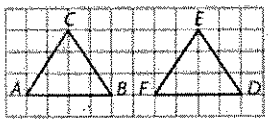
Day 1: Introduction to Transformations and Translations

Warm-Up:

Transformations: Translations

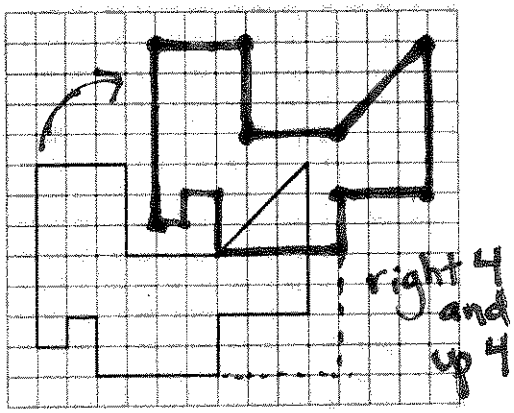
A translation, or a slide, is the movement of a figure from one position to another without turning. To the right are examples of a horizontal slide and a vertical slide.

horizontal slide

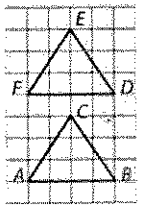


6 units to the right

Look at the figure below. Slide the figure 4 units to the right and 4 units up. Draw the image on the graph.



vertical slide

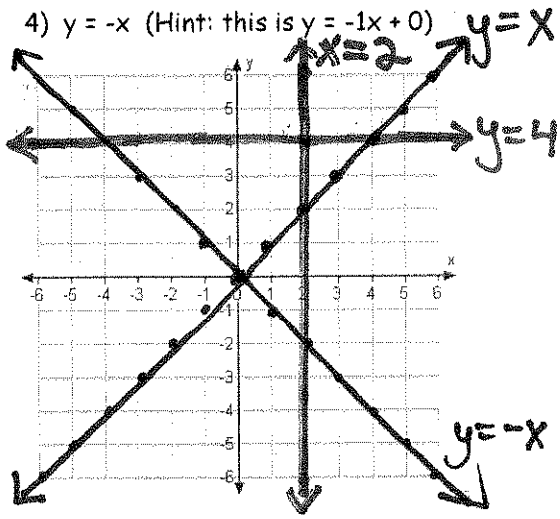


4 units up

Prerequisite Skill: Graphing Lines

Graph the following lines.

1) x = 2
2) y = 4
3) y = x (Hint: this is y = 1x + 0)
4) y = -x (Hint: this is y = -1x + 0)



Introduction to Transformations and Translations

Congruent figures have the same size and the same shape.

When two figures are congruent, you can move one so that it fits exactly on the other one.

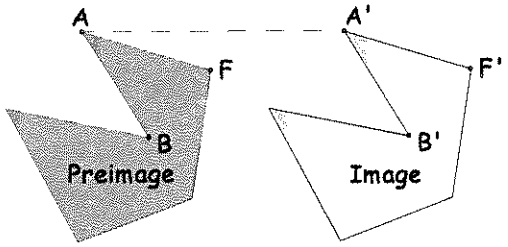
Transformation of a geometric figure: change in its position, shape, or size

Preimage - original figure

Notation: △AFB

Image - new or resulting figure

Notation: △A'F'B'



Isometry - transformation in which preimage and image are the same size and same shape (also called: rigid transformation/motion)

Examples:

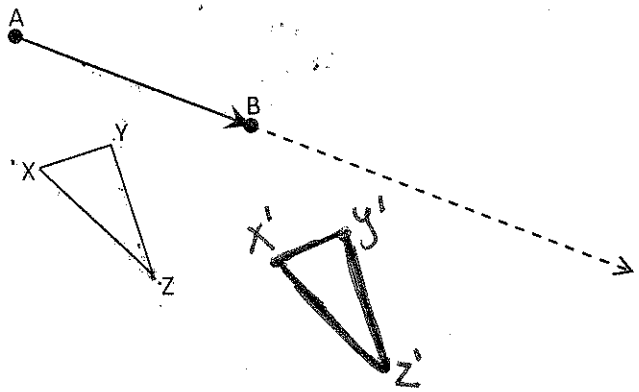
translation, reflection, and rotation

Translation – an isometry that maps all points the Same distance and the same direction. (like the figure in the warmup moved 4 right and 4 up)

Activity 1: Patty Paper Translation

The translation T is defined by T(A) = B … meaning that it slides the figure the distance AB in the direction that $\overrightarrow{AB}$ goes.

1) Place the patty paper over this page. Trace the triangle and points A and B.
2) Slide the patty paper along $\overrightarrow{AB}$ so that the A on the patty paper is on top of B on this sheet and B on the patty paper is still on $\overrightarrow{AB}$ on this sheet.
3) The position of the triangle on your patty paper now corresponds to the image of ΔXYZ under the translation, T. If you press down hard with a sharp pencil, the image of the triangle can be seen on this page when you remove the patty paper.

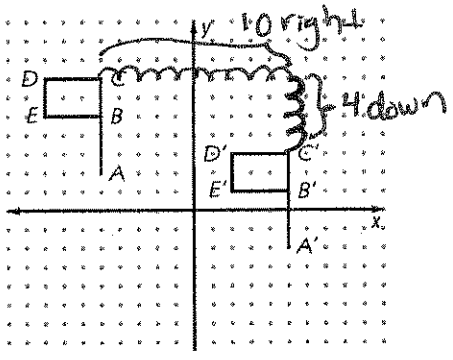


Translation Vector – an arrow that indicates the **distance** and **direction** to translate a figure in a plane.
$\overrightarrow{AB}$ in the activity above is an example of a translation vector.

