

TRANSLATIONS

Professional Development Provider Notes

<p>Summary</p> <p>Participants experiment with translations, and learn some properties of this isometry. Participants use translations to create 3-dimensional figures.</p>	<p>Goals</p> <ul style="list-style-type: none"> • Visualize, and then perform translations using patty paper and coordinates • Explore properties of translations • Apply translations to draw figures. 	<p>Participant Pages</p> <p>PP1: Translations PP2: Visualizing Translations PP3: Translations in the Coordinate Plane PP4: Drawing Figures in Three Dimensions</p>
<p>Reproducibles</p> <p>Reproduce standards page and word bank for participants if desired.</p>	<p>Materials</p> <ul style="list-style-type: none"> • Patty paper (2-3 sheets per participant) • Colored pencils • internet access (for demonstration) 	<p>Technology</p> <p>To see translations in action, go to:</p> <p>http://www.waldomaths.com/</p> <p>At this website go to Ages 11 – 16, and then translations</p>

MATHEMATICS STANDARDS

COMMON CORE STATE STANDARDS FOR MATHEMATICS

8.G.1a	Verify experimentally the properties of rotations, reflections, and translations: Lines are taken to lines, and line segments to line segments of the same length.
8.G.1b	Verify experimentally the properties of rotations, reflections, and translations: Angles are taken to angles of the same measure.
8.G.1c	Verify experimentally the properties of rotations, reflections, and translations: Parallel lines are taken to parallel lines.
8.G.2	Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.
G-CO-2	Represent transformations in the plane using, e.g. transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation vs. horizontal stretch).
G-CO-5	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry the given figure onto another.

STANDARDS FOR MATHEMATICAL PRACTICE

Some of the Standards for Mathematical Practice that are applied in this lesson are:

2 Reason abstractly and quantitatively

Participants begin their exploration of translations using a concrete model. But as the lesson progresses, they move to quantifying the transition with a vector.

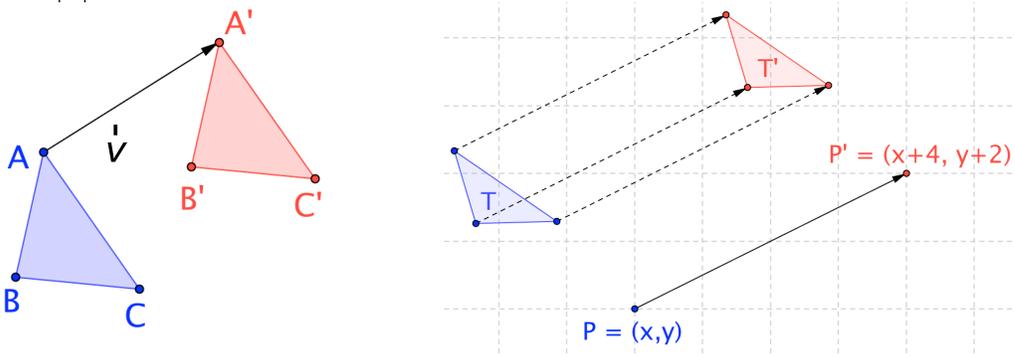
5 Use appropriate tools strategically.

Tools that emphasize how transformations work dynamically help participants to develop meaning for the concept. Tools used here include patty paper, protractor, and an interactive applet available on the internet.

8 Look for regularity in repeated reasoning

As participants recognize the effect of a translation vector to describe a translation, they apply this concept to other transformations under translation. This pattern allows them to create 3-D figures using mathematical ideas.

WORD BANK

isometry	An isometry is a transformation of the plane that preserves length.
image	An image is the resulting point or set of points under a mapping (function).
translation	<p>A <u>translation</u> of the plane shifts all points on the plane in the same direction and in the same distance. That is, given a vector (directed segment) \vec{v}, the image P' of a point P is the point for which $\overline{PP'}$ is parallel to \vec{v} and $PP' = \vec{v}$.</p> 
transformation	A transformation of the plane is a one-to-one mapping (function) of the plane onto itself.

WARMUP

Whole Class

➤ SP1
Translations

- Introduce the goals and standards of the lesson. Discuss important vocabulary as relevant.
- Participants examine a figure and its image under a translation transformation. Discuss properties.

Describe steps that map the figure to its image. Slide the figure to the left.

Do these figures appear congruent? Yes

Are the letters of the triangle and its image in the same order, when read clockwise? Yes. This means the transformation preserves 'orientation'. Participants will learn that a reflection does not preserve orientation in another lesson.

Identify the transformation. This is called a translation.

INTRODUCE

Whole Class

➤ SP2
Rotations

Materials:
colored pencils
patty paper
internet access

- Participants use patty paper to perform translations.

Under the translation, are there any points that do not move? No

What do you observe the relationship of the vectors formed that connect a point to its image? They are parallel to each other

Is distance preserved? What does that mean? Yes. All lengths of segments remain the same. Lines are taken to lines, and line segments to line segments of the same length.

Is parallelism preserved? What does this mean? In general, yes. Parallel lines are taken to parallel lines. This does not refer to the vectors that show the translation. This refers to parallel lines in the original figure that continue to be parallel under in the image under translation.

Are angle measures preserved? Yes. What does this mean? Angles are taken to angles of the same measure.

EXPLORE

Groups

➤ SP3
Translations in the
Coordinate Plane

Materials:
Patty paper
Colored pencils

- Participants explore translations on a coordinate plane. Vector notation is introduced as a language for describing the transformation.

SUMMARIZE

Whole Class

➤ SP3
Introduction to
Isometries

- Ask participants to state and explain the meaning of some of the key properties of translations. Record them on the board, and revise language for clarity as a group. Some possible statements are:

Translations preserve distance.

Translations preserve parallelism.

Translations preserve angle measure.

Translations maintain orientation.

Translations maintain betweenness of points.

Translations preserve collinearity.

PRACTICE

Individuals

➤ SP4
Drawing Figures in
Three Dimensions

- Participants may find that applying concepts of translations makes drawing 3-D figures easy, even if they don't perceive themselves as artistic.

CLOSURE

Whole class

➤ SP1
Visualizing
Rotations

Review standards, vocabulary, and goals for lesson.