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Progressive Mathematics Initiative®

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Geometry

Transformations

2014-09-08

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Transformations

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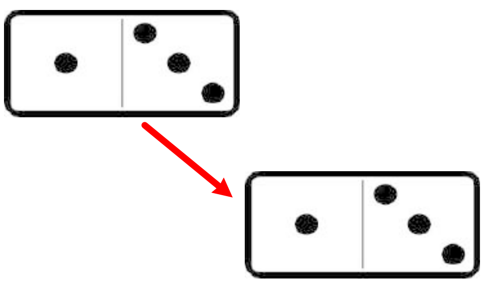
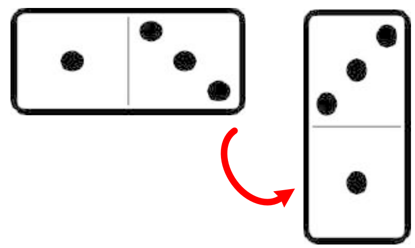
A transformation of a geometric figure is a mapping that results in a change in the position, shape, or size of the figure.

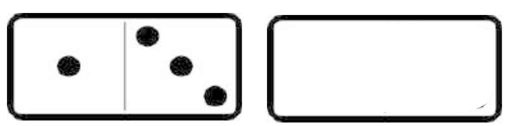
In the game of dominoes, you often move the dominoes by sliding them, turning them or flipping them. Each of these moves is a type of transformation.



translation - slide



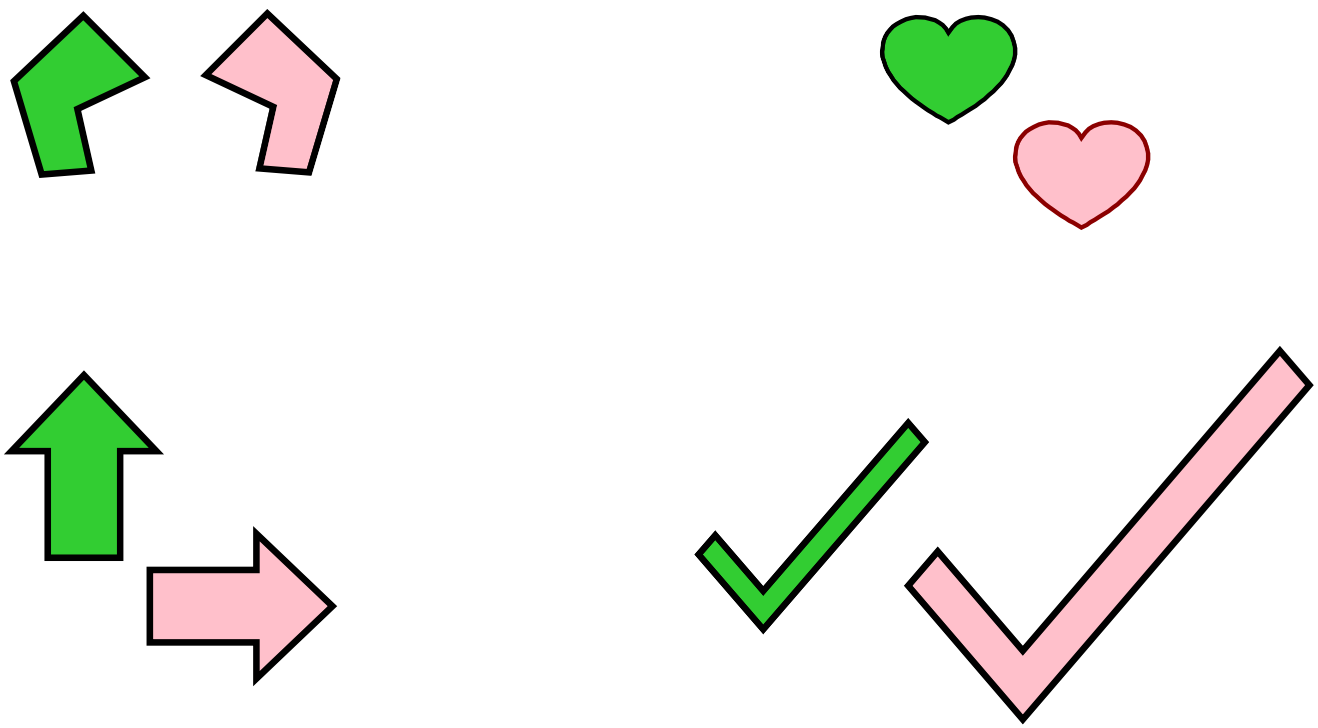
rotation - turn



reflection - flip

In a transformation, the original figure is the preimage, and the resulting figure is the image.

In the examples below, the preimage is green and the image is pink.



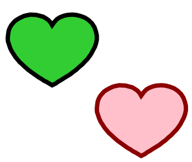
Some transformations (like the dominoes) preserve distance and angle measures. These transformations are called rigid motions.

To preserve distance means that the distance between any two points of the image is the same as the distance between the corresponding points of the preimage.

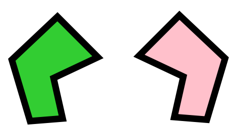
To preserve angles means that the angles of the image have the same measures as the corresponding angles in the preimage.

Answer

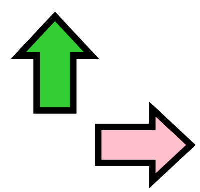
Translation- slide



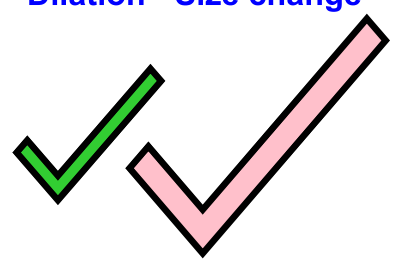
Reflection- Flip



Rotation-turn



Dilation - Size change



Which of these is a rigid motion?

Some transformations (like ... nd angle measures. These tra... s.

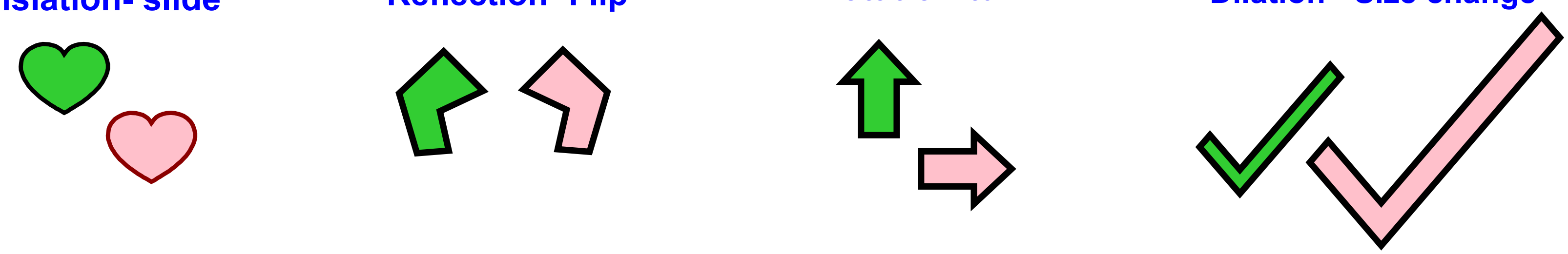
To preserve distance means ... s of the image is the same as t... points of the preimage.

To preserve angles means th... he measures as the correspondi...

Answer

Translation,
reflection,
rotation
are rigid transformations.

Translation- slide **Reflection- Flip** **size change**



Which of these is a rigid motion?

A transformation maps every point of a figure onto its image and may be described using arrow notation ($\longrightarrow$).

Prime notation (′) is sometimes used to identify image points.

In the diagram below, *A′* is the image of *A*.

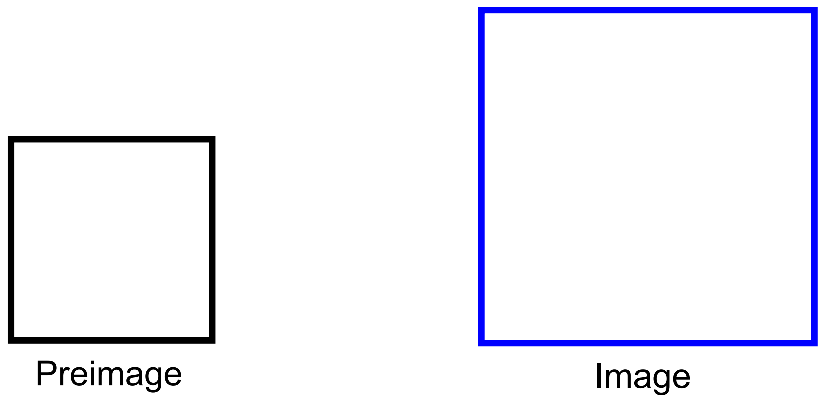
$\triangle ABC \longrightarrow \triangle A'B'C'$

$\triangle ABC$ maps onto $\triangle A'B'C'$

Note: You list the corresponding points of the preimage and image in the same order, just as you would for corresponding points in congruent figures or similar figures.

1 Does the transformation appear to be a rigid motion? Explain.

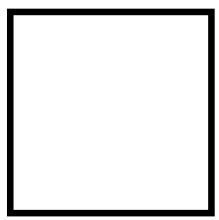
- Yes, it preserves the distance between consecutive points.
- No, it does not preserve the distance between consecutive points.



Answer

1 Does the transformation appear to be a rigid motion? Explain.

- A Yes, it preserves the c
- B No, it does not preser
points.



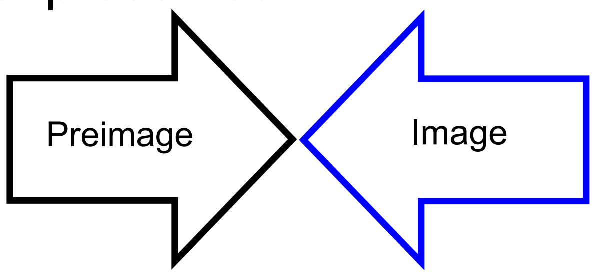
Preimage

Answer

B

2 Does the transformation appear to be a rigid motion? Explain.

- Yes, distances are preserved.
- Yes, angle measures are preserved.
- Both A and B.
- No, distance are not preserved.



Answer

2 Does the transformation appe

- Yes, distances are pr
- Yes, angle measures
- Both A and B.
- No, distance are no

Answer

C

3 Which transformation is not a rigid motion?

- Reflection
- Translation
- Rotation
- Dilation

Answer

3 Which transformation is not a rigid motion?

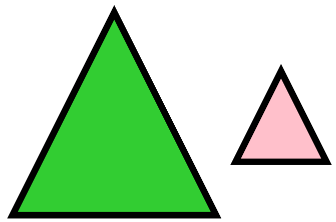
- Reflection
- Translation
- Rotation
- Dilation

Answer

D

4 Which transformation is demonstrated?

- A Reflection
- B Translation
- C Rotation
- D Dilation



Answer

4 Which transformation is demonstrated?

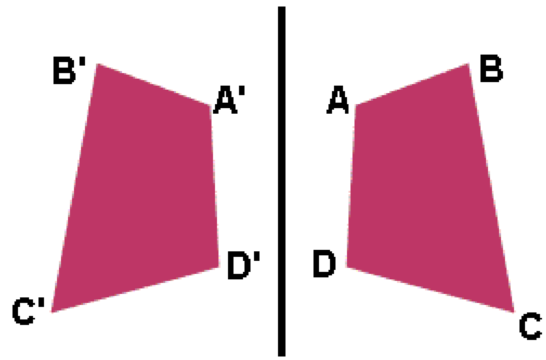
- Reflection
- Translation
- Rotation
- Dilation

Answer

D

5 Which translation is demonstrated?

- Reflection
- Translation
- Rotation
- Dilation



Answer

5 Which translation is demonstrat...?

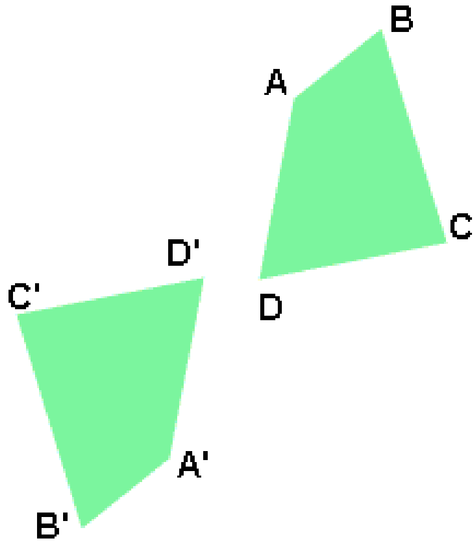
- Reflection
- Translation
- Rotation
- Dilation

Answer

A

6 Which transformation is demonstrated?

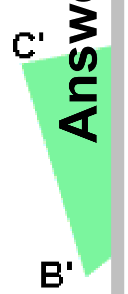
- Reflection
- Translation
- Rotation
- Dilation



Answer

6 Which transformation is demonstrated?

- Reflection
- Translation
- Rotation
- Dilation



Answer

C

Translations

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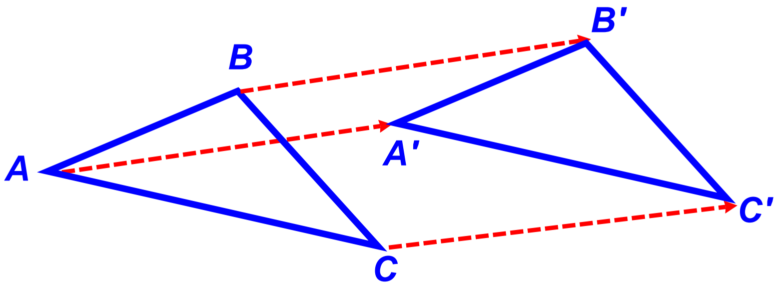
A **translation** is a transformation that maps all points of a figure the same distance in the same direction.

A translation is a rigid motion with the following properties:

- $\overline{AA'} = \overline{BB'} = \overline{CC'}$

- $\overline{AB} = \overline{A'B'}$, $\overline{BC} = \overline{B'C'}$, $\overline{AC} = \overline{A'C'}$

- $m\angle A = m\angle A'$, $m\angle B = m\angle B'$, $m\angle C = m\angle C'$



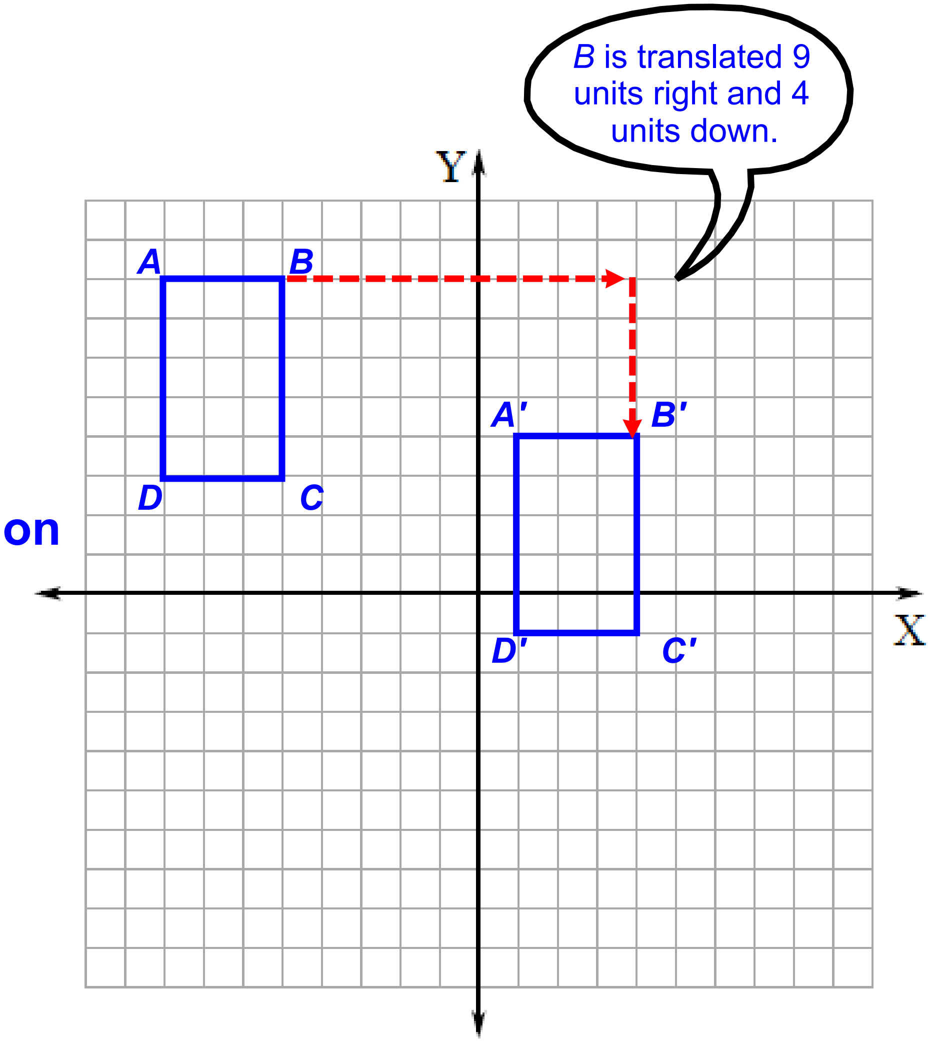
You write the translation that maps $\triangle ABC$ onto $\triangle A'B'C'$ as $T(\triangle ABC) = \triangle A'B'C'$

Translations in the Coordinate Plane

Each (*x, y*) pair in *ABCD* is mapped to (*x* + 9, *y* - 4).

You can use the function notation

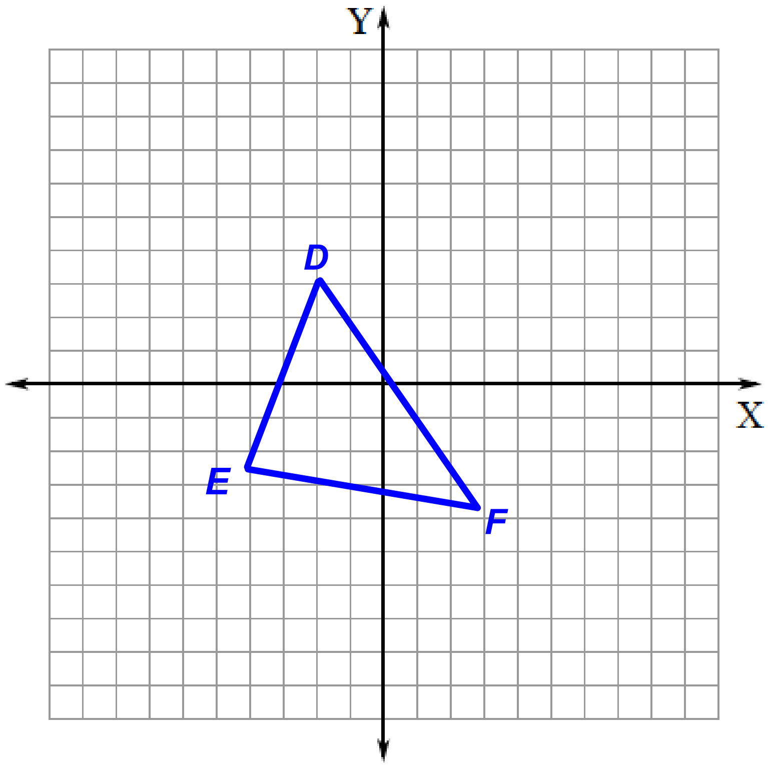
$T_{<9,\,-4>}(ABCD) = A'B'C'D'$
to describe the translation.



Finding the Image of a Translation

What are the vertices of $T_{<-2,\ 5>}(\triangle\ DEF)$? Graph the image of $\triangle\ DEF$.

***D'* (   )**
***E'* (   )**
***F'* (   )**



Answer

Draw $\overline{DD'}$, $\overline{EE'}$ and $\overline{FF'}$. What relationships exist among these three segments? How do you know?

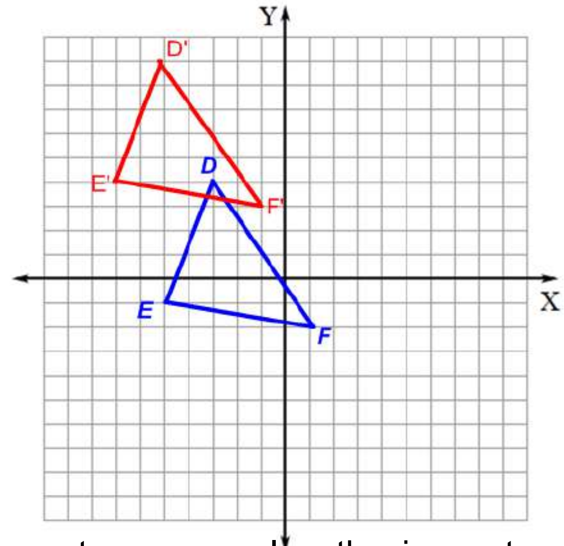
Finding the Image of a Translation

What are the vertices of [partially hidden] **DEF.**

***D'* (**
***E'* (**
***F'* (**

Answer

D' (-5, 9), E'(-7, 4) F'(-1, 3)

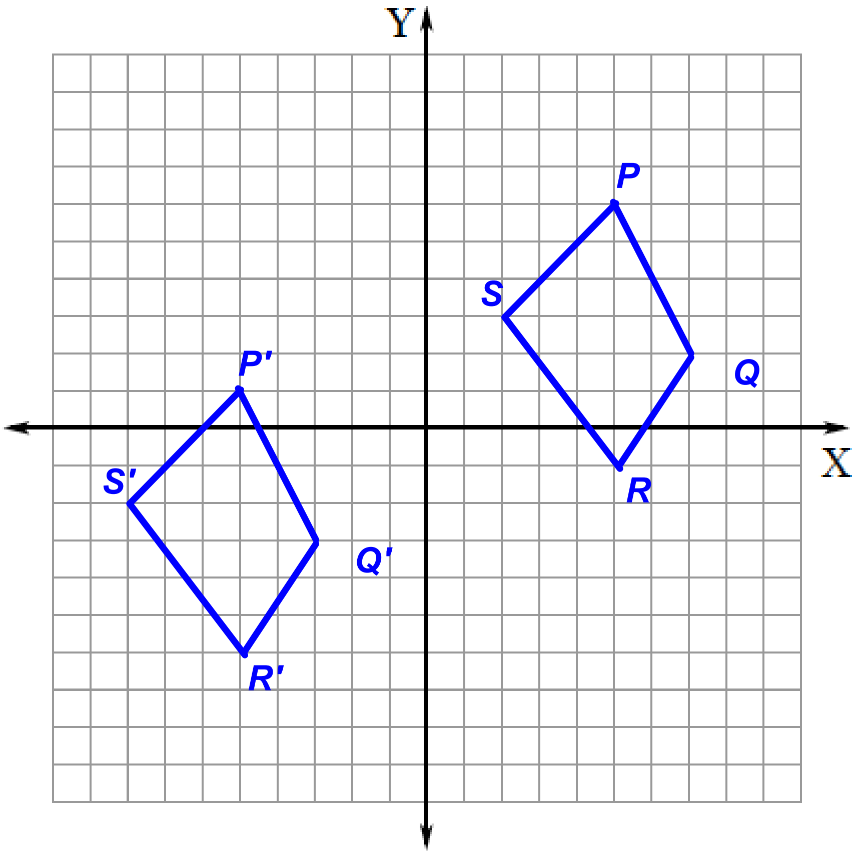


Segments are same length, since a translation moves all points the same distance.

Draw $\overline{DD'}$, $\overline{EE'}$ and $\overline{FF'}$. What relationships exist among these three segments? How do you know?

Writing a Translation Rule

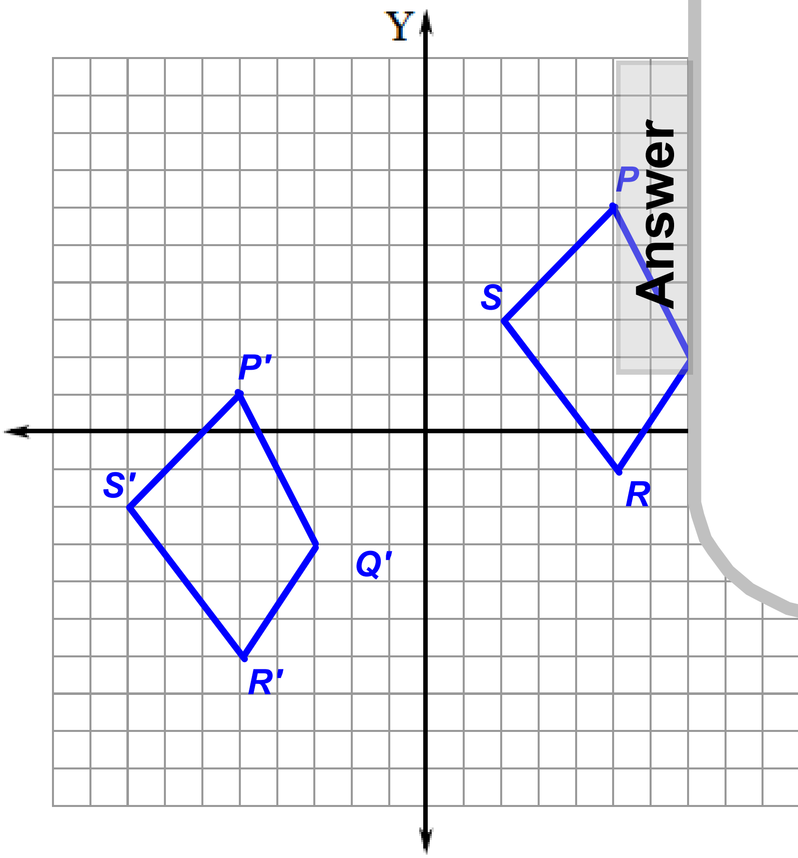
Write a translation rule that maps *PQRS* ⟶ *P'Q'R'S'*.



Answer

Writing a Translation Rule

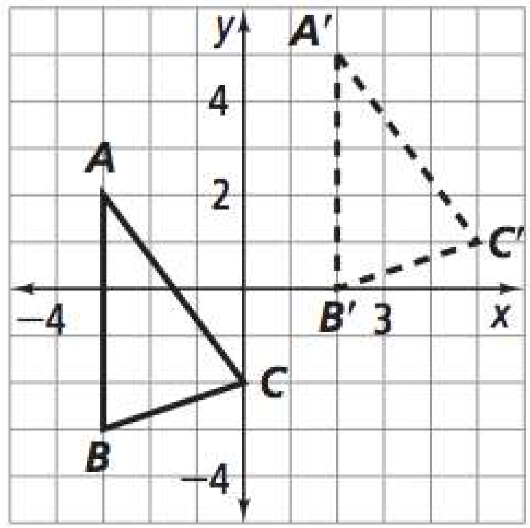
Write a translation rule that m



$T_{<10,\ 5>}$ (PQRS) = P'Q'R'S'

7 In the diagram, $\Delta A'B'C'$ is an image of ΔABC. Which rule describes the translation?

- A $T_{<-5,-3>}(\Delta ABC)$
- B $T_{<5,3>}(\Delta ABC)$
- C $T_{<-3,-5>}(\Delta ABC)$
- D $T_{<3,5>}(\Delta ABC)$



Answer

7 In the diagram, $\Delta A'B'C'$ is an image of ΔABC. Which rule describes the trans

A $T_{<-5,-3>}(\Delta ABC)$

B $T_{<5,3>}(\Delta ABC)$

C $T_{<-3,-5>}(\Delta ABC)$

D $T_{<3,5>}(\Delta ABC)$

Answer

B

8 If $T_{<4,-6>}$(JKLM) = J'K'L'M', what translation maps J'K'L'M' onto JKLM?

- A $T_{<4,-6>}(J'K'L'M')$
- B $T_{<6,-4>}(J'K'L'M')$
- C $T_{<-6,4>}(J'K'L'M')$
- D $T_{<-4,6>}(J'K'L'M')$

Answer

8 If $T_{<4,-6>}$(JKLM) = J'K'L'M', what translation maps J'K'L'M' onto JKLM?

- A $T_{<4,-6>}(J'K'L'M')$
- B $T_{<6,-4>}(J'K'L'M')$
- C $T_{<-6,4>}(J'K'L'M')$
- D $T_{<-4,6>}(J'K'L'M')$

Answer

D

9 ΔRSV has coordinates R(2,1), S(3,2), and V(2,6). A translation maps point R to R' at (-4,8). What are the coordinates of S' for this translation?

- A (-6,-4)
- B (-3,2)
- C (-3,9)
- D (-4,13)
- E none of the above

Answer

9 ΔRSV has coordinates R(2,1), S(3,2), and V(2,6). A translation maps point R to
coordinates of S' for this

- (-6,-4)
- (-3,2)
- (-3,9)
- (-4,13)
- E none of the above

Answer

C

Reflections

Reflections Activity
Lab
(Click for link to lab)

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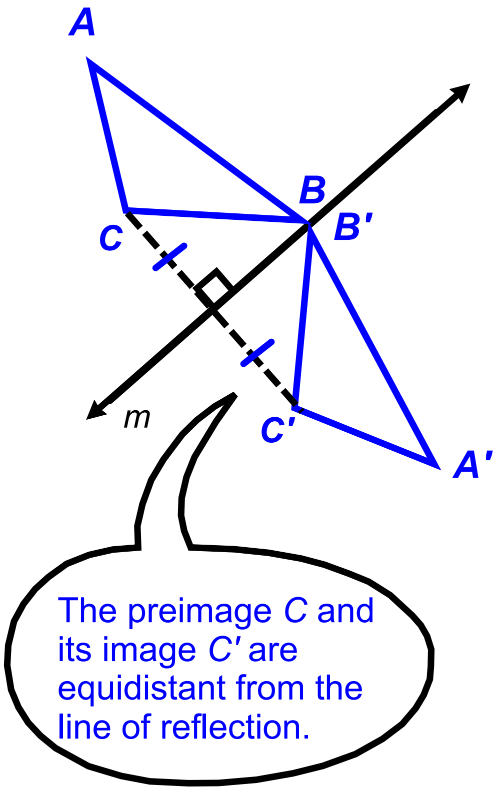
A <u>reflection</u> is a transformation of points over a line. This line is called the <u>line of reflection</u>. The result looks like the preimage was flipped over the line. The preimage and the image have opposite orientations.



Properties

-If a point *B* is on line *m*, then the image of *B* is itself (*B* = *B'*).

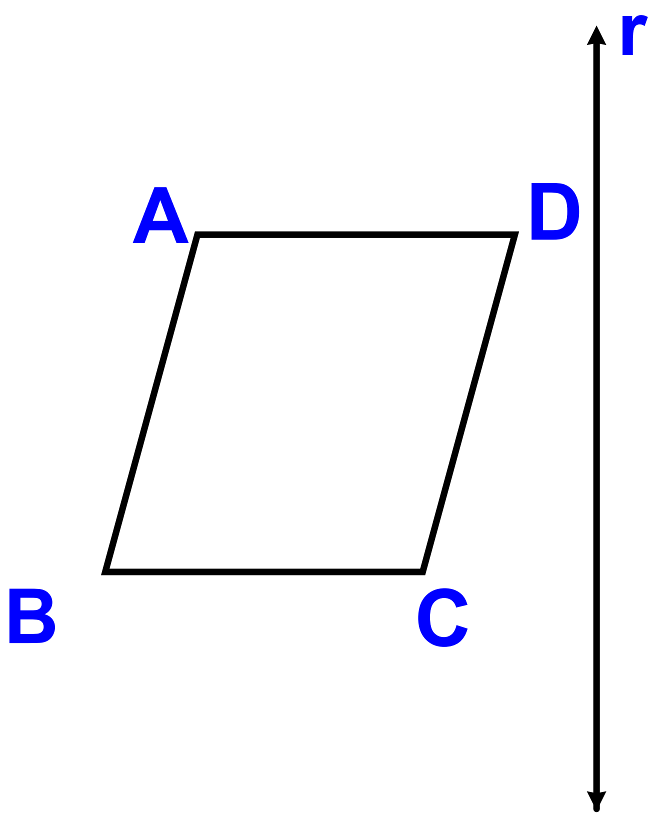
-If a point *C* is not on line *m*, then *m* is the perpendicular bisector of $\overline{CC'}$

The reflection across *m* that maps $\Delta ABC \rightarrow \Delta A'B'C'$ can be written as

$$R_m(\Delta ABC) = \Delta A'B'C$$

When reflecting a figure, reflect the vertices and then draw the sides.

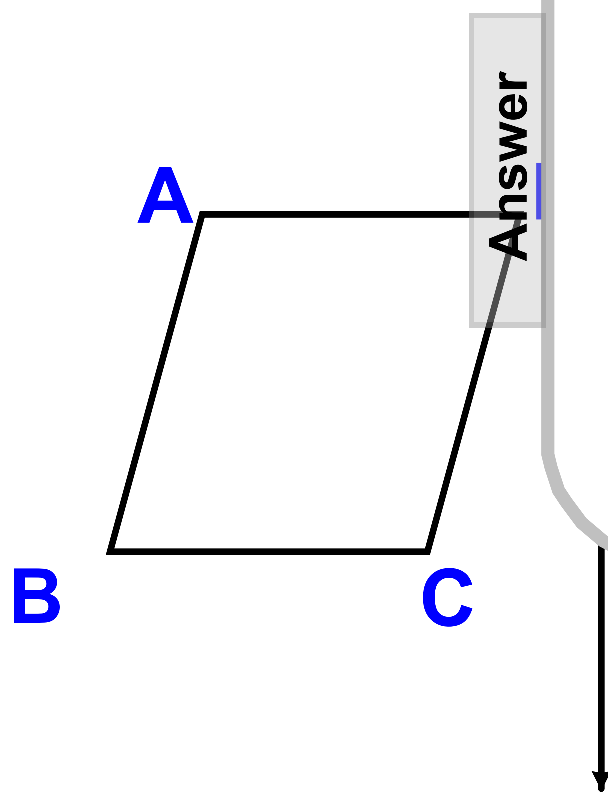
Reflect ABCD over line r. Label the vertices of the image.

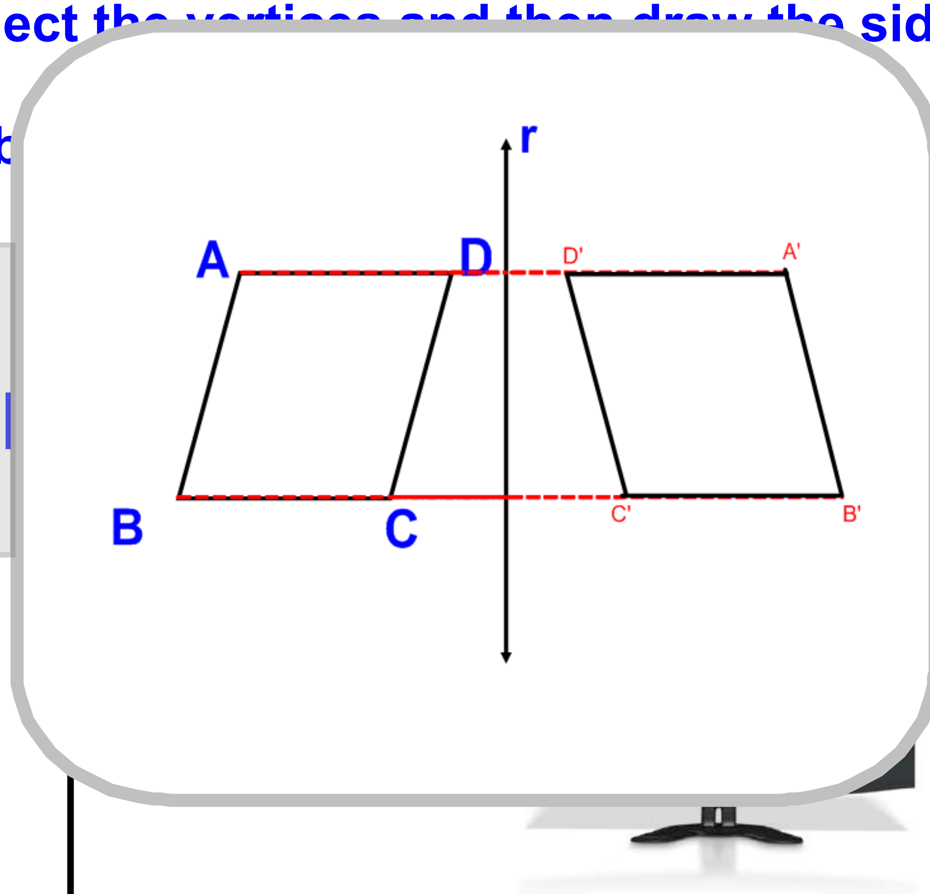


Answer

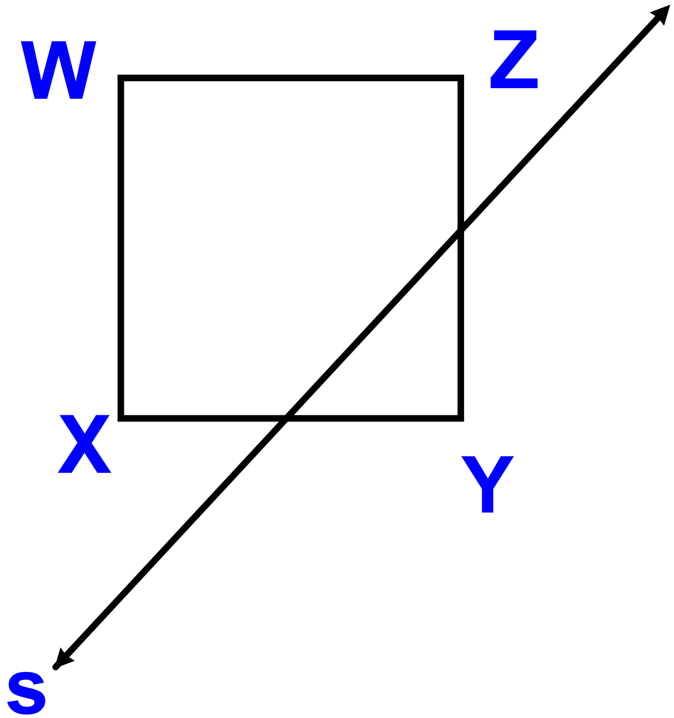
When reflecting a figure, reflect the vertices and then draw the sides.

