



MATHS

BOOKS - CENGAGE

TRANSFORMATIONS

Example

1. Use $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$ to find the coordinates of images of the following points when reflected on the y-axis

(1,1)



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2. Use $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$ to find the coordinates of images of the following points when reflected on the y-axis

(2,3)



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Test Yourself Level 1

1. Find the reflection of the point $P(3,4)$ in the following using the transformation of matrices :

x - axis



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2. Find the reflection of the point $P(3,4)$ in the following using the transformation of matrices :

y - axis



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3. Find the reflection of the point $P(3,4)$ in the following using the transformation of matrices :
through the origin



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4. Find the reflection of the segment formed by the points using matrix transformation :

A (1,3) and B(2,5) on x-axis



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5. Find the reflection of the segment formed by the points using matrix transformation :

C (3,4) and D (4,6) on y-axis



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6. Find the reflection of the triangle using matrix transformation formed by the points A(1,1), B(3,5), and C(2,7) on y- axis



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7. Use $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ \frac{1}{2} & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$ to transform the following :

The rectangle (1,2),(2,2),(2,4),(1,4)



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8. Use $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ \frac{1}{2} & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$ to transform the following :

The triangle (1,1),(4,1),(3,4)



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9. Use $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ \frac{1}{2} & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$ to transform the following :

The parallelogram (1,1),(4,2),(5,4),(2,3)



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10. Use $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 1 & \frac{1}{2} \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$ to transform the figures gives the above questions



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11. Using $\begin{pmatrix} X \\ Y \end{pmatrix} = \begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$, transform the rectangle whose vertices are $(1,1),(3,1),(3,2),(1,2)$



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12. Using $\begin{pmatrix} X \\ Y \end{pmatrix} = \begin{pmatrix} -\frac{1}{3} & 0 \\ 0 & -\frac{1}{3} \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$ transform the triangle whose vertices are $(3,3),(9,3),(3,12)$



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13. If a transformation is given by the matrix form, $\begin{pmatrix} X \\ Y \end{pmatrix} = \begin{pmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$ then find the transformation matrix, where $\theta = 30^\circ$, $\theta = 45^\circ$ and $\theta = 60^\circ$



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14. Find the reflection of the triangle using matrix transformation, whose coordinates are (3,4), (3,8), and (-2,6) on x-axis and y-axis

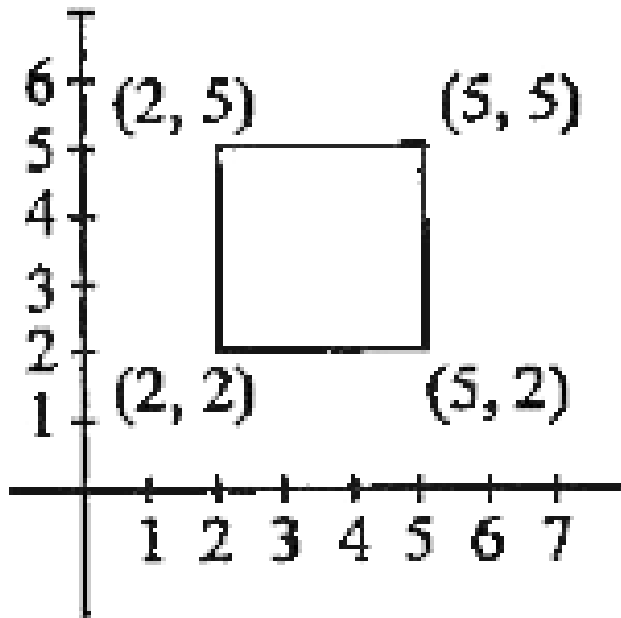


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15. Find the reflection of the figure formed by joining the coordinates of the points (0,-7), (1,-5), (4,-3), (2,0), (3,3), (0,4), (4,6), using the matrix transformation on y-axis



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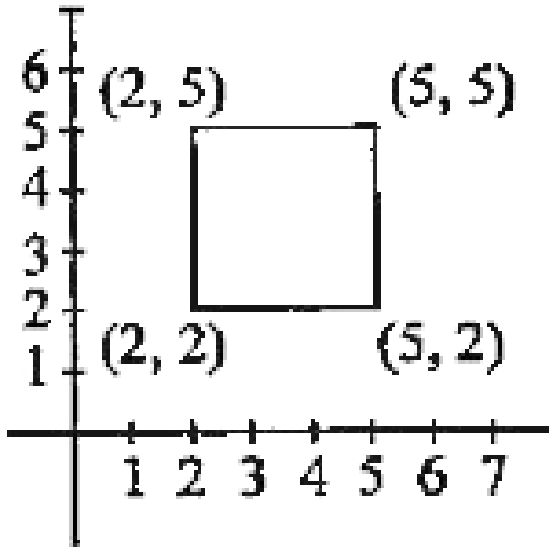


16.

