Transformations on the Coordinate Plane

Spot mistakes, reason, and work backward

Name _____ **Date** _____ **Score** _____ / 6

QUICK REVIEW

Translation adds a fixed coordinate change. Reflections use $(x, y) \to (x, -y)$ across the x-axis or $(-x, y)$ across the y-axis. About the origin, a $90°$ counterclockwise rotation uses $(-y, x)$ and $180°$ uses $(-x, -y)$. For $(2, 3)$ these images are $(-3, 2)$ and $(-2, -3)$. Rigid motions preserve length.

Worked example

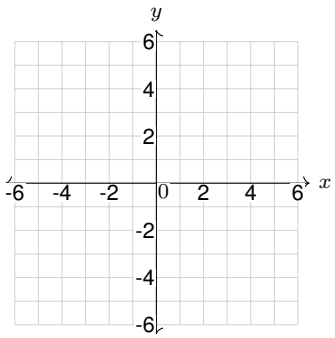
Translate $(1, -2)$ by $(3, 1)$.

1. New $x = 1 + 3 = 4$.
2. New $y = -2 + 1 = -1$.
3. The image is $(4, -1)$; reverse change $(4 - 3, -1 - 1) = (1, -2)$.
Answer: $(4, -1)$.

Practice Problems

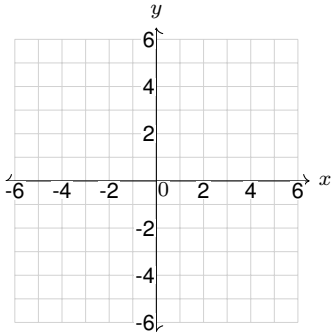
Show your thinking.

1. An image was formed by the rule: translate $(3, -2)$. Its vertices are $A\prime = (2, -2), B\prime = (4, -2), C\prime = (3, 0)$. Recover all original coordinates. Plot the original triangle.



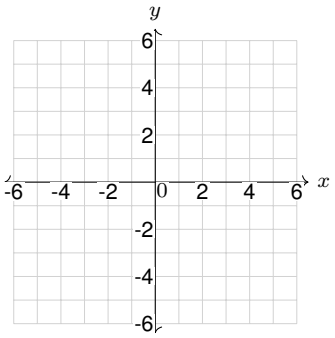
2. An image was formed by the rule: reflect across the x-axis. Its vertices are $A\prime = (-1, 0), B\prime = (1, 0), C\prime = (0, -2)$. Recover all original coordinates.

3. An image was formed by the rule: reflect across the y-axis. Its vertices are $A\prime = (1, 0), B\prime = (-1, 0), C\prime = (0, 2)$. Recover all original coordinates. Plot the original triangle.



4. An image was formed by the rule: rotate $90°$ counterclockwise about the origin. Its vertices are $A\prime = (0, -1), B\prime = (0, 1), C\prime = (-2, 0)$. Recover all original coordinates.

5. An image was formed by the rule: rotate $180°$ about the origin. Its vertices are $A\prime = (1, 0), B\prime = (-1, 0), C\prime = (0, -2)$. Recover all original coordinates. Plot the original triangle.



6. An image was formed by the rule: translate $(-1, 2)$. Its vertices are $A\prime = (-2, 2), B\prime = (0, 2), C\prime = (-1, 4)$. Recover all original coordinates.

Answer Key

1. Original: $A=(-1,0), B=(1,0), C=(0,2)$.
2. Original: $A=(-1,0), B=(1,0), C=(0,2)$.
3. Original: $A=(-1,0), B=(1,0), C=(0,2)$.
4. Original: $A=(-1,0), B=(1,0), C=(0,2)$.
5. Original: $A=(-1,0), B=(1,0), C=(0,2)$.
6. Original: $A=(-1,0), B=(1,0), C=(0,2)$.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. From image $(2,-2)$: $x=2-3=-1$; $y=-2+2=0$. Original $(-1,0)$.
2. From image $(4,-2)$: $x=4-3=1$; $y=-2+2=0$. Original $(1,0)$.
3. From image $(3,0)$: $x=3-3=0$; $y=0+2=2$. Original $(0,2)$.
4. Plot the three result points and connect them in order to close the triangle.

Problem 2

1. From image $(-1,0)$: $x=-1=-1$; $y=-(0)=0$. Original $(-1,0)$.
2. From image $(1,0)$: $x=1=1$; $y=-(0)=0$. Original $(1,0)$.
3. From image $(0,-2)$: $x=0=0$; $y=-(-2)=2$. Original $(0,2)$.

Problem 3

1. From image $(1,0)$: $x=-(1)=-1$; $y=0=0$. Original $(-1,0)$.
2. From image $(-1,0)$: $x=-(-1)=1$; $y=0=0$. Original $(1,0)$.
3. From image $(0,2)$: $x=-(0)=0$; $y=2=2$. Original $(0,2)$.
4. Plot the three result points and connect them in order to close the triangle.

Problem 4

1. From image $(0,-1)$: $x=-1=-1$; $y=-(0)=0$. Original $(-1,0)$.
2. From image $(0,1)$: $x=1=1$; $y=-(0)=0$. Original $(1,0)$.
3. From image $(-2,0)$: $x=0=0$; $y=-(-2)=2$. Original $(0,2)$.

Problem 5

1. From image $(1,0)$: $x=-(1)=-1$; $y=-(0)=0$. Original $(-1,0)$.
2. From image $(-1,0)$: $x=-(-1)=1$; $y=-(0)=0$. Original $(1,0)$.
3. From image $(0,-2)$: $x=-(0)=0$; $y=-(-2)=2$. Original $(0,2)$.
4. Plot the three result points and connect them in order to close the triangle.

Problem 6

1. From image $(-2,2)$: $x=-2+1=-1$; $y=2-2=0$. Original $(-1,0)$.
2. From image $(0,2)$: $x=0+1=1$; $y=2-2=0$. Original $(1,0)$.
3. From image $(-1,4)$: $x=-1+1=0$; $y=4-2=2$. Original $(0,2)$.

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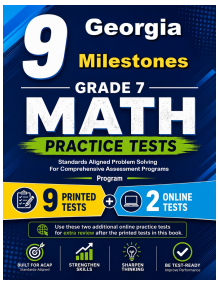

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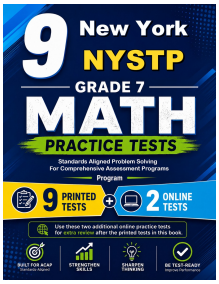

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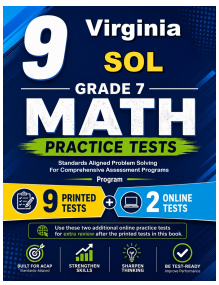

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