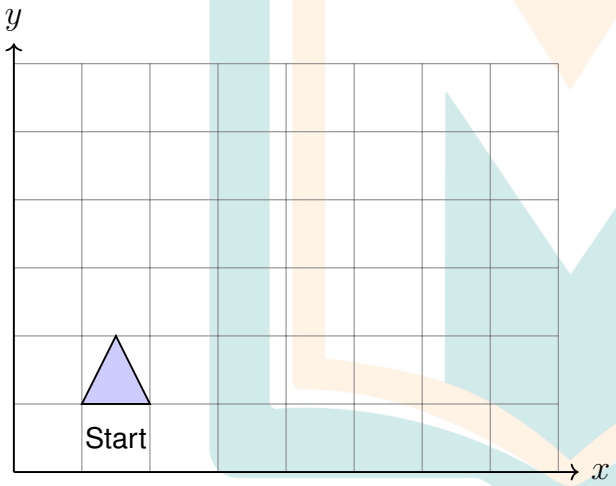
Merit Tutoring

Worksheet 45: Translations & Reflections

Year 6 Mathematics — Space & Geometry — Name: _____

Section 1: Fluency — Translation (Sliding Shapes)

Question 1: Look at the triangle on the grid below. Translate (slide) the triangle **4 units Right** and **2 units Up**. Draw the new position of the triangle.



Answer: Draw your translated triangle on the grid above.

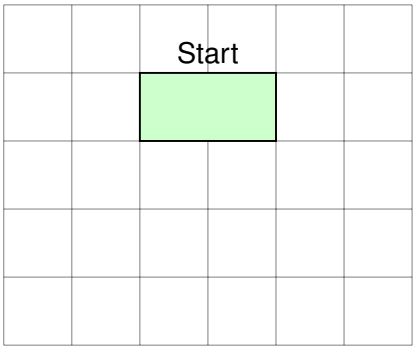
Question 2: A point is located at

$$(2, 3)$$

on a coordinate grid. If the point is translated **3 units Left** and **1 unit Down**, what are the new coordinates?

Answer: _____

Question 3: Look at the rectangle below. Translate it **2 units Down**. Draw the new position.



Answer: Draw your translated rectangle on the grid above.

Question 4: True or False: When you translate a shape, its size and orientation stay the same.

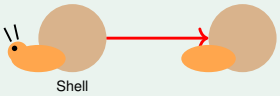
Answer: _____

Question 5: A dot at

$$(5, 4)$$

moves **2 units Right** and **3 units Up**. What are its new coordinates?

Answer: _____

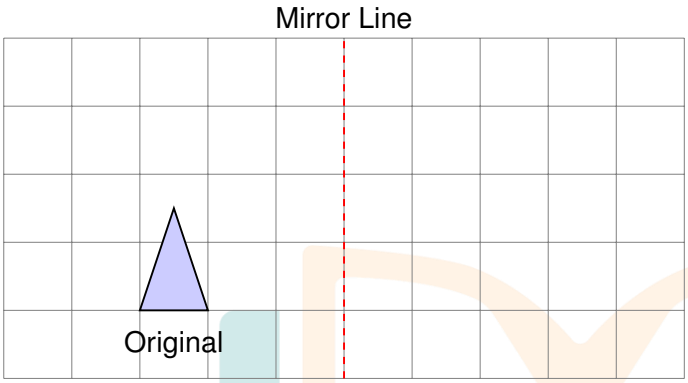


Sliding Superstar!

Why did the shape go on a slide?
Because it wanted to translate its excitement!

Section 2: Reasoning — Reflection (Flipping Shapes)

Question 6: Reflect the triangle over the dashed mirror line (vertical line). Draw the reflected triangle.



Answer: Draw your reflected triangle on the grid above.