Reflect ABCD over line r. Lab





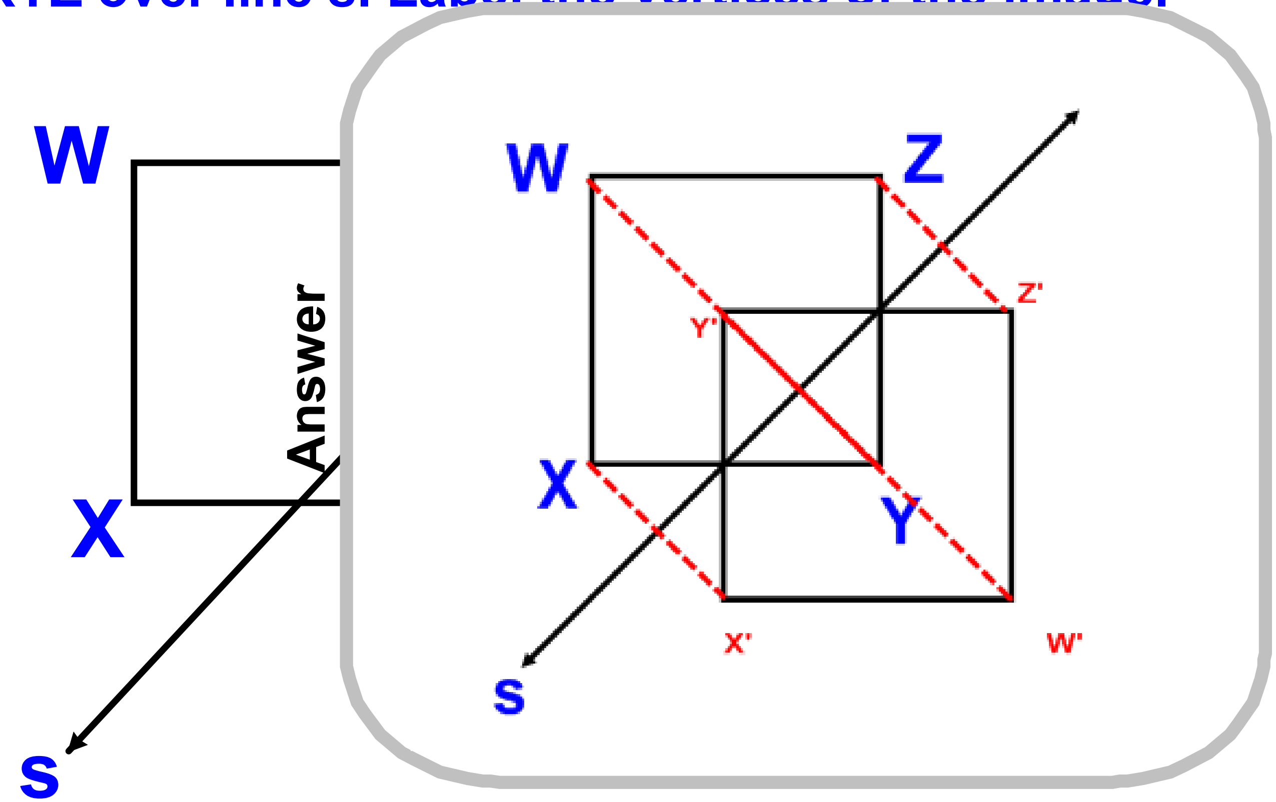
Reflect WXYZ over line s. Label the vertices of the image.



Answer

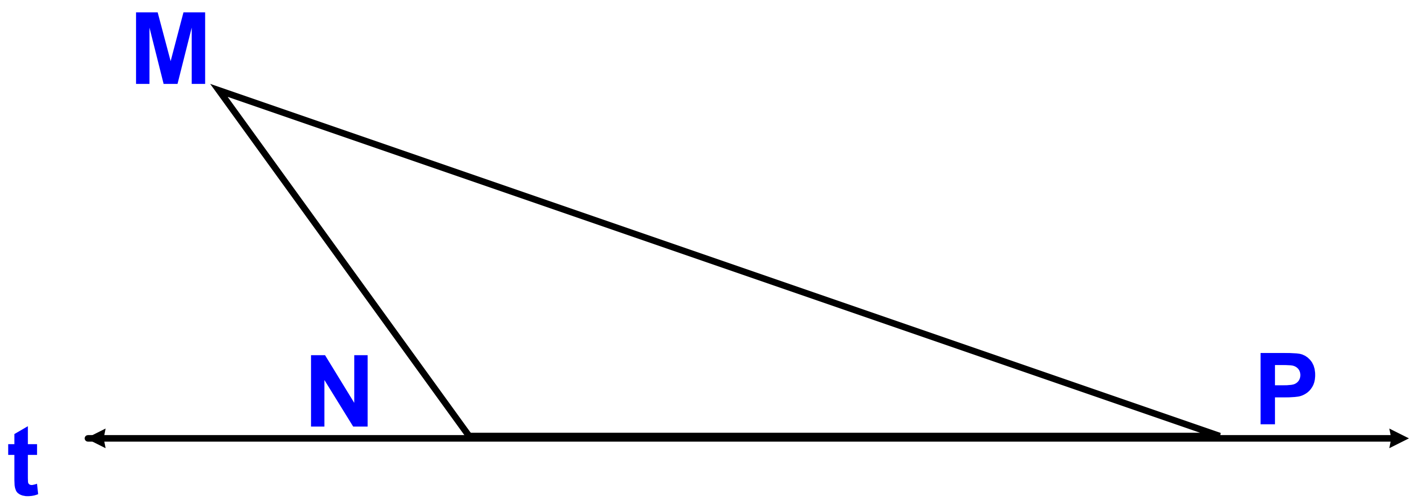
HINT: Turn page so line of symmetry is vertical

Reflect WXYZ over line s. Label the vertices of the image.



Turn page so line of symmetry is vertical

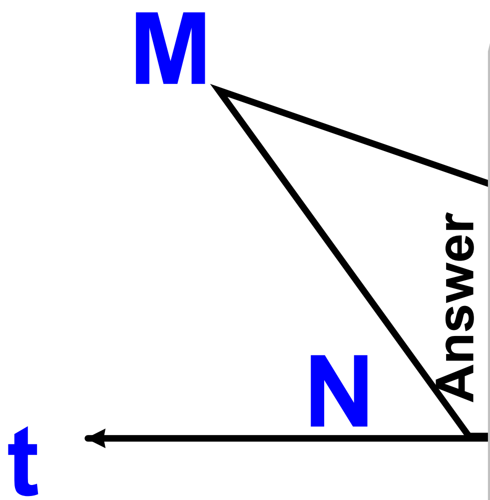
Reflect MNP over line t. Label the vertices of the image.

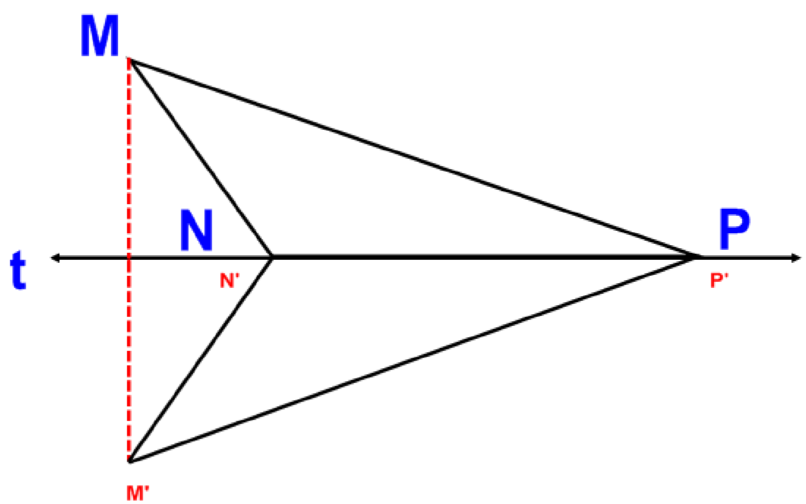


Answer

Where is the image of N? Why?

Reflect MNP over line t. Label the vertices of the image.



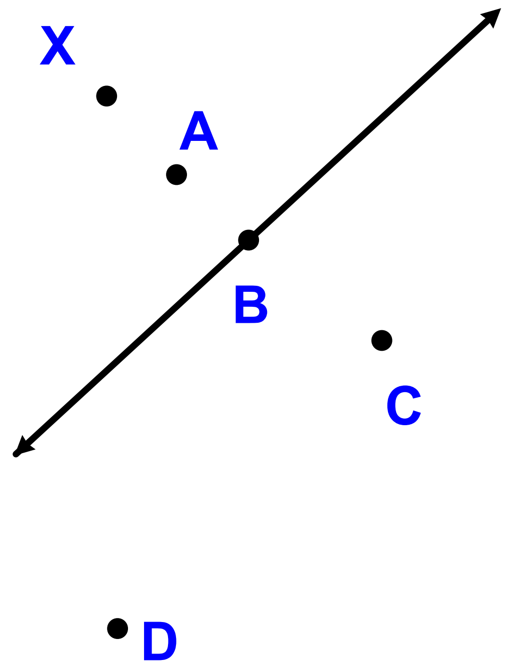


N' is the same point as N because N is on the line of relfection

Where is the image of N? Why?

10 Which point represents the reflection of X?

- point A
- point B
- point C
- point D
- None of the above



Answer

10 Which point represents the reflection of X?

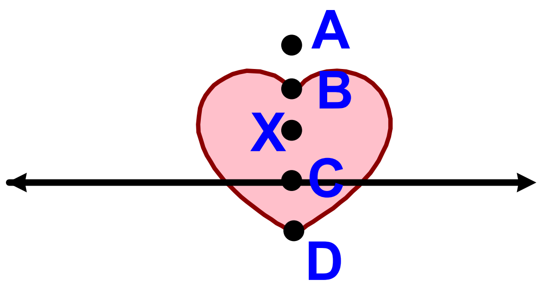
- point A
- point B
- point C
- point D
- None of the above

Answer

C

11 Which point represents the reflection of X?

- point A
- point B
- point C
- point D
- none of the above



Answer

11 Which point represents th

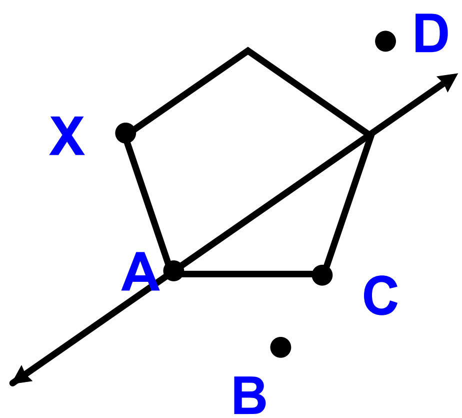
- point A
- point B
- point C
- point D
- none of the above

Answer

D

12 Which point represents the reflection of X?

- point A
- point B
- point C
- point D
- none of the above



Answer

12 Which point represents the

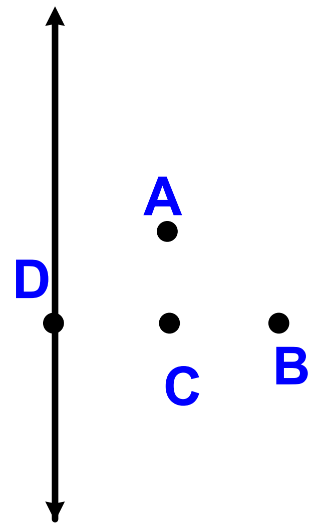
- point A
- point B
- point C
- point D
- none of the above

Answer

B

13 Which point represents the reflection of D?

- point A
- point B
- point C
- point D
- none of these



Answer

13 Which point represents the reflection of D?

- point A
- point B
- point C
- point D
- none of these

Answer

D

14 Is a reflection a rigid motion?

- Yes
- No

Answer

14 Is a reflection a rigid motion?

- Yes
- No

Answer

Yes

Reflections in the Coordinate Plane

Since reflections are perpendicular to and equidistant from the line of reflection, we can find the exact image of a point or a figure in the coordinate plane.

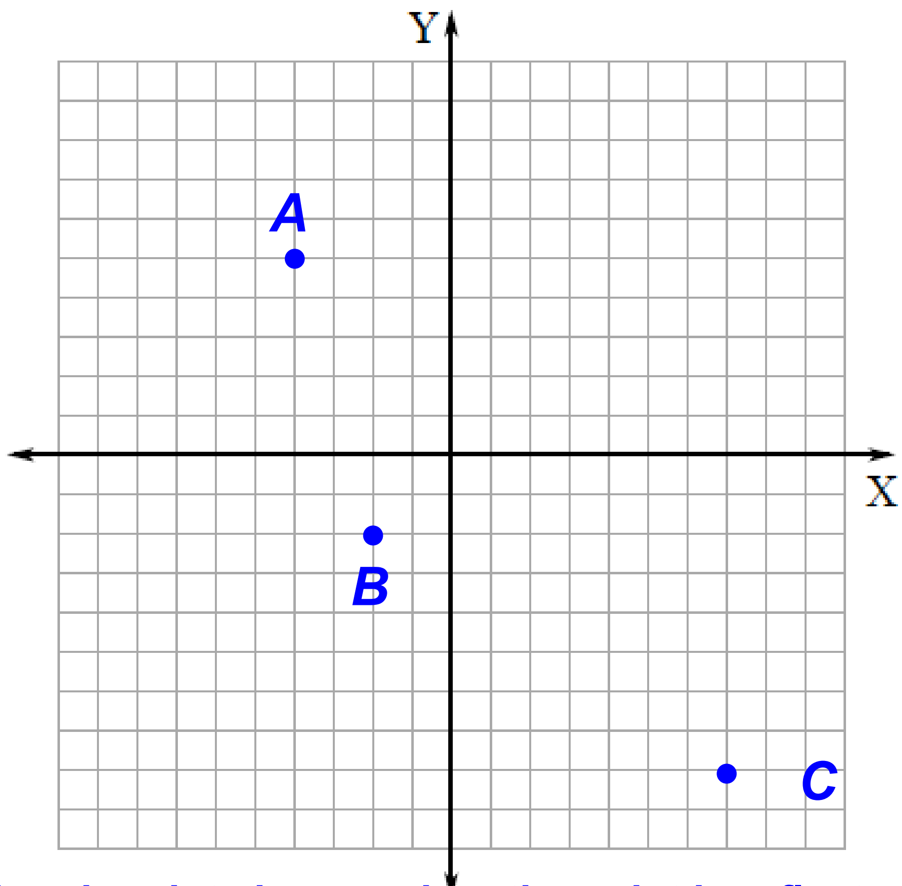
Reflect *A*, *B*, & *C* over the *y*-axis.

Notation

$R_{y\text{-axis}}(A) = A'$

$R_{y\text{-axis}}(B) = B'$

$R_{y\text{-axis}}(C) = C'$

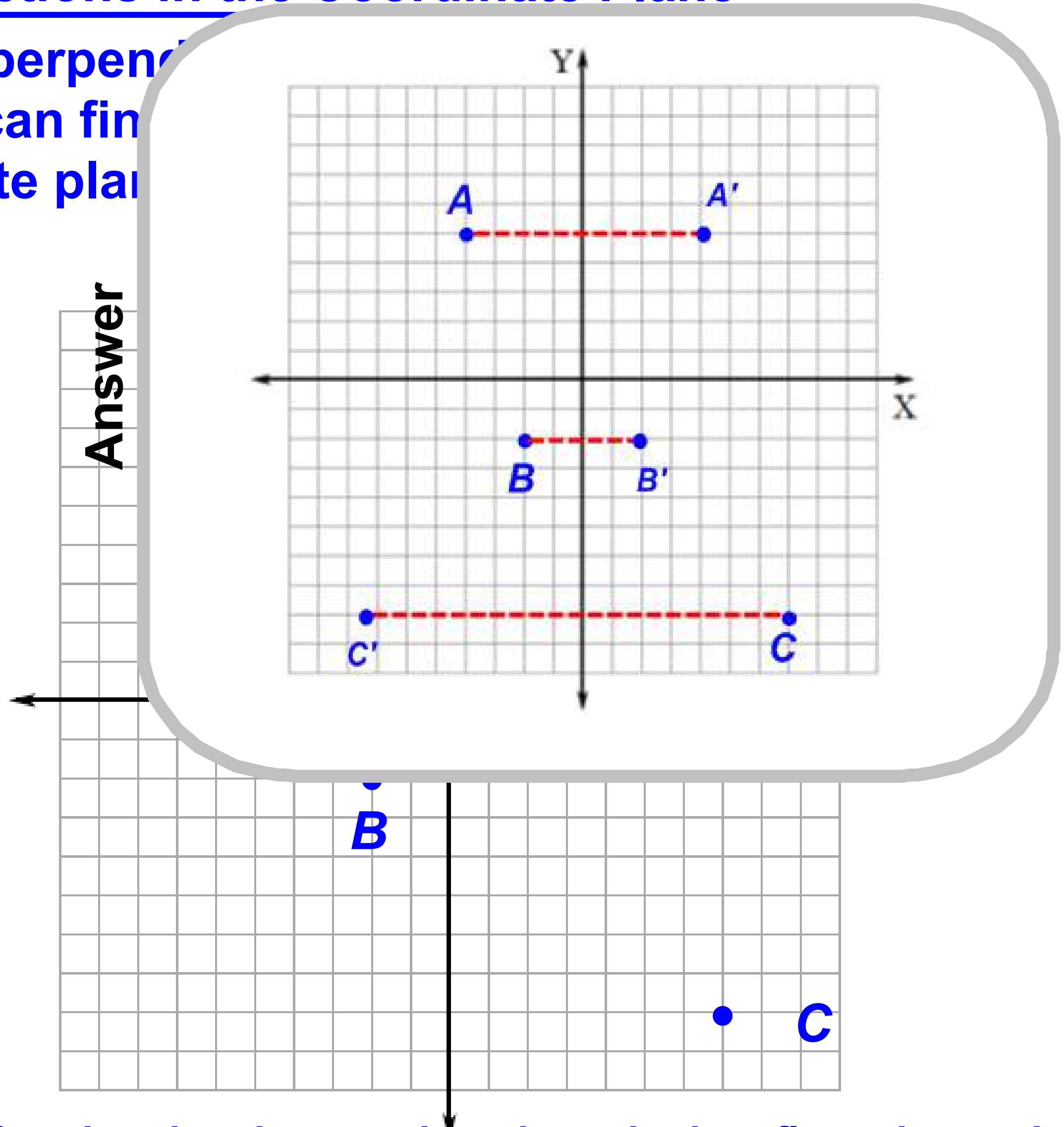


Answer

How do the coordinates of each point change when the point is reflected over the *y*-axis?

Reflections in the Coordinate Plane

Since reflections are perpen
line of reflection, we can fin
figure in the coordinate pla



Reflect *A*, *B*, & *C* over the *y*-axis.

Notation

$R_{y\text{-axis}}(A) = A'$

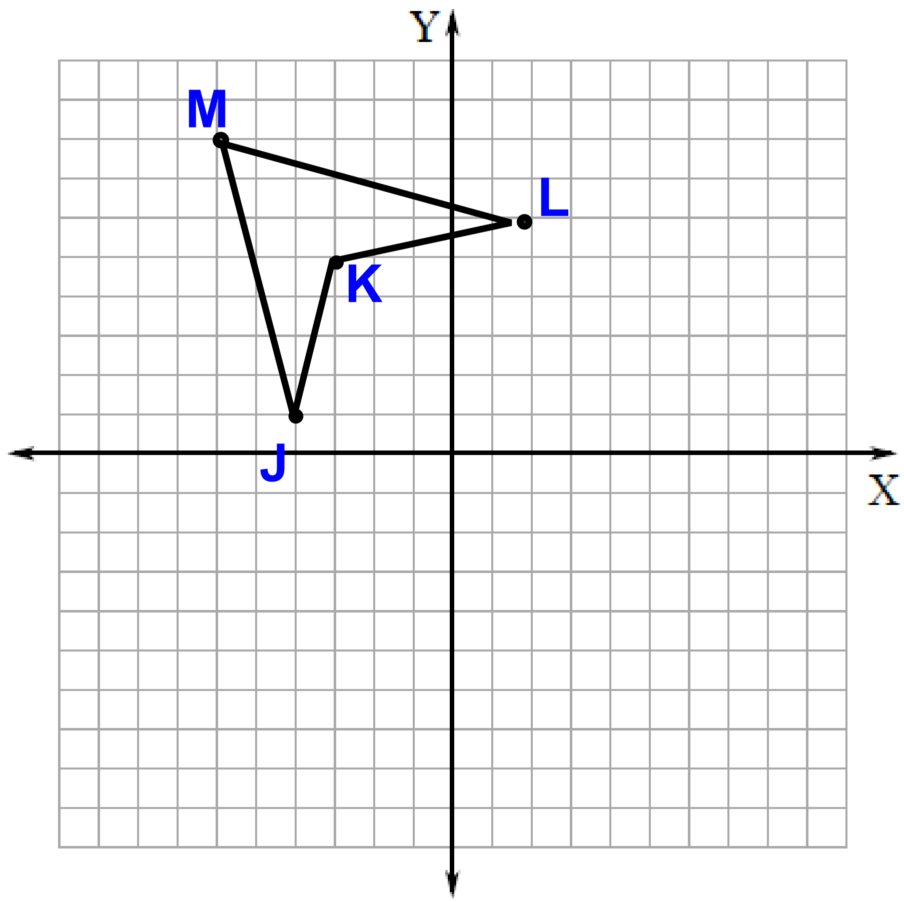
$R_{y\text{-axis}}(B) = B'$

$R_{y\text{-axis}}(C) = C'$

How do the coordinates of each point change when the point is reflected over the *y*-axis?

Reflections in the Coordinate Plane

Reflect figure *JKLM* over the *x*-axis.



Answer

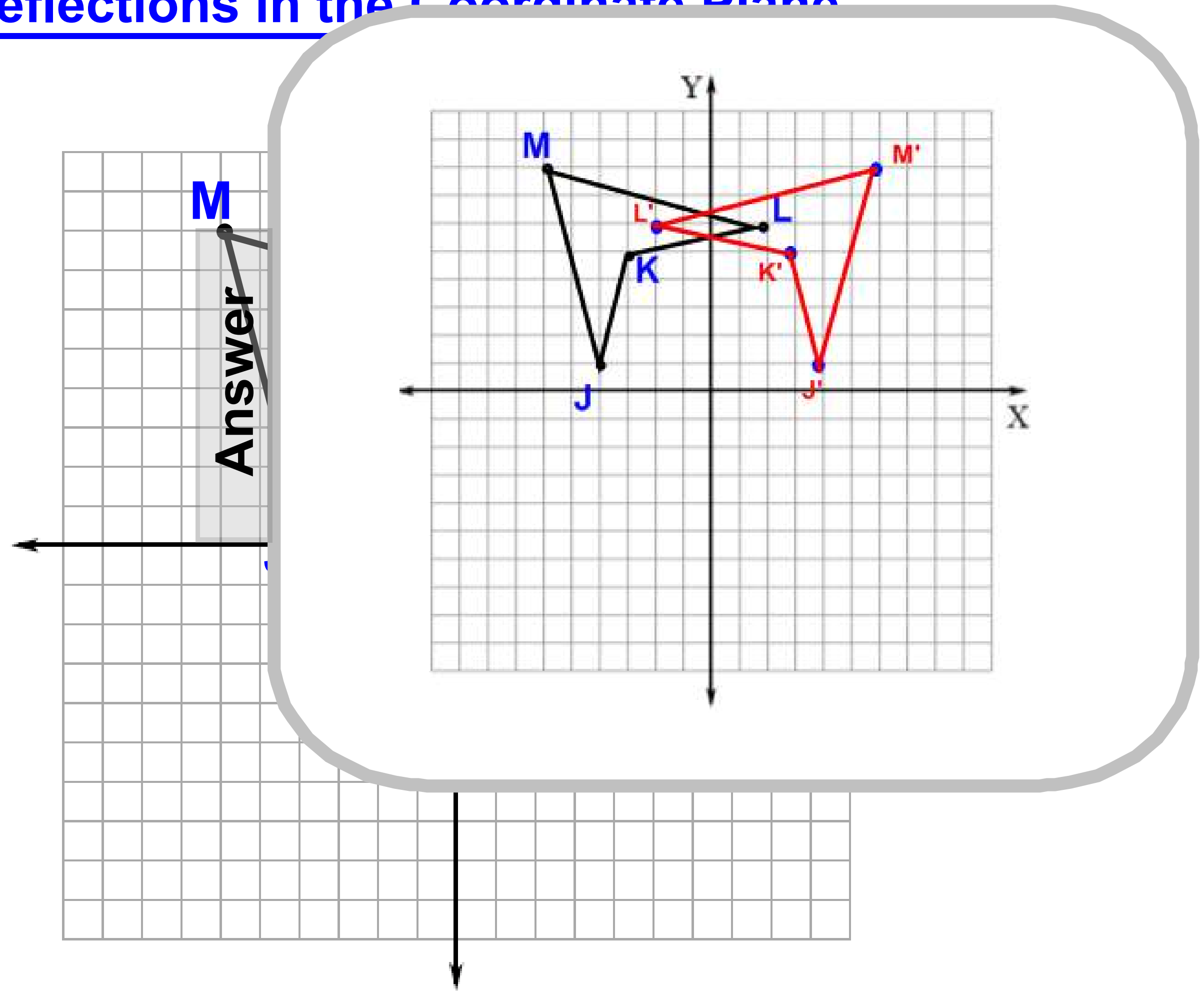
Notation

$R_{x\text{-axis}}(JKLM) = J'K'L'M'$

How do the coordinates of each point change when the point is reflected over the *x*-axis?

Reflections in the Coordinate Plane

Reflect figure *JKLM* over the *x*-axis.



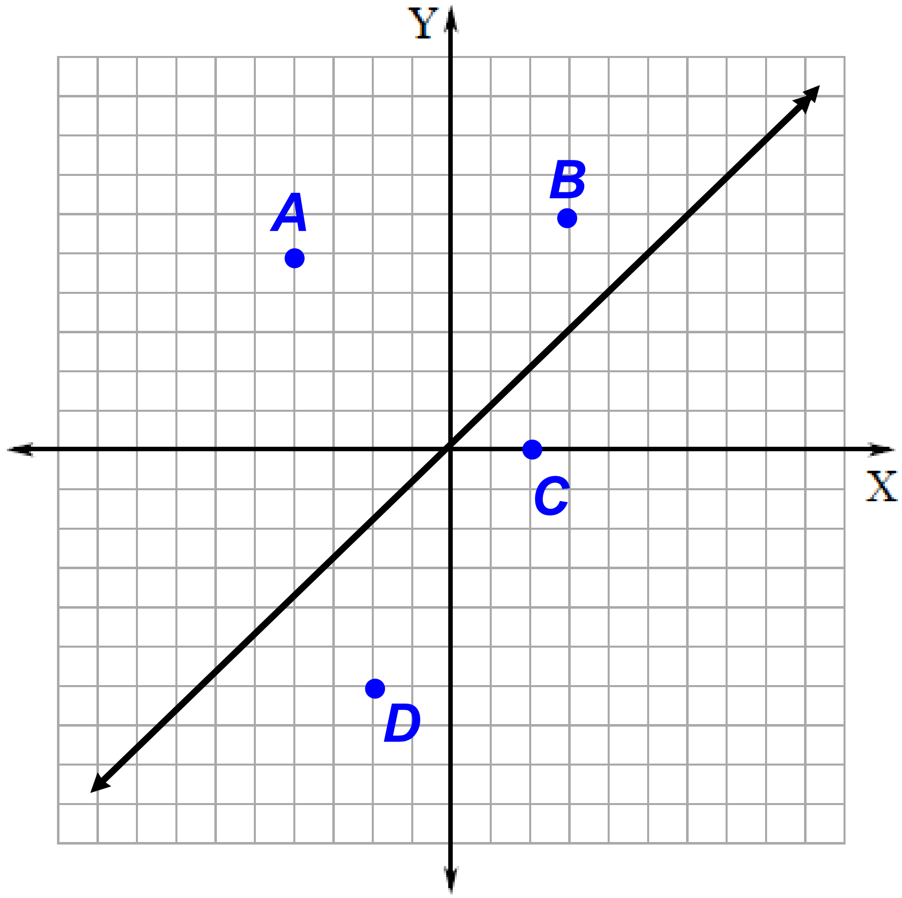
Notation

$R_{x\text{-axis}}(JKLM) = J'K'L'M'$

How do the coordinates of each point change when the point is reflected over the *x*-axis?

Reflections in the Coordinate Plane

Reflect *A*, *B*, *C* & *D* over the line *y* = *x*.



Notation

$R_{y=x}(A) = A'$

$R_{y=x}(B) = B'$

$R_{y=x}(C) = C'$

$R_{y=x}(D) = D'$

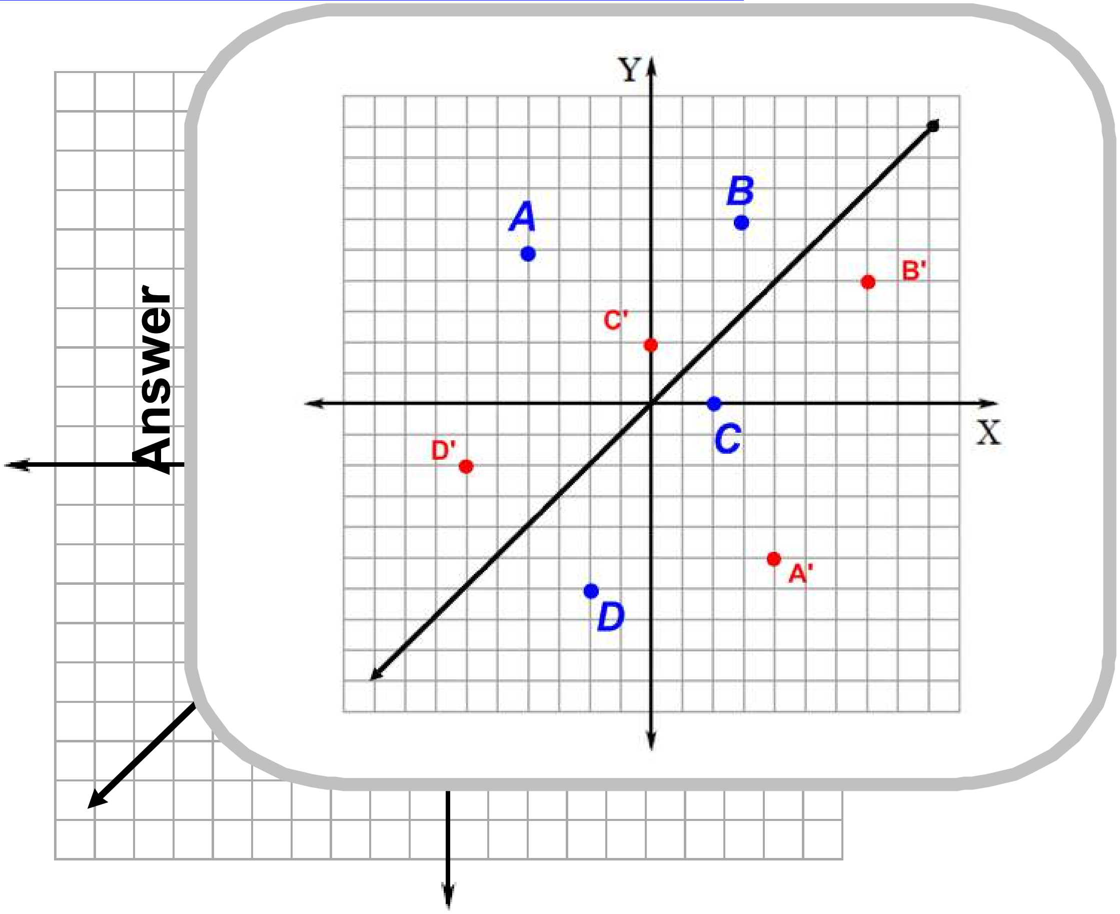
Answer

HINT: Count the number of diagonals from the point to the line of reflection.

How do the coordinates of each point change when the point is reflected over the *y*-axis?

Reflections in the Coordinate Plane

Reflect *A, B, C & D* over the line *y = x*.



Notation

$R_{y=x}(A) = A'$

$R_{y=x}(B) = B'$

$R_{y=x}(C) = C'$

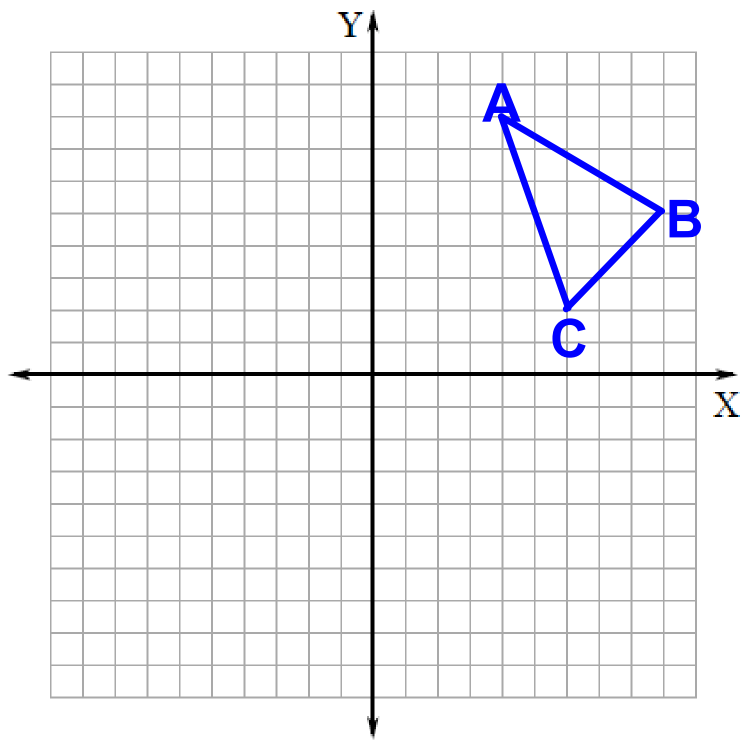
$R_{y=x}(D) = D'$

HINT: Count the number of diagonals from the point to the line of reflection.

How do the coordinates of each point change when the point is reflected over the *y*-axis?

Reflections in the Coordinate Plane

Reflect $\triangle ABC$ over $x = 2$.



Notation

$R_{x=2}(\triangle ABC) = \triangle A'B'C'$

HINT: Draw line of reflection first.

Answer

Reflections in the Coordinate Plane

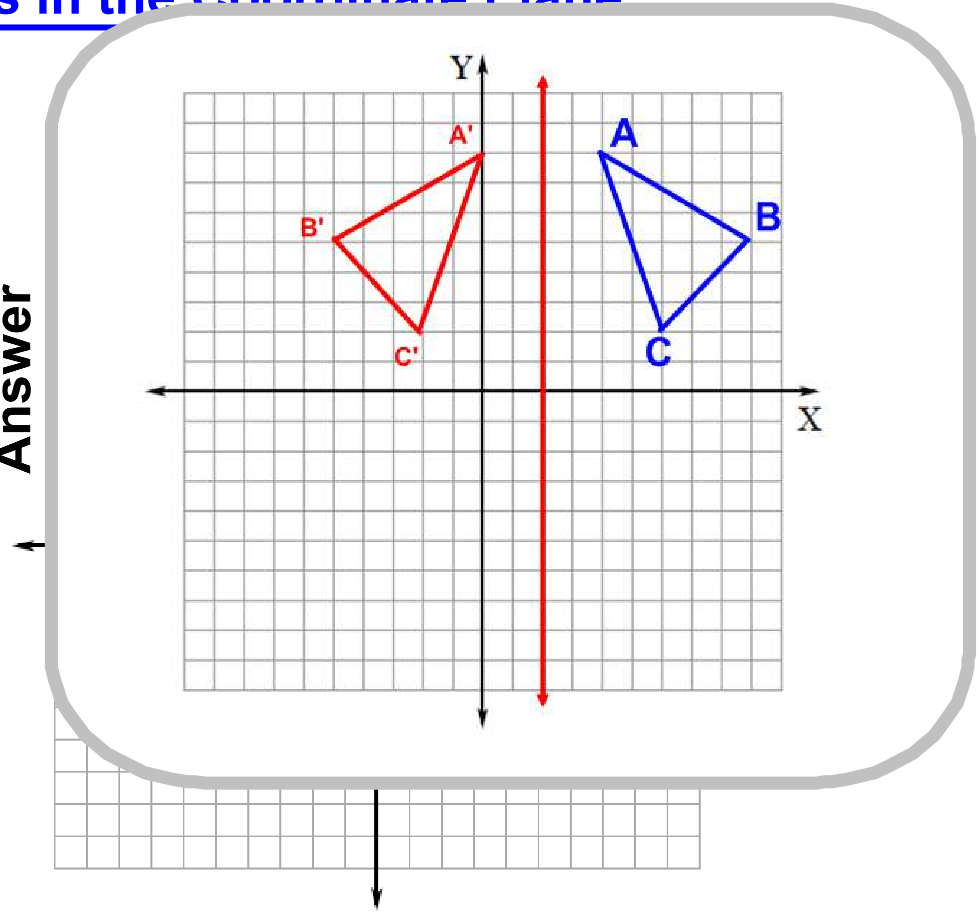
Reflect $\triangle$ *ABC* over *x* = 2.

