

BLACK PANTHER

Dear Teacher,

You can bring the magic of Marvel's *Black Panther* into your classroom with this math infused STEM lesson. In the movie, the people Wakanda communicate through holograms using a special AV bead on their Kimoyo Bracelet. These images can be scaled small for personal use or can be proportionally larger for display purposes. Invite your students to explore scale factor through hands-on math this activity that will help develop problem - solving skills. More info can be provided on [youtube.com/drvcjones](https://www.youtube.com/drvcjones).

~Dr. Valerie Camille Jones (@DrVCJones)

Lesson: Transforming Black Panther

Goal: Students will practice using scale factor to create similar figures and transform them on the coordinate plane.

Time: One to two 45-minutes class periods

Standards:

CCSS.MATH.CONTENT.6.G.A.3

CCSS.MATH.CONTENT.7.G.A.1

CCSS.MATH.CONTENT.8.G.A.3

CCSS.MATH.CONTENT.8.G.A.4

1. **Distribute** Activity Sheet 1 and Activity Sheet 2
2. As a class, **review** the four transformations: translation, reflection, rotation, and dilation. Make sure to talk about how transformations move on the coordinate plane. To create a dilation, one must use a scale factor. The way I introduce scale factor is through a video/ comic book called **Scale Ella**. It can be found here: <http://mathsnacks.com/scale-ella-guide.html>
3. As a class, **discuss** how holograms are truly created. There are several videos on **YouTube** that explain in detail how a real hologram is created. Ask the class if they can find any relationship between holograms and scale factor. For example, in the Black Panther movie, the kimoyo bead created a scaled down version of Okoye when she communicated in hologram form to King T'Challa.
4. **Present** students with the task of translating and dilating T'Challa on the coordinate plane through Activity 1 and Activity 2.
5. **Final Activity: Construct** a "hologram like" image in class. Several users on YouTube have created videos with four mirrored images centered at the origin and reflected across the x and y axis. You can find these videos by searching under the words "**hologram video**." To allow these 2D images to create a 3D "hologram" image, the students will need a clear trapezoidal (bottomless) prism. Distribute **Activity Sheet 3** for instructions on how to create this prism using scale factor. Once created, students can place the prism on center of the hologram video and allow the 3D image to appear. *(The visual for Activity 3 contains the answer key.)*



Image from Scale Ella by
New Mexico State University



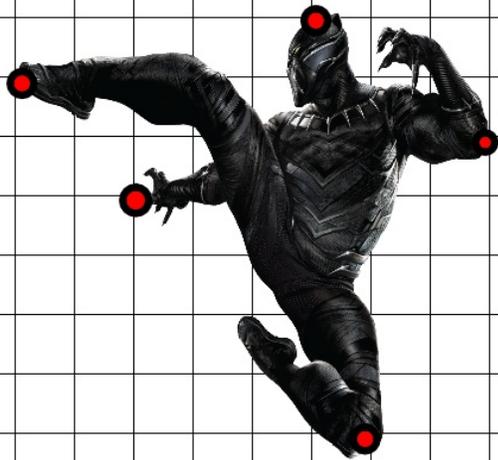
Image from the Black Panther
comic Vol 3 #1

WHAT IS THE RELATIONSHIP BETWEEN HOLOGRAMS AND SCALE FACTOR?

ACTIVITY SHEET 1

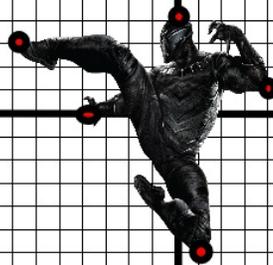
WHAT WOULD THE COORDINATES OF BLACK PANTHER'S POINTS BE IF HE WAS PROJECTED USING THESE REQUIREMENTS?

TRANSLATED EIGHT UNITS TO THE RIGHT



WHAT IS THE RELATIONSHIP BETWEEN HOLOGRAMS AND SCALE FACTOR?

ACTIVITY SHEET 2



WHAT WOULD THE COORDINATES OF BLACK PANTHER'S POINTS BE IF HE WAS PROJECTED USING THESE REQUIREMENTS?

DILATION: SCALE FACTOR OF 3



BLACK PANTHER



Scale Factor

Activity 3

Holograms



Kimoyo Beads are a piece of advanced communication technology developed and used in the technological advanced nation of Wakanda. They tap into the Vibranium of Wakanda. The technology cannot be exported as it simply can't work outside of the country.

The bead on the Kimoyo bracelet that provides a holographic display is the **AV Bead**. It allows the people of Wakanda access to the Wakandan database (similar to the Internet). They can access video files and receive broadcasts on any frequency. The size of the projected can be altered proportionally according to **Scale factor** from small personal use to larger for display purposes.



Follow These Directions To Create Your Hologram Projector Mathematically:

Step 1: On your graph paper, create a trapezoid with the following vertices:

T (-9, 10) ; **R** (-7, 10) ; **A** (-4, 5) ; **P** (-12, 5)

Step 2: Find the length of each side of the trapezoid. Find the length of the height.

Step 3: Using the lengths that you found, make a new trapezoid T'R'A'P' that is scaled using a dilation of $\frac{3}{2}$ for each length. Put this trapezoid in quadrant four.

Step 4: After getting your trapezoid approved, cut it out. Trace four of the same trapezoid on the plexi glass paper given to you and cut each out.



Step 5: Tape each side together to create your projector.

VISUAL FOR ACTIVITY 3

