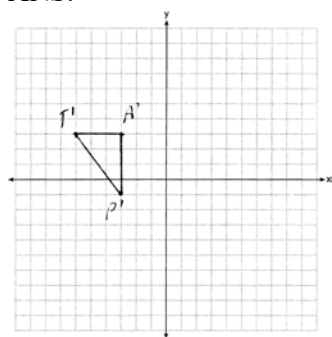
transformation that was performed.

Point reflection

Dilation of -1 Rotation of 180°
 $A' (7, -9)$
 $B' (2, -8)$
 $C' (3, -4)$


REF: 080838a

29 ANS:


 $T'(-6, 3), A'(-3, 3), P'(-3, -1)$

REF: 061229ge

30 ANS:

d (1) equal; (2) reciprocals; (3) additive inverses

REF: 068139siii