Notation

$R_{x=2}(\triangle ABC) = \triangle A'B'C'$

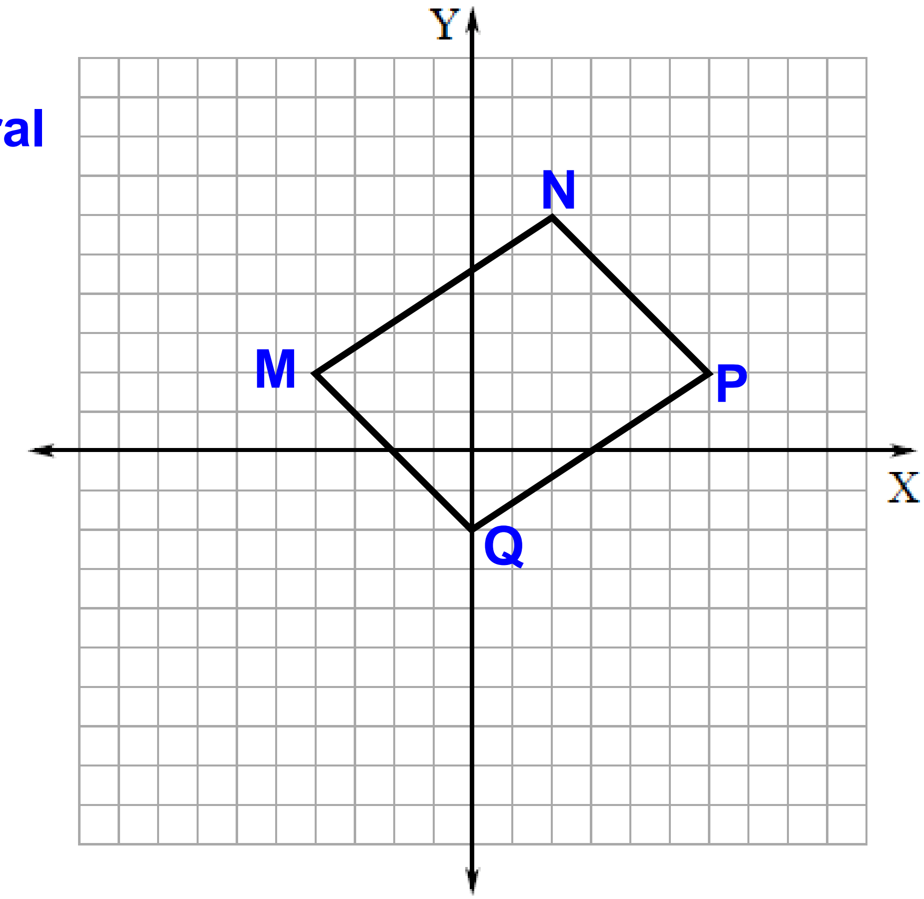
HINT: Draw line of reflection first.

Answer



Reflections in the Coordinate Plane

Reflect quadrilateral *MNPQ* over *y* = -3



Answer

Notation

$R_{y=-3}(MNPQ) = M'N'P'Q'$

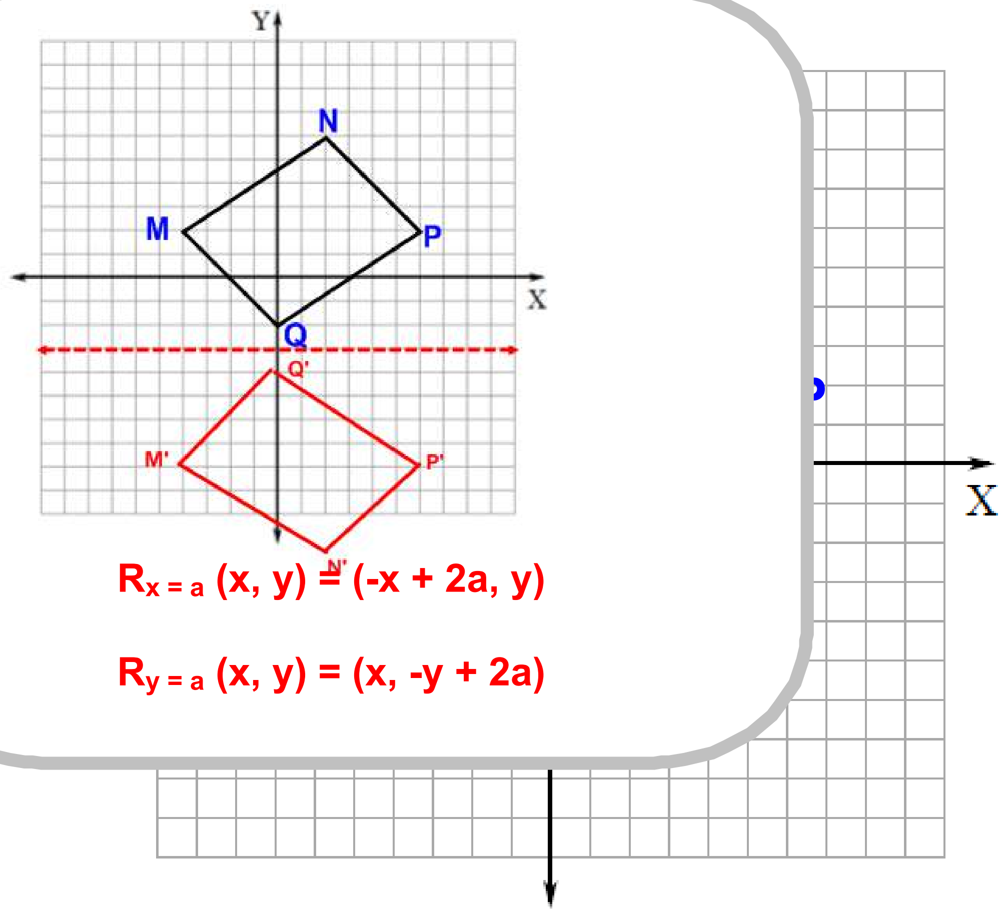
Reflections in the Coordinate Plane

Reflect qu
MNPQ ove

Answer

Notation

$R_{y=-3}(MNPQ)$ =



$R_{x=a}(x, y) = (-x + 2a, y)$

$R_{y=a}(x, y) = (x, -y + 2a)$

Find the coordinates of each image.

1. $R_{x\text{-axis}}(A)$

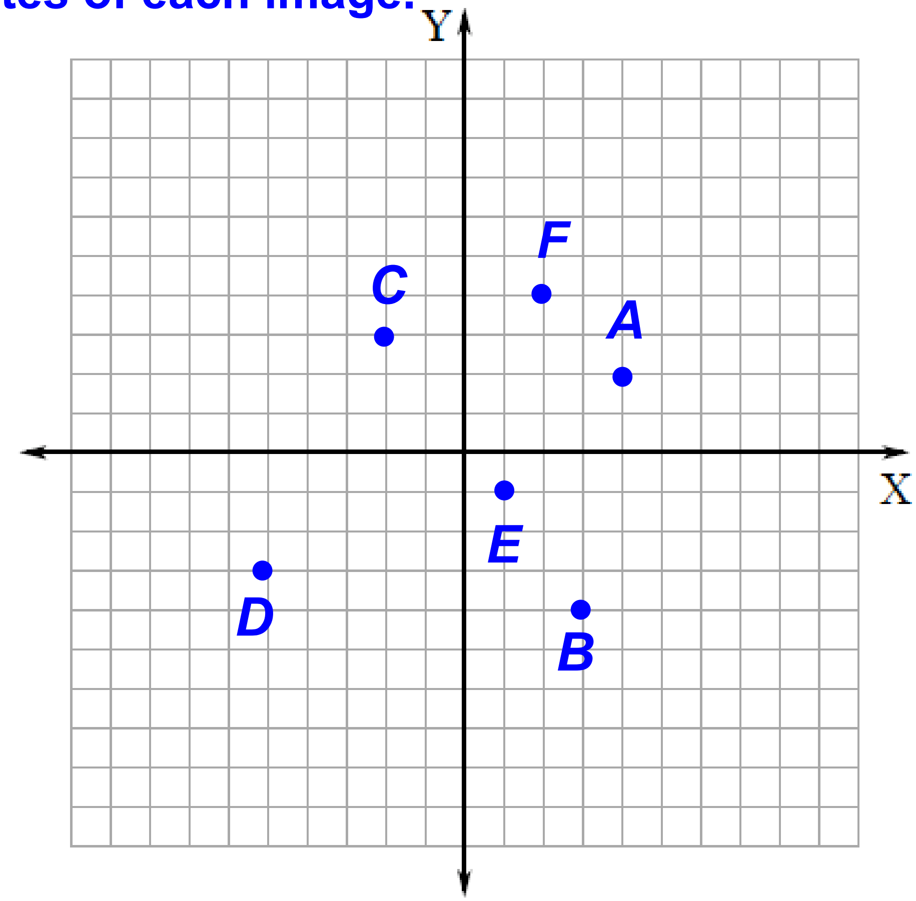
2. $R_{y\text{-axis}}(B)$

3. $R_{y=1}(C)$

4. $R_{x=-1}(D)$

5. $R_{y=x}(E)$

6. $R_{x=-2}(F)$



Answer

Find the coordinates of each image.

1. $R_{x\text{-axis}}(A)$

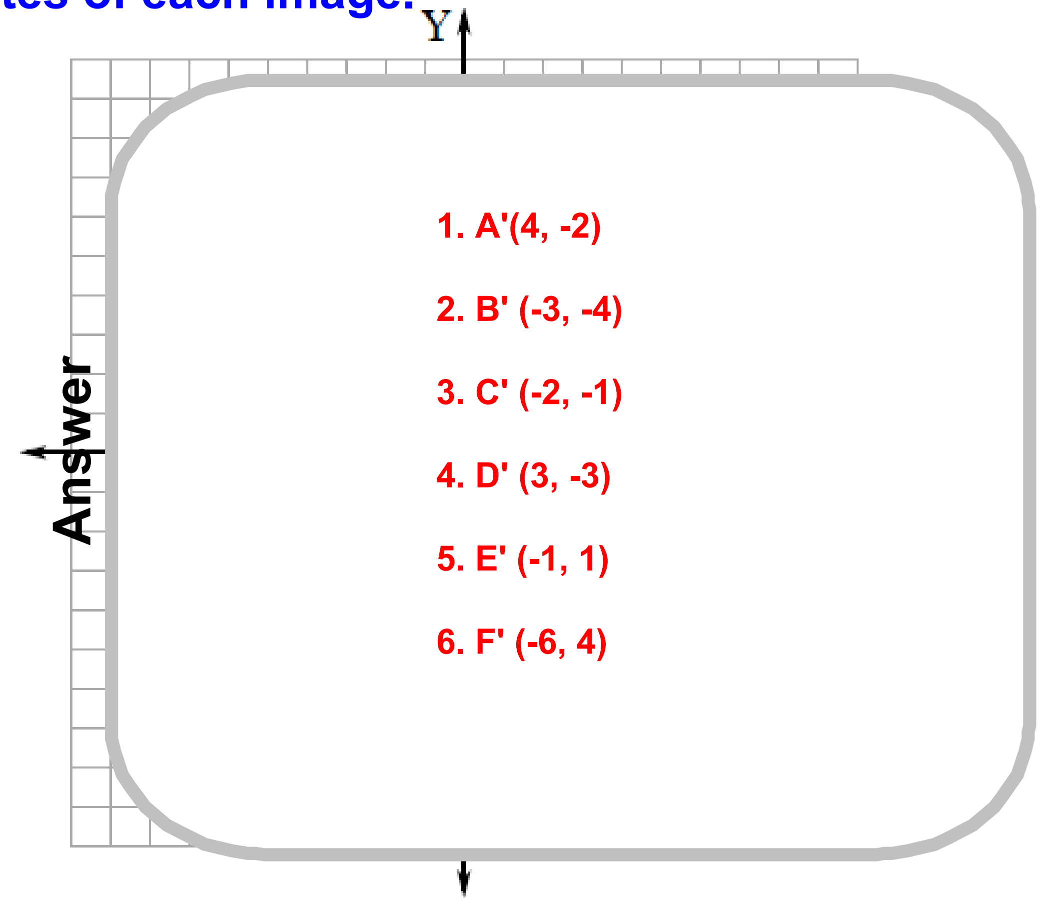
2. $R_{y\text{-axis}}(B)$

3. $R_{y=1}(C)$

4. $R_{x=-1}(D)$

5. $R_{y=x}(E)$

6. $R_{x=-2}(F)$



1. A'(4, -2)

2. B' (-3, -4)

3. C' (-2, -1)

4. D' (3, -3)

5. E' (-1, 1)

6. F' (-6, 4)

15 The point (4,2) reflected over the x-axis has an image of _______.

- A (4,2)
- B (-4,-2)
- C (-4,2)
- D (4,-2)

Answer

15 The point (4,2) reflected over the x-axis has an image of ______.

- A (4,2)
- B (-4,-2)
- C (-4,2)
- D (4,-2)

Answer

D

16 The point (4,2) reflected over the y-axis has an image of _____.

- A (4,2)
- B (-4,-2)
- C (-4,2)
- D (4,-2)

Answer

16 The point (4,2) reflected over the y-axis has an image of _____.

- (4,2)
- (-4,-2)
- (-4,2)
- (4,-2)

Answer

C

17 B has coordinates (-3,0). What would be the coordinates of B' if B is reflected over the line x = 1?

- (-3,0)
- (4,0)
- (-3,2)
- (5,0)

Answer

17 B has coordinates (-3,0). What would be the coordinates of B' if B is reflected over the line x = 1?

- (-3,0)
- (4,0)
- (-3,2)
- (5,0)

Answer

D

18 The point (4,2) reflected over the line y=2 has an image of _____.

- A (4,2)
- B (4,1)
- C (2,2)
- D (4,-2)

Answer

18 The point (4,2) reflected over the line y=2 has an image of _____.

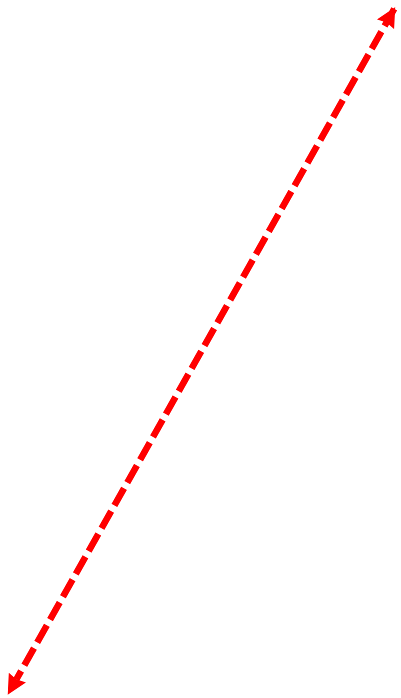
- (4,2)
- (4,1)
- (2,2)
- (4,-2)

Answer

A

Line of Symmetry

A line of symmetry is a line of reflection that divides a figure into 2 congruent halves. These 2 halves reflect onto each other.



If lines of symmetry exist, draw all of them for the figure.

A

B

C

Answer

D

E

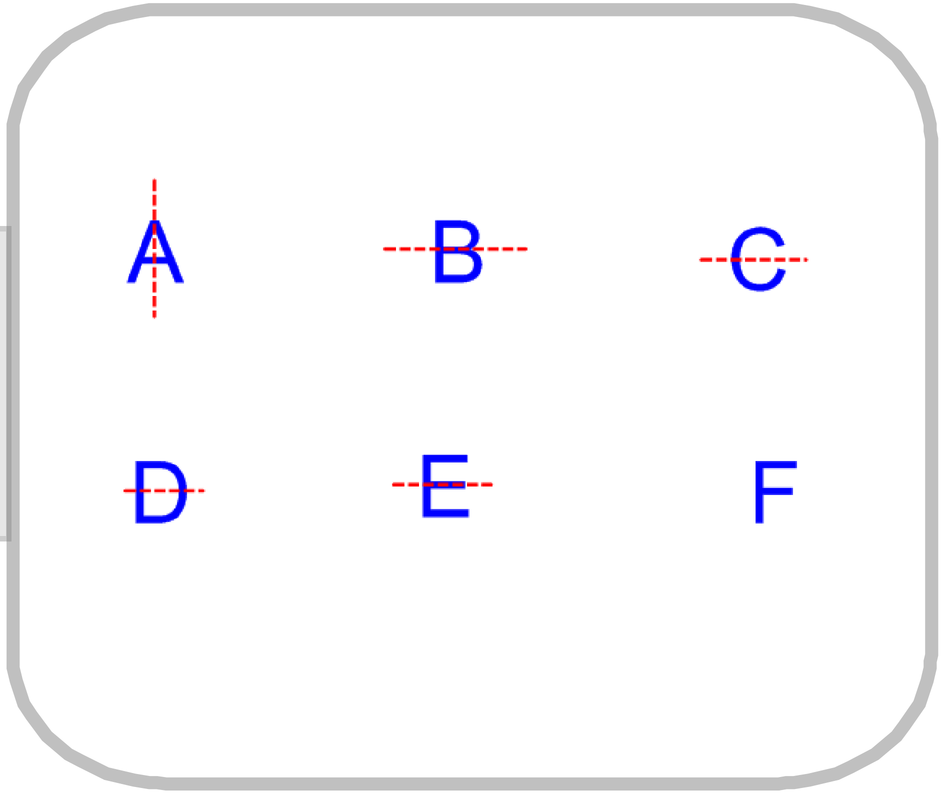
F

If lines of symmetry exist, draw all of them for the figure.

A

D

Answer



If lines of symmetry exist, draw all of them for the figure.

M N O

P Q R

Answer

If lines of symmetry exist

M

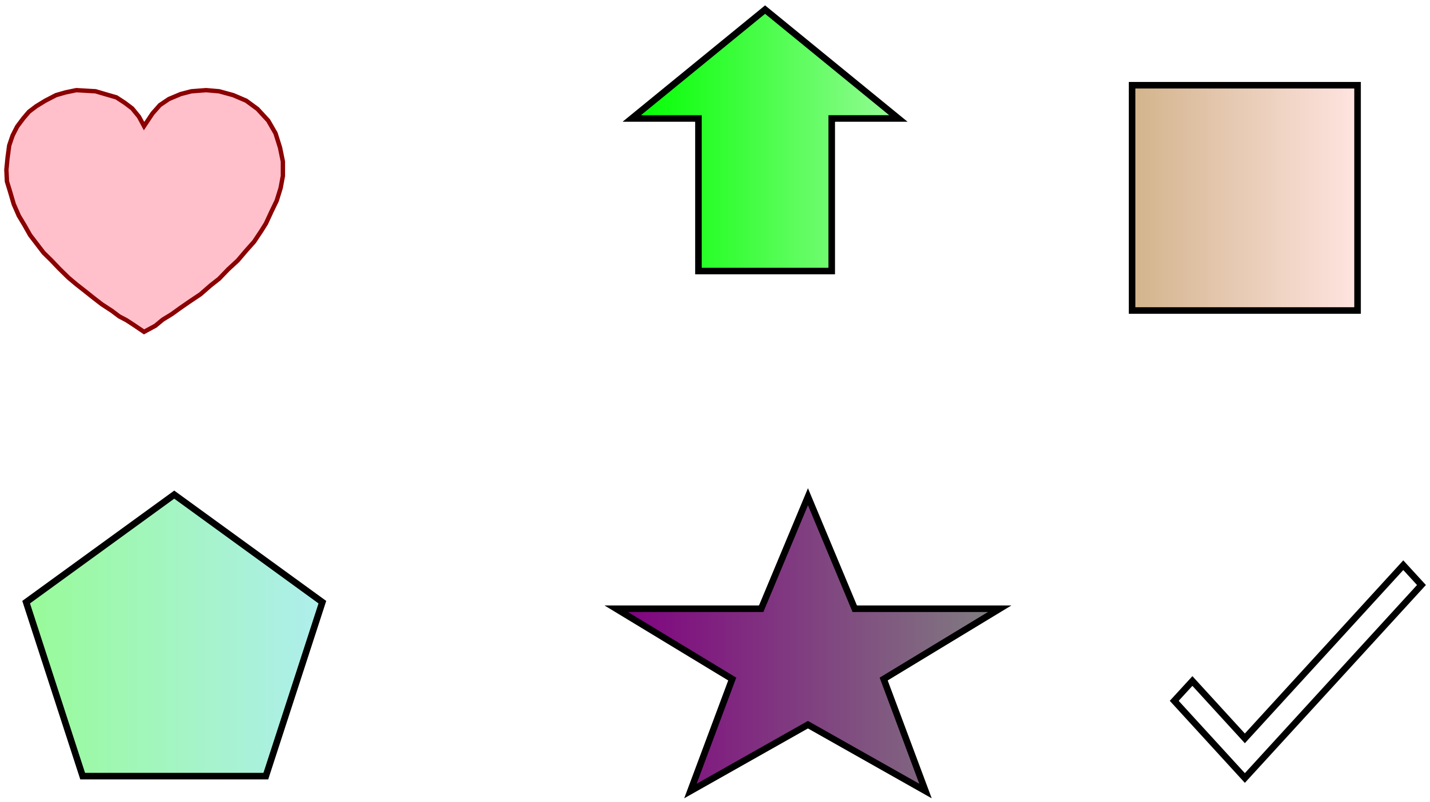
P

Answer

M N O

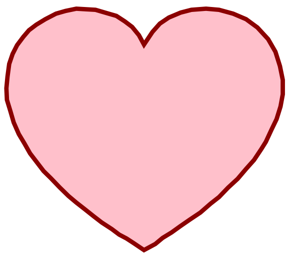
P Q R

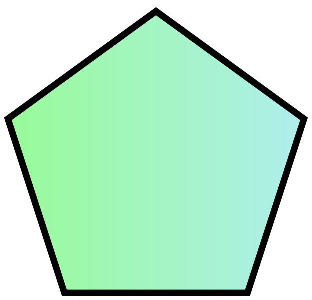
If lines of symmetry exist, draw all of them for the figure.



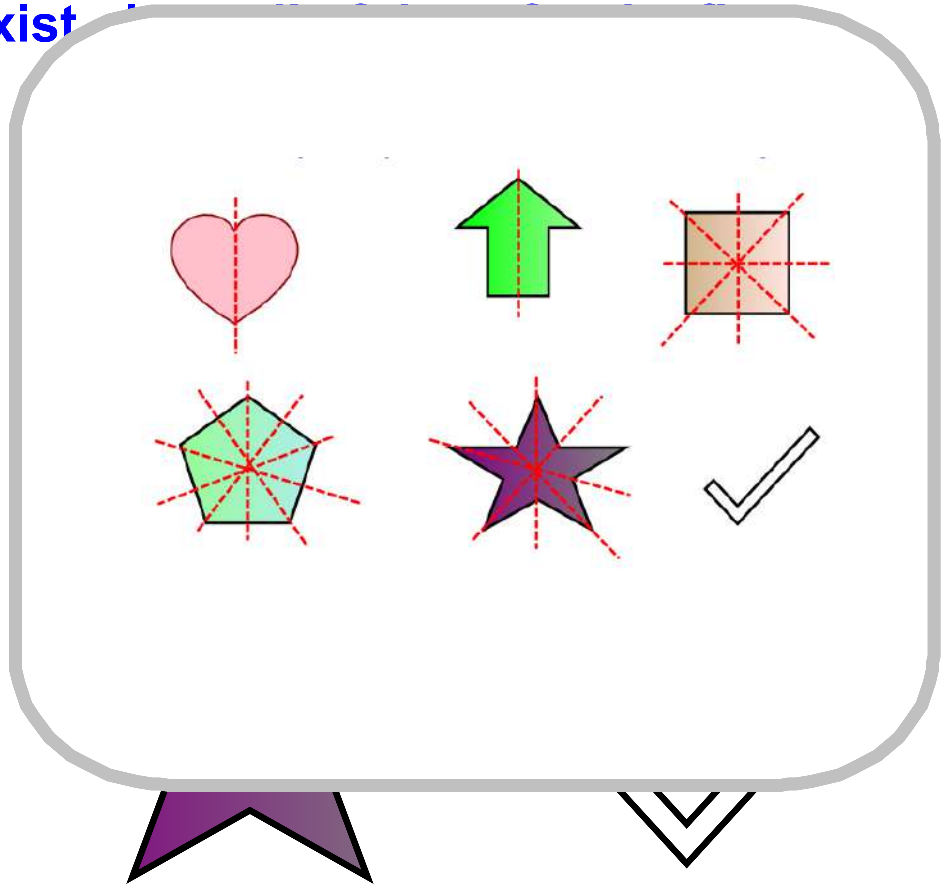
Answer

If lines of symmetry exist



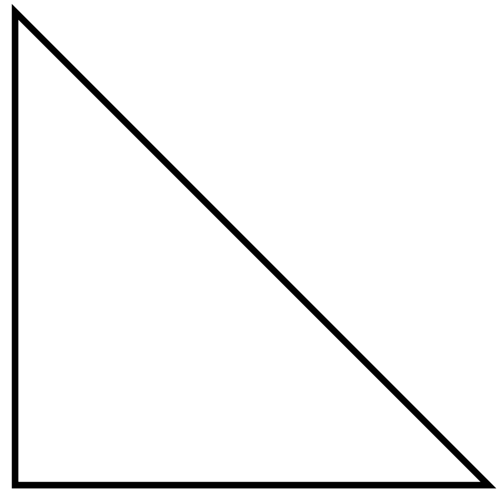


Answer



19 How many lines of symmetry does the following have?

- one
- two
- three
- none



Answer

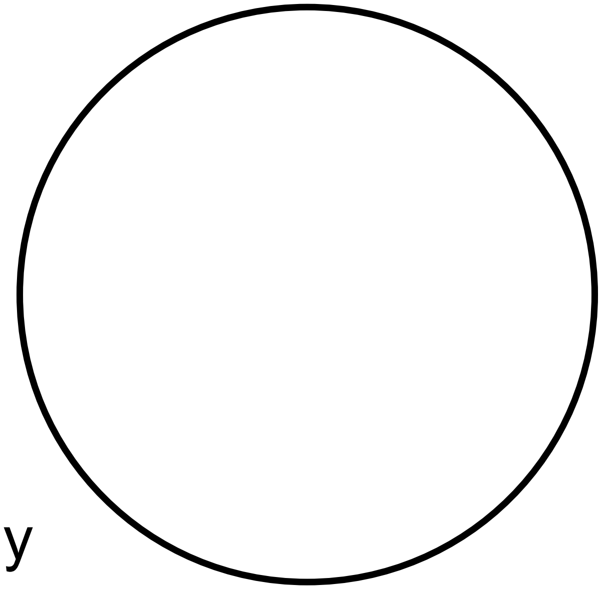
19 How many lines of symm ?

- one
- two
- three
- none

Answer

A

20 How many lines of symmetry does the following have?



- A 10
- B 2
- C 100
- D infinitely many

Answer

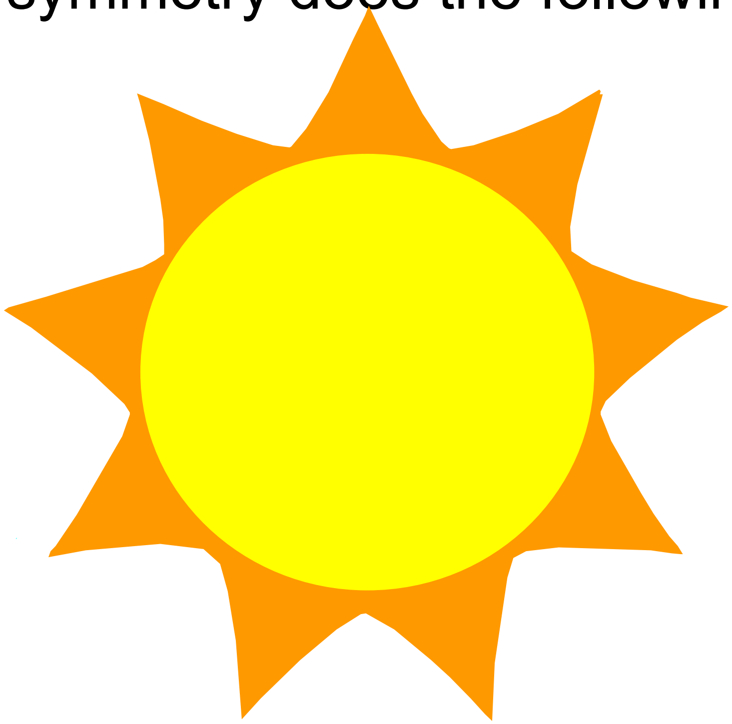
20 How many lines of symmetry does the following have?

- A 10
- B 2
- C 100
- D infinitely many

Answer

D

21 How many lines of symmetry does the following have?



- A none
- B one
- C nine
- D infinitely many

Answer

21 How many lines of symmetry does the following have?

- A none
- B one
- C nine
- D infinitely many

Answer

C

22 How many lines of symmetry does the following have?

- none
- one
- two
- infinitely many

J

Answer

22 How many lines of symmetry does the following have?

- A none
- B one
- C two
- D infinitely many

Answer

A

23 How many lines of symmetry does the following have?

- none
- one
- two
- infinitely many

H

Answer

23 How many lines of symmetry does the following have?

A none

B one

C two

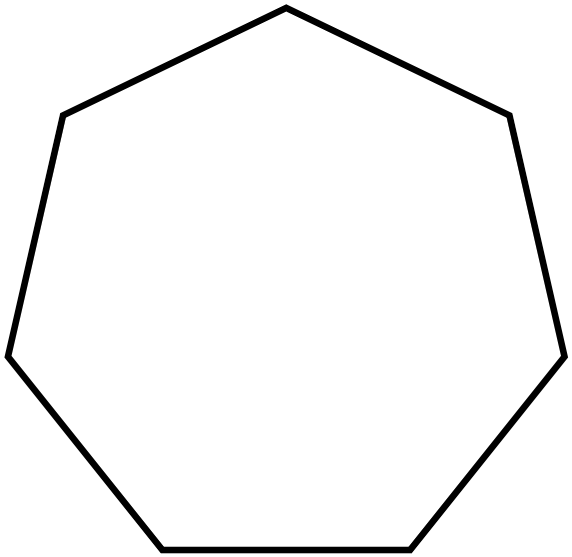
D infinitely many

Answer

C

24 How many lines of symmetry does the following have?

- A none
- B 5
- C 7
- D 9



Answer

24 How many lines of symmetry does the following have?

- A none
- B 5
- C 7
- D 9

Answer

C

Rotations

Rotations Activity Lab
(Click for link to lab)

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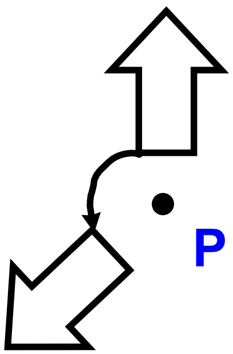
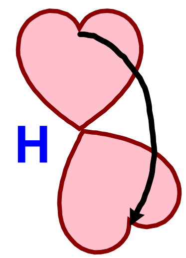
A **rotation** is a rigid motion that turns a figure about a point.

The amount of turn is in degrees.

The direction of turn is either clockwise or counterclockwise.



The arrow was rotated 120^0 counterclockwise about point P.



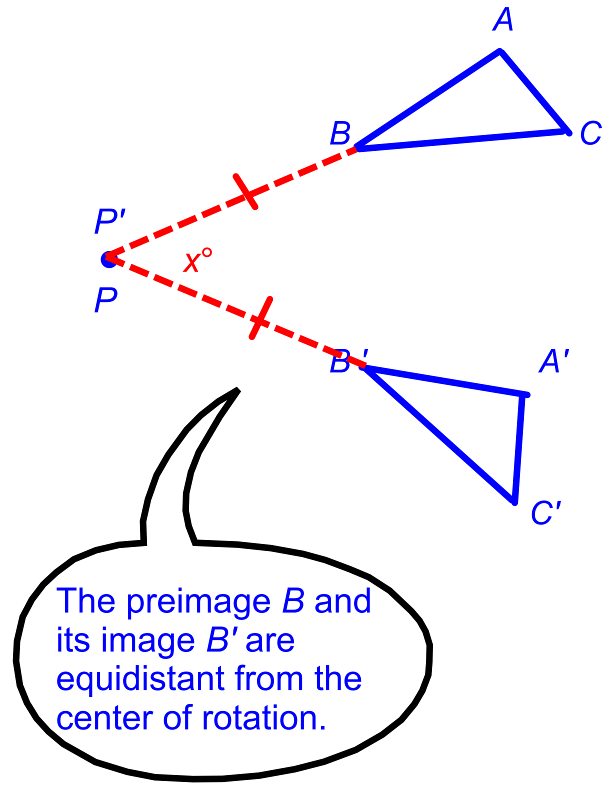
The heart was rotated 160^0 clockwise about H.

A rotation of *x*°, about a point *P* is a transformation with the following properties:

- The image of P is itself ($P = P'$)

- For any other point B, $PB' = PB$

-The $m\ \angle BPB' = x$



Notation

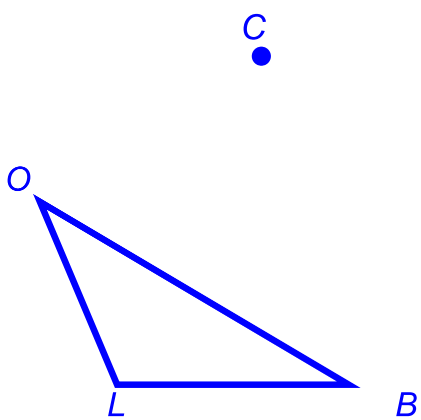
$\mathbf{r}_{(x°,\ P)}(\triangle ABC) = \triangle A'B'C'$ *for a rotation clockwise x°* about P

$\mathbf{r}_{(-x°,\ P)}(\triangle ABC) = \triangle A'B'C'$ *for a rotation counterclockwise x°* about P

Drawing Rotation Images

What is the image of $r_{(100°, C)}(\triangle LOB)$? (counterclockwise)

Answer



Step 1
Draw $\overline{CO}$. Use a protractor to draw a 100° angle with side $\overline{CO}$ and vertex C.

Step 2
Use a compass or a ruler to construct $\overline{CO} \cong \overline{CO'}$

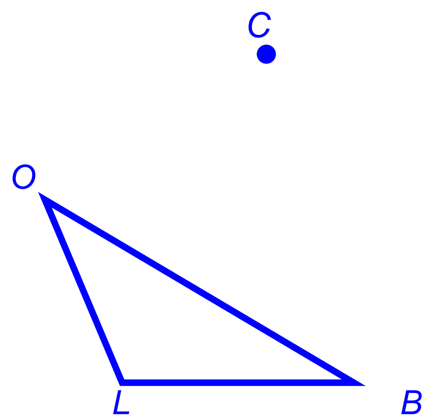
Step 3
Locate L' and B' following steps 1 and 2.

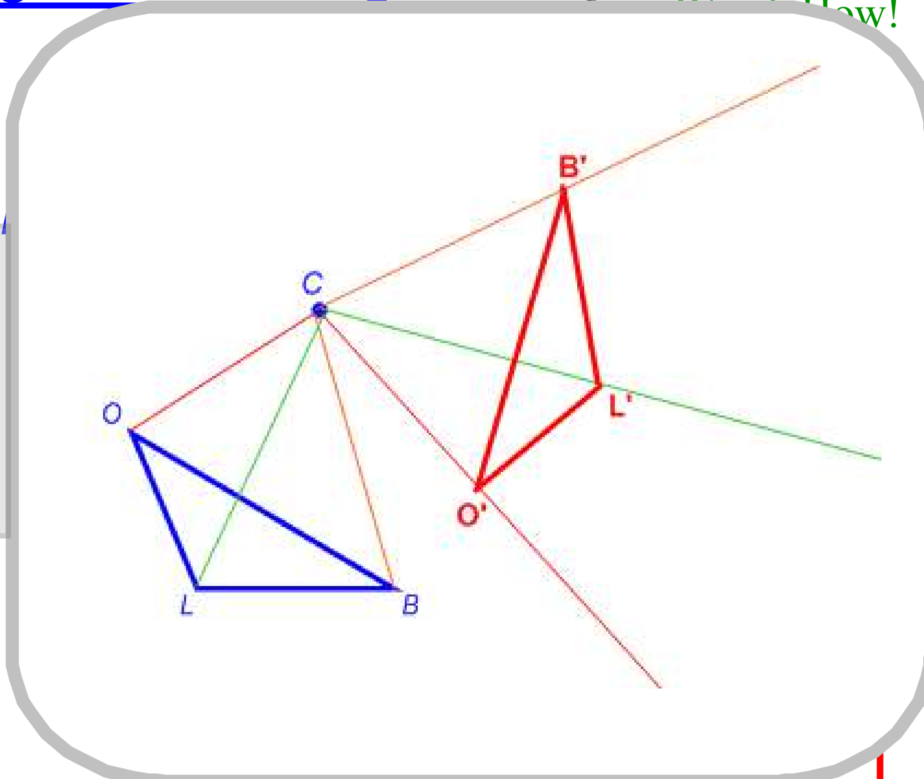
Step 4
Draw $\triangle L'O'B'$

Drawing Rotation Images

What is the image of $r_{(100°, C)}(\triangle$

Answer



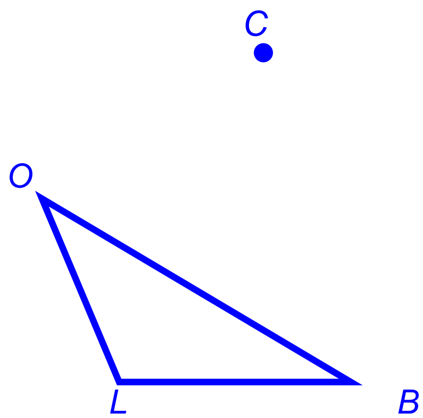


Step 3
Locate L' and B' following steps 1 and 2.