Using the above figure the coordinates of the images of the vertices of the square

Reflection in the x-axis

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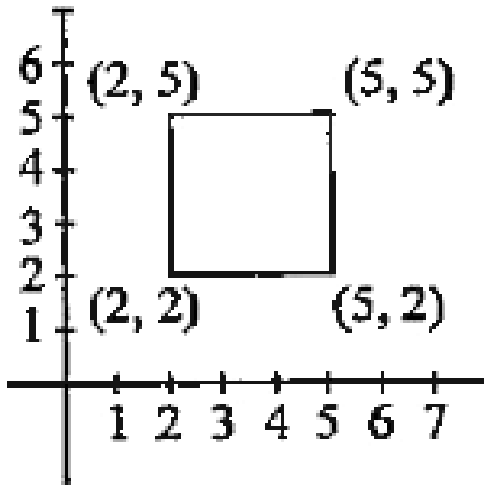
17.

Using the above figure the coordinates of the images of the vertices of the square

Reflection in the y-axis



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18.

Using the above figure the coordinates of the images of the vertices of the square

Reflection in the origin



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Test Yourself Level 1 M C Q

1. The coordinates of images of the point (2,3) when reflected on the y-axis are

A. (2,3)

B. (2,-3)

C. (-2,-3)

D. (-2,3)

Answer: D



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2. When the point $(x + y, x - y)$ is reflected through x - axis, the point $(3,5)$ is obtained. The values of x and y are

A. $x = -1$ and $y = 4$

B. $x = 1$ and $y = 4$

C. $x = 1$ and $y = -4$

D. $x = -$ and $y = -4$

Answer: A

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3. If the point $(3,2)$ is reflected through x -axis, the point $(2\alpha + 3\beta, 3\alpha - 2\beta)$ is obtained. The values of α and β are

A. $\alpha = 1, \beta = 0$

B. $\alpha = 0, \beta = 1$

C. $\alpha = 1, \beta = 1$

D. none of these

Answer: B

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4. The coordinates of the points which is obtained by taking reflection of point $(3, 5)$ through origin are

A. $(-3,5)$

B. (3,5)

C. (-3,-5)

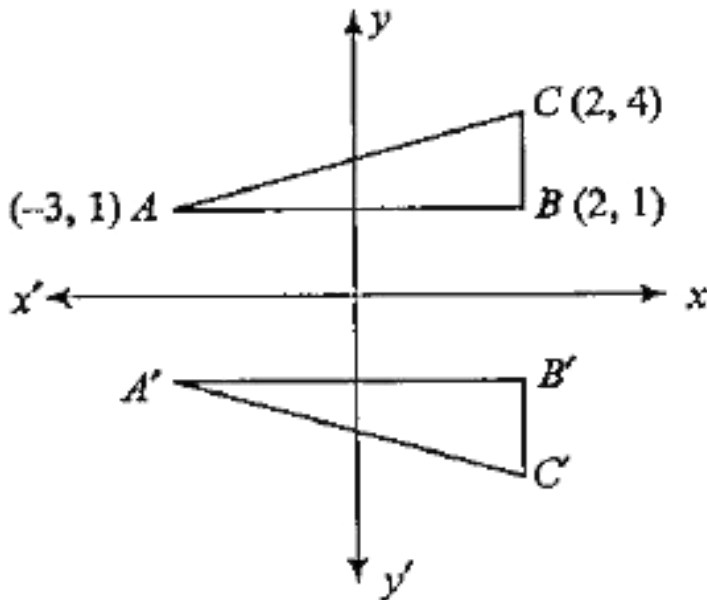
D. (3,-5)

Answer: C



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5. Triangle ABC is reflected through x - axis as shown in the figure . The coordinates of A' , B' and C' are



A. $A' \equiv (-3, -1), B' \equiv (2, -1), C' \equiv (2, -4)$

B. $A' \equiv (-3, -1), B' \equiv (2, -4), C' \equiv (2, -1)$

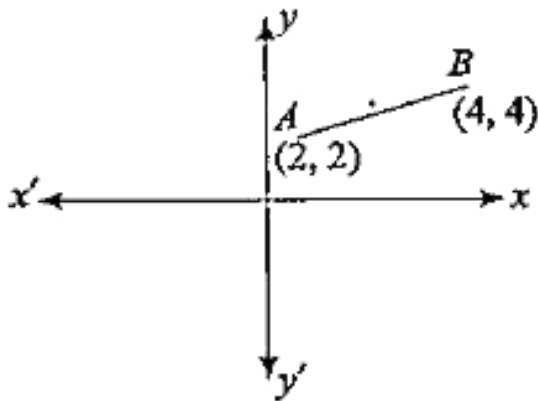
C. $A' \equiv (-3, 1), B' \equiv (2, -1), C' \equiv (2, -4)$