Question 7: A point is at

$$(3, 2)$$

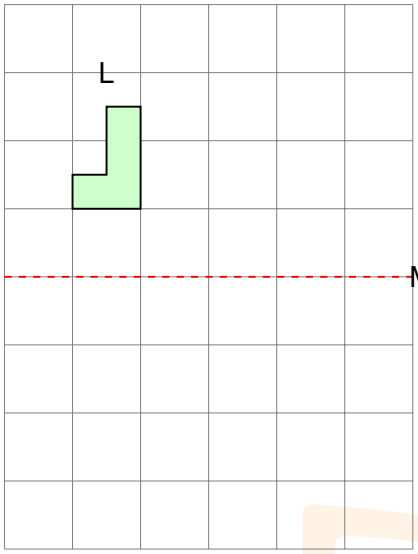
. It is reflected over a vertical line at

$$x = 5$$

. What are the new coordinates? *Hint:* The point is 2 units to the left of the line, so it will be 2 units to the right after reflection.

Answer: _____

Question 8: Reflect the letter L over the horizontal mirror line. Draw the reflected shape.



Answer: Draw your reflected L on the grid above.

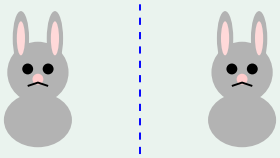
Question 9: Is a reflection the same as a translation (slide)? Explain why or why not in one sentence.

Answer: _____

_____

Question 10: A shape is reflected over a mirror line and then reflected again over the same line. Where does it end up?

Answer: _____



Reflection Champion!

What did the mirror say to the shape?
I can see right through you... and make a copy!

Section 3: Challenge — Coordinate Transformations

Question 11: Point A is at

$$(4, 5)$$

. It is reflected over the x-axis (the horizontal axis). What are the new coordinates? *Hint:* The x-coordinate stays the same, but the y-coordinate changes sign.

Answer: _____

Question 12: Point B is at

$$(6, 2)$$

. It is reflected over the y-axis (the vertical axis). What are the new coordinates?

Answer: _____

Question 13: A triangle has vertices at

$$(1, 1)$$

,

$$(3, 1)$$

, and

$$(2, 3)$$

. If the entire triangle is translated **2 units Right** and **1 unit Up**, what are the new coordinates of all three vertices?

Answer: _____

_____

Question 14: Describe the transformation: A shape at

$$(2, 4)$$

moves to

$$(2, -4)$$

. Is this a translation or a reflection?

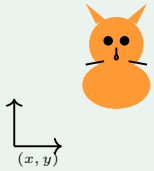
Answer: _____

Question 15: Point C is at

$$(-3, 5)$$

. It is translated **4 units Right** and **2 units Down**. What are the new coordinates?

Answer: _____



Transformation Titan!

Why did the coordinate point bring a map?
Because it didn't want to lose its position!

Fantastic work! Check your answers on the next page.

Worksheet 45: Answer Key

Section 1: Fluency — Translation (Sliding Shapes)

Question 1: The triangle should be drawn with vertices at approximately

$$(5, 3)$$

,

$$(6, 3)$$

, and

$$(5.5, 4)$$

(moved 4 right, 2 up from original position).

Question 2:

$$(-1, 2)$$

(Left 3 means subtract 3 from x; Down 1 means subtract 1 from y)

Question 3: Rectangle drawn from

$$(2, 1)$$

to

$$(4, 2)$$

(moved 2 units down)

Question 4: True

Question 5:

$$(7, 7)$$

(

$$5 + 2 = 7$$

,

$$4 + 3 = 7$$

)

Section 2: Reasoning — Reflection (Flipping Shapes)

Question 6: Triangle reflected with vertices at approximately

$$(7, 1)$$

,

$$(8, 1)$$

, and

$$(7.5, 2.5)$$

(mirror image across

$$x = 5$$

line)

Question 7:

$$(7, 2)$$

(Point is 2 units left of

$$x = 5$$

, so reflection is 2 units right:

$$5 + 2 = 7$$

)

Question 8: L shape reflected below the mirror line (upside down L)

Question 9: No, because reflection creates a mirror image (flips the shape), while translation just moves it without flipping. (Accept reasonable explanations)

