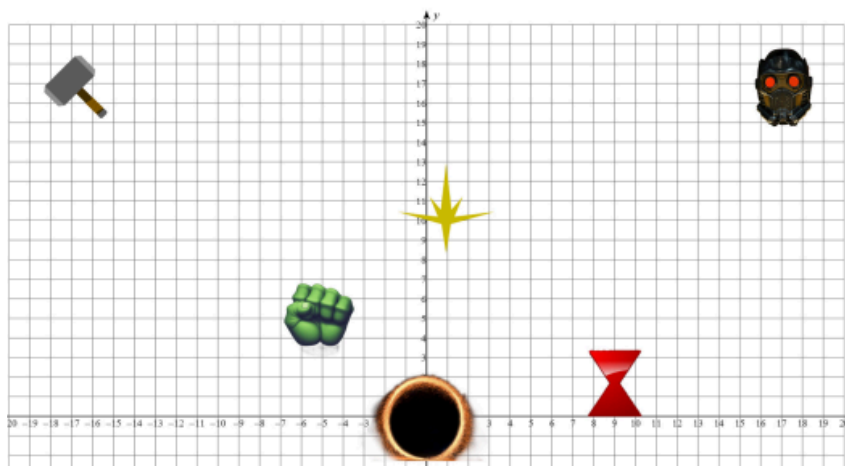


Graphing Transformations Activity

Operation Infinity Safeguard: Nick Fury's Top Secret Mission



Objective: To experiment with transformations in the coordinate plane. Given a geometric figure and a rotation, reflection, dilation, or translation, draw the transformed figure.

Activity Directions: Each student should receive a copy of pages 3-6. Place students into 6 groups. Assign each group an infinity stone to protect. They will use the initial position of that stone to perform transformations on the Marvel Universe map. Print out one copy of the safehouse location on page 10, laminate and cut out the letters. After students have completed all 6 transformations (in order) on the same coordinate plane, they should have obtained a code that they will check with you. If their code is correct, they should receive two letters of the secret message containing the safehouse location. The two letters each group receives from you is illustrated in the answer key. Once all groups have successfully completed their task of retrieving the code, they must put their parts of the secret message together to determine the safehouse location for the stones and save the universe!

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Cassidy and Chloe - [Inspired By Math](#)



Name: _____

Operation Infinity Safeguard: Nick Fury's Top Secret Mission

Avengers, assemble! Thanos is after the Infinity Stones, and we need your help to protect them. Your mission is to safeguard your assigned Infinity Stone through a series of transformations across the Marvel Universe. If all teams are successful, they will receive part of a coded message from Nick Fury informing them of the safehouse location for the stones. Teams must then work together to decode the hidden message and determine the location.

Materials Needed:

- Marvel Universe Coordinate Plane Map
- Pencil and eraser
- Colored pencils or markers

Team Assignments and Initial Position:

1. **Team Space (Tesseract - Blue):**
A: (10, 8), B: (12, 6), C: (11, 2)
2. **Team Reality (Aether - Red):**
A: (- 4, 0), B: (- 2, 4), C: (- 5, 2)
3. **Team Power (Orb - Purple):**
A: (0, - 16), B: (2, - 12), C: (- 1, - 14)
4. **Team Mind (Scepter - Yellow):**
A: (- 7, - 8), B: (- 5, - 10), C: (- 6, - 12)
5. **Team Time (Eye of Agamotto - Green):**
A: (4, 12), B: (7, 10), C: (6, 14)
6. **Team Soul (Soul Stone - Orange):**
A: (8, - 8), B: (7, - 12), C: (11, - 10)

Mission Objectives:

1. Complete each transformation step, showing all calculations for each step.
2. Plot each new position of your stone by transforming all three vertices on your map.
3. Use point A's coordinates for decoding at checkpoints.
4. Reach your final safehouse coordinates.
5. Combine your team's final message with others to reveal Nick Fury's secret message.

Remember, Avengers:

- Keep your map clear, using your team's color for all plotting.
- If you're stuck, communicate with your team or ask your teacher for help.
- Time is of the essence! The fate of the universe is in your hands!

Good luck, Avengers. We're counting on you to safeguard the Infinity Stones!

Mission Steps:

1. Initial Plotting:

- Use your team's assigned color when plotting vertex points.
- Plot all 3 vertices (A , B , C) of your stone's initial position on the Marvel map.
- Connect the points to form a triangle and label the vertices accordingly.