Step 4
Draw $\triangle L'O'B'$

Drawing Rotation Images

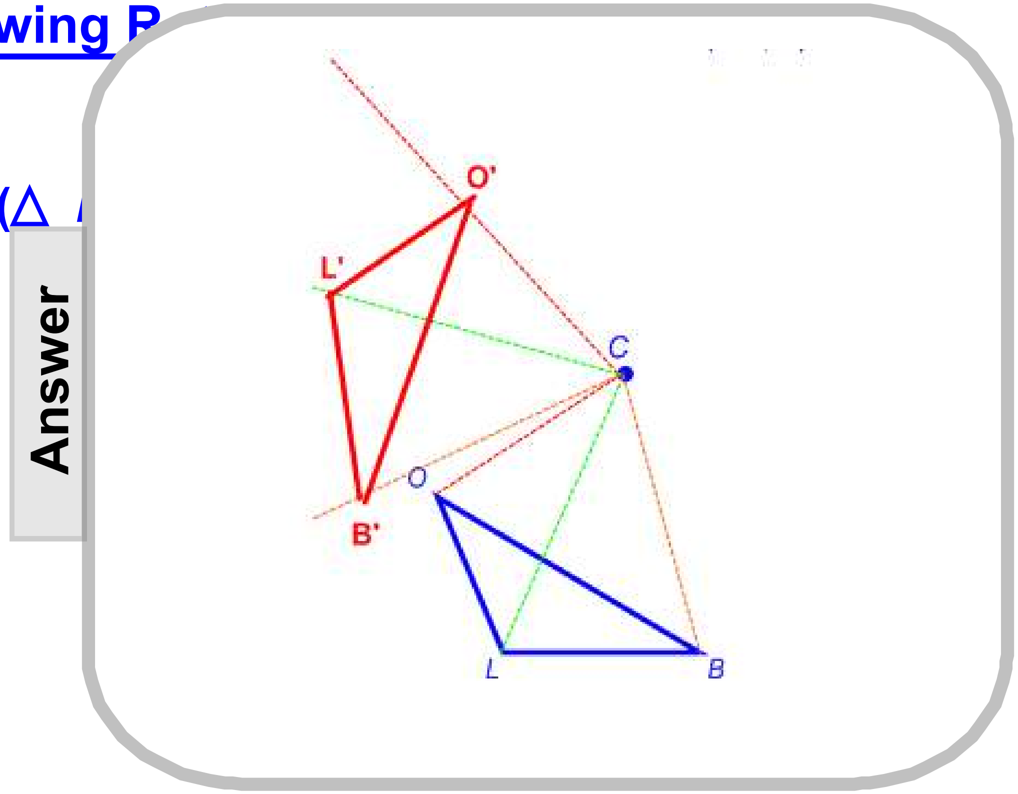
What is the image of $r_{(80°,\ C)}(\triangle\ LOB)$? (clockwise)

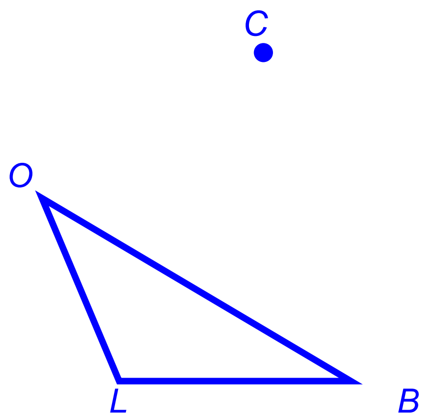


Answer

Drawing R

What is the image of $r_{(80°, C)}(\triangle$ I

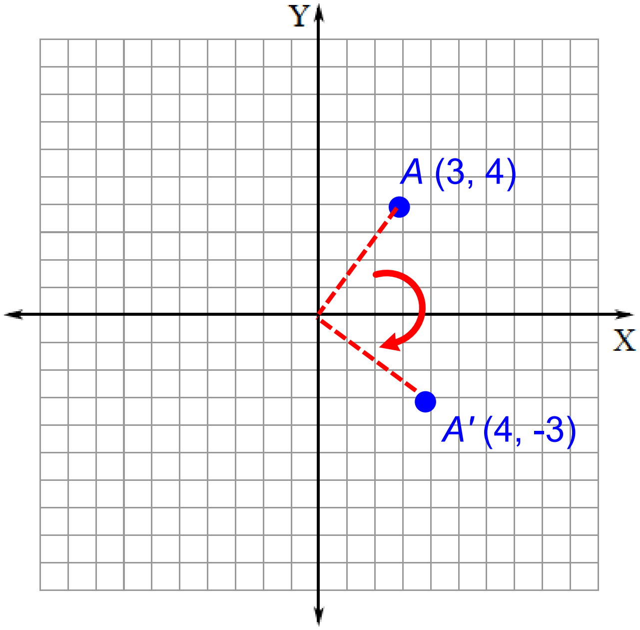




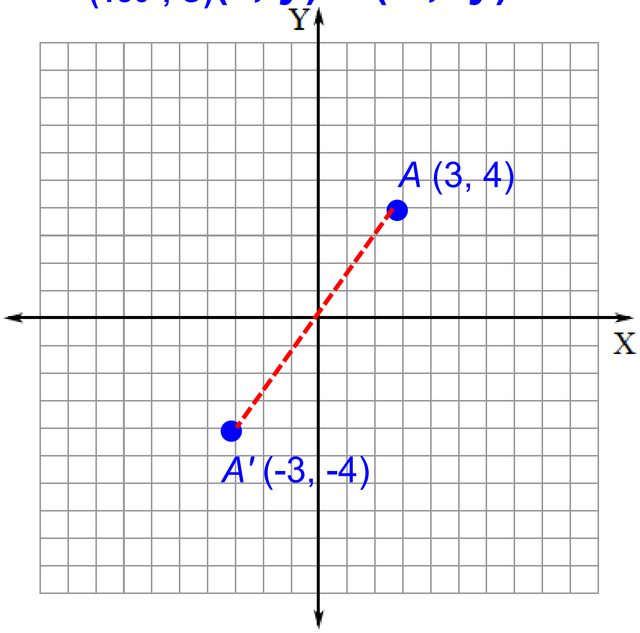
Rotations in the Coordinate Plane

When a figure is rotated 90°, 180°, or 270° clockwise about the origin O in the coordinate plane, you can use the following rules.

$$r_{(90°,\, O)}(x, y) = (y, -x)$$

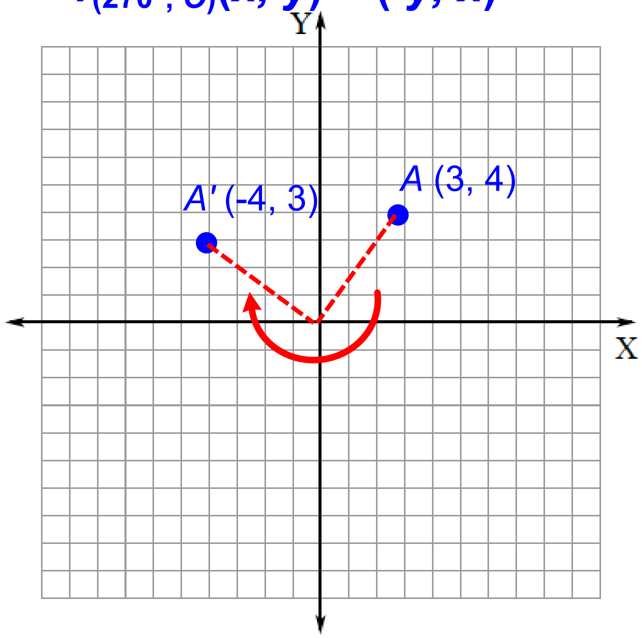


$$r_{(180°,\, O)}(x, y) = (-x, -y)$$

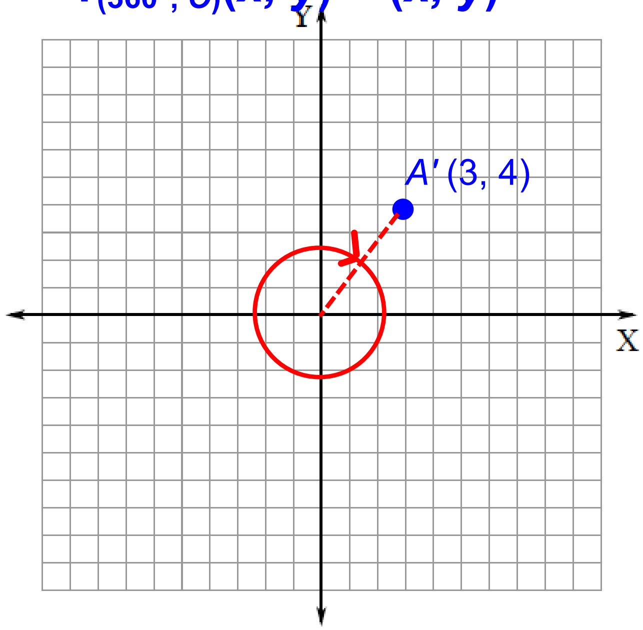


Rotations in the Coordinate Plane (continued)

$r_{(270°, O)}(x, y) = (-y, x)$



$r_{(360°, O)}(x, y) = (x, y)$



Note:

$r_{(-90°, O)}(x, y) = r_{(270°, O)}(x, y)$ and $r_{(-270°, O)}(x, y) = r_{(90°, O)}(x, y)$

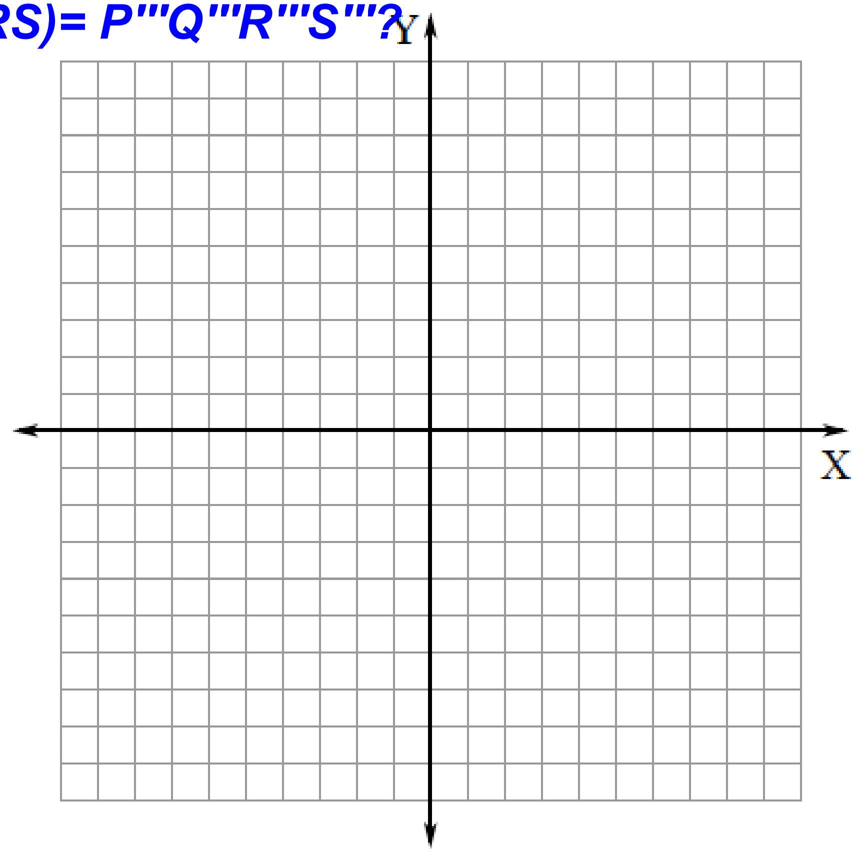
Graphing Rotation Images

PQRS has vertices P(1, 1), Q(3, 3), R(4, 1) and S(3, 0).

a) What is the graph of $r_{(90^\circ, O)}$*(PQRS) = P'Q'R'S'?*

b) What is the graph of $r_{(90^\circ, O)}$*(PQRS) = P''Q''R''S''?*

c) What is the graph of $r_{(270^\circ, O)}$*(PQRS)= P'''Q'''R'''S'''?*



Answer

Graphing Rotation Images

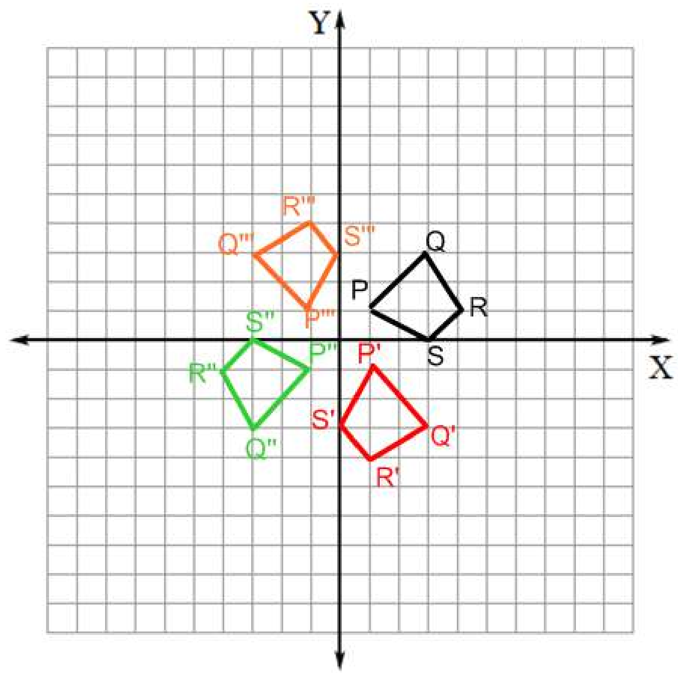
PQRS **has vertices P(1, 1), Q(3, 3)**

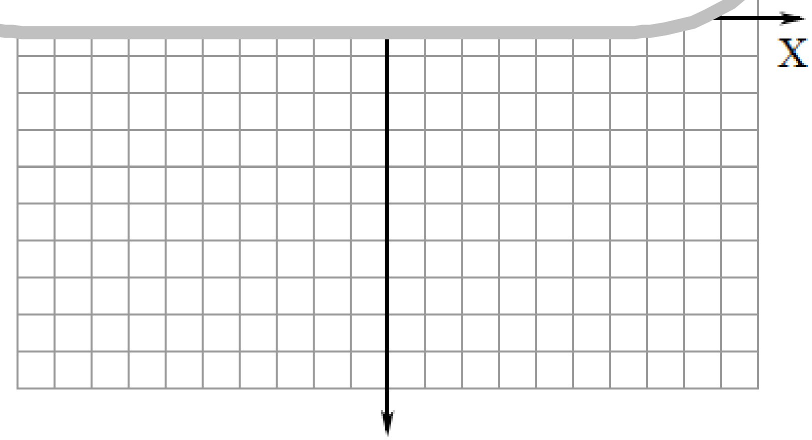
a) What is the graph of $r_{(90^\circ,\ o)}$(P

b) What is the graph of $r_{(90^\circ,\ o)}$(P

c) What is the graph of $r_{(270^\circ,\ o)}$(

Answer





25 Square ABCD has vertices A(3,3), B(-3,3), C(-3, -3), and D(3, -3). Which of the following images is A?

- A $r_{(90°,O)}(C)$
- B $r_{(180°,O)}(D)$
- C $r_{(90°,O)}(B)$
- D $r_{(270°,O)}(C)$

Answer

25 Square ABCD has vertices A(3,3), B(-3,3), C(-3, -3), and D(3, -3). Which of the following images is A?

- A $r_{(90°,O)}(C)$
- B $r_{(180°,O)}(D)$
- C $r_{(90°,O)}(B)$
- D $r_{(270°,O)}(C)$

Answer

C

26 PQRS has vertices P(1,5), Q(3, -2), R(-3, -2), and S(-5, 1). What are the coordinates of Q' after $r_{(270°,O)}(Q)$?

A (-2, -3)

B (2,3)

C (-3, 2)

D (-3, -2)

Answer

26 PQRS has vertices P(1,5), Q(3, -2), R(-3, -2), and S(-5, 1). What are the coord

A (-2, -3)

B (2,3)

C (-3, 2)

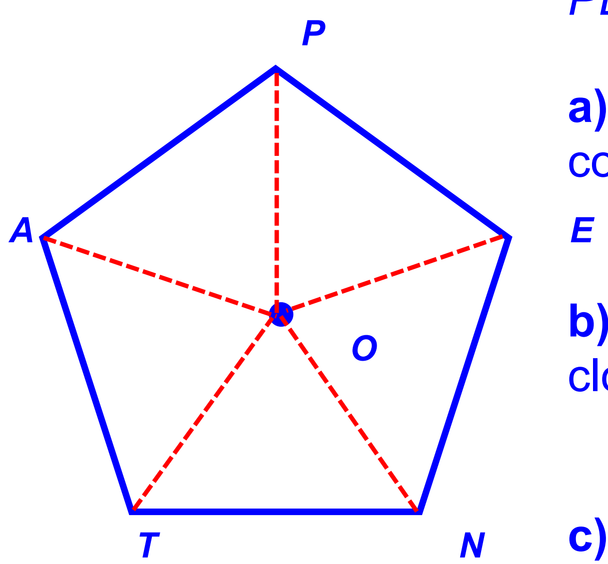
D (-3, -2)

Answer

B

Identifying a Rotation Image

A regular polygon has a center that is equidistant from its vertices. Segments that connect the center to the vertices divide the polygon into congruent triangles. You can use this fact to find rotation images of regular polygons.



PENTA is a regular pentagon with center *O*.

a) Name the image of *E* for a 72° rotation counterclockwise about *O*.

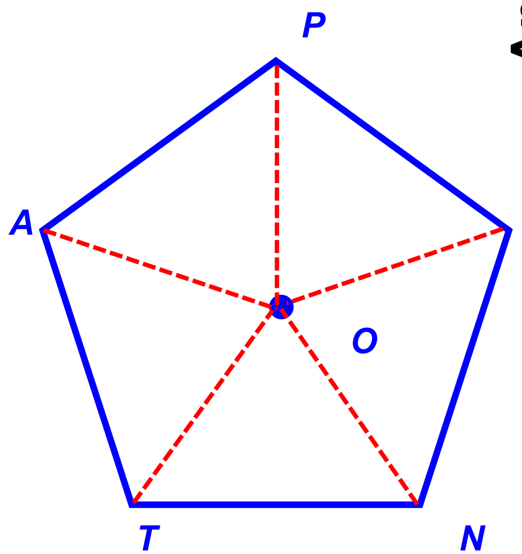
b) Name the image of *P* for a 216° rotation clockwise about *O*.

c) Name the image of $\overline{AP}$ for a 144° rotation counterclockwise about *O*.

Answer

Identifying a Rotation Image

A regular polygon has a center
Segments that connect the cer
congruent triangles. You can u **r**
polygons.



Answer

a.) P

b.) T

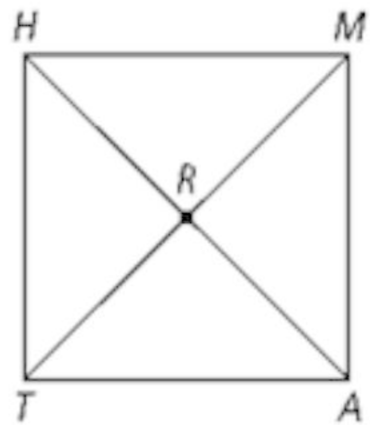
c.) NT

b
clock

c) Name the image of $\overline{AP}$ for a 144° rotation counterclockwise about *O*.

27 MATH is a regular quadrilateral with center R. Name the image of M for a 180° rotation counterclockwise about R.

- A M
- B A
- C T
- D H



Answer

27 MATH is a regular quadrilateral with center R. Name the image of M for a 180° rot ... t R.

A M

B A

C T

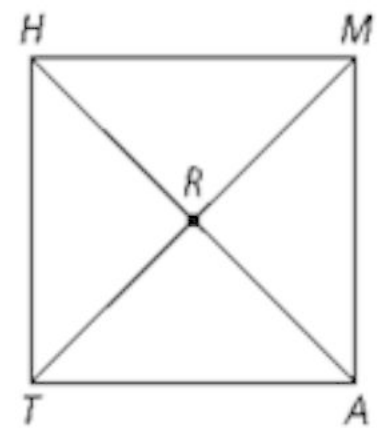
D H

Answer

C

28 MATH is a regular quadrilateral with center R. Name the image of $\overline{HT}$ for a 270° rotation clockwise about R.

- A $\overline{HM}$
- B $\overline{MA}$
- C $\overline{AT}$
- D $\overline{TH}$



Answer

28 MATH is a regular quadrilateral with center R. Name the image of $\overline{HT}$ for a 270° r

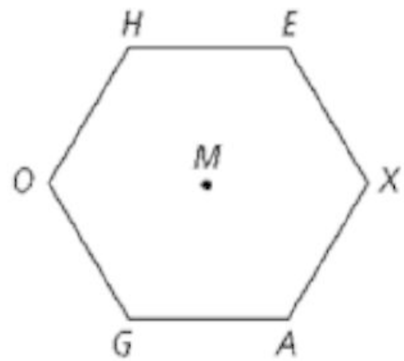
- A $\overline{HM}$
- B $\overline{MA}$
- C $\overline{AT}$
- D $\overline{TH}$

Answer

D

29 HEXAGO is a regular hexagon with center M. Name the image of G for a 300° rotation counterclockwise about M.

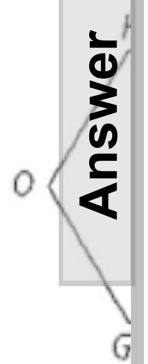
- A
- X
- E
- H
- O



Answer

29 HEXAGO is a regular hex
image of G for a 300° ro

- A
- X
- E
- H
- O

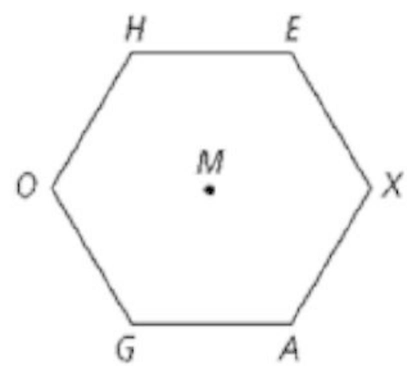


Answer

E

30 HEXAGO is a regular hexagon with center M. Name the image of $\overline{OH}$ for a 240° rotation clockwise about M.

- $\overline{HE}$
- $\overline{AG}$
- $\overline{EX}$
- $\overline{AX}$
- $\overline{OG}$



Answer

30 HEXAGO is a regular hexagon with center M. Name the image of $\overline{OH}$ for a 240° r

- $\overline{HE}$
- $\overline{AG}$
- $\overline{EX}$
- $\overline{AX}$
- $\overline{OG}$

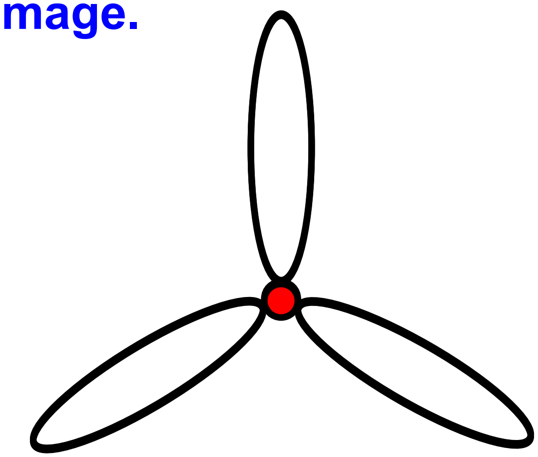
Answer

B

Rotational Symmetry

A figure has rotational symmetry if there is at least one rotation less than or equal to 180° about a point so that the preimage is the image.

Think of the blades of a fan.

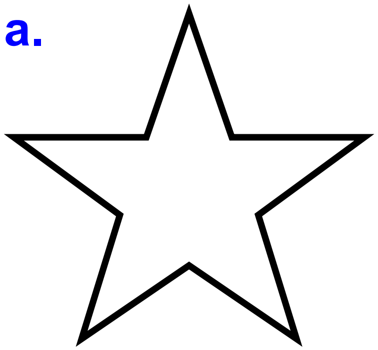


This figure has rotational symmetry at 120°

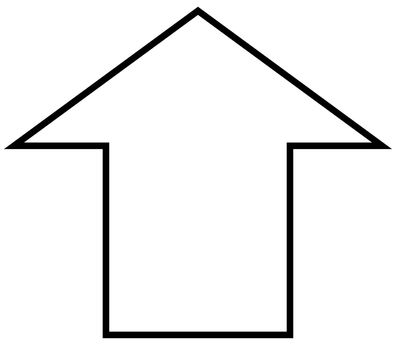
A circle has infinite rotational symmetry.

Do the following have rotational symmetry? If yes, what is the degree of rotation?

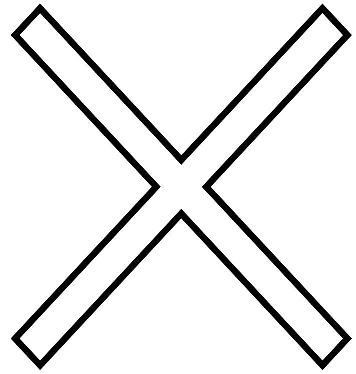
a.



b.



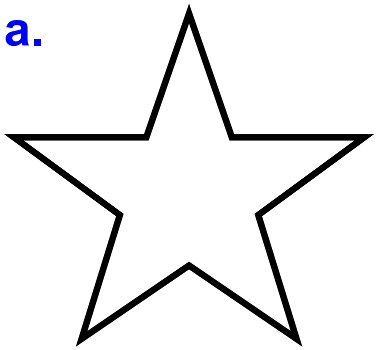
c.



Answer

Do
symm

a.

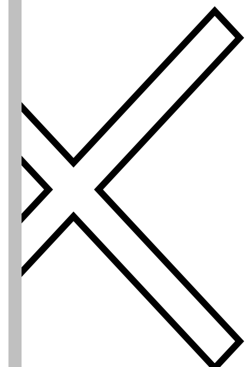


Answer

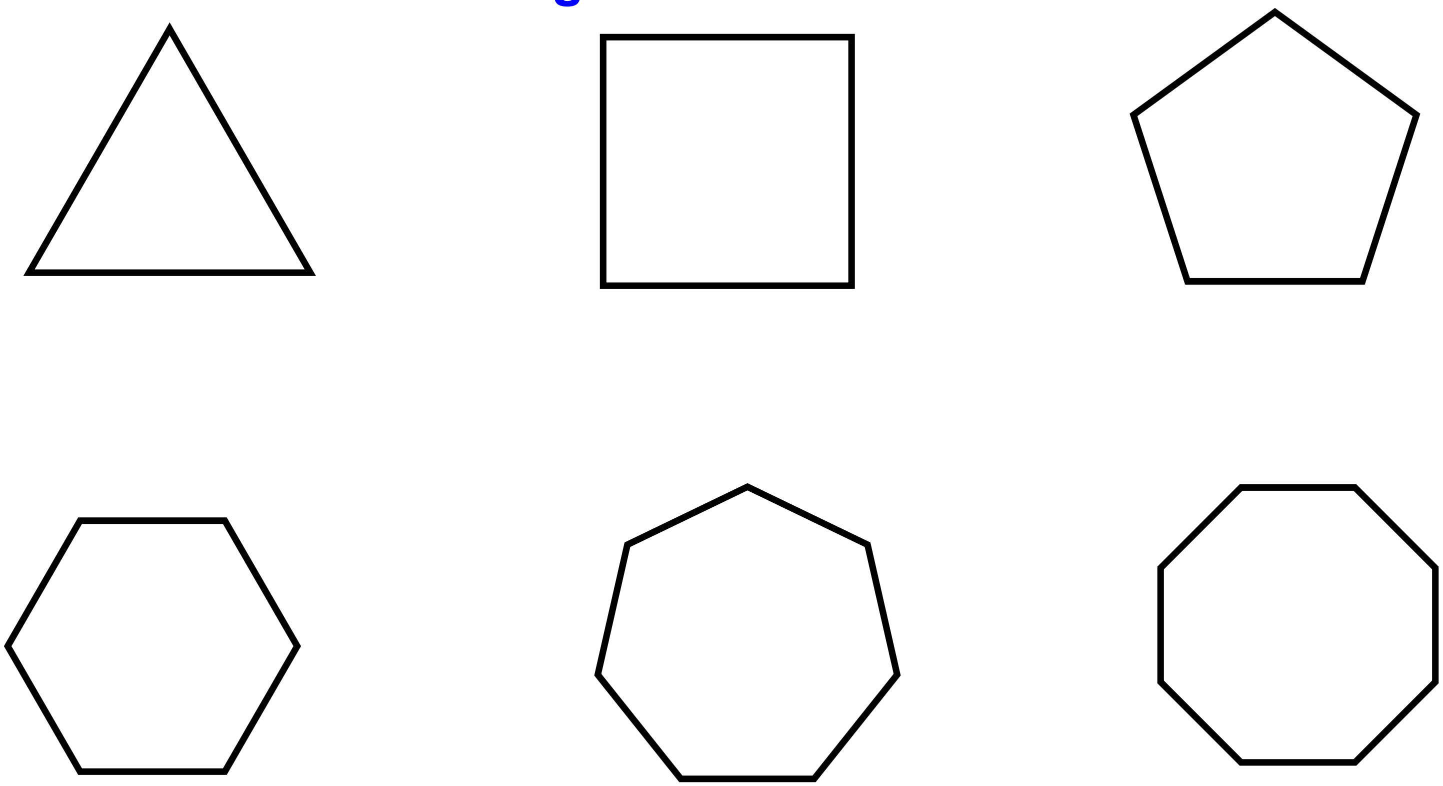
a.) yes; 72°

b.) no

c.) yes; 90°



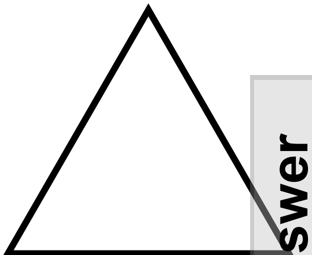
Do the following regular shapes have rotational symmetry? If yes, what is the degree of rotation.



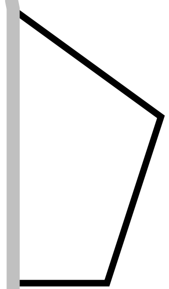
Answer

In general, what is the rule that can be used to find the degree of rotation for a regular polygon?

Do the following regular shapes have rotatio

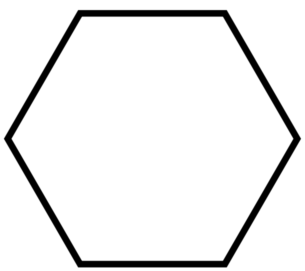


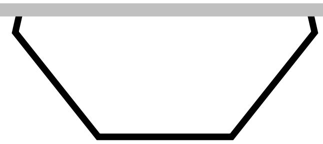
Answer

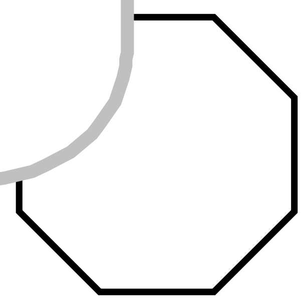


a.) yes; 120°
b.) yes 90°
c.) yes; 72°
d.) yes; 60°
e.) yes; 51.4°
f.) yes; 45°

360°/ number of sides







In general, what is the rule that can be used to find the degree of rotation for a regular polygon?

31 Does the following figure have rotational symmetry? If yes, what degree?

- yes, 90°
- yes, 120°
- yes, 180°
- no

S

Answer

31 Does the following figure have rotational symmetry? If yes, what degree?

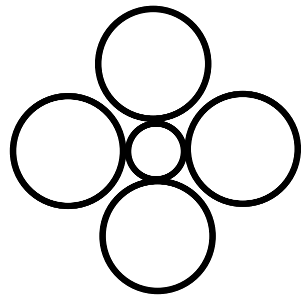
- yes, 90°
- yes, 120°
- yes, 180°
- no

Answer

C

32 Does the following figure have rotational symmetry? If yes, what degree?

- yes, 90°
- yes, 120°
- yes, 180°
- no



Answer

32 Does the following figure have rotational symmetry? If yes, what degree?

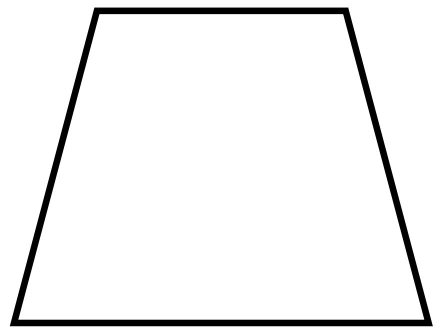
- yes, 90°
- yes, 120°
- yes, 180°
- no

Answer

A

33 Does the following figure have rotational symmetry? If yes, what degree?

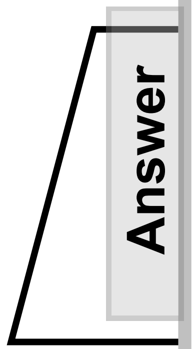
- yes, 90°
- yes, 120°
- yes, 180°
- no



Answer

33 Does the following figure have rotational symmetry? If yes, what degree?

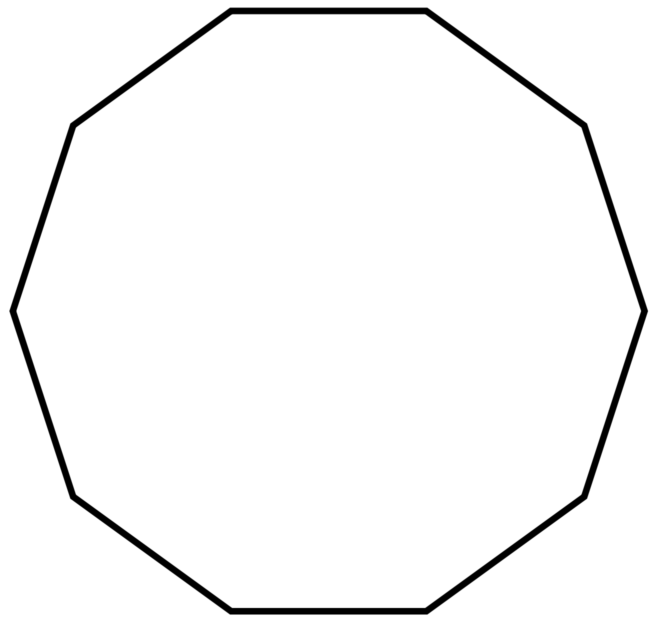
- yes, 90°
- yes, 120°
- yes, 180°
- no



D

34 Does the following figure have rotational symmetry? If yes, what degree?

- yes, 18°
- yes, 36°
- yes, 72°
- no



Answer

34 Does the following figure have rotational symmetry? If yes, what degree?

- yes, 18°
- yes, 36°
- yes, 72°
- no

Answer

B

Composition of Transformations

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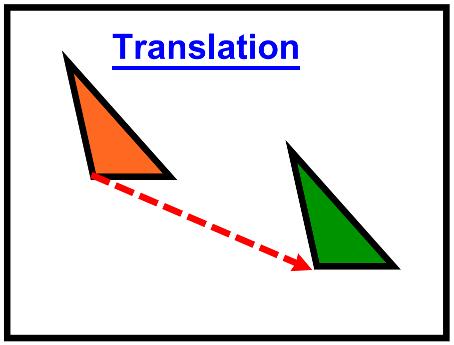
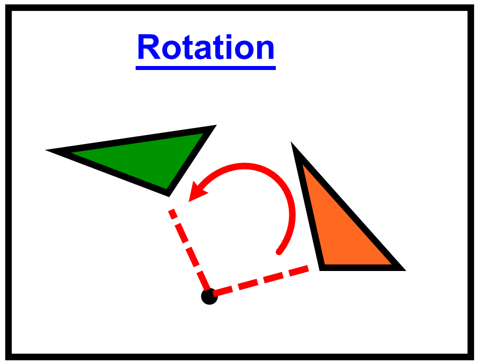
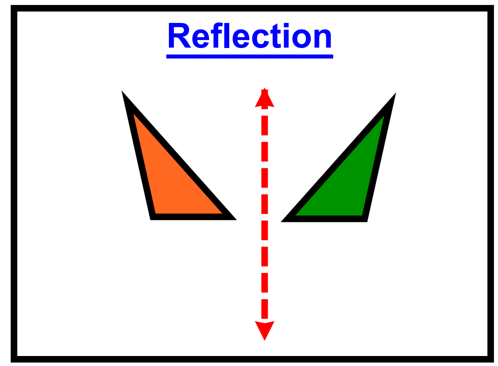
When an image is used to as the preimage for a second transformation it is called a composition of transformations.

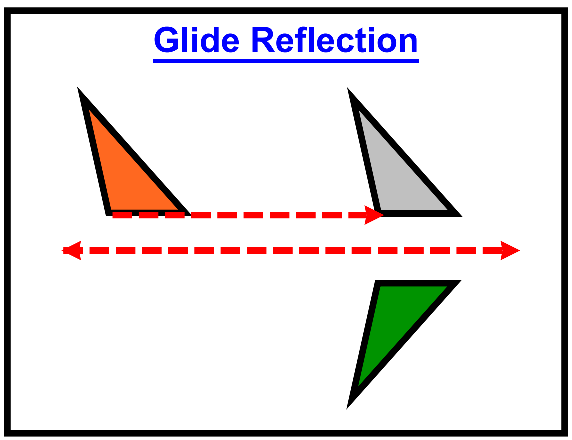
An isometry is transformation that preserves distance, or length.

The transformations below are isometries.









The composition of two or more isometries is an isometry.

Glide Reflections

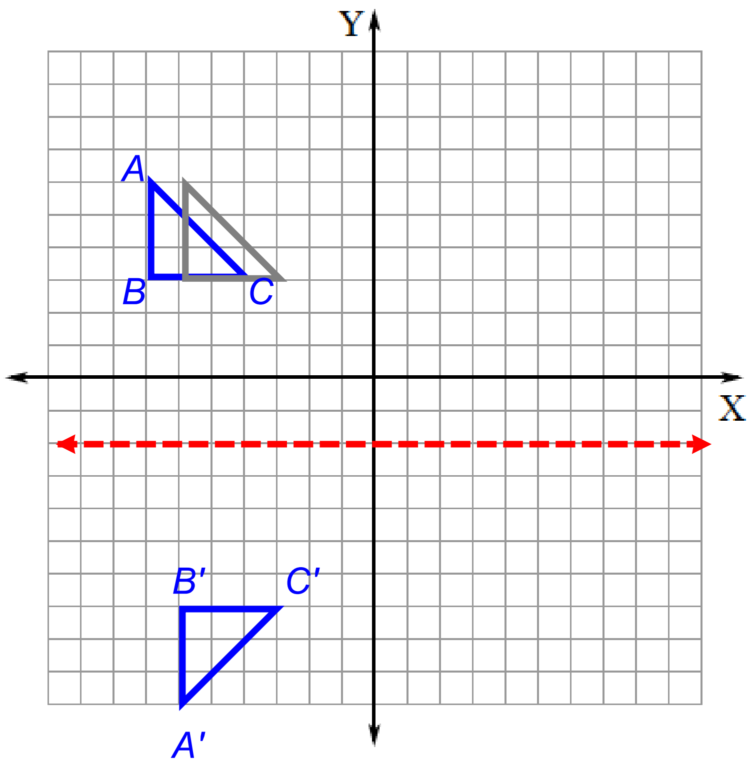
If two figures are congruent and have opposite orientations (but are not simply reflections of each other), then there is a translation and a reflection that will map one onto the other. A glide reflection is the composition of a glide (translation) and a reflection across a line parallel to the direction of translation.

$\triangle ABC$ is translated 1 unit to the right and then reflected over the line $y = -2$.