Question 10: Back in its original position

Section 3: Challenge — Coordinate Transformations

Question 11:

$$(4, -5)$$

(x stays same, y changes sign)

Question 12:

$$(-6, 2)$$

(x changes sign, y stays same)

Question 13:

$$(3, 2)$$

,

$$(5, 2)$$

, and

$$(4, 4)$$

(Add 2 to all x-coordinates, add 1 to all y-coordinates)

Question 14: Reflection (over the x-axis)

Question 15:

$$(1, 3)$$

(

$$-3 + 4 = 1$$

,

$$5 - 2 = 3$$

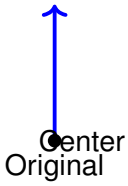
)

Worksheet 46: Rotations & Tessellations

Year 6 Mathematics — Space & Geometry — Name: _____

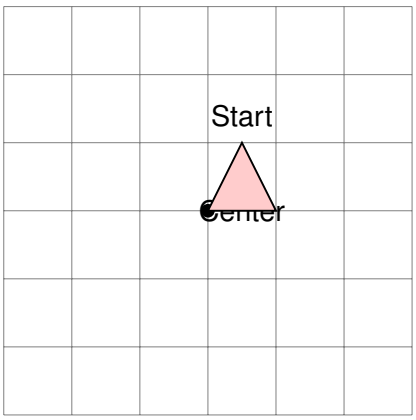
Section 1: Fluency — Rotation (Turning Shapes)

Question 1: The arrow below is pointing UP. Rotate it 90° clockwise (quarter turn to the right). Which direction will it point? Draw the rotated arrow.



Answer: _____

Question 2: Rotate the triangle below 180° (half turn) around the center point. Draw the new position.



Answer: Draw your rotated triangle on the grid above.

Question 3: A shape is rotated 90° clockwise. How many more degrees does it need to rotate to complete a full turn (360°)?

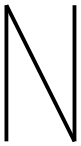
Answer: _____

Question 4: True or False: Rotating a shape 360° brings it back to its original position.

Answer: _____

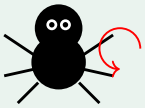
Question 5: The letter N is rotated 90°

clockwise. Sketch what it might look like after rotation.



N

Answer: Draw your rotated N above or describe it: _____

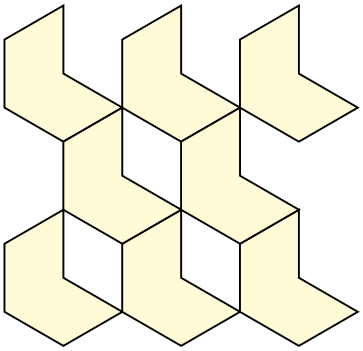


Rotation Rockstar!

Why did the spider love rotations?
Because it could spin its web in every direction!

Section 2: Reasoning — Tessellations (Tiling Patterns)

Question 6: Look at the hexagon pattern below. Do regular hexagons tessellate (fit together with no gaps)? Answer Yes or No.



Answer: _____

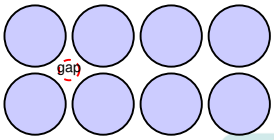
Question 7: Do squares tessellate? Think about tiles on a floor. Answer Yes

or No and explain why in one sentence.

Answer: _____

_____

Question 8: Look at the pattern below. Do circles tessellate (fit together with no gaps)?



Answer: _____

Question 9: Which of these shapes tessellate? Circle all correct answers: **Triangle, Pentagon, Rectangle, Circle**

Answer: _____

Question 10: A tessellation is a pattern made by fitting shapes together with no _____ or overlaps.

Answer: _____

Pattern Pro!

Why did the turtle love tessellations?
Because its shell is made of perfect hexagons!

Section 3: Challenge — Combined Transformations

Question 11: A square has vertices at $(1, 1)$, $(2, 1)$, $(2, 2)$, and $(1, 2)$. Translate it **3 units Right**. What are the new coordinates of all four vertices?