The notation for a vector is: ⟨ -a, b ⟩ for a translation *a* units to the left and *b* units up.

(- for left, + for right) (+ for up, use - for down)

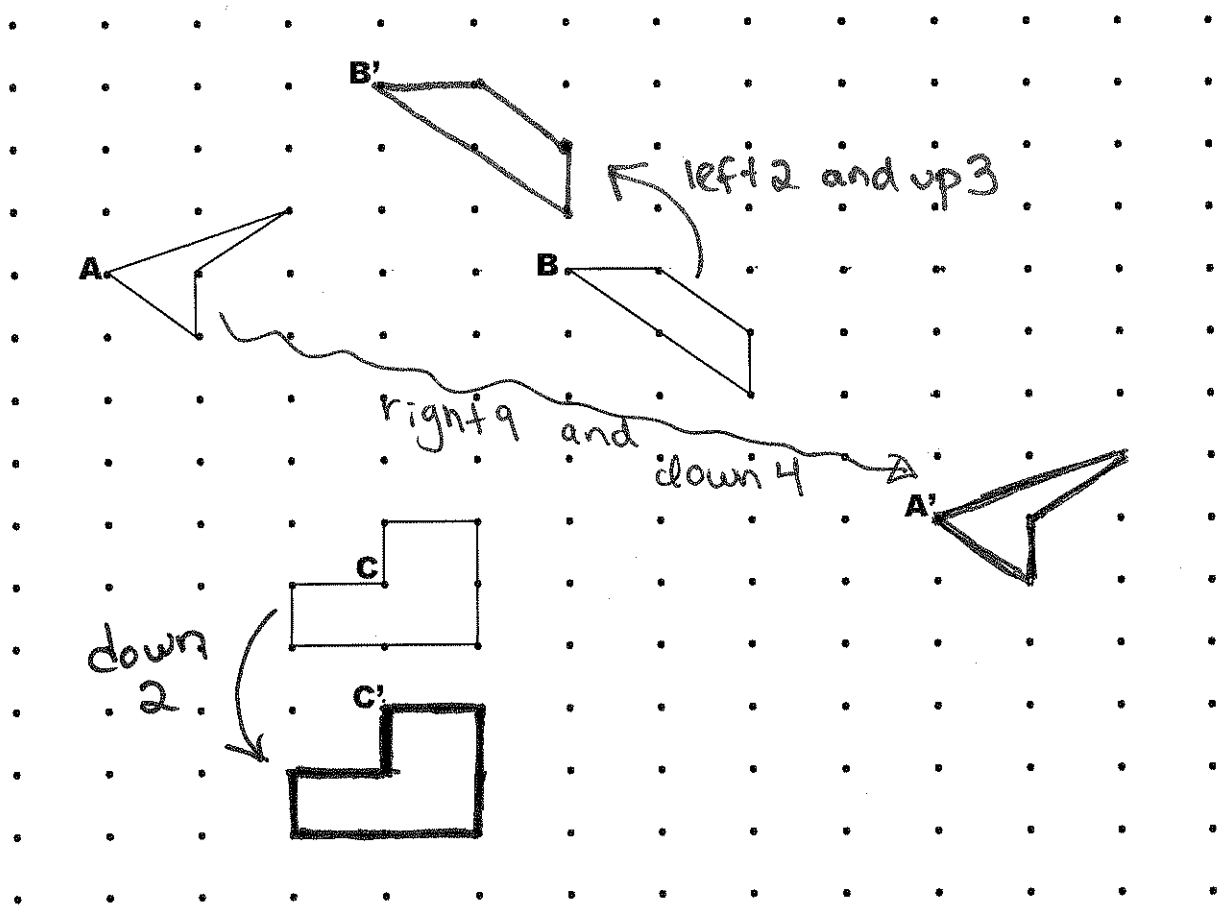
Three ways to describe a transformation (using example shown right):
Always be specific when completing **any type of description!!



1) **Words:** Translation to the right 10 units and down 4 units.
2) **Algebraic rule** (motion rule): T: (x, y) -> (x + 10, y - 4)
3) **Vector:** ⟨ 10, - 4 ⟩

Activity 2: Dot Paper Translations

1) Use the dots to help you draw the image of the first figure so that A maps to A'.
2) Use the dots to help you draw the image of the second figure so that B maps to B'.
3) Use the dots to help you draw the image of the third figure so that C maps to C'.
4) Complete each of the following translation rules using your mappings from 1 – 3 above.
   a) For A, the translation rule is: $T:(x, y) \rightarrow (\underline{x+9}, \underline{y-4})$ or $\langle \underline{9}, \underline{-4} \rangle$
   b) For B, the translation rule is: $T:(x, y) \rightarrow (\underline{x-2}, \underline{y+3})$ or $\langle \underline{-2}, \underline{3} \rangle$
   c) For C, the translation rule is: $T:(x, y) \rightarrow (\underline{x}, \underline{y-2})$ or $\langle \underline{0}, \underline{-2} \rangle$



Checkpoint: ΔGEO has coordinates G(-2, 5), E(-4, 1) O(0, -2). A translation maps G to G' (3, 1). right 5, down 4

1. Find the coordinates of:
   a) E' (1 , -3) b) O' (5 , -6)
2. The translation rule is: $(x, y) \rightarrow (\underline{x+5}, \underline{y-4})$ Algebraic Rule or $\langle \underline{5}, \underline{-4} \rangle$ vector
3. Specifically describe the transformation: translation right 5 units and down 4 units.