D. none of these

Answer: A

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6. The line segment shown in the figure is reflected through x - axis. The equation of reflected line segment will be



A. $y = x$

B. $y = x + 2$

C. $y = -x$

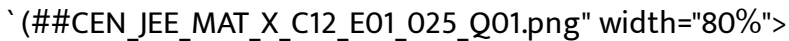
D. none of these

Answer: C



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7. Find the coordinates of new square when ABCD is reflected through origin



A.

$$A' \equiv (-2, -2), B' \equiv (-4, -2), C' \equiv (-4, -4), D' \equiv (-2, -4)$$

B.

$$A' \equiv (2, 2), B' \equiv (4, -2), C' \equiv (-4, -4), D' \equiv (-2, -4)$$

C. $A' \equiv (-2, -2), B' \equiv (-4, -2), C' \equiv (4, 4), D' \equiv (2, 4)$

D. $A' \equiv (2, -2), B' \equiv (4, -2), C' \equiv (4, -4), D' \equiv (2, -4)$

Answer: A



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8. Find the value of (α, β) when $(3\alpha + 2, 3\beta + 2)$ is reflected by transformation $\begin{pmatrix} X \\ Y \end{pmatrix} = \begin{pmatrix} 3 & 0 \\ 0 & 2 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$ to get new coordinates $(\alpha - \beta, \alpha + \beta)$

A. $\alpha = \frac{-20}{41}, \beta = \frac{-78}{41}$

B. $\alpha = \frac{21}{41}, \beta = \frac{-310}{41}$

C. $\alpha = \frac{-20}{41}, \beta = \frac{-310}{41}$

D. $\alpha = \frac{-20}{41}, \beta = \frac{78}{41}$

Answer: D



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9. The point P (3, 4) is transformed using $\begin{pmatrix} X \\ Y \end{pmatrix} = \begin{pmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$ where $\theta = 45^\circ$. The coordinates of new point are

A. $\left(\frac{-7}{\sqrt{2}}, \frac{-1}{\sqrt{2}} \right)$

B. $\left(\frac{-7}{\sqrt{2}}, \frac{1}{\sqrt{2}} \right)$

C. $\left(\frac{7}{\sqrt{2}}, \frac{1}{\sqrt{2}} \right)$

D. none of these

Answer: C



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10. Which point is obtained when P(2,4) undergoes the following transformation

(I) Reflection in the x- axis, after that

(II) Reflection in the y - axis, and then

(III) Reflection through origin

A. (2,4)

B. (-2,4)

C. (-2,-4)

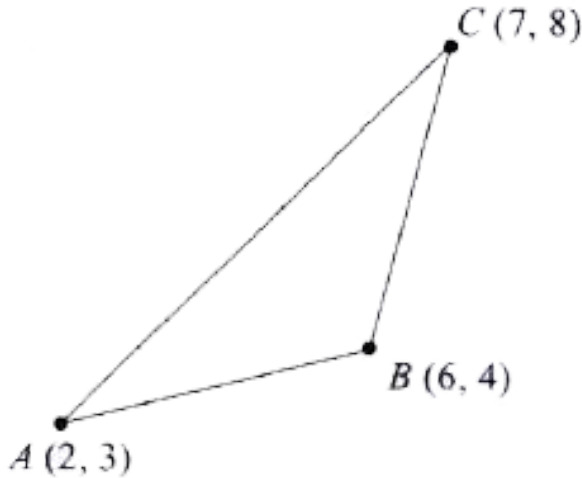
D. (2,-4)

Answer: A



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11. Consider triangle ABC as shown in the figure



The new vertices of triangle when it undergoes the transformation

$$\begin{pmatrix} X \\ Y \end{pmatrix} = \begin{pmatrix} \frac{-1}{3} & 1 \\ 1 & \frac{-1}{3} \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} \text{ will be}$$

A. $A' \equiv \left(\frac{7}{3}, 1 \right), B' \equiv \left(2, \frac{14}{3} \right), C' \equiv \left(\frac{17}{3}, \frac{13}{3} \right)$

B. $A' \equiv \left(\frac{7}{3}, 1 \right), B' \equiv \left(\frac{14}{3}, 2 \right), C' \equiv \left(\frac{17}{3}, \frac{13}{3} \right)$