Notation for a Composition

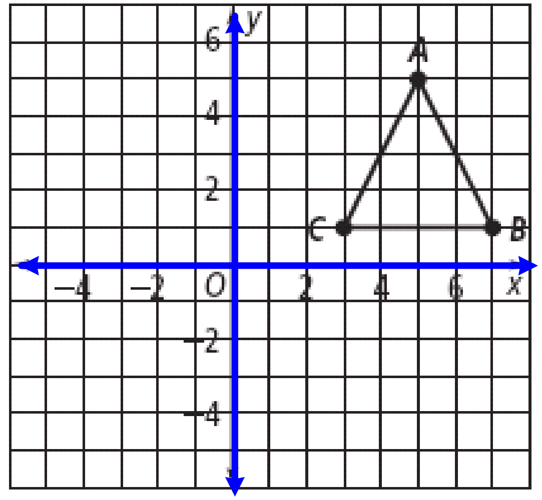
$$R_{y=-2} \circ T_{<1,0>}(\triangle ABC)$$

Note: Transformations are performed right to left.

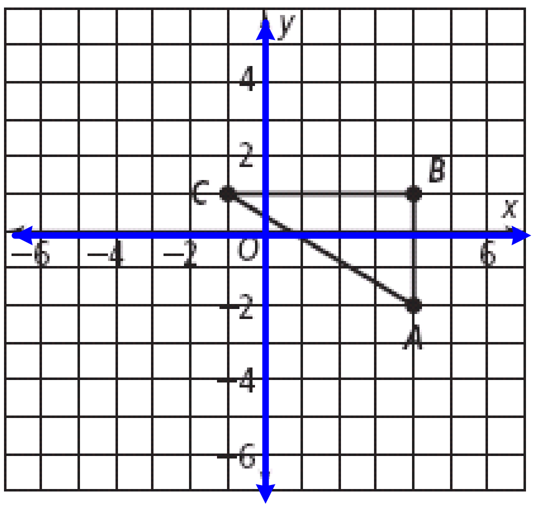


Graph the glide reflection image of △ABC.

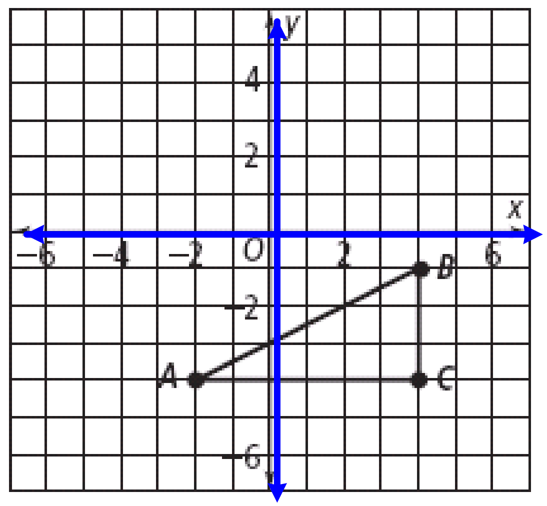
1.) $R_{x\text{-axis}} \circ T_{\langle -2,\, 0\rangle}(\triangle ABC)$



3.) $R_{y=-1} \circ T_{\langle 1,\, -1\rangle}(\triangle ABC)$



2.) $R_{y\text{-axis}} \circ T_{\langle 0,\, -3\rangle}(\triangle ABC)$



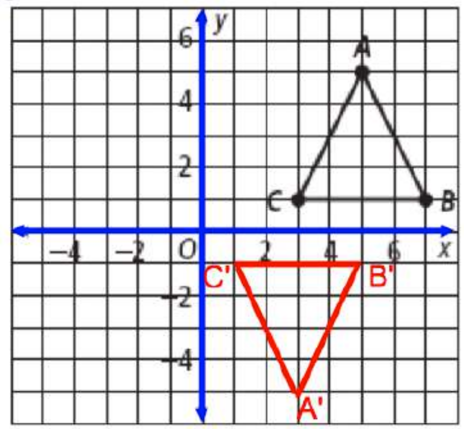
Answer

Graph the glide reflection image of △ABC.

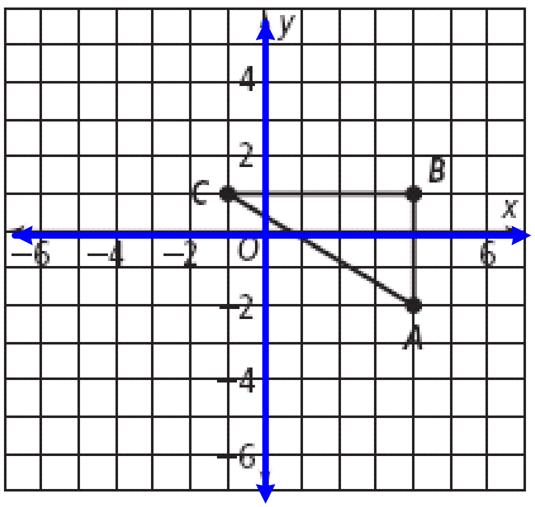
1.) $R_{x\text{-axis}} \circ T_{<-2,\, 0>}(\triangle ABC)$

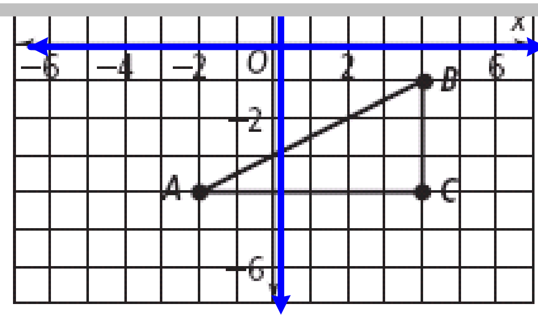
Answer

1.



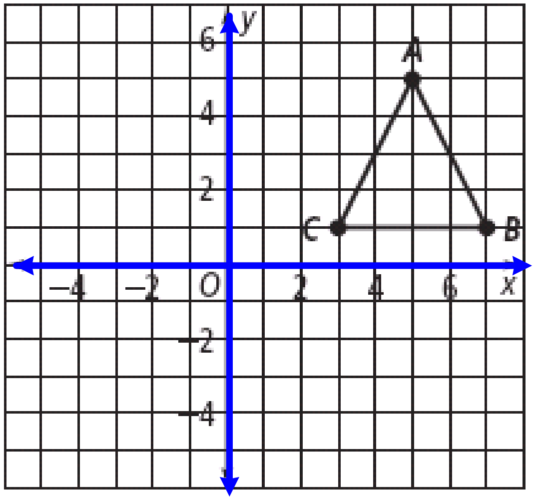
3.) $R_{y=-1} \circ T_{<1,\, -1>}(\triangle ABC)$



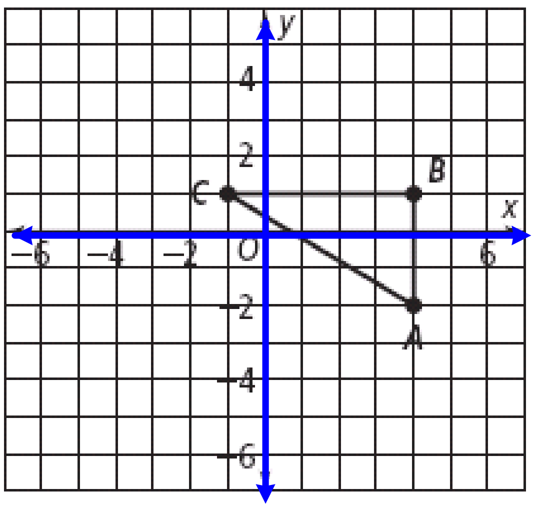


Graph the glide reflection image of △ABC.

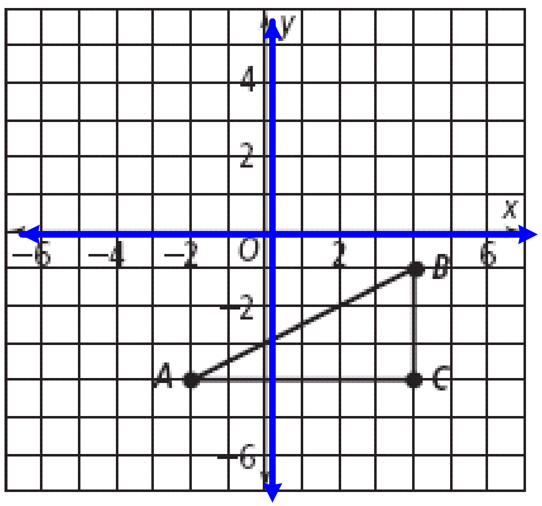
1.) $R_{x\text{-axis}} \circ T_{<-2,\ 0>}(\triangle ABC)$



3.) $R_{y=-1} \circ T_{<1,\ -1>}(\triangle ABC)$

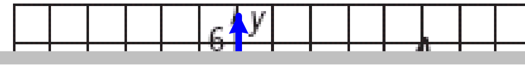


2.) $R_{y\text{-axis}} \circ T_{<0,\ -3>}(\triangle ABC)$



Answer

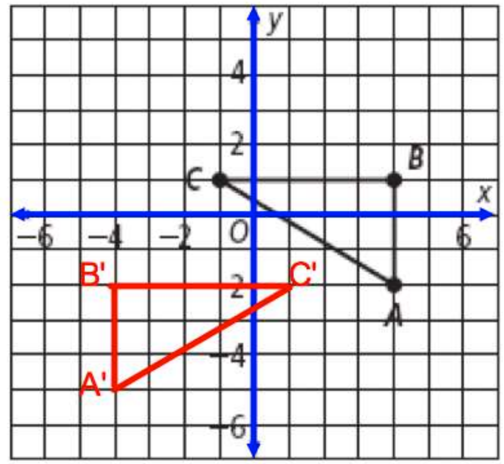
Graph the glide reflection image of △ABC.



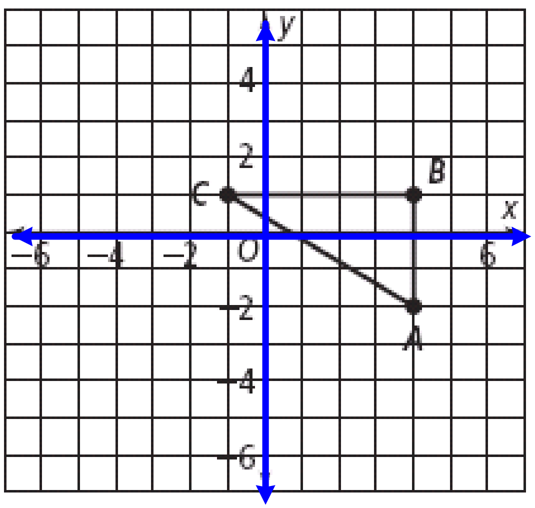
1.) $R_{x\text{-axis}} \circ T_{<-2,\, 0>} (\triangle ABC)$

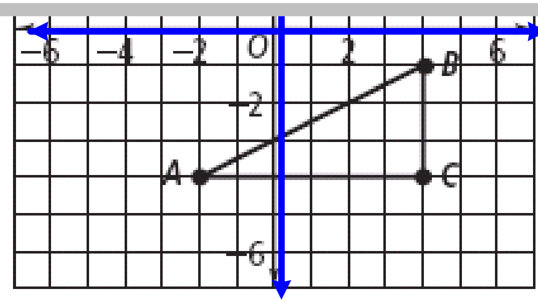
Answer

2.



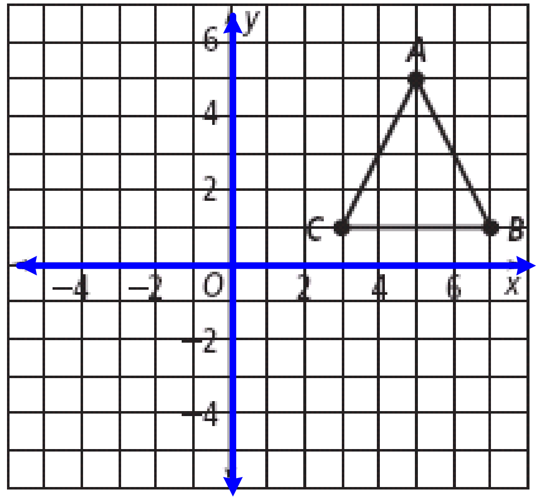
3.) $R_{y = -1} \circ T_{<1,\, -1>} (\triangle ABC)$



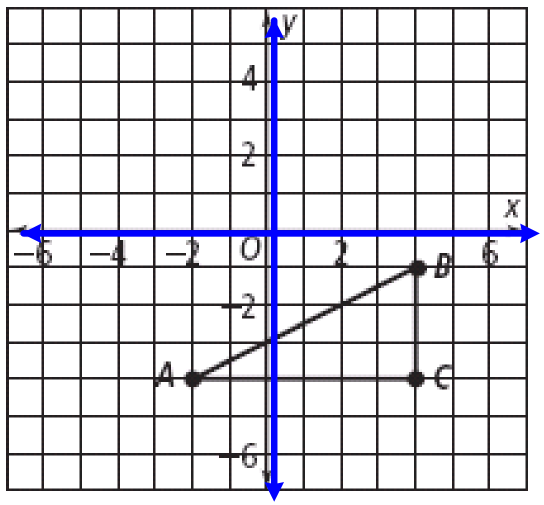


Graph the glide reflection image of △ABC.

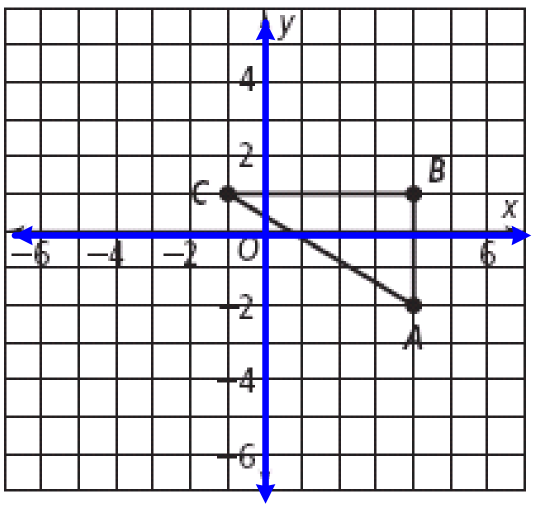
1.) $R_{x\text{-axis}} \circ T_{<-2,\,0>}(\triangle ABC)$



2.) $R_{y\text{-axis}} \circ T_{<0,\,-3>}(\triangle ABC)$



3.) $R_{y=-1} \circ T_{<1,\,-1>}(\triangle ABC)$



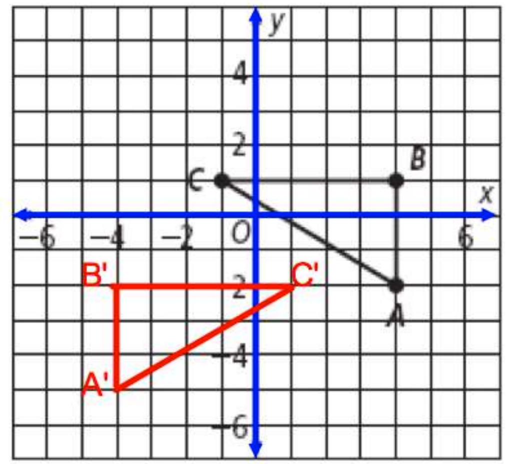
Answer

Graph the glide reflection image of $\triangle ABC$.

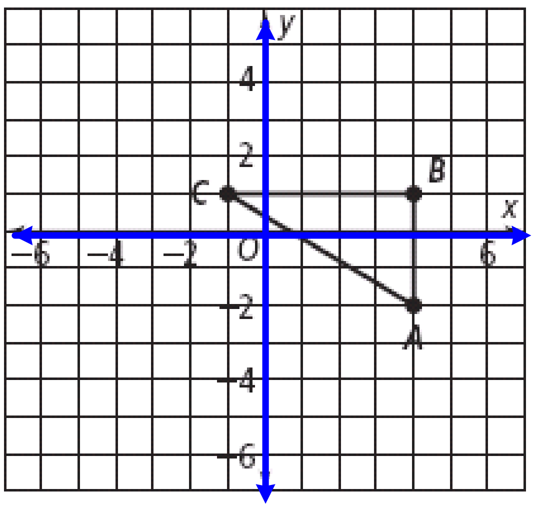
1.) $R_{x\text{-axis}} \circ T_{<-2,\,0>}(\triangle ABC)$

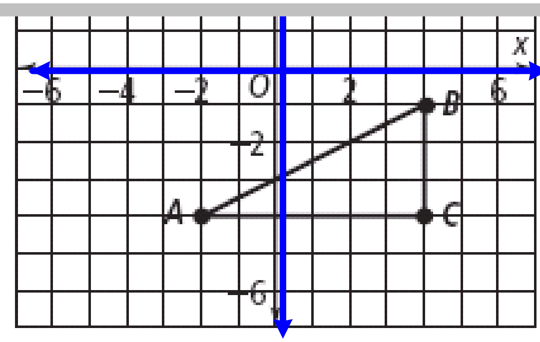
Answer

3.

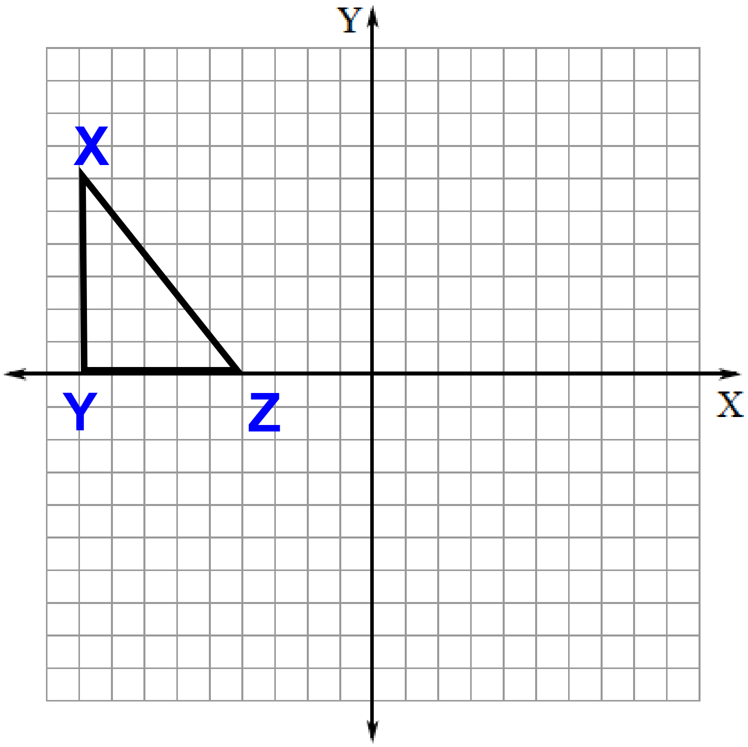


3.) $R_{y=-1} \circ T_{<1,\,-1>}(\triangle ABC)$





Composition of Reflections



Translate $\triangle XYZ$ by using a composition of reflections.
Reflect over x = -3 then over x = 4.
Label the first image $\triangle X'Y'Z'$ and the second $\triangle X''Y''Z''$.

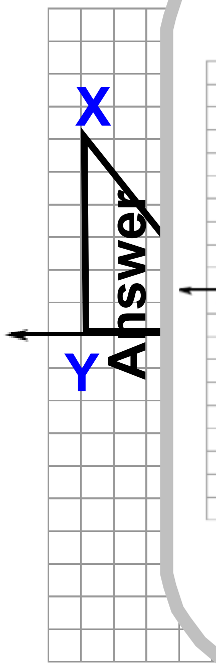
Answer

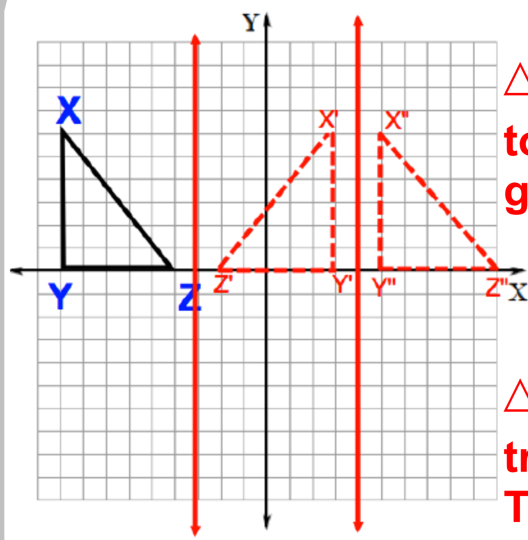
1.) What direction did $\triangle XYZ$ slide? How is this related to the lines of reflection?

2.)How far did $\triangle XYZ$ slide? How is this related to the lines of reflection?

Make a conjecture.

Composition of Reflections





△*XYZ* was translated to the right. The x's go right and left.

△*XYZ* was translated 14 units. This is twice the distance between the lines of reflection.

Z by using a reflections.

= -3 then over *x* = 4.

mage △*X'Y'Z'* and "Y"Z".

ction did △*XYZ* this related to flection?

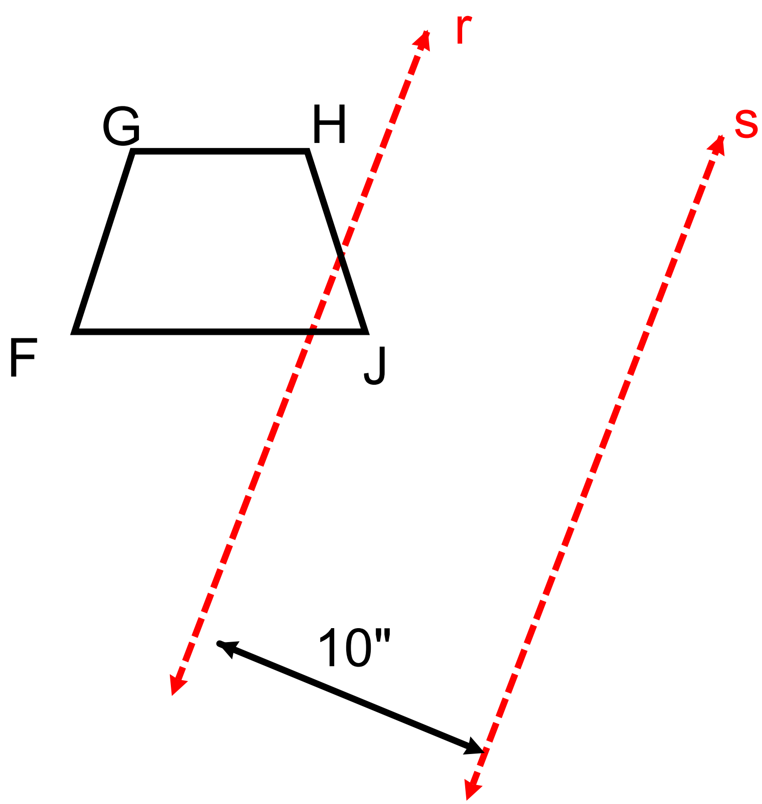
d △XYZ slide?

s related to the lines of reflection?

Make a conjecture.

35

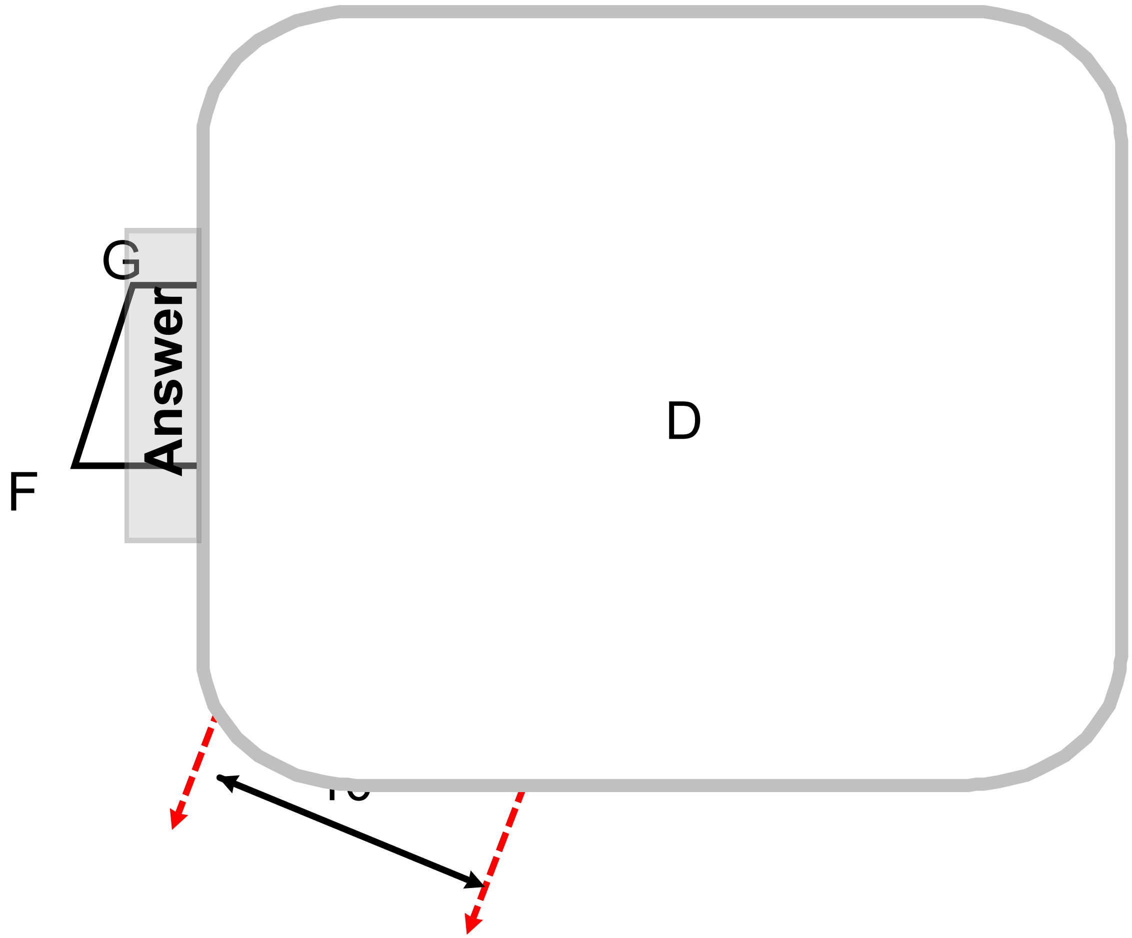
- 5"
- 10"
- 15"
- 20"



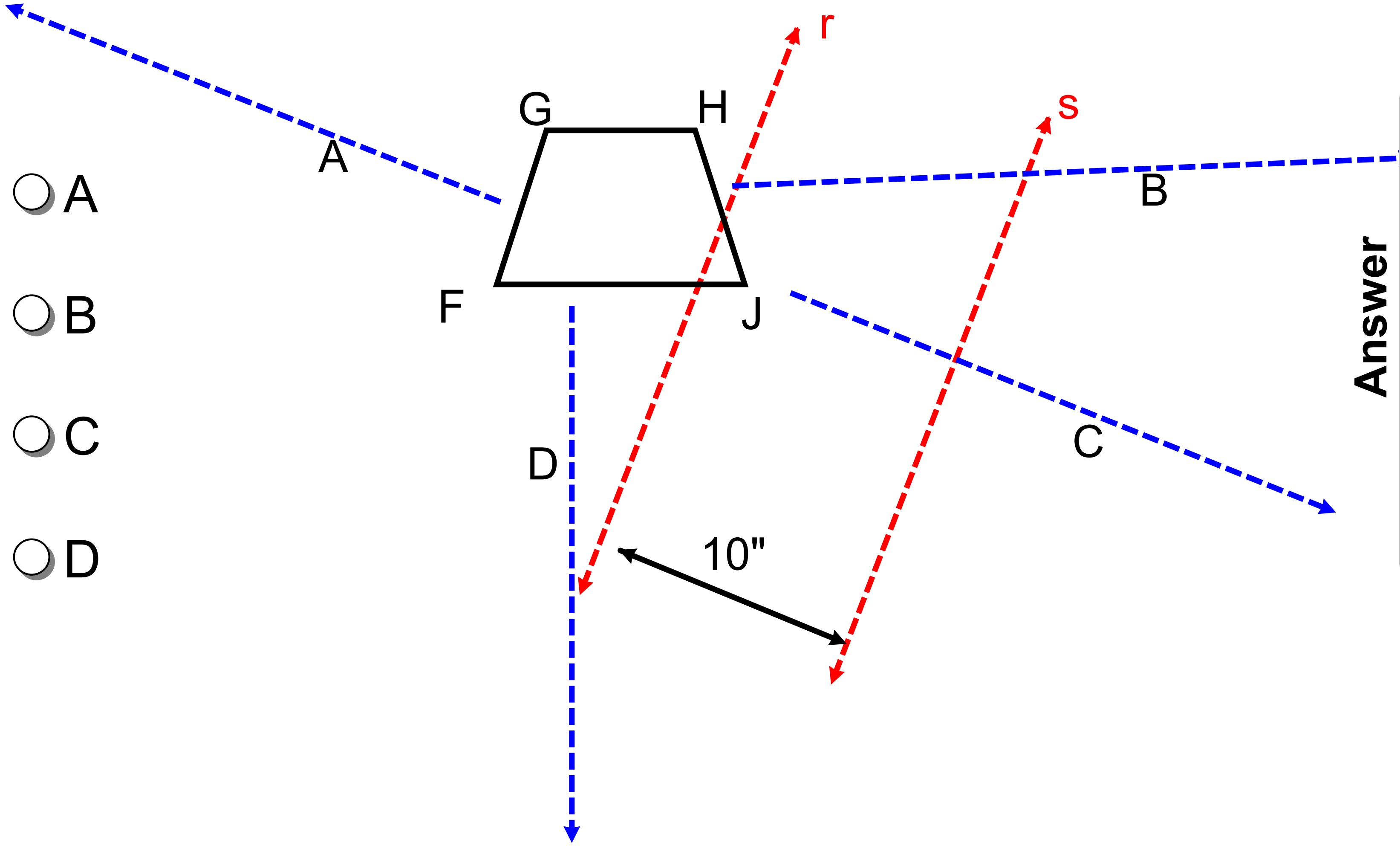
Answer

35

- 5"
- 10"
- 15"
- 20"



36



A

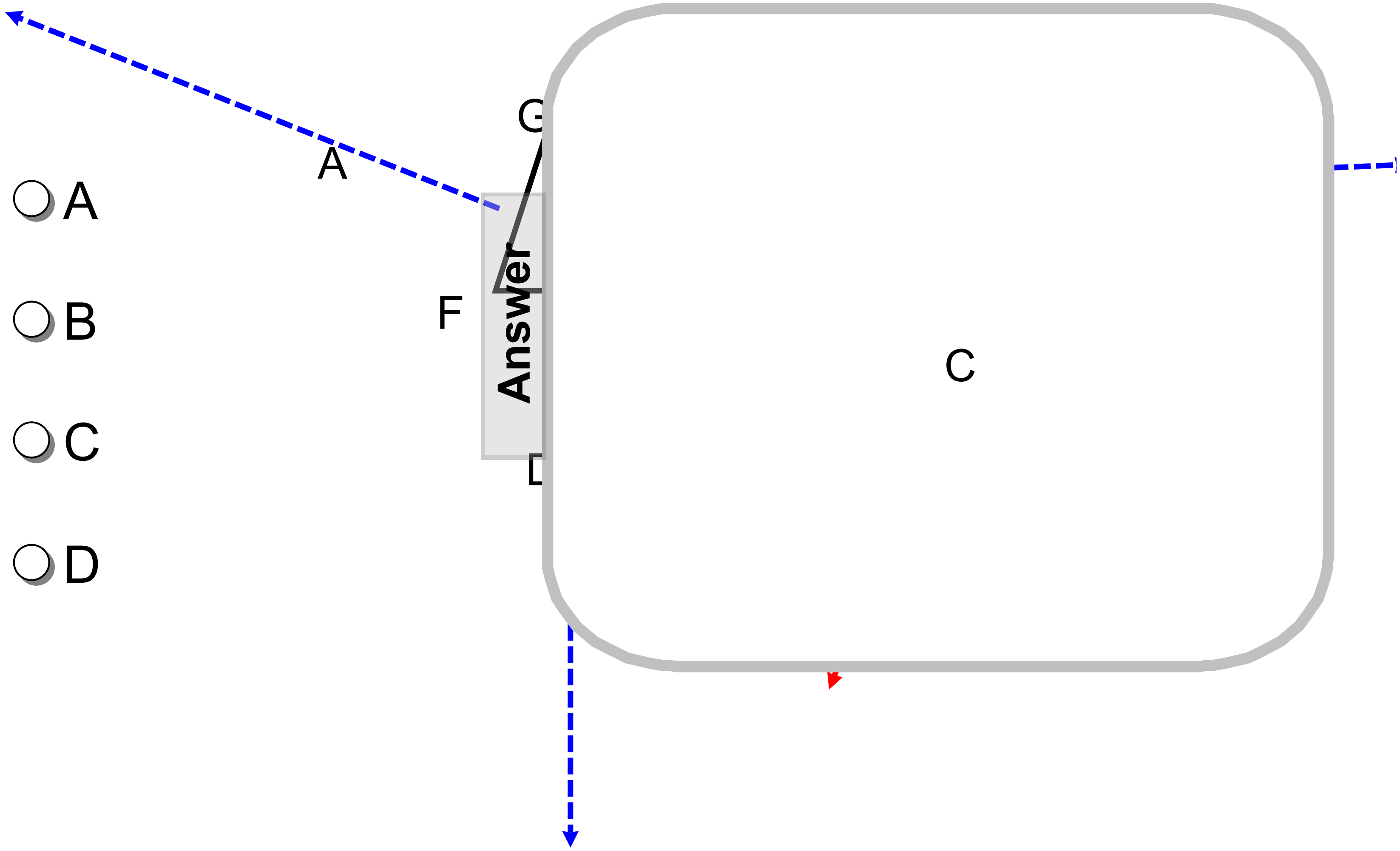
B

C

D

36

- A
- B
- C
- D



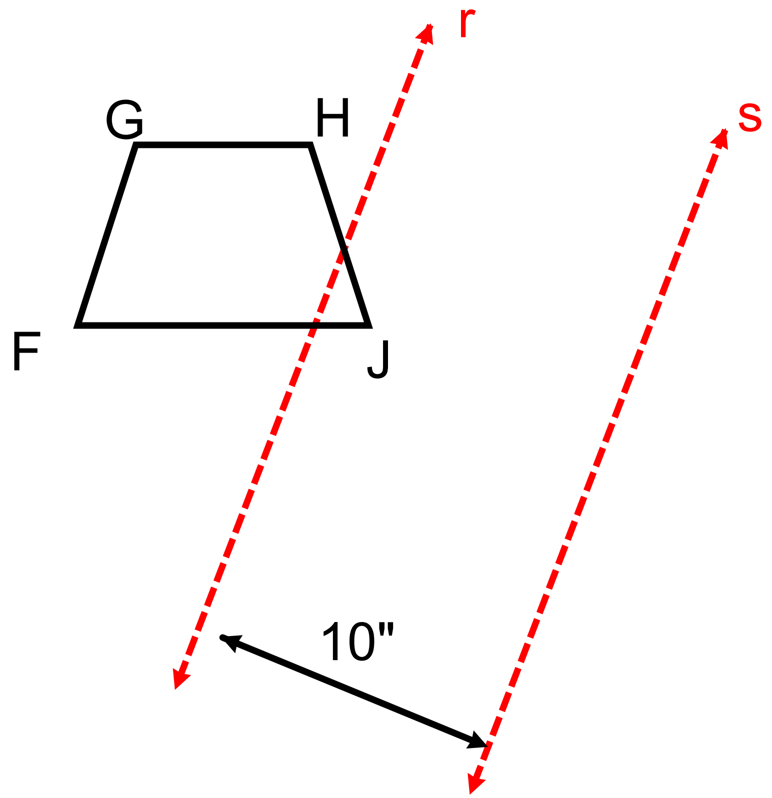
37

A. 5"

B. 10"

C. 20"

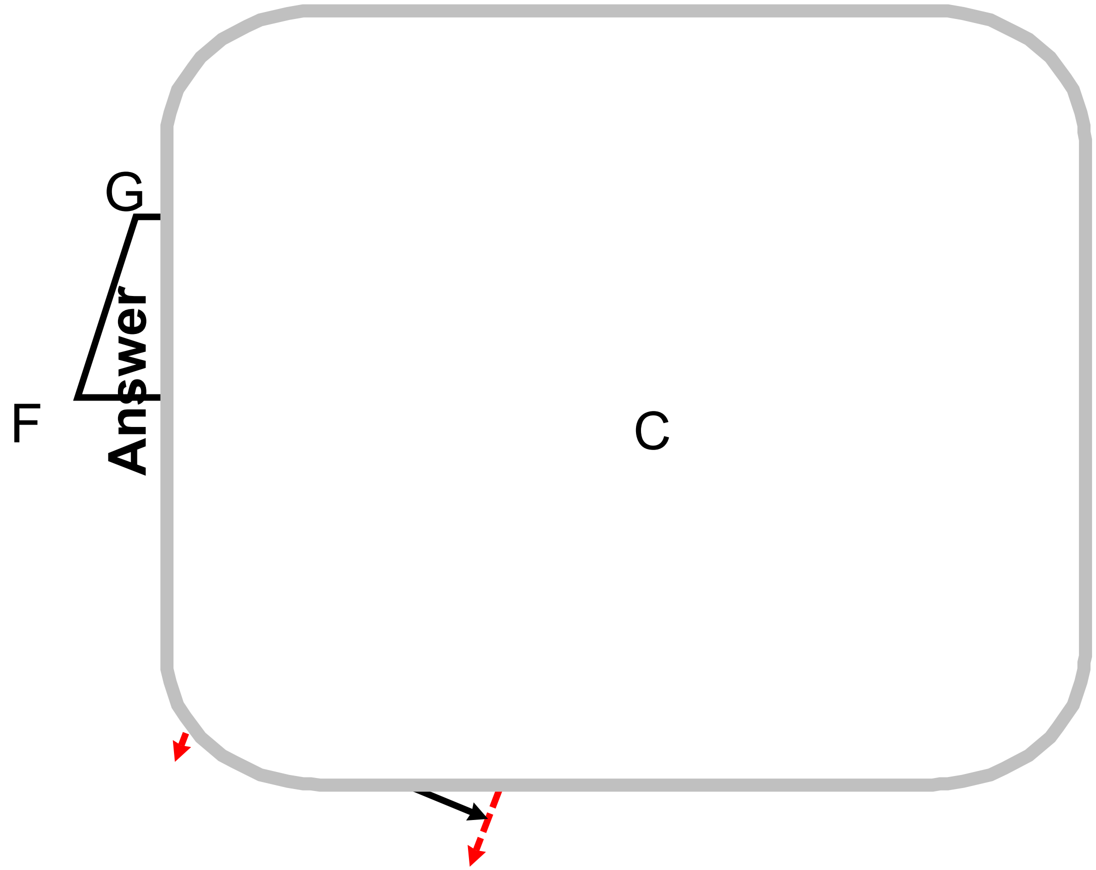
D. 30"



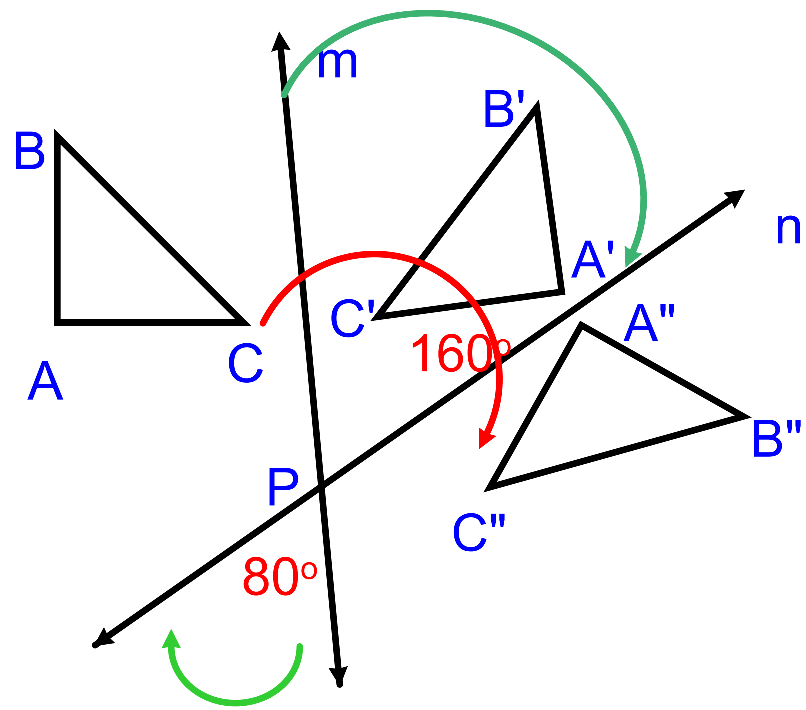
Answer

37

- 5"
- 10"
- 20"
- 30"



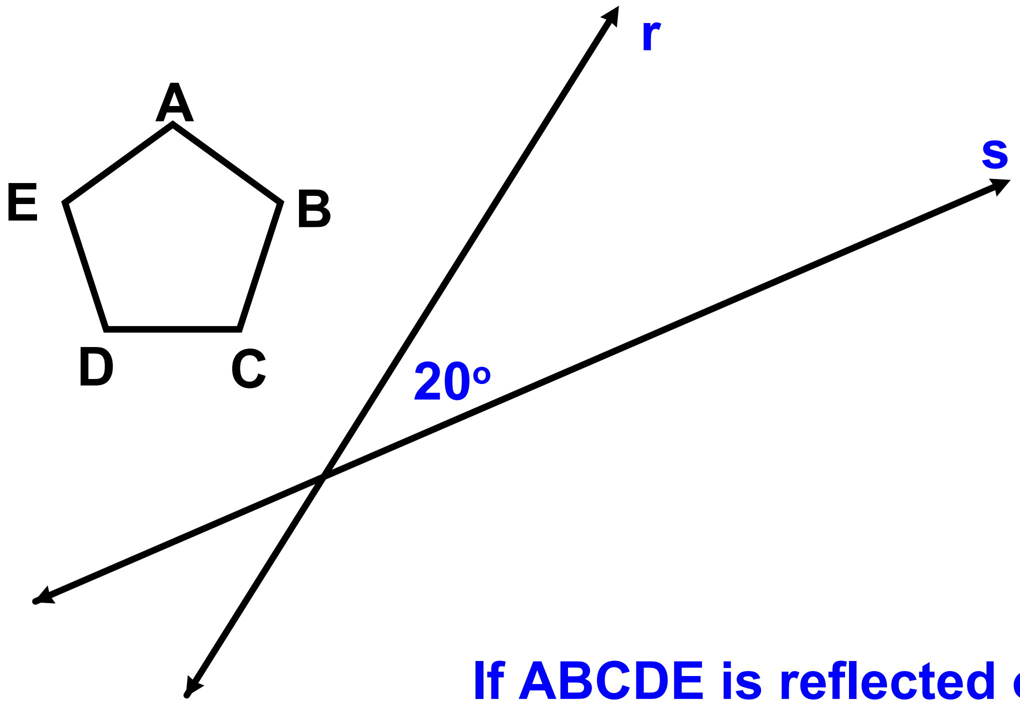
Rotations can be done as a composition of reflections over intersecting lines.