Answer: _____

_____

Question 12: A triangle is rotated 90° clockwise, then rotated another 90° clockwise. What is the total rotation?

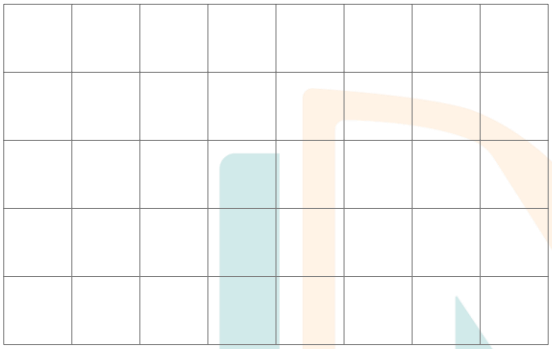
Answer: _____

Question 13: Start with a point at $(2, 3)$.

. First, reflect it over the y-axis. Then translate it **1 unit Up**. What are the final coordinates?

Answer: _____

Question 14: Draw a simple tessellation pattern using only equilateral triangles. Fit at least 6 triangles together on the grid below.



Answer: Draw your tessellation on the grid above.

Question 15: A shape undergoes the following transformations in order:

- Translate 2 units Right
- Rotate

$$180^\circ$$

- Reflect over a vertical line

If the transformations are complex, which transformation changed the shape's orientation the most?

Answer: _____

Question 16: Create your own transformation sequence: Describe how to move a square from

$$(0, 0)$$

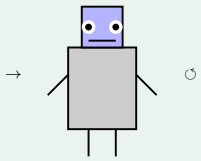
to

$$(5, 5)$$

using any combination of translation, reflection, or rotation.

Answer: _____

_____



Transformation Master!

What's a robot's favorite transformation?
The rotation—because it loves to do the robot dance!

Outstanding effort! Check your answers on the next page.

Worksheet 46: Answer Key

Section 1: Fluency — Rotation (Turning Shapes)

Question 1: RIGHT (The arrow will point to the right after a

$$90^\circ$$

clockwise rotation)

Question 2: Triangle drawn with vertices at

$$(3, 3)$$

,

$$(2, 3)$$

, and

$$(2.5, 2)$$

(upside down from original)

Question 3:

$$270^\circ$$

(

$$360^\circ - 90^\circ = 270^\circ$$

)

Question 4: True

Question 5: The N rotated

$$90^\circ$$

clockwise looks like a sideways N (or a Z-like shape). Accept reasonable sketches showing the letter turned.

Section 2: Reasoning — Tessellations (Tiling Patterns)

Question 6: Yes (Regular hexagons tessellate perfectly, as shown in the diagram)

Question 7: Yes, squares tessellate because their

$$90^\circ$$

angles fit together perfectly with no gaps. (Accept reasonable explanations)
Question 8: No (Circles leave gaps between them and cannot tessellate)
Question 9: Triangle and Rectangle (Regular pentagons do NOT tessellate; circles do NOT tessellate)
Question 10: gaps (A tessellation has no gaps or overlaps)

Section 3: Challenge — Combined Transformations

Question 11:

$$(4, 1)$$

,

$$(5, 1)$$

,

$$(5, 2)$$

, and

$$(4, 2)$$

(Add 3 to all x-coordinates)
Question 12:

$$180^\circ$$

(

$$90^\circ + 90^\circ = 180^\circ$$

)
Question 13:

$$(-2, 4)$$

(Reflection over y-axis:

$$(2, 3) \to (-2, 3)$$

; then translate up 1:

$$(-2, 3) \to (-2, 4)$$

)
Question 14: Student should draw 6 or more equilateral triangles fitting together (accept reasonable tessellation patterns)
Question 15: Rotation (

$$180^\circ$$

rotation) or Reflection (Both change orientation significantly; accept either answer with reasonable explanation)

Question 16: Example: ”Translate 5 units Right and 5 units Up” (Accept any valid transformation sequence that moves the square to

$$(5, 5)$$

)