2. Evasive Maneuvers:

- Translate each vertex of your stone from its initial position to $(x - 3, y + 6)$.
- Calculate the new coordinates for all vertices (A' , B' , C') of your infinity stone and plot them on your map.

3. Checkpoint Alpha:

- Use only point A's new coordinates with the decoding key.
- Write down this number; it will be needed to acquire your part of the secret message.

4. Thanos Interference – Mirror Dimension:

- Reflect the entire stone across the y-axis from its current position.
- Calculate the new coordinates, plot and label the transformed infinity stone.

5. Reality Bender:

- Dilate the stone accordingly: $(x, y) \rightarrow (2x, \frac{1}{2}y)$ from its current position.
- Calculate the new coordinates, plot and label the stone.

6. Checkpoint Beta:

- Use only point A's new coordinates with the decoding key.
- Write down this number.

7. Power Spin:

- Rotate the stone 90° counterclockwise around the origin from its current position.
- Calculate the new coordinates, plot and label the stone.

8. Thanos Interference – Mind Maze:

- Reflect the stone across the line $y = -x$ from its current position.
- Calculate the new coordinates, plot and label the stone.

9. Checkpoint Gamma:

- Use only point A's new coordinates with the decoding key.
- Write down this number.

10. Final Transformation:

- Rotate the stone 180° from its current position.
- Calculate the new coordinates, plot and label the stone.

11. Mission Completion:

Verify that point A of your stone has reached these coordinates:

- **Space Stone Vertex A:** $(-14, -7)$
- **Reality Stone Vertex A:** $(14, -3)$
- **Power Stone Vertex A:** $(6, 5)$
- **Mind Stone Vertex A:** $(20, 1)$
- **Time Stone Vertex A:** $(-2, -9)$
- **Soul Stone Vertex A:** $(-10, 1)$

12. Checkpoint Delta:

- Retrieve the final number using point A's coordinates and the decoder key.

Decoder Key: You will acquire a number at each checkpoint. That number is the absolute value of the difference of x and y for coordinate point A. Once you have all four checkpoints completed, check your code with the teacher to receive your part of the hidden message.

Alpha Checkpoint Number:

Gamma Checkpoint Number:

Beta Checkpoint Number:

Delta Checkpoint Number:

13. Avengers Assemble:

- Join other teams to combine your parts of the hidden message.
- Unscramble the combined letters to reveal Nick Fury's complete secret message and transport the stones to the correct safehouse location!

MARVEL UNIVERSE MAP



KEY

Operation Infinity Safeguard: Nick Fury's Top Secret Mission

Space Stone:

Initial Position: $A: (10, 8)$, $B: (12, 6)$, $C: (11, 2)$

Evasive Maneuvers: $A': (7, 14)$, $B': (9, 12)$, $C': (8, 8)$

Checkpoint Alpha: **7**

Mirror Dimension: $A'': (-7, 14)$, $B'': (-9, 12)$, $C'': (-8, 8)$

Reality Bender: $A''': (-14, 7)$, $B''': (-18, 6)$, $C''': (-16, 4)$

Checkpoint Beta: **21**

Power Spin: $A^{(4)}: (-7, -14)$, $B^{(4)}: (-6, -18)$, $C^{(4)}: (-4, -16)$

Mind Maze: $A^{(5)}: (14, 7)$, $B^{(5)}: (18, 6)$, $C^{(5)}: (16, 4)$

Checkpoint Gamma: **7**

Final Destination: $A^{(6)}: (-14, -7)$, $B^{(6)}: (-18, -6)$, $C^{(6)}: (-16, -4)$

Checkpoint Delta: **7**

Code: **72177**

Part of Hidden Message: **QL**

Reality Stone:

Initial Position: $A: (-4, 0)$, $B: (-2, 4)$, $C: (-5, 2)$

Evasive Maneuvers: $A': (-7, 6)$, $B': (-5, 10)$, $C': (-8, 8)$

Checkpoint Alpha: **13**

Mirror Dimension: $A'': (7, 6)$, $B'': (5, 10)$, $C'': (8, 8)$

Reality Bender: $A''': (14, 3)$, $B''': (10, 5)$, $C''': (16, 4)$

Checkpoint Beta: **11**

Power Spin: $A^{(4)}: (-3, 14)$, $B^{(4)}: (-5, 10)$, $C^{(4)}: (-4, 16)$

Mind Maze: $A^{(5)}: (-14, 3)$, $B^{(5)}: (-10, 5)$, $C^{(5)}: (-16, 4)$

Checkpoint Gamma: **17**

Final Destination: $A^{(6)}: (14, -3)$, $B^{(6)}: (10, -5)$, $C^{(6)}: (16, -4)$

Checkpoint Delta: **17**

Code: **13111717**

Part of Hidden Message: **TM**

Power Stone:

Initial Position: $A: (0, -16), B: (2, -12), C: (-1, -14)$

Evasive Maneuvers: $A': (-3, -10), B': (-1, -6), C': (-4, -8)$

Checkpoint Alpha: 7

Mirror Dimension: $A'': (3, -10), B'': (1, -6), C'': (4, -8)$

Reality Bender: $A''': (6, -5), B''': (2, -3), C''': (8, -4)$

Checkpoint Beta: 11

Power Spin: $A^{(4)}: (5, 6), B^{(4)}: (3, 2), C^{(4)}: (4, 8)$

Mind Maze: $A^{(5)}: (-6, -5), B^{(5)}: (-2, -3), C^{(5)}: (-8, -4)$

Checkpoint Gamma: 1

Final Destination: $A^{(6)}: (6, 5), B^{(6)}: (2, 3), C^{(6)}: (8, 4)$

Checkpoint Delta: 1

Code: 71111

Part of Hidden Message:UA

Mind Stone:

Initial Position: $A: (-7, -8), B: (-5, -10), C: (-6, -12)$

Evasive Maneuvers: $A': (-10, -2), B': (-8, -4), C': (-9, -6)$

Checkpoint Alpha: 8

Mirror Dimension: $A'': (10, -2), B'': (8, -4), C'': (9, -6)$

Reality Bender: $A''': (20, -1), B''': (16, -2), C''': (18, -3)$

Checkpoint Beta: 21

Power Spin: $A^{(4)}: (1, 20), B^{(4)}: (2, 16), C^{(4)}: (3, 18)$

Mind Maze: $A^{(5)}: (-20, -1), B^{(5)}: (-16, -2), C^{(5)}: (-18, -3)$

Checkpoint Gamma: 19

Final Destination: $A^{(6)}: (20, 1), B^{(6)}: (16, 2), C^{(6)}: (18, 3)$

Checkpoint Delta: 19

Code: 8211919

Part of Hidden Message:NR

Time Stone:

Initial Position: $A: (4, 12), B: (7, 10), C: (6, 14)$

Evasive Maneuvers: $A': (1, 18), B': (4, 16), C': (3, 20)$

Checkpoint Alpha: 17

Mirror Dimension: $A'': (-1, 18), B'': (-4, 16), C'': (-3, 20)$

Reality Bender: $A''': (-2, 9), B''': (-8, 8), C''': (-6, 10)$

Checkpoint Beta: 11

Power Spin: $A^{(4)}: (-9, -2), B^{(4)}: (-8, -8), C^{(4)}: (-10, -6)$

Mind Maze: $A^{(5)}: (2, 9), B^{(5)}: (8, 8), C^{(5)}: (6, 10)$

Checkpoint Gamma: 7

Final Destination: $A^{(6)}: (-2, -9), B^{(6)}: (-8, -8), C^{(6)}: (-6, -10)$

Checkpoint Delta: 7

Code: 171177

Part of Hidden Message: UE

Soul Stone:

Initial Position: $A: (8, -8), B: (7, -12), C: (11, -10)$

Evasive Maneuvers: $A': (5, -2), B': (4, -6), C': (8, -4)$

Checkpoint Alpha: 7

Mirror Dimension: $A'': (-5, -2), B'': (-4, -6), C'': (-8, -4)$

Reality Bender: $A''': (-10, -1), B''': (-8, -3), C''': (-16, -2)$

Checkpoint Beta: 9

Power Spin: $A^{(4)}: (1, -10), B^{(4)}: (3, -8), C^{(4)}: (2, -16)$

Mind Maze: $A^{(5)}: (10, -1), B^{(5)}: (8, -3), C^{(5)}: (16, -2)$

Checkpoint Gamma: 11

Final Destination: $A^{(6)}: (-10, 1), B^{(6)}: (-8, 3), C^{(6)}: (-16, 2)$

Checkpoint Delta: 11

Code: 791111

Part of Hidden Message: MA

Safehouse Location: Quantum Realm