Where the lines of reflection intersect, P, is center of rotation.

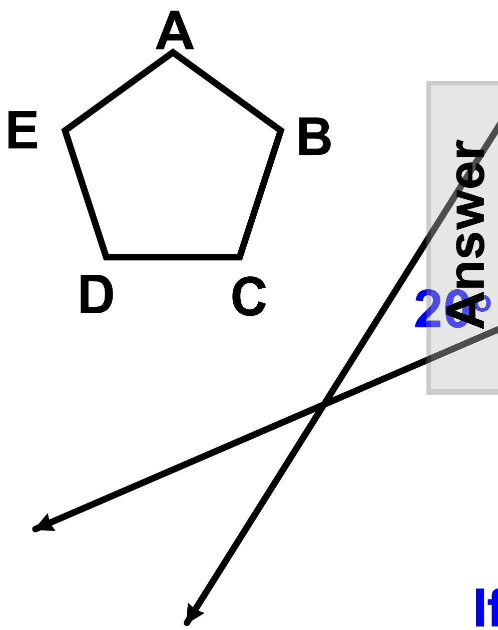
The amount of rotation is twice the acute,or right, angle formed by the lines of reflection.

The direction of rotation is clockwise because rotating from m to n across the acute angle is clockwise. Had the triangle reflected over n then m, the rotation would have been counterclockwise.



If ABCDE is reflected over r then s:
What is the angle of rotation?
What is the direction of the rotation?

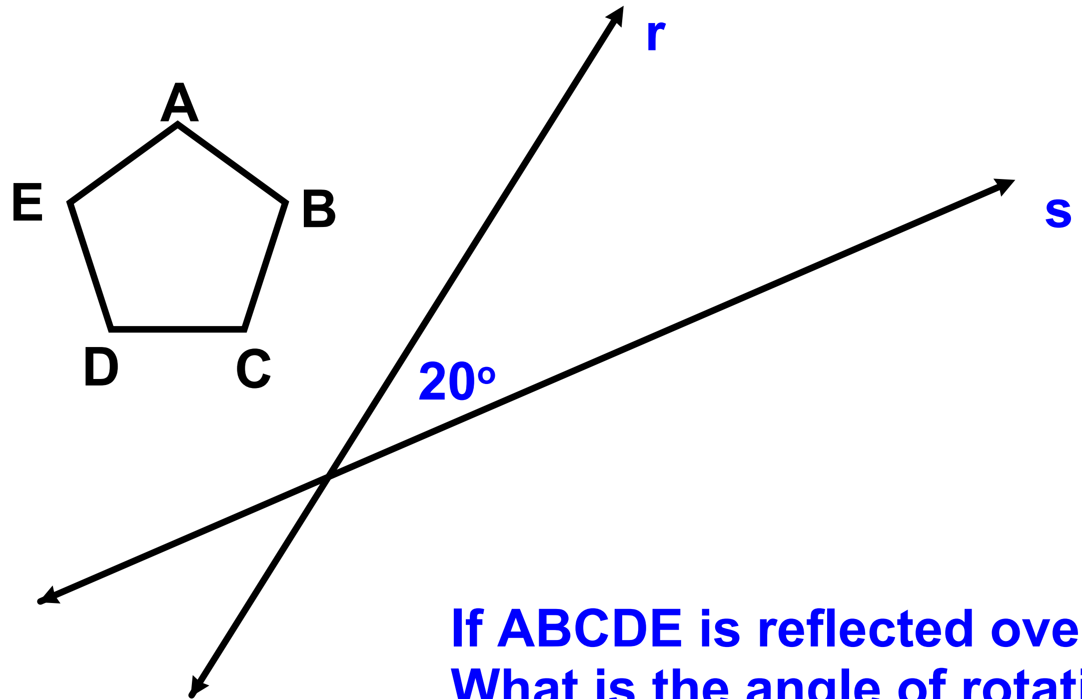
Answer



Answer

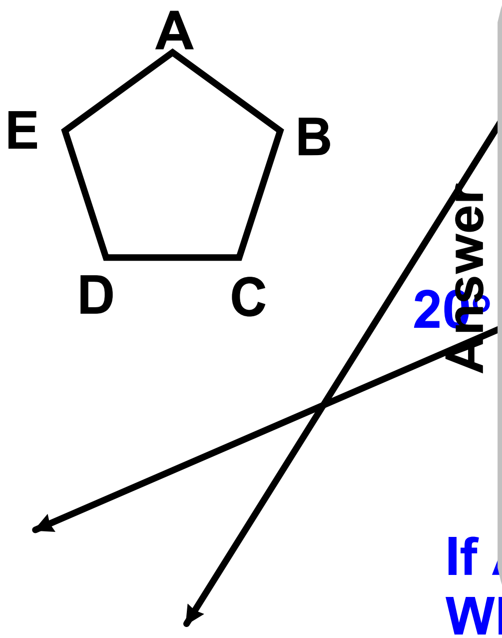
40 degrees clockwise

If A
What is the angle of rotation?
What is the direction of the rotation?



If ABCDE is reflected over s then r:
What is the angle of rotation?
What is the direction of the rotation?

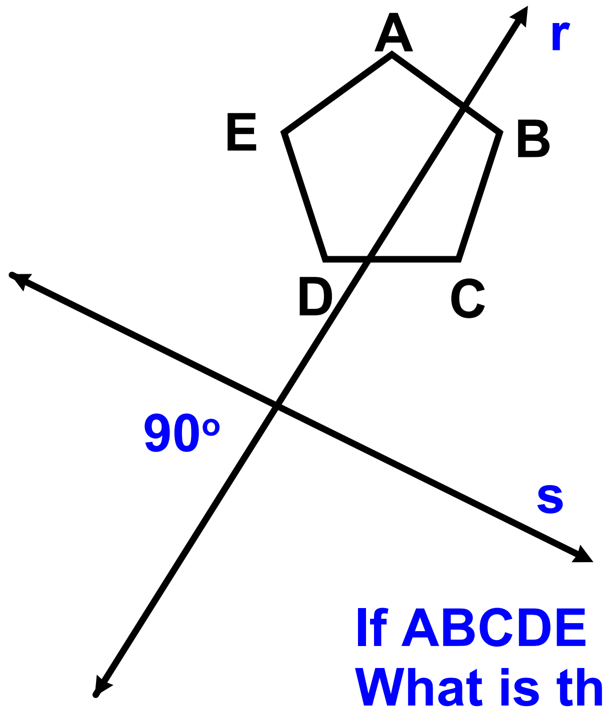
Answer



Answer

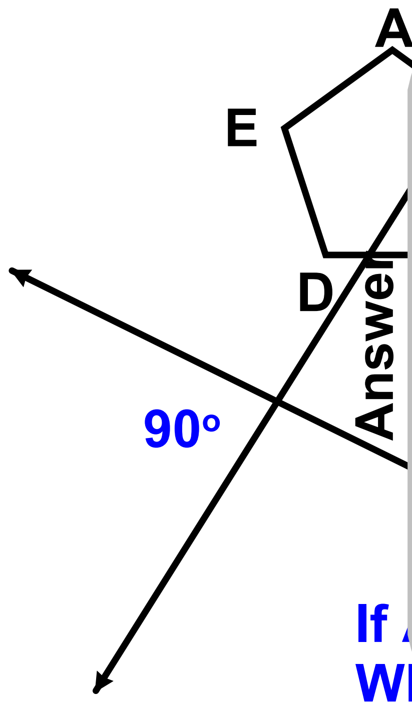
40 degrees
counterclockwise

If
Wh
What is the direction of the
rotation?



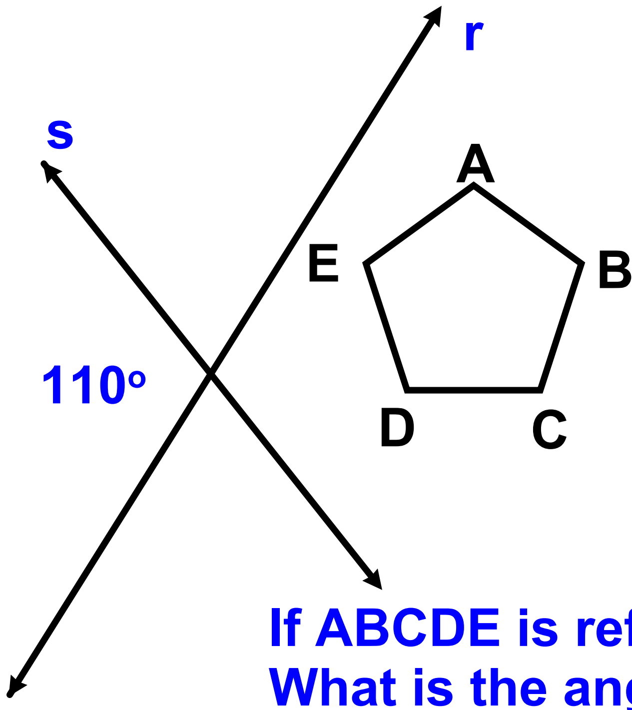
If ABCDE is reflected over s then r:
What is the angle of rotation?
What is the direction of the rotation?

Answer



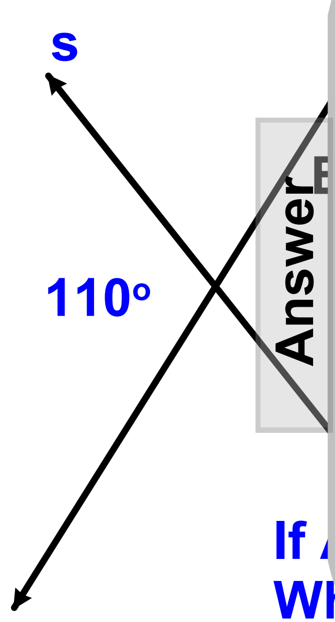
180 degrees
counterclockwise

If ...
Wh...
What is the direction of the
rotation?



If ABCDE is reflected over s then r:
What is the angle of rotation?
What is the direction of the rotation?

Answer

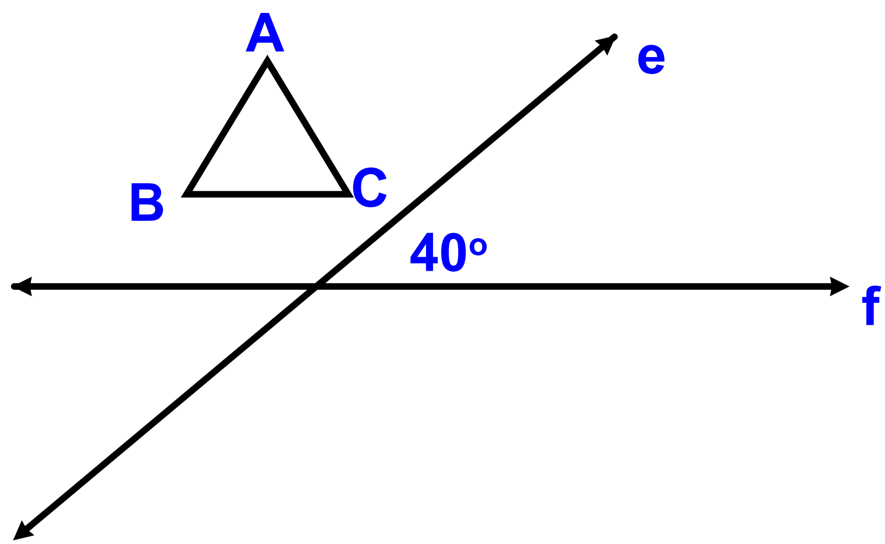


140 degrees
clockwise

If A
Wh
What is
rotation?

38 If the image of $\triangle ABC$ is the composite of reflections over e then f, what is the angle of rotation?

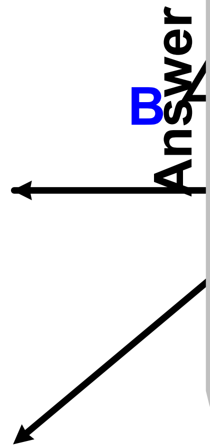
- 40°
- 80°
- 160°
- 280°



Answer

38 If the image of $\triangle ABC$ is the composite of reflections over e then f, what is the angle

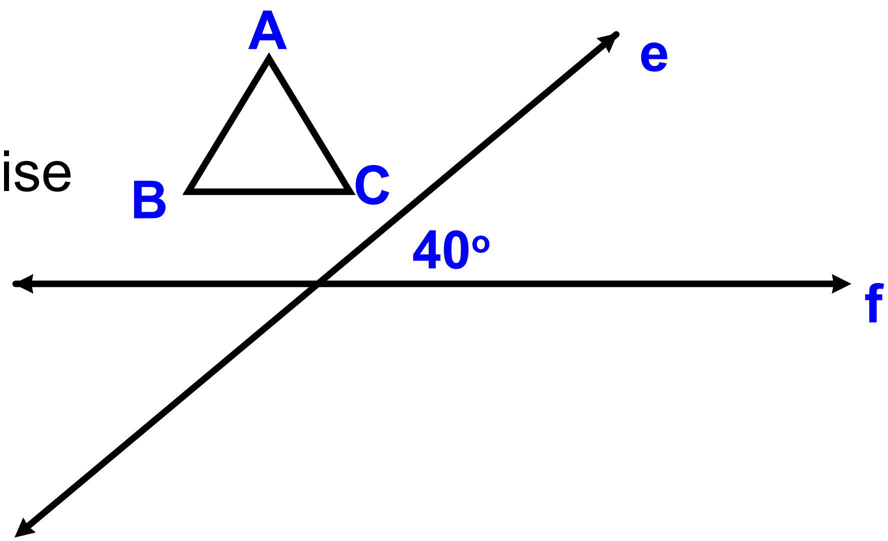
- A 40°
- B 80°
- C 160°
- D 280°



B

39 What is the direction of the rotation if the image of $\triangle ABC$ is the composite of reflections first over e then f?

- Clockwise
- Counterclockwise



Answer

39 What is the direction of the rotation if the image of $\triangle ABC$ is the composite of reflecti

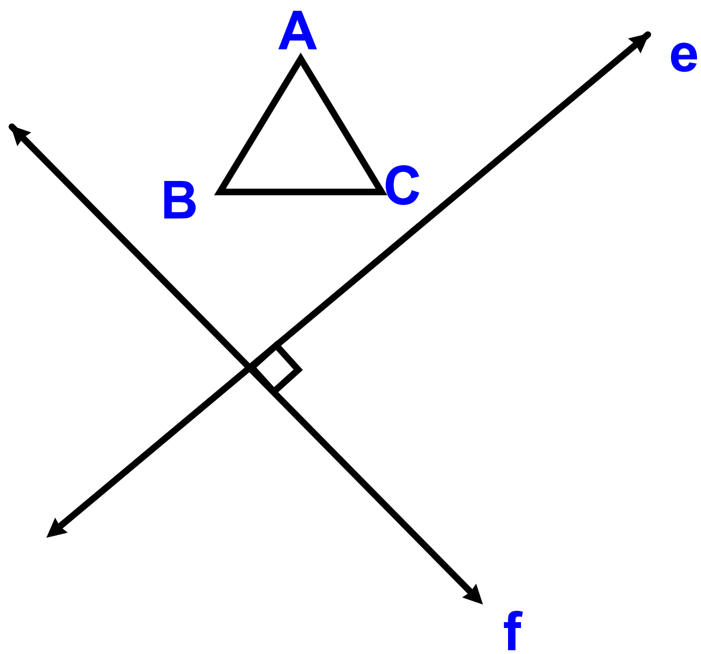
- Clockwise
- Counterclockwise

Answer

A

40 If the image of $\triangle$ABC is the composite of reflections over f then e, what is the angle of rotation?

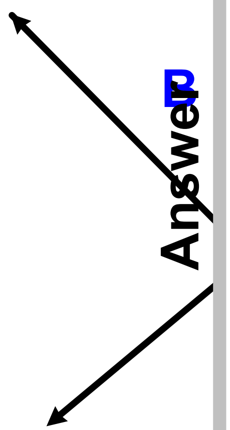
- 90°
- 180°
- 270°
- 360°



Answer

40 If the image of $\triangle$ABC is the composite of reflections over f then e, what is the angle

- 90°
- 180°
- 270°
- 360°

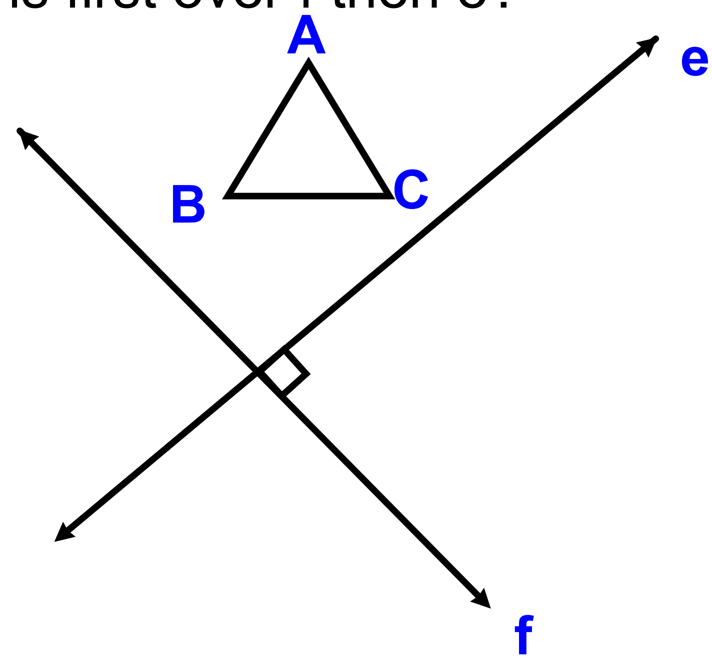


Answer

B

B

41 What is the direction of rotation if the image of $\triangle ABC$ is the composite of reflections first over f then e?



- Clockwise
- Counterclockwise

Answer

41 What is the direction of rotation if the image of $\triangle$ABC is the composite of reflections f

A Clockwise

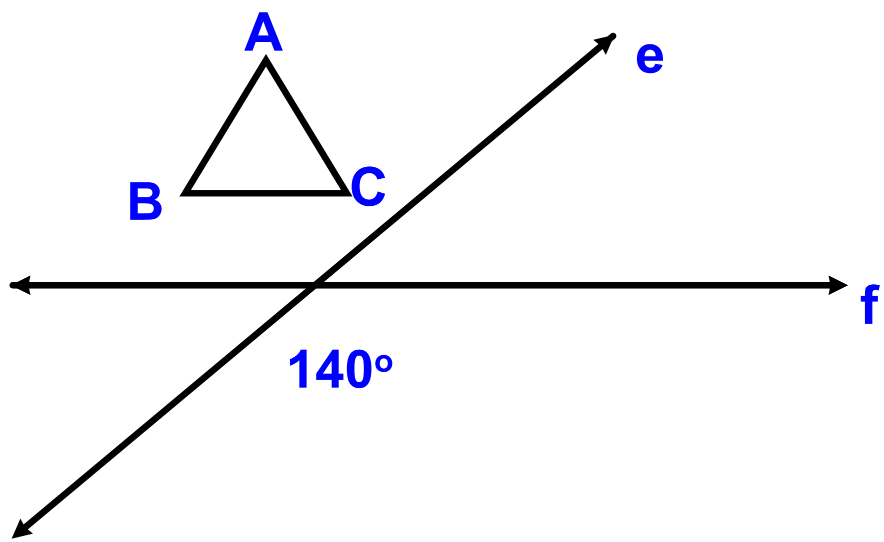
B Counterclockwise

Answer

B

42 If the image of $\triangle ABC$ is the composite of reflections over e then f, what is the angle of rotation?

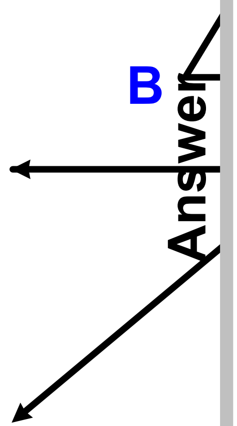
- A 40°
- B 80°
- C 140°
- D 160°



Answer

42 If the image of $\triangle ABC$ is the composite of reflections over e then f, what is the angle of

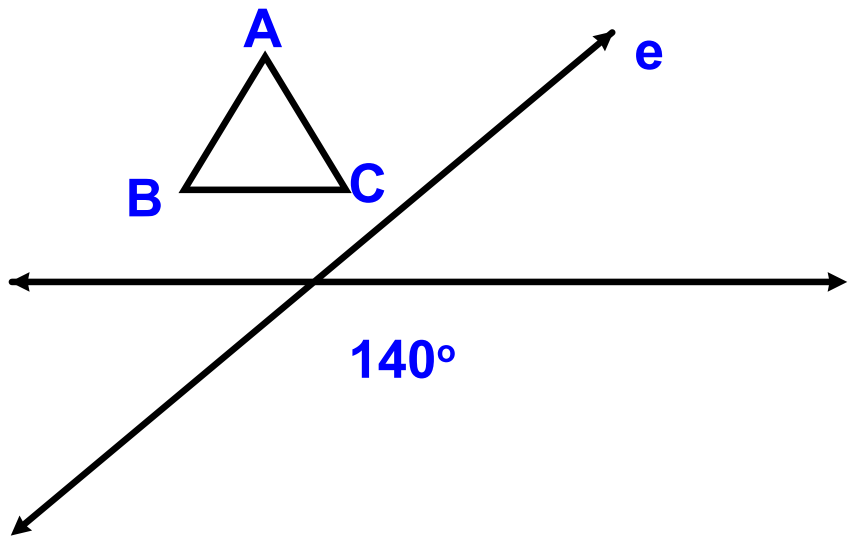
- A 40°
- B 80°
- C 140°
- D 160°



B

43 What is the direction of the rotation if the image of $\triangle ABC$ is the composite of reflections first over e then f?

- Clockwise
- Counterclockwise



Answer

43 What is the direction of the rotation if the image of $\triangle ABC$ is the composite of reflectio

- Clockwise
- Counterclockwise

Answer

A

Congruence Transformations

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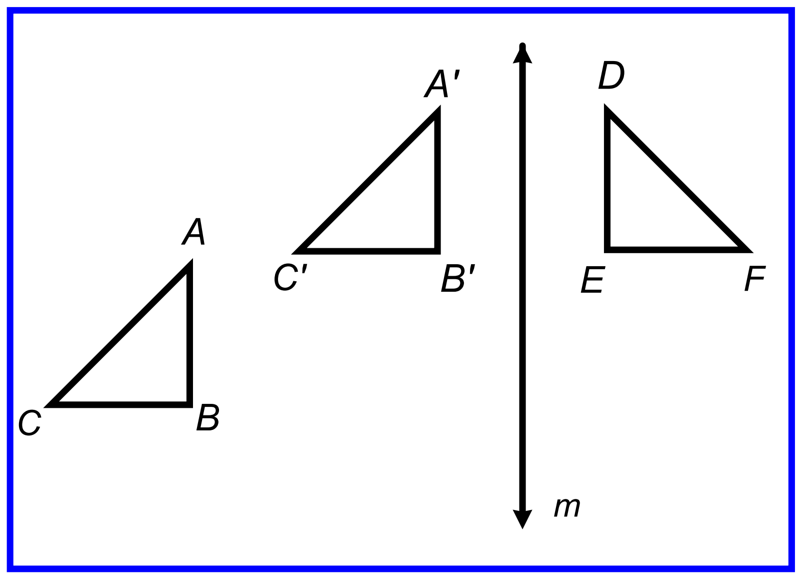
Congruent Figures

Two figures are congruent if and only if there is a sequence of one or more rigid motions that maps one figure onto another.

The composition $R_m \circ T_{<2, 3>}(\triangle ABC) = (\triangle DEF)$

Since compositions of rigid motions preserve angle measures and distances the corresponding sides and angles have equal measures.

Fill in the blanks below.



$\overline{AB}$ = _____

$\overline{BC}$ = _____

$\overline{AC}$ = _____

m#A = m# ____

m#B = m# ____

m#C = m# ____

Answer

Congruent Figures

nd only if there is a sequence of one
s one figure onto another.

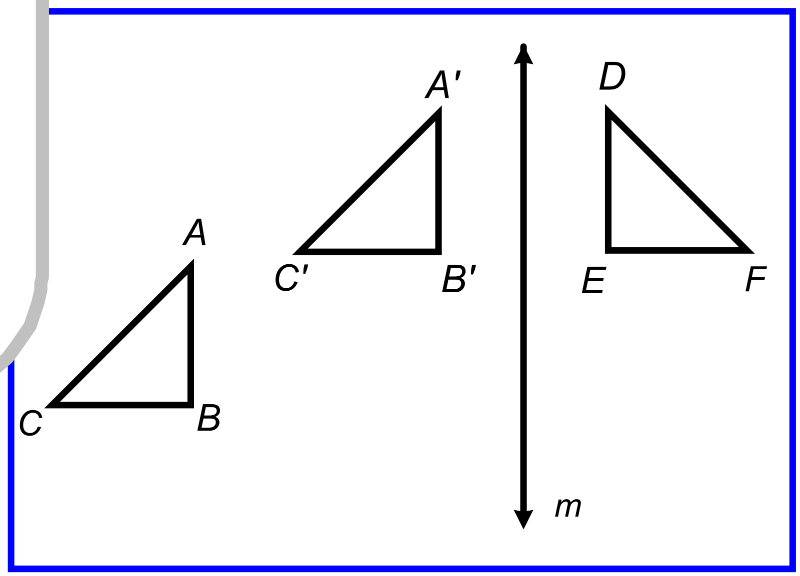
$_{<2, 3>}(\triangle ABC) = (\triangle DEF)$

$\overline{AB}$ = $\overline{DE}$

$\overline{BC}$ = $\overline{EF}$

$\overline{AC}$ = $\overline{DF}$

m# A = m# D
m# B = m# E
m# C = m# F



$\overline{AC}$ = _____

m# A = m# ____

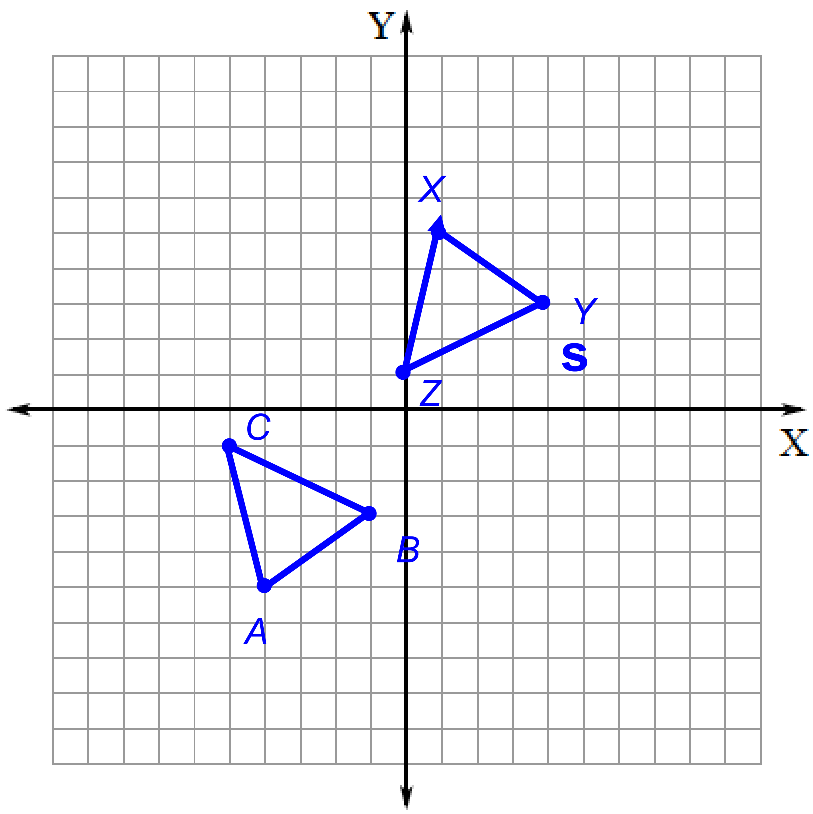
m# B = m# ____

m# C = m# ____

Identifying Congruence Transformations

Because compositions of rigid motions take figures to congruent figures, they are also called congruence transformations.

What is the congruence transformation that maps $\triangle XYZ$ to $\triangle ABC$?



Answer

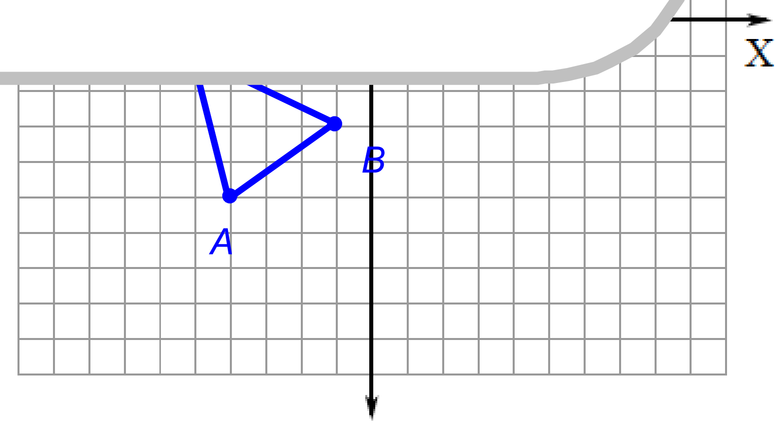
Identifying Congruence Transformations

Because compositions ... t
figures, they are also ca...

Answer

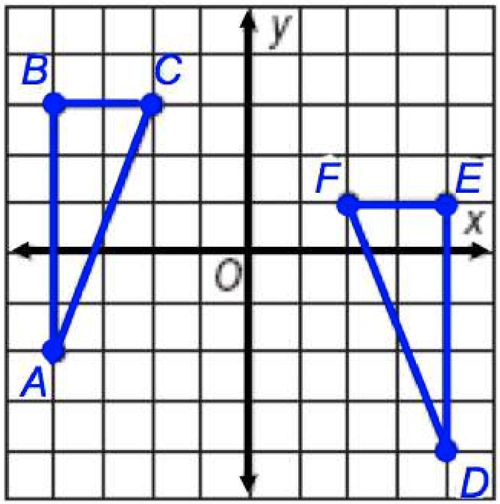
$R_{x\text{-}axis}$ o $T_{<-5,\ 0>}$ ($\triangle$ *XYZ*) =
$\triangle$ *ABC*

What is the congruence
transformation that
maps $\triangle XYZ$ to $\triangle ABC$?

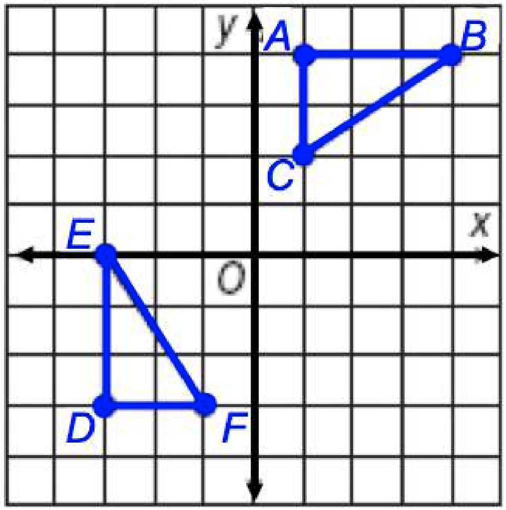


Use congruence transformations to verify that $\triangle ABC$ # $\triangle DEF$.

1.



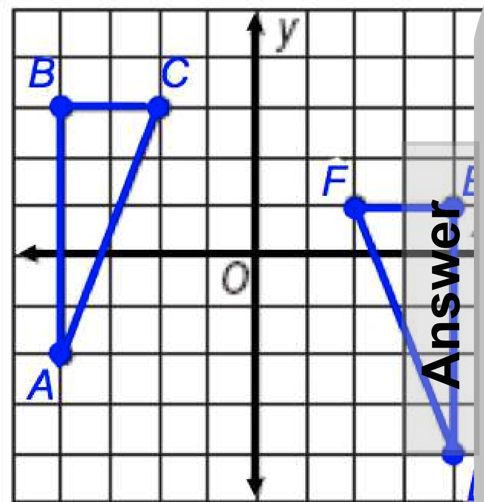
2.



Answer

Use congruence transformations to verify that $\triangle ABC$ # $\triangle DEF$.

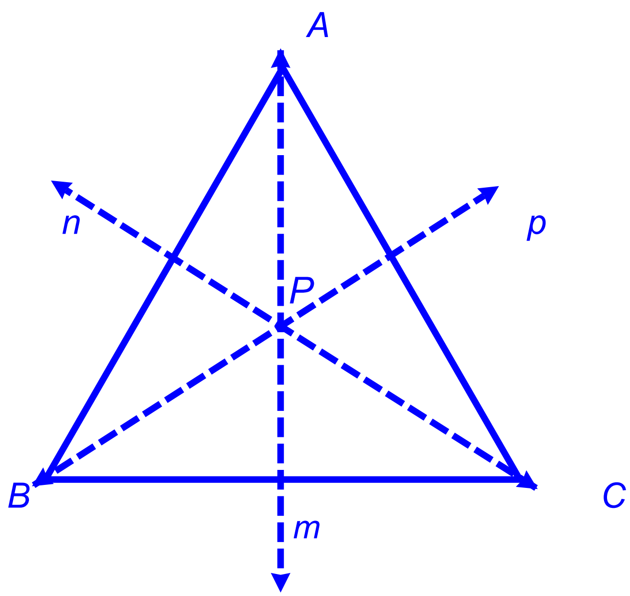
1.



1. $R_{y\text{-axis}}$ o $T_{<0, -2>}$ $(\triangle ABC) = \triangle DEF$

2. $T_{<1, -4>}$ o $r_{(270, O)}$ $(\triangle ABC) = \triangle DEF$

To show that $\triangle ABC$ is an equilateral triangle, what congruence transformation can you use that maps the triangle onto itself? Explain.