C. $A' \equiv \left(\frac{7}{3}, 1 \right), B' \equiv \left(2, \frac{14}{3} \right), C' \equiv \left(\frac{13}{3}, \frac{13}{3} \right)$

D. $A' \equiv \left(1, \frac{7}{3} \right), B' \equiv \left(2, \frac{14}{3} \right), C' \equiv \left(\frac{17}{3}, \frac{13}{3} \right)$

Answer: A



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12. Which of the following transformations is equivalent to get reflection through x-axis

A. $\begin{pmatrix} X \\ Y \end{pmatrix} = \begin{pmatrix} \cos 2\theta & \sin 2\theta \\ -\sin 2\theta & -\cos 2\theta \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}, \theta = 45^\circ$

B. $\begin{pmatrix} X \\ Y \end{pmatrix} = \begin{pmatrix} \cos 2\theta & \sin 2\theta \\ -\sin 2\theta & -\cos 2\theta \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}, \theta = 0^\circ$

C. $\begin{pmatrix} X \\ Y \end{pmatrix} = \begin{pmatrix} \sin 2\theta & 2\theta \\ \cos 2\theta & -\sin 2\theta \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}, \theta = 90^\circ$

D. none of these

Answer: B



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Olympiad And Ntse Level Exercises

1. If the vertices of a right - angled triangle are reflected through x - axis, the new vertices so obtained will form

- A. an equilateral trinagle
- B. an isoseles triangle
- C. a right - angled trinagle
- D. a scalene triangle

Answer: C

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2. If the point $(-3,4)$ is first reflected through origin and then the new point undergoes the transformation $\begin{pmatrix} X \\ Y \end{pmatrix} = \begin{pmatrix} \frac{1}{2} & 1 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$ then the final point will be

- A. $(3,4)$
- B. $(11/2,4)$
- C. $(11/2,-4)$
- D. $(5/2,4)$

Answer: B



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3. If the point (2,-) is first reflected through x - axis and then the new point undergoes the transformation $\begin{pmatrix} X \\ Y \end{pmatrix} = \begin{pmatrix} 0 & 1 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$ then the final point will be

A. (2,5)

B. (2,2)

C. (5,5)

D. (5,2)

Answer: C



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4. If the point $(-1, -3)$ is first reflected through y -axis and then the new point undergoes the transformation $\begin{pmatrix} X \\ Y \end{pmatrix} = \begin{pmatrix} 1 & -1 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$, then the final point will be

A. $(4,3)$

B. $(1,-3)$

C. $(3,4)$

D. $(0,4)$

Answer: A



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5. If a point is reflected through any of coordinate axes, what will be the effect on its distance from origin ?

A. It will become half

B. It will become twice

C. It will remain the same

D. none of these

Answer: C



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6. A point located in second quadrant is reflected through the origin, what will be the location of the new point

A. First Quadrant

B. Second Quadrant

C. Third Quadrant

D. Fourth Quadrant

Answer: D



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7. If a point A (4,6) is reflected through x-axis to get point B and then B is transformed using $\begin{pmatrix} X \\ Y \end{pmatrix} = \begin{pmatrix} \frac{1}{2} & 1 \\ -1 & -\frac{1}{2} \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$ to get point C, then the area of triangle ABC is

- A. 104 sq. unit
- B. 52 sq, unit
- C. 50 sq. unit
- D. 100 sq. Unit

Answer: B

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8. Which of the following transformations of point (x,y), where $x \neq 0, y \neq 0$, will give the points forming a right - angled triangle ?

- A. Reflection through origin and then reflection through x - axis
- B. Reflection through y - axis and then reflection through origin

C. Reflection through x - axis and then reflection through y - axis

D. All of these

Answer: D



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9. A point $(-6, 4)$ undergoes two consecutive transformations

$$\begin{pmatrix} X \\ Y \end{pmatrix} = \begin{pmatrix} \frac{2}{3} & -1 \\ 0 & -\frac{1}{4} \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} \text{ and } \begin{pmatrix} X \\ Y \end{pmatrix} = \begin{pmatrix} 1 & \frac{-1}{2} \\ 0 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} . \text{ The final}$$

point will be a

A. $\left(-\frac{17}{2}, 1\right)$

B. $\left(-\frac{15}{2}, -1\right)$

C. $\left(-\frac{17}{2}, -1\right)$

D. $\left(\frac{-15}{2}, 1\right)$

Answer: D



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10. If all the vertices of a triangle undergo the same transformation

$\begin{pmatrix} X \\ Y \end{pmatrix} = \begin{pmatrix} \frac{1}{2} & \frac{-1}{2} \\ 1 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$ what will be the effect on the area of the triangle?

- A. It will remain unchanged
- B. It will become half
- C. It will become 0
- D. It will get double

Answer: C



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