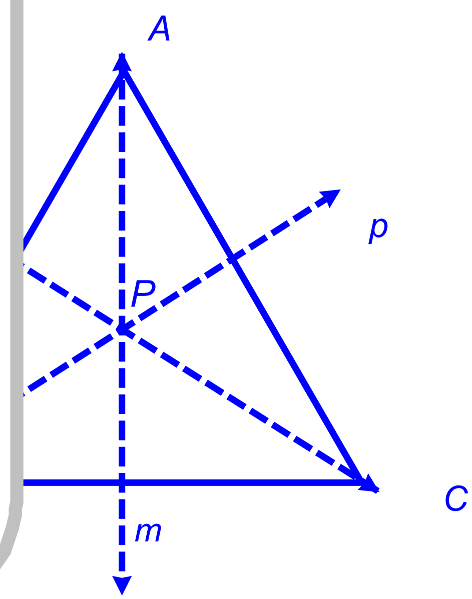


Answer

To show that $\triangle ABC$ is an equilateral triangle, what congruence

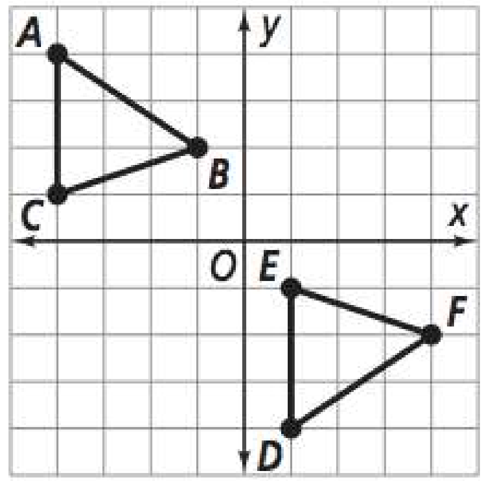
use that maps the triangle onto itself?

$r_{(60°, P)}(\triangle ABC)$ or $R_m(\triangle ABC)$



44 Which congruent transformation maps ΔABC to ΔDEF?

- A $T_{<-5,5>}$
- B $r_{<180°,O>}$
- C $R_{x-axis} \circ T_{<5,0>}$
- D $R_{y-axis} \circ r_{<90°,O>}$



Answer

44 Which congruent transformation maps $\triangle ABC$ to $\triangle DEF$?

- A $T_{<-5,5>}$
- B $r_{<180°,O>}$
- C $R_{x-axis} \circ T_{<5,0>}$
- D $R_{y-axis} \circ r_{<90°,O>}$

Answer

C

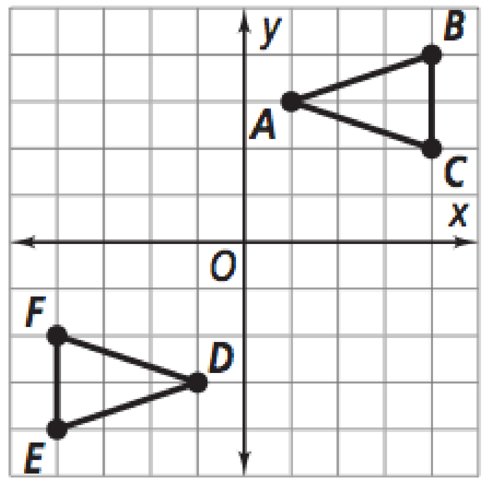
45 Which congruence transformation does not map ΔABC to ΔDEF?

A $r_{(180°,O)}$

B $T_{<0,6>} \circ R_{y-axis}$

C $R_{x-axis} \circ R_{y-axis}$

D $R_{y-axis} \circ R_{x-axis}$



Answer

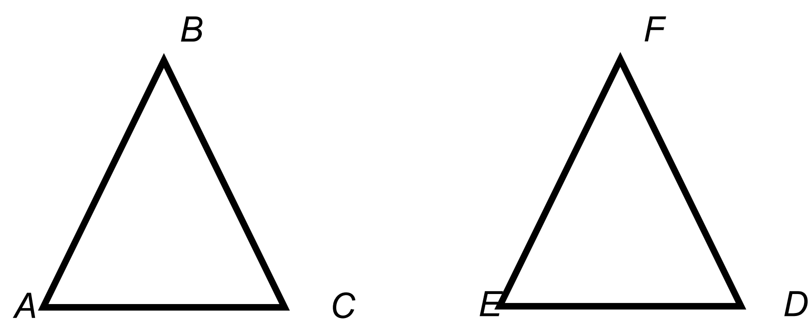
45 Which congruence transformation does not map Δ ABC to ΔDEF?

- A $r_{(180°,O)}$
- B $T_{<0,6>} \circ R_{y-axis}$
- C $R_{x-axis} \circ R_{y-axis}$
- D $R_{y-axis} \circ R_{x-axis}$

Answer

B

46 Which of the following best describe a congruence transformation that maps ΔABC to ΔDEF?



- a reflection only
- a translation only
- a translation followed by a reflection
- a translation followed by a rotation

Answer

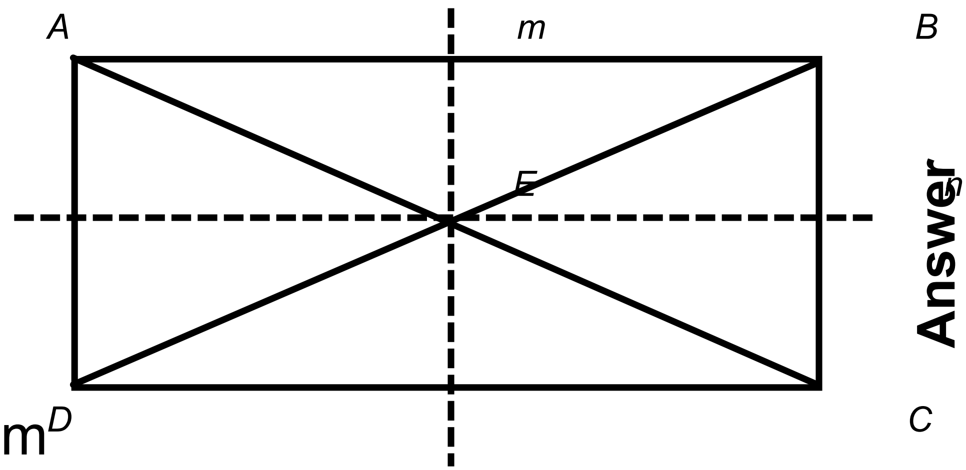
46 Which of the following best describe a congruence transformation that maps ΔABC to ΔDEF?

- a reflection only
- a translation only
- a translation follow
- a translation followe

Answer

D

47 Quadrilateral ABCD is shown below. Which of the following transformations of ΔAEB could be used to show that ΔAEB is congruent to ΔDEC?



- a reflection over $\overline{DB}$
- a reflection over $\overline{AC}$
- a reflection over line m
- a reflection over line n

Answer

47 Quadrilateral ABCD is shown below. Which of the following transformations of ΔAEB ... is congruent to ΔDEC?

- a reflection over DB
- a reflection over AC
- a reflection over line
- a reflection over line

Answer

D

B

n

C

Dilations

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Contents

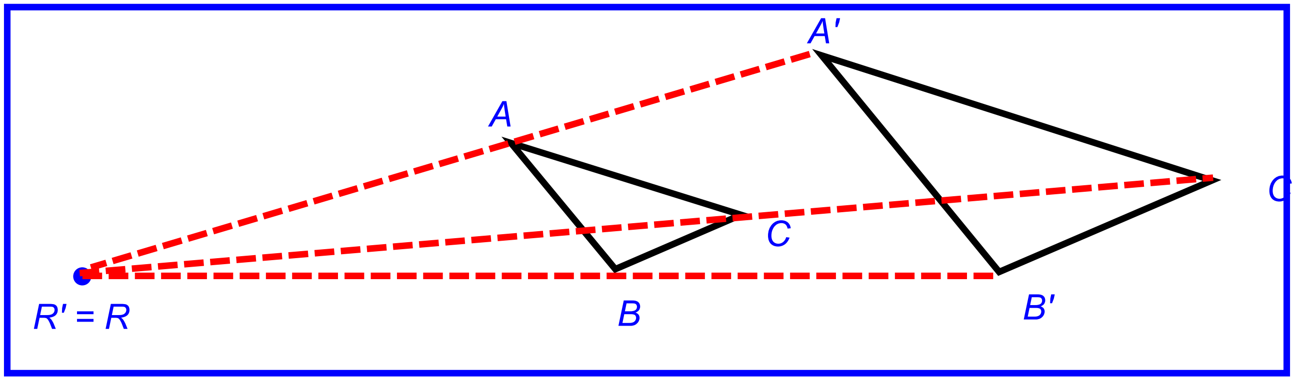
A dilation is a transformation whose pre image and image are similar. Thus, a dilation is a similarity transformation. It is *not*, in general, a rigid motion.

Pupil

Dilated Pupil

Every dilation has a center and a scale factor *n*, *n* > 0. The scale factor describes the size change from the original figure to the image.

A dilation with center *R* and scale factor *n, n > 0,* is a transformation with the following properties:



- The image of *R* is itself (R' = R)

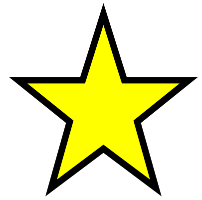
- For any other point *B*, *B'* is on $\overrightarrow{RB}$

- $RB' = n \bullet RB$ or $n = \dfrac{RB'}{RB}$

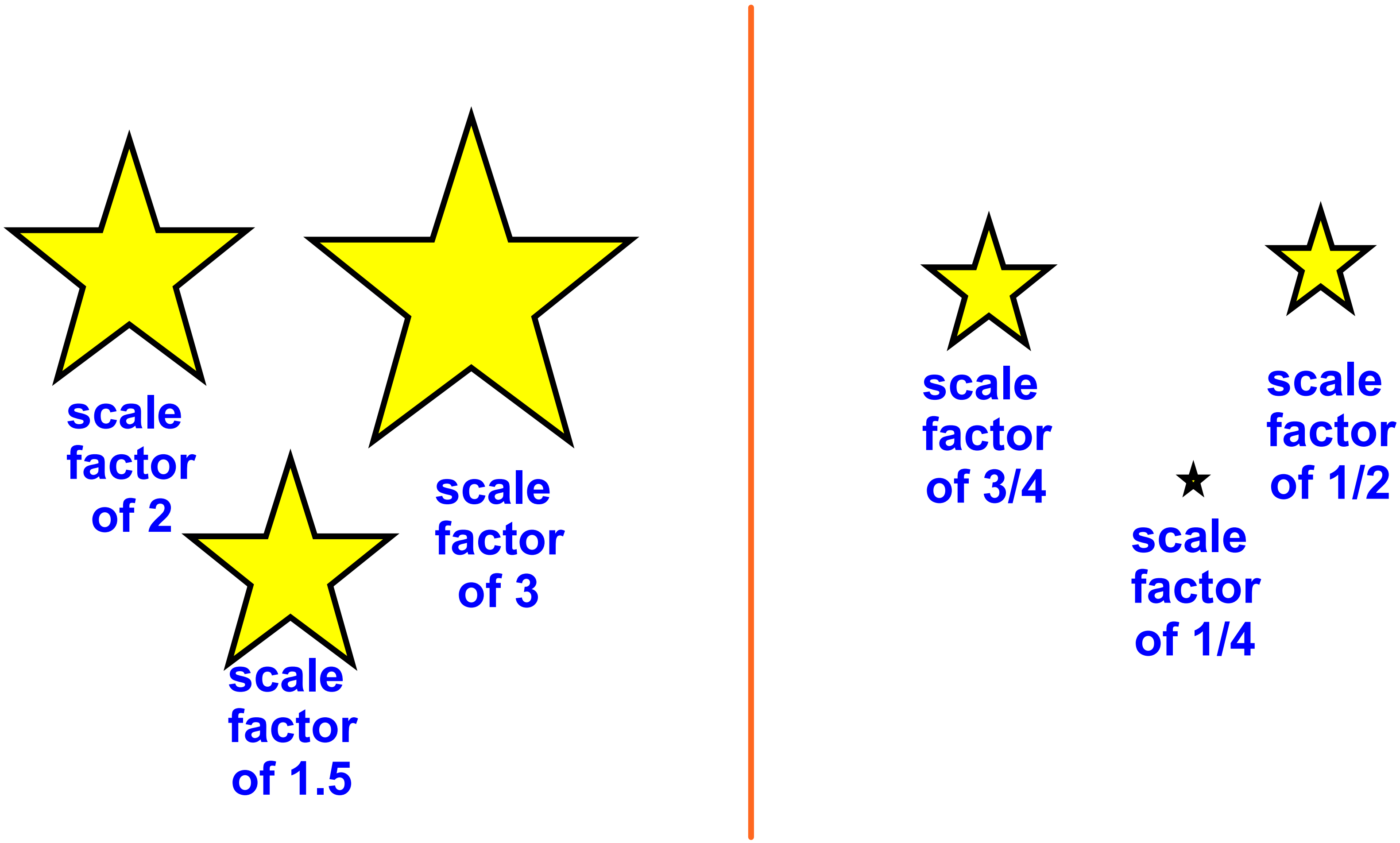
- $\triangle ABC \sim \triangle A'B'C'$

There are 2 types of dilations.

A dilation is an enlargement if the scale factor is greater than 1.



A dilation is a reduction if the scale factor is less than one, but greater than 0.



The symbol for scale factor is *n*.

A dilation is an enlargement if $n > 1$.

A dilation is a reduction if $0 < n < 1$.

What happens to a figure if $n = 1$?

Answer

The sym

A dilatio

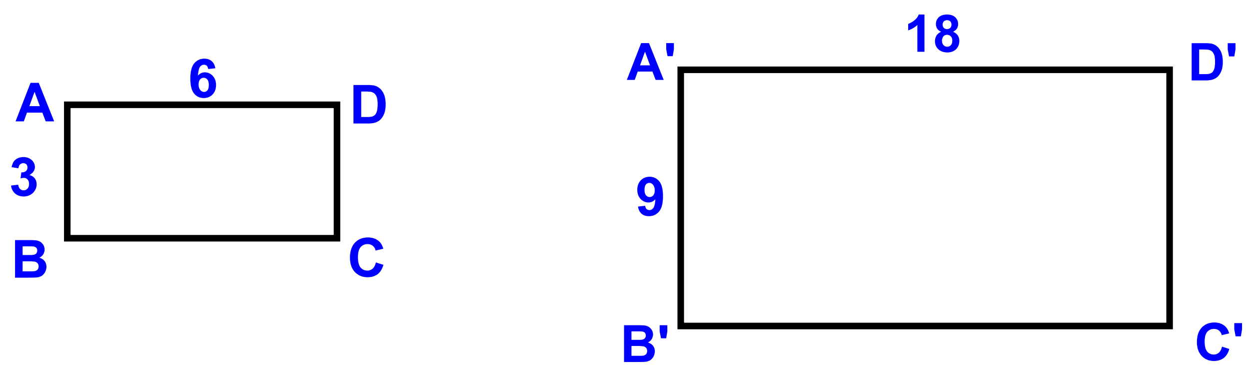
A dilatio

What ha

Answer

The dilation is the same size, which means the figures are congruent.

Finding the Scale Factor



Answer

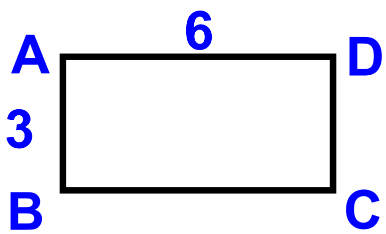
- The ratio of corresponding sides is

$\frac{\text{image}}{\text{preimage}}$ = ______

which is the scale factor (*n*) of the dilation.

- Corresponding angles are congruent.

Finding the Scale Factor



Answer

18/6 = 3

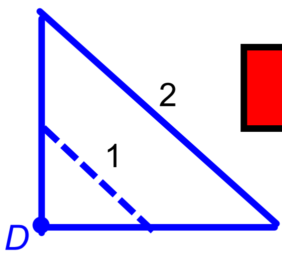
- The ratio of co

$$\frac{\text{image}}{\text{preimage}} = \underline{\qquad\qquad}$$

which is the scale factor (*n*) of the dilation.

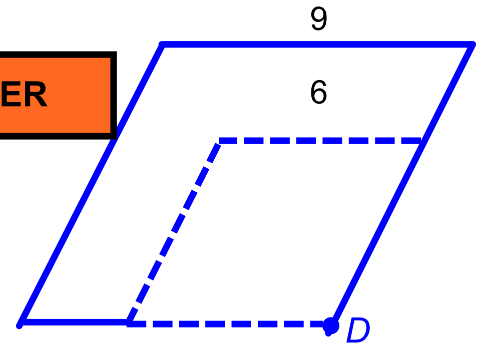
- Corresponding angles are congruent.

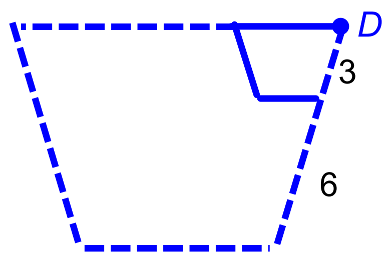
The dashed line figure is a dilation image of the solid-line figure. *D* is the center of dilation. Tell whether the dilation is an enlargement or a reduction. Then find the scale factor of the dilation.



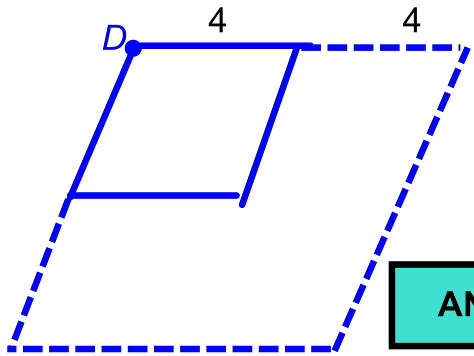
ANSWER

ANSWER



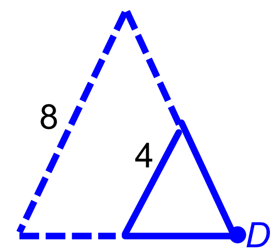


ANSWER



ANSWER

ANSWER



48 **Is a dilation a rigid motion?**

- Yes
- No

Answer

48 **Is a dilation a rigid mo**

- Yes
- No

Answer

No

49 Is a dilation a rigid motion?

- Yes
- No

Answer

49 Is a dilation a rigid motic

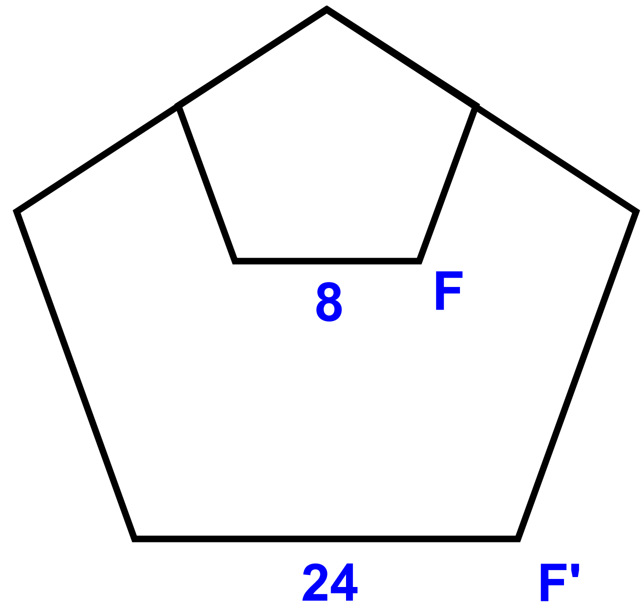
- Yes
- No

Answer

No

50 Is the dilation an enlargement or a reduction? What is the scale factor of the dilation?

- enlargement, n = 3
- enlargement, n = 1/3
- reduction, n = 3
- reduction, n = 1/3



Answer

50 Is the dilation an enlargement or a reduction? What is the scale factor of the

A enlargement, n = 3

B enlargement, n = 1

C reduction, n = 3

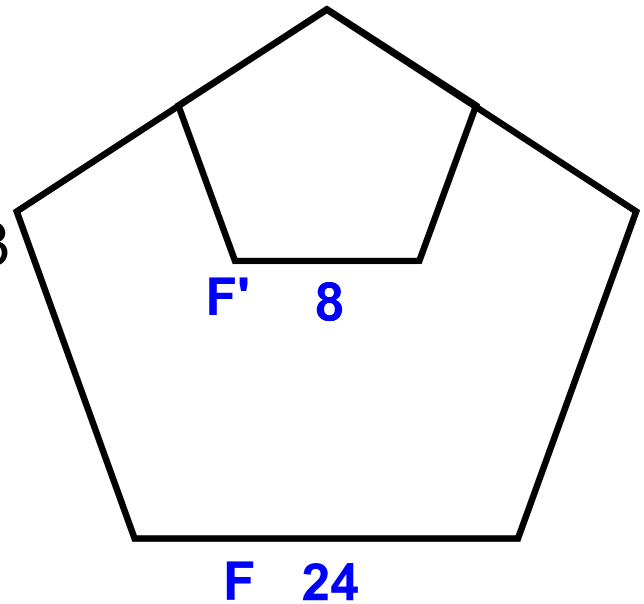
D reduction, n = 1/3

Answer

A

51 Is the dilation an enlargement or reduction? What is the scale factor of the dilation?

- enlargement, n=3
- enlargement, n = 1/3
- reduction, n = 3
- reduction, n = 1/3



Answer

51 Is the dilation an enlargement or reduction? What is the scale factor of the dilation?

A enlargement, n=3

B enlargement, n = 1/3

C reduction, n = 3

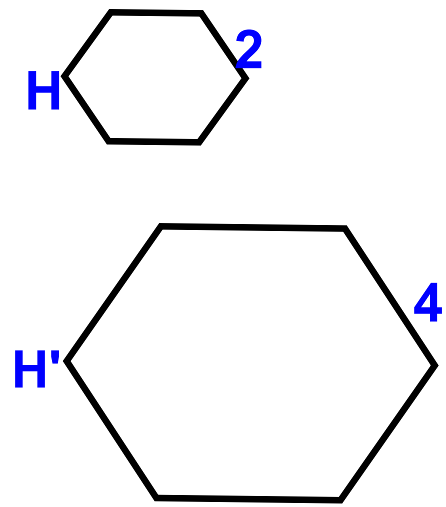
D reduction, n = 1/3

Answer

D

52 Is the dilation an enlargement or reduction? What is the scale factor of the dilation?

- enlargement, n = 2
- enlargement, n = 1/2
- reduction, n = 2
- reduction, n = 1/2



Answer

52 Is the dilation an enlargement or reduction? What is the scale factor of the dilati

A enlargement, n = 2

B enlargement, n = 1

C reduction, n = 2

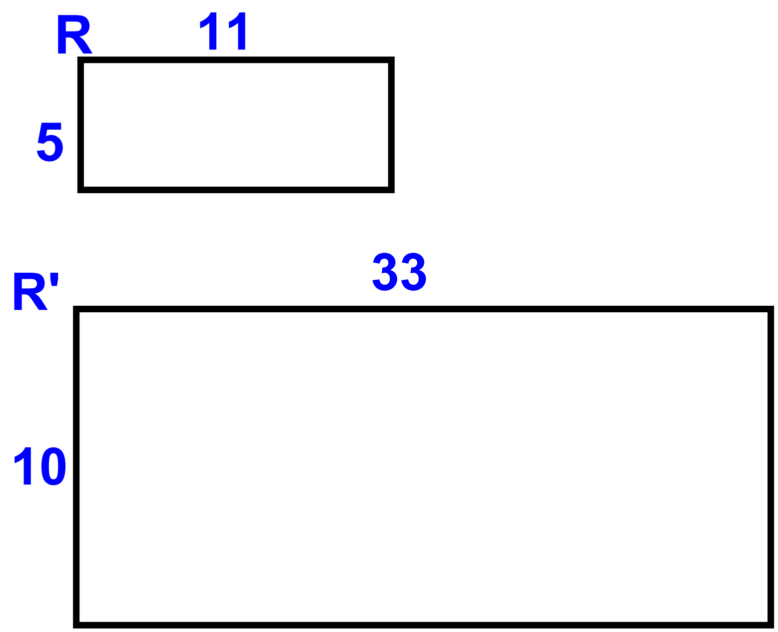
D reduction, n = 1/2

Answer

A

53 Is the dilation an enlargement or reduction? What is the scale factor of the dilation?

- enlargement, n = 2
- enlargement, n = 3
- enlargement, n = 6
- not a dilation



Answer

53 Is the dilation an enlargement or reduction? What is the scale factor of the dilation?

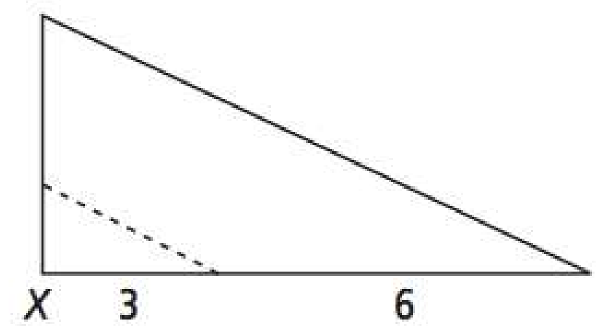
- enlargement, n = 2
- enlargement, n = 3
- enlargement, n = (
- not a dilation

Answer

D

54 The solid-line figure is a dilation of the dashed-line figure. The labeled point is the center of dilation. Find the scale factor of dilation.

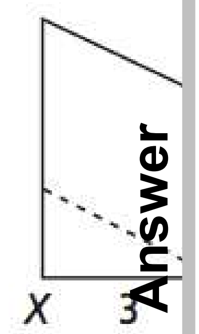
- A 2
- B 3
- C 1/2
- D 1/3



Answer

54 The solid-line figure is a dilation of the dashed-line figure. The labeled point is the center of dilation. Find the scale factor of dilation.

- A 2
- B 3
- C 1/2
- D 1/3



Answer

B

55 A dilation maps triangle LMN to triangle L'M'N'. MN = 14 in. and M'N' = 9.8 in. If LN = 13 in., what is L'N' ?

- A 13 in.
- B 14 in.
- C 9.1 in.
- D 9.8 in.

Answer

55 A dilation maps triangle LMN to triangle L'M'N'. MN = 14 in. and M'N' = 9.8 in. If LN = 13 in., what is L'N'?

A 13 in.

B 14 in.

C 9.1 in.

D 9.8 in.

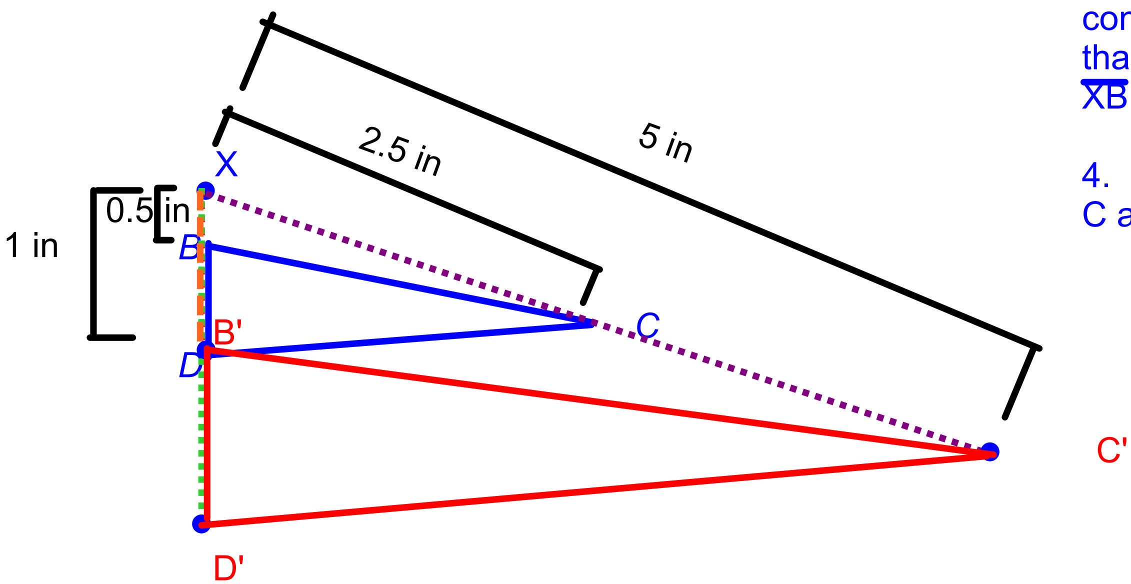
Answer

C

Drawing Dilation Images

Draw the dilation image Δ*B′C′D′*.

$D_{(2,\,X)}(\Delta BCD)$



Steps

1. Use a straightedge to construct ray $\overrightarrow{XB}$.

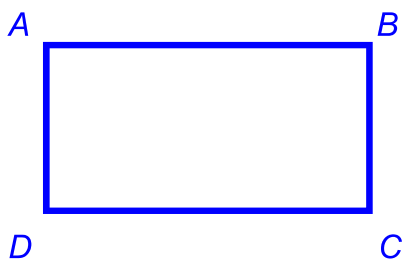
2. Use a compass to measure $\overline{XB}$.

3. Construct $\overline{XB'}$ by constructing a congruent segment on ray $\overrightarrow{XB}$ so that $\overline{XB'}$ is twice the distance of $\overline{XB}$.

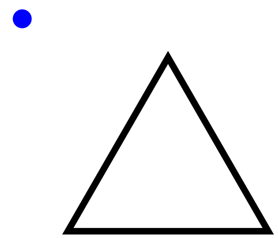
4. Repeat steps 1- 3 with points C and D.

Draw each dilation image.

a.) $D_{(0.5,\ B)}(ABCD)$



b.) $D_{(2,\ C)}(\Delta DEF)$



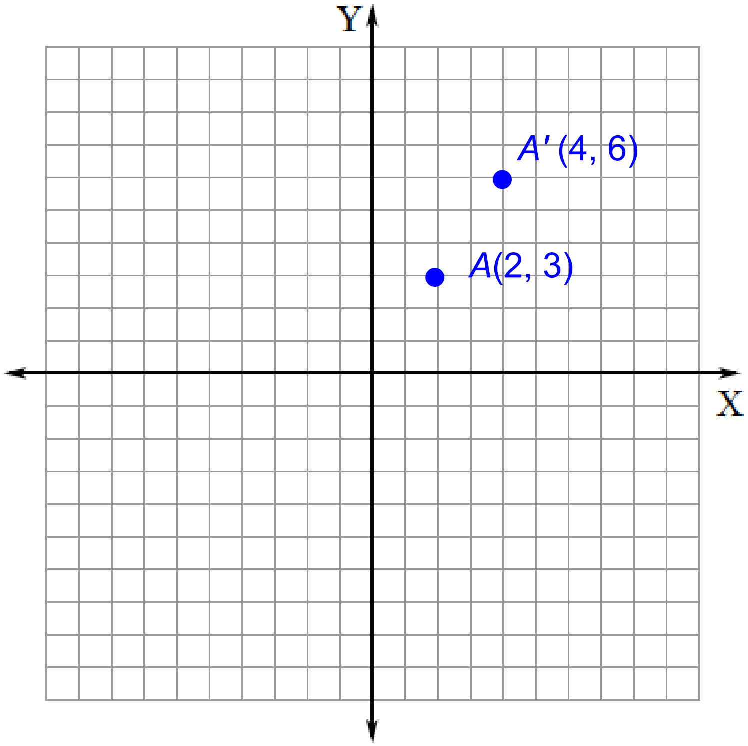
ANSWER

ANSWER

Dilations in the Coordinate Plane

Suppose a dilation is centered at the origin. You can find the dilation image of a point by multiplying its coordinates by the scale factor.

Scale factor 2, $(x, y) \longrightarrow (2x, 2y)$



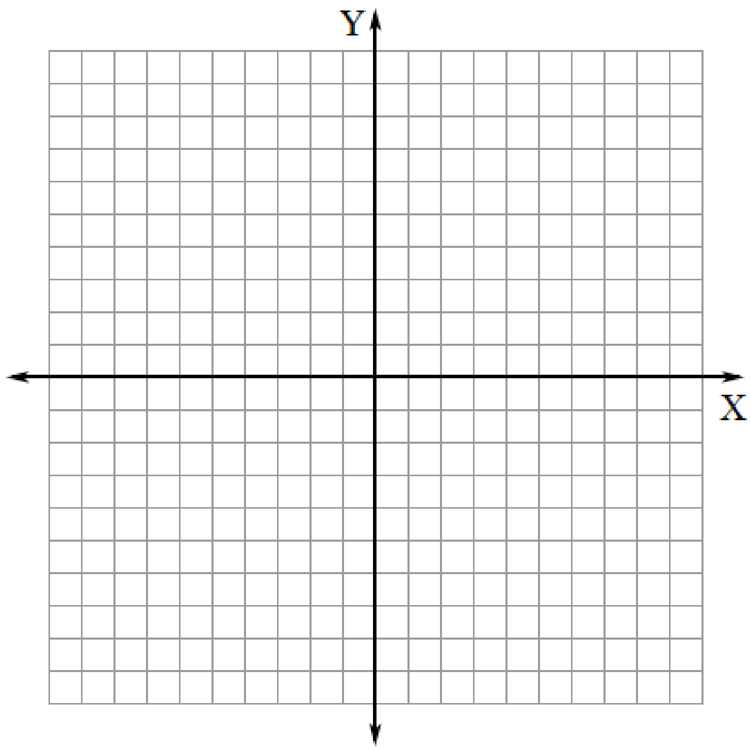
Notation

$D_2\,(A) = A'$

Graphing Dilation Images

To dilate a figure from the origin, find the dilation images of its vertices.

△HJK has vertices H(2, 0), J(-1, 0.5), and K(1, -2). What are the coordinates of the vertices of the image of △HJK for a dilation with center (0, 0) and a scale factor 3? Graph the image and the preimage.



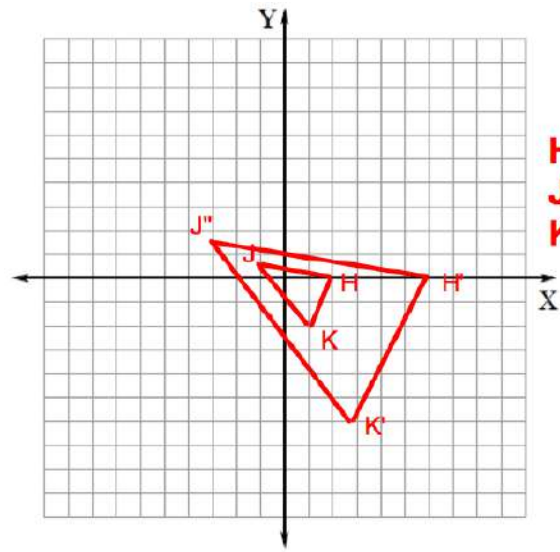
Answer

Graphing Dilation Images

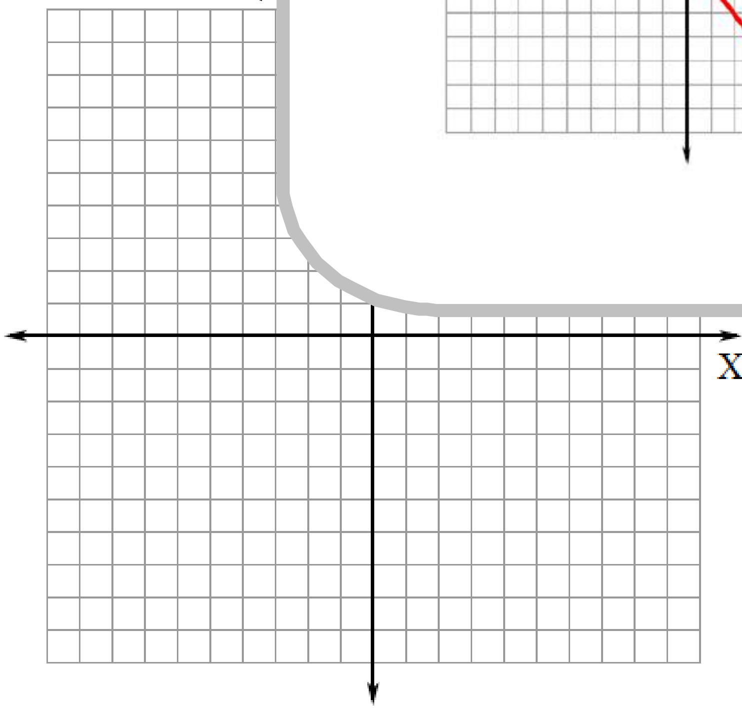
To dilate a figure from the orig

△HJK has vertices H(2, 0), J(-1 ... es
of the vertices of the image of △
scale factor 3? Graph the image

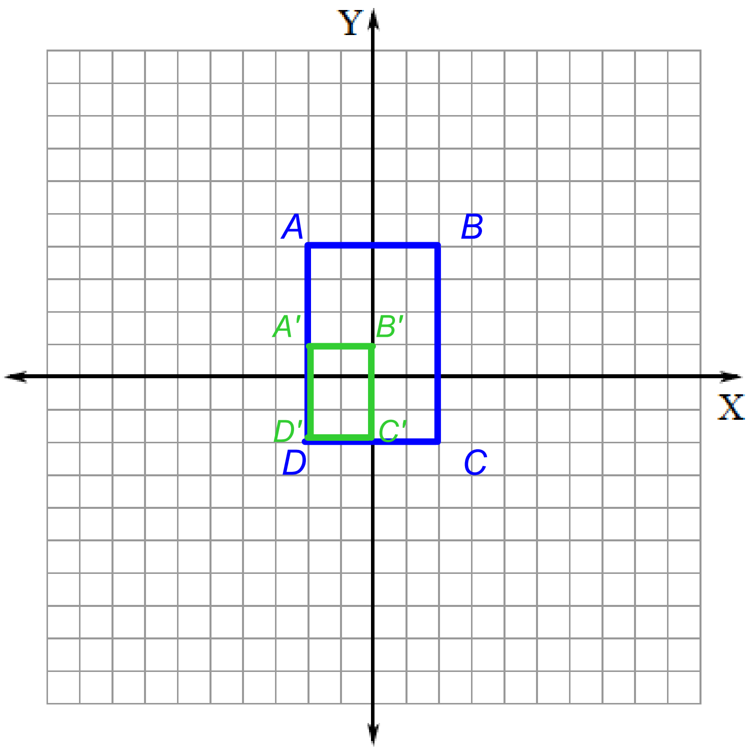
Answer



H'(6,0)
J'(-3, 1.5)
K'(3, -6)



Dilations NOT Centered at the Origin



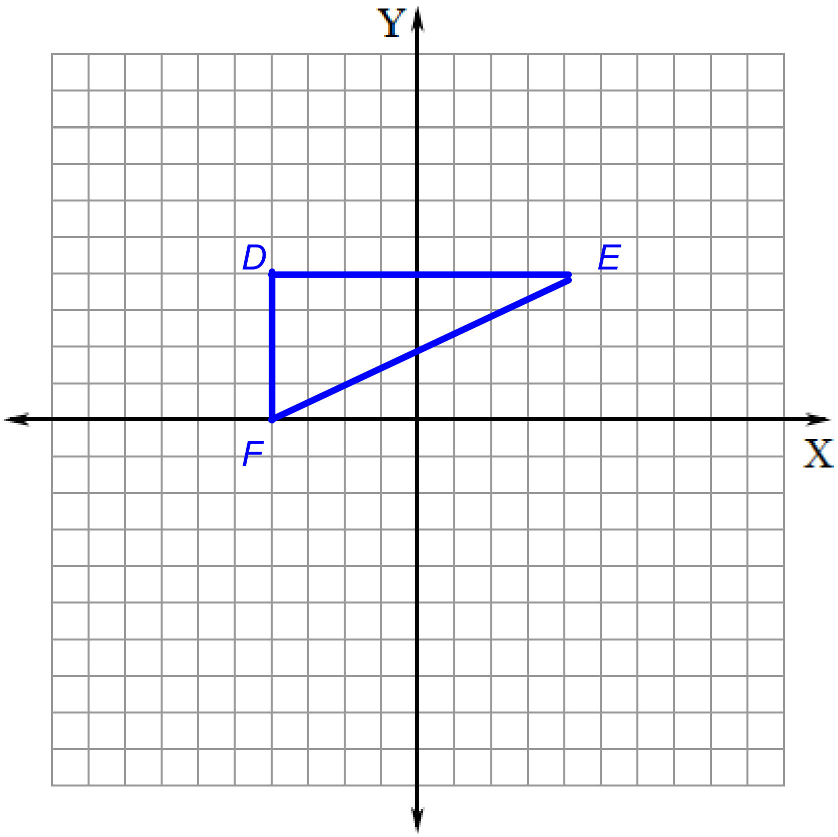
In this example, the center of dilation is NOT the origin. The center of dilation *D*(-2, -2) is a vertex of the original figure. This is a reduction with scale factor 1/2.

Point *D* and its image are the same. It is important to look at the distance from the center of dilation *D,* to the other points of the figure.

If *AD* = 6, then *A'D'* = 6/2 = 3.

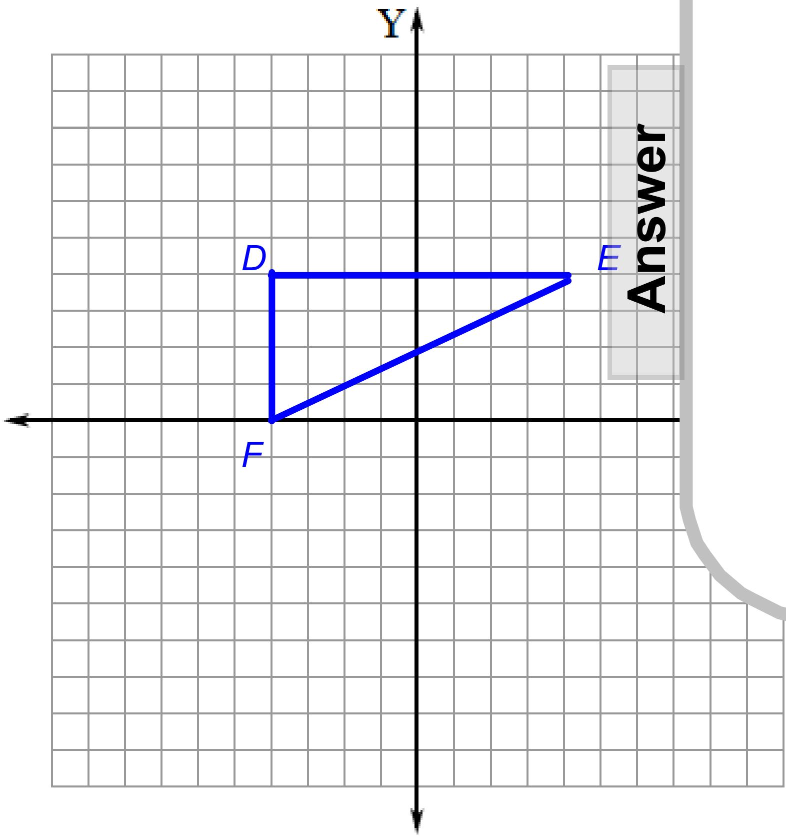
Also notice *AB* = 4 and *A'B'* = 2, etc.

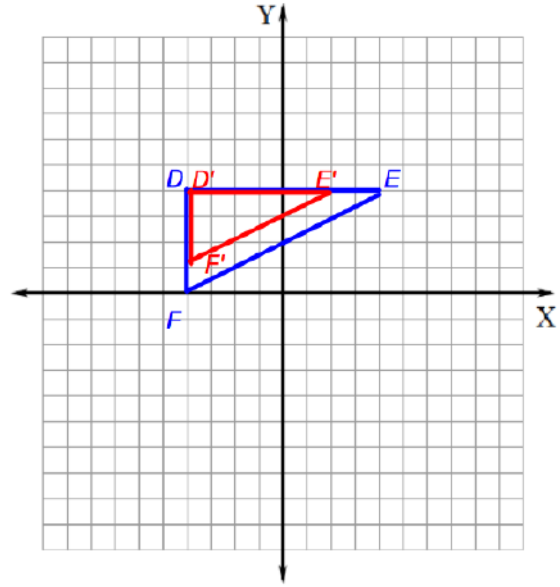
Draw the dilation image of △*DEF* with the center of dilation at point *D* with a scale factor 3/4.



Answer

Draw the dilation image of △D
point *D* with a scale factor 3





56 What is the y-coordinate of the image (8, -6) under a dilation centered at the origin and having a scale factor of 1.5?

- A -3
- B -8
- C -9
- D -12

Answer

56 What is the y-coordinate of the image (8, -6) under a dilation centered at the origin and having a scale factor of 1.5?

- A -3
- B -8
- C -9
- D -12

Answer

C

57 What is the x-coordinate of the image (8, -6) under a dilation centered at the origin and having a scale factor of 1/2?

- A 4
- B 8
- C -6
- D -3

Answer

57 What is the x-coordinate ... dilation centered at th... of 1/2?

- 4
- 8
- -6
- -3

Answer

A

58 What is the y-coordinate of the image (8, -6) under a dilation centered at the origin and having a scale factor of 1/2?

- A 4
- B 8
- C -6
- D -3

Answer

58 What is the y-coordinate of the image (8, -6) under a dilation centered at the ... tor of 1/2?

- A 4
- B 8
- C -6
- D -3

Answer

D

59 What is the x-coordinate of the image of (8, -6) under a dilation centered at the origin and having a scale factor of 3?

- A 8
- B -2
- C 24
- D -6

Answer

59 What is the x-coordinate of the image of (8, -6) under a dilation centered at the ... r of 3?

- 8
- -2
- 24
- -6

Answer

C

60 What is the x-coordinate of the image of (8, -6) under a dilation centered at the origin and having a scale factor of 1.5?

- A 3
- B 8
- C 9
- D 12

Answer

60 What is the x-coordinate of th... of (6, 9) under a dilation centered at th... of 1.5?

- A 3
- B 8
- C 9
- D 12

Answer

D

61 What is the y-coordinate of the image of (8, -6) under a dilation centered at the origin and having a scale factor of 3?

- A -8
- B -2
- C -24
- D -18

Answer

61 What is the y-coordinate of the image of (8, -6) under a dilation centered at the ... of 3?

A -8

B -2

C -24

D -18

Answer

D

62 What is the x-coordinate of (4, -2) under a dilation centered at (1, 3) with a scale factor of 2?

- A 7
- B -2
- C -7
- D 8

Answer

62 What is the x-coordinate of (4, -2) under a dilation centered at (1, 3) with

- A 7
- B -2
- C -7
- D 8

Answer

A

63 What is the y-coordinate of (4, -2) under a dilation centered at (1, 3) with a scale factor of 2?

- A 7
- B -2
- C -7
- D 8

Answer

63 What is the y-coordinat
centered at (1, 3) with

A 7

B -2

C -7

D 8

Answer

C

Similarity Transformations

Return to Table of Contents

Warm Up

1. Choose the correct choice to complete the sentence.

Rigid motions and dilations both preserve ***angle measure / distance.***

2. Complete the sentence by filling in the blanks.

dilations rigid motions

____________ ***preserve distance;*** ____________ ***do not preserve distance.***

3. Define similar polygons on the lines below.

____

____

____

Answer

Warm Up

1. Choose the co

Rigid motions a

stance.

2. Complete the

dilations

___________pre

rve distance.

3. Define similar polygons on the lines below.

Answer

1. angle measure

2. rigid motions; dilations

3. Figures with congruent corresponding angles and proportional corresponding sides.

Drawing Transformations

Triangle *GHI* has vertices *G*(-4, 2), *H*(-3, -3) and *N*(-1, 1). Suppose the triangle is translated 4 units right and 2 units up and then dilated by a scale factor of 2 with the center of dilation at the origin. Sketch the resulting image of the composition of transformations.

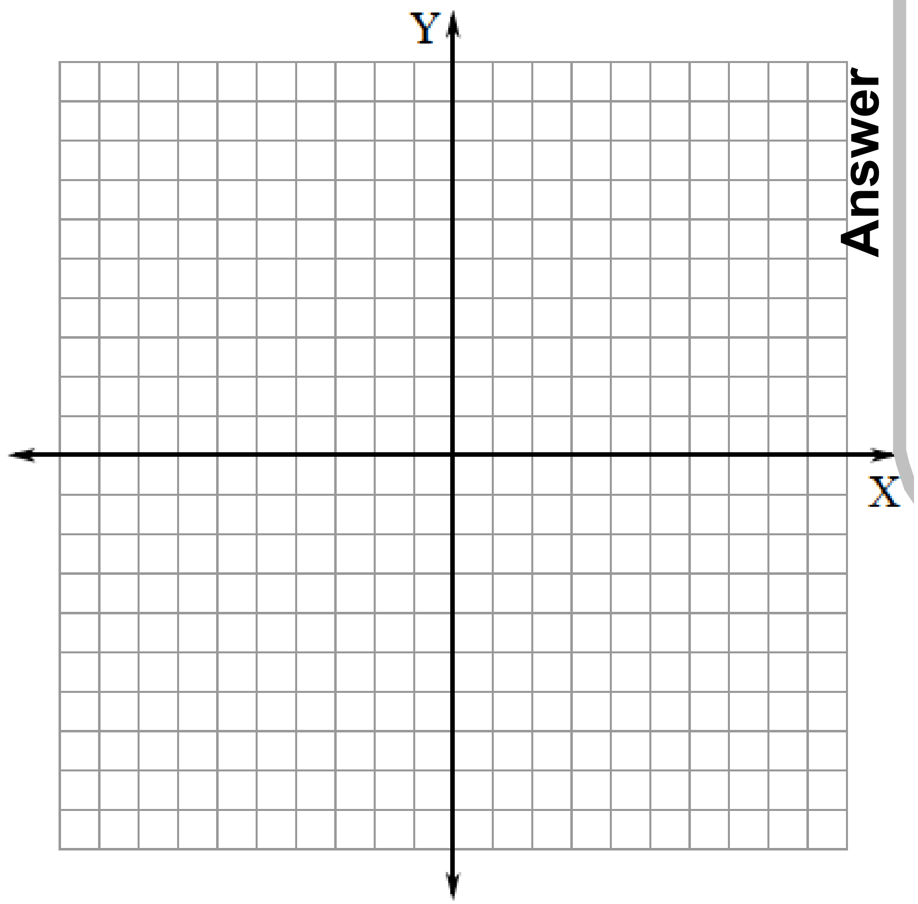
Step 1
Draw the original figure.

Step 2
$T_{<4,\ 2>}(\triangle GHI)$

G' (___, ___)
H' (___, ___)
I' (___, ___)

~~Step 3~~
$D_2(\triangle G'H'I')$

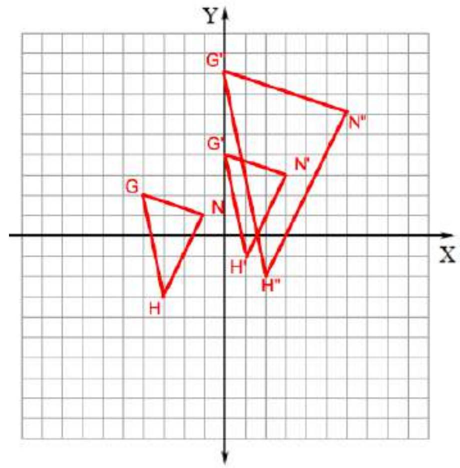
G'' (___, ___)
H'' (___, ___)
I'' (___, ___)



Drawing Transformations

Triangle *GHI* has vertices ... pose the triangle is translated 4 ... ted by a scale factor of 2 with ... h the resulting image of the

Answer



G'(0,4) H'(1, -1) I'(3, 3)
G"(0,8) H"(2, -2) I"(6, 6)

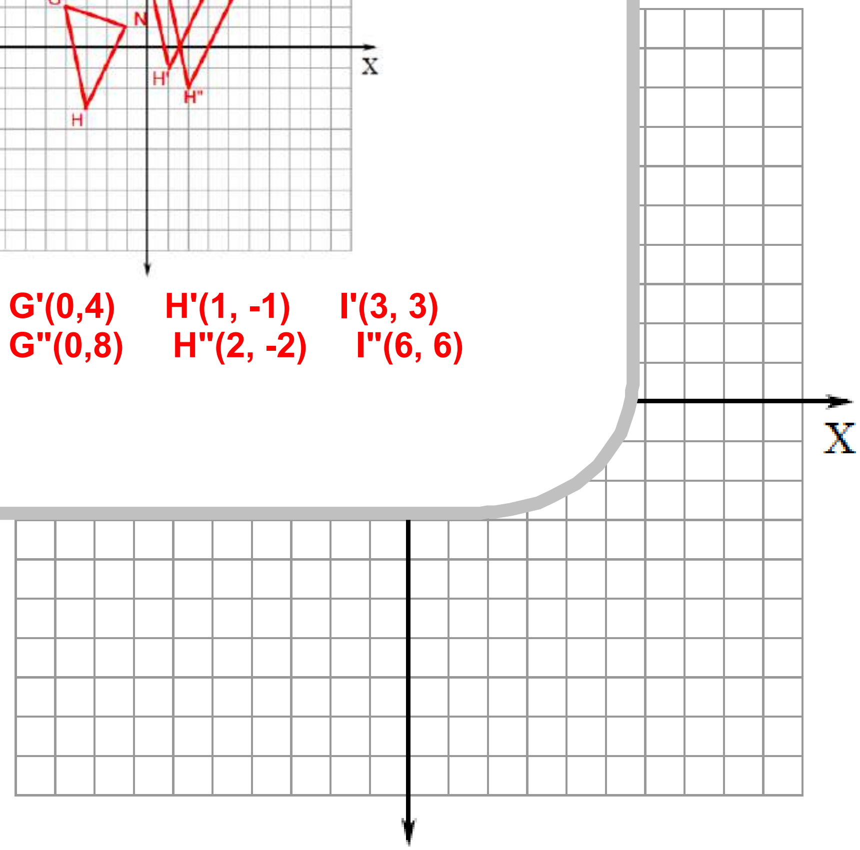
Step 1
Draw the orig...

Step 2
$T_{<4, 2>}(\triangle GHI)$

G' (___, ___)
H' (___, ___)
I' (___, ___)

~~Step 3~~
$D_2(\triangle G'H'I')$

G" (___, ___)
H" (___, ___)
I" (___, ___)



△*LMN* has vertices L(0, 2), M(2, 2), and N(0, 1). For each similarity transformation, draw the image.

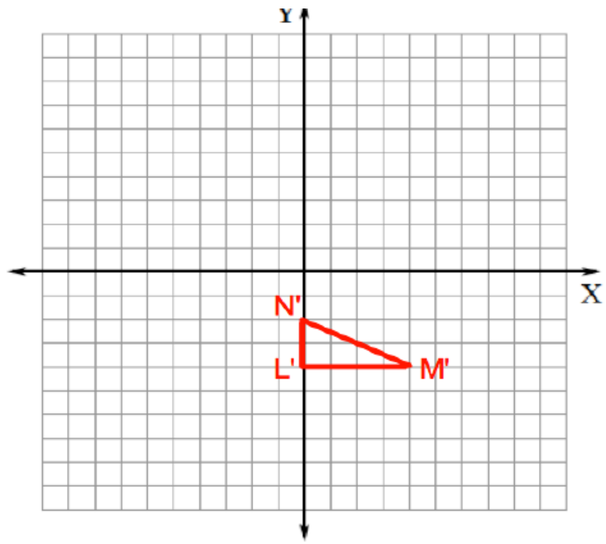
1. $D_2 \circ R_{x\text{-axis}}$ (△*LMN*)

Answer

△*LMN* has vertices L(0, 2), M(2, 2), and N(0, 1). For each similarity transformat

1. D_2 o $R_{x\text{-axis}}$ (△ *L*

Answer



$\triangle$*LMN* has vertices L(0, 2), M(2, 2), and N(0, 1). For each similarity transformation, draw the image.

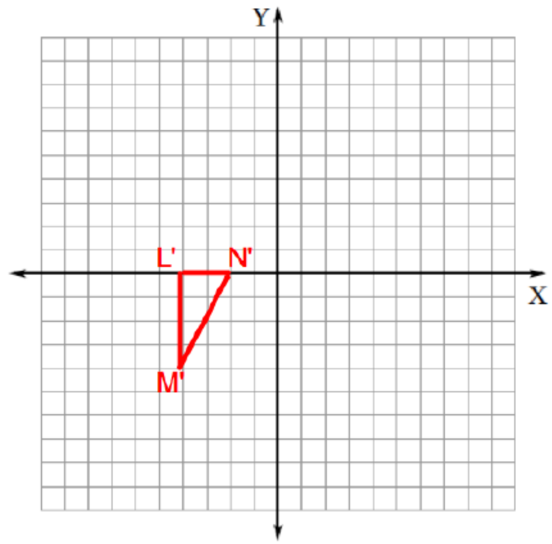
2. $D_2 \circ r_{(270^\circ, O)}$ ($\triangle LMN$)

Answer

△*LMN* has vertices L(0, 2), M(2, 2), and N(0, 1). For each similarity transformatio

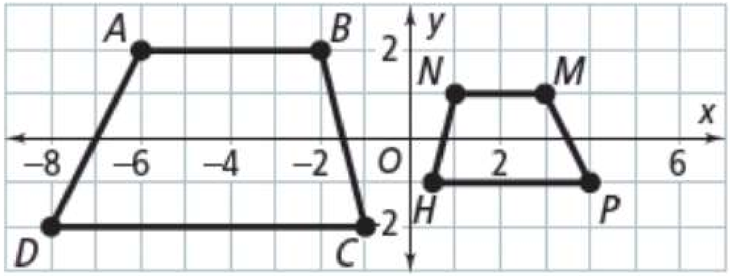
2. $D_2 \circ r_{(270°, O)}$ (△ *L*

Answer



Describing Transformations

What is a composition of transformations that maps trapezoid *ABCD* onto trapezoid *MNHP*?



Answer

Describing Tr

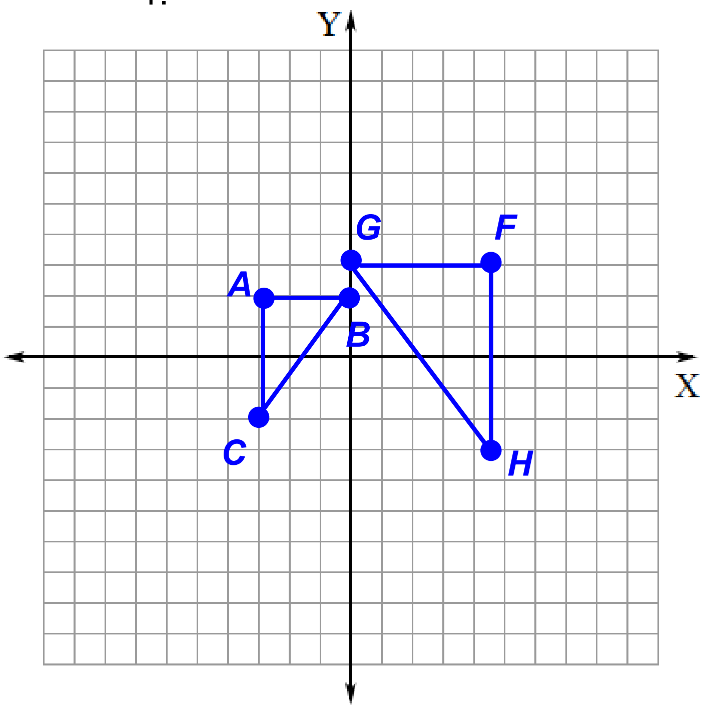
What is a composition of transformations that maps trapezoid *ABCD* onto trapezoid *MNHP*?

Answer

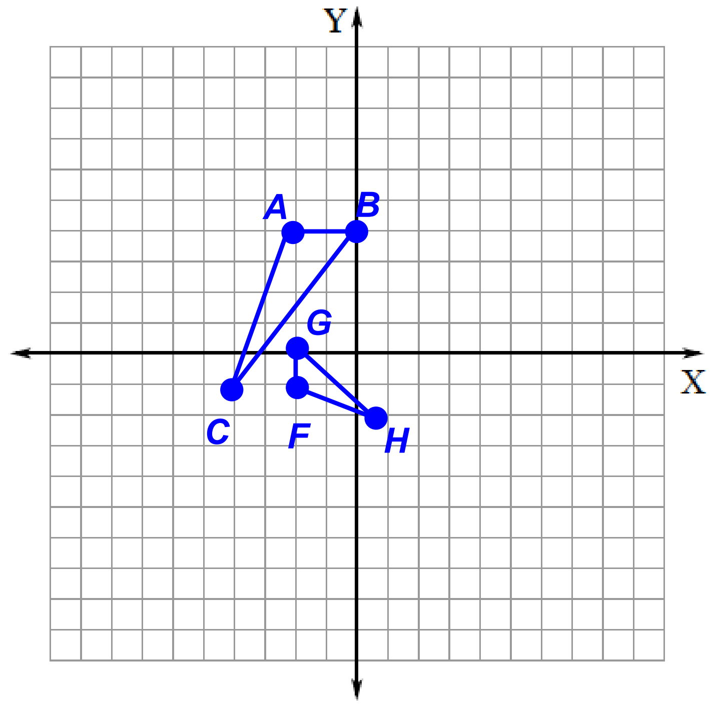
$$\mathbf{R_{\mathit{y}\text{-axis}} \circ D_{0.5}\ (ABCD) = MNHP}$$

For each graph, describe the composition of transformations that maps $\triangle ABC$ onto $\triangle FGH$

1.

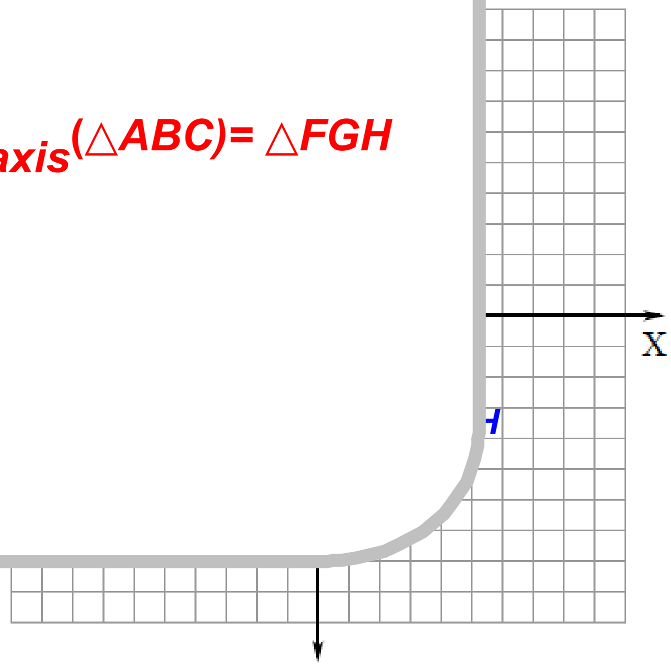


2.



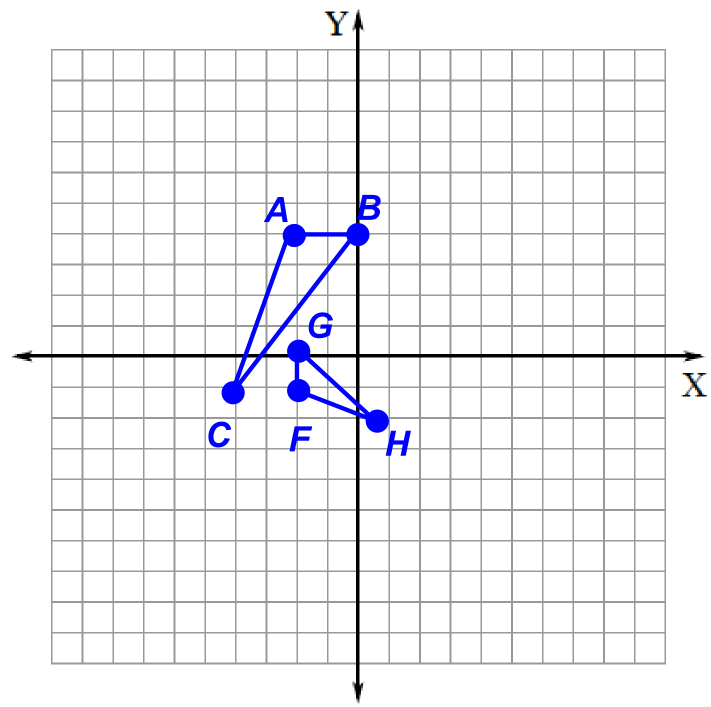
Answer

For each graph, describe the composition of transformations that maps $\triangle ABC$ onto $\triangle FGH$



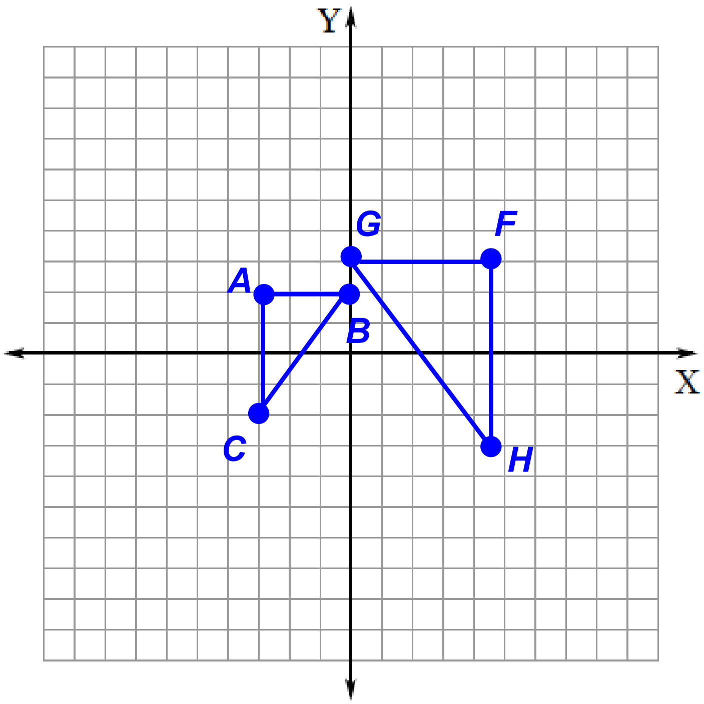
.5 o $R_{y\text{-axis}}(\triangle ABC) = \triangle FGH$

2.

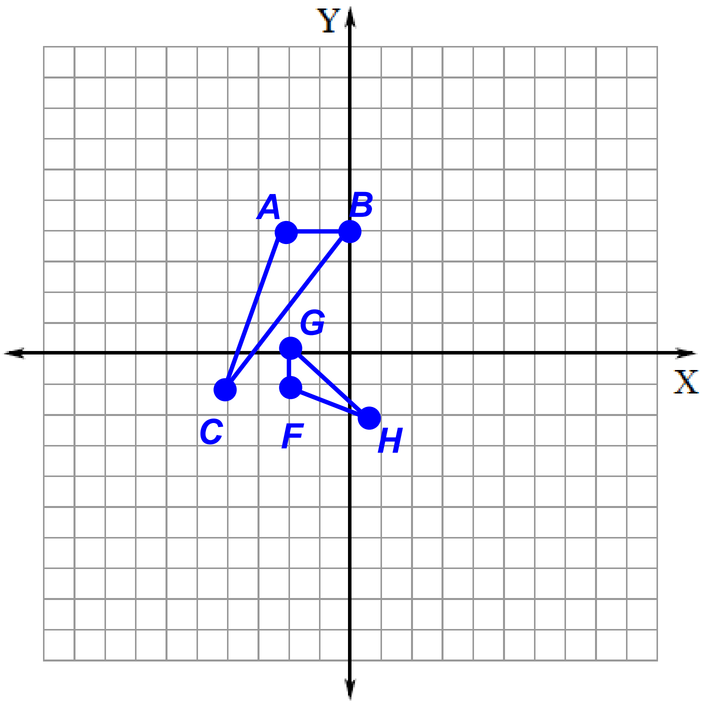


For each graph, describe the composition of transformations that maps △*ABC* onto △*FGH*

1.



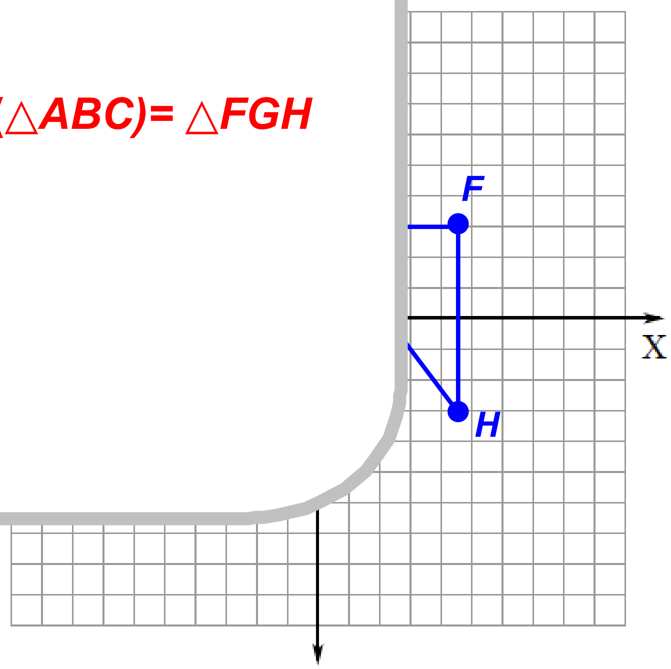
2.



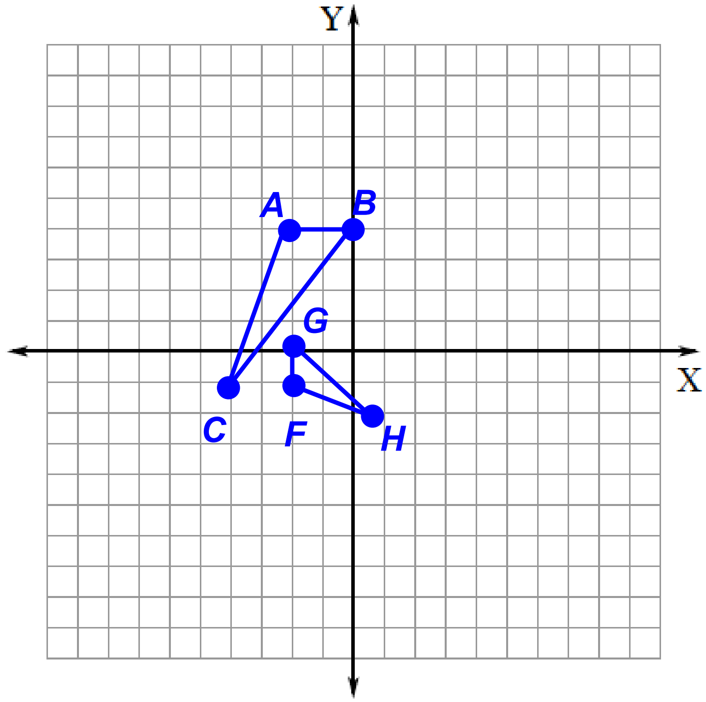
Answer

describe the composition of transformations that maps $\triangle ABC$ onto $\triangle FGH$

$r_{(90,\ O)}(\triangle ABC) = \triangle FGH$



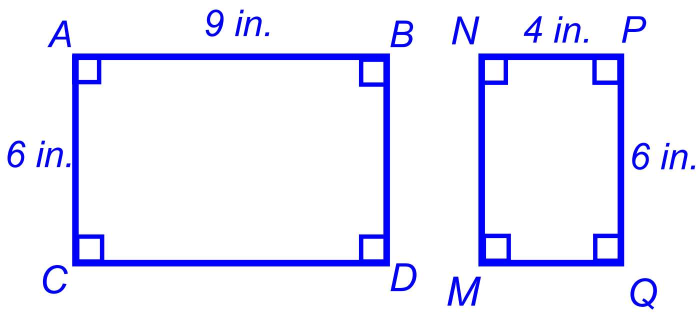
2.

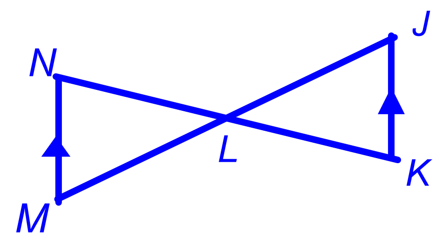


Similar Figures

Two figures are similar if and only if there is a similarity transformation that maps one figure onto the other.

Identify the similarity transformation that maps one figure onto the other and then write a similarity statement.





Answer

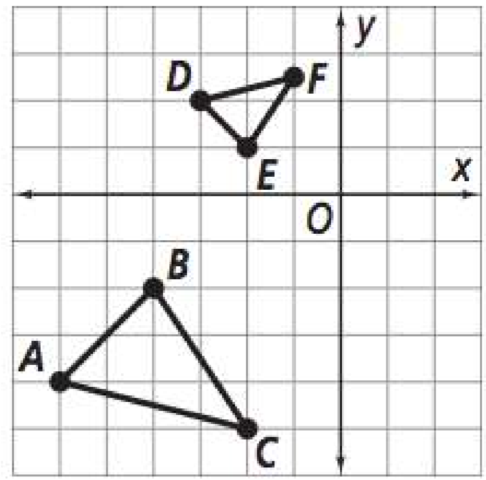
d

Answer

ABCD ~ MNPQ

64 Which similarity transformation maps ΔABC to ΔDEF?

- A $R_{x-axis} \circ D_{0.5}$
- B $R_{x-axis} \circ D_{2}$
- C $r_{(90°,o)} \circ D_{0.5}$
- D $r_{(270°,o)} \circ D_{2}$



Answer

64 Which similarity transformation maps ΔABC to ΔDEF?

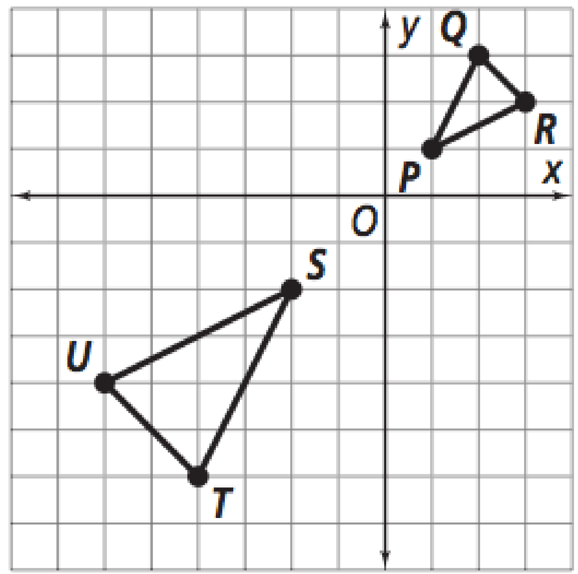
- A $R_{x-axis} \circ D_{0.5}$
- B $R_{x-axis} \circ D_{2}$
- C $r_{(90°,o)} \circ D_{0.5}$
- D $r_{(270°,o)} \circ D_{2}$

Answer

A

65 Which similarity transformation does not map ΔPQR to ΔSTU?

- A $r_{(180°,O)} \circ D_2$
- B $D_2 \circ R_{x-axis} \circ R_{y-axis}$
- C $D_2 \circ r_{(180°,O)}$
- D $D_2 \circ R_{x-axis} \circ r_{(90°,O)}$



Answer

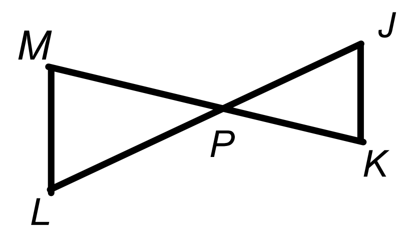
65 Which similarity transformation does not map ΔPQR to ΔSTU?

- A $r_{(180°,o)} \circ D_2$
- B $D_2 \circ R_{x-axis} \circ R_{y-axis}$
- C $D_2 \circ r_{(180°,o)}$
- D $D_2 \circ R_{x-axis} \circ r_{(90°,o)}$

Answer

D

66 Which of the following best describes a similarity transformation that maps ΔJKP to ΔLMP?



- a dilation only
- a rotation followed by a dilation
- a reflection followed by a dilation
- a translation followed by a dilation

Answer

66 Which of the following best describes a similarity transformation that maps ΔJKP to ΔLMP?

- a dilation only
- a rotation followed
- a reflection followe
- a translation follov

Answer

B