Transformational Geometry Reflections

TEACHER NOTES

Name _____

Class _____

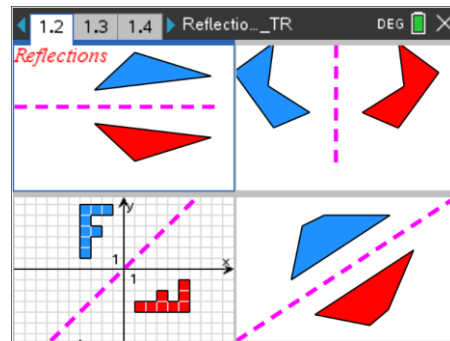**Reflections Lesson**

Transformational Geometry is a way to study geometry by focusing on geometric "movements" or "transformations" and observing/studying properties about these figures.

There are four geometric transformations:
< Reflections   < Translations   < Rotations   < Dilations

Play - Investigate - Explore - Discover
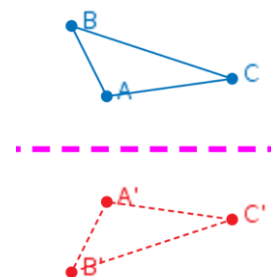## P I E D

In the figure to the right, ΔABC is reflected about the dashed line.

ΔABC is called the pre-image while $\Delta A'B'C'$ is called the image (of reflection).

$\Delta A'B'C'$ is read "triangle A prime, B prime, C prime."

The dashed line is called the line of reflection, or the reflection line.

Download and install the red TI-Nspire student software and the Reflections TNS file from the website where you obtained this document.

Then you can interact with these figures, too. If you decide not to download the software, or if you cannot, you can still do this activity along with the video.

A **conjecture** is an opinion or conclusion based on what is observed.

1. What conjecture(s) can you make based upon what you observed about a triangle and its image after being reflected?

If you connect the corresponding vertices of the triangle and its image with a line, that line is perpendicular to the line of reflection. The corresponding image points and pre-image points are the same distance from the line of reflection, but in opposite directions. Reflected images are mirror images on each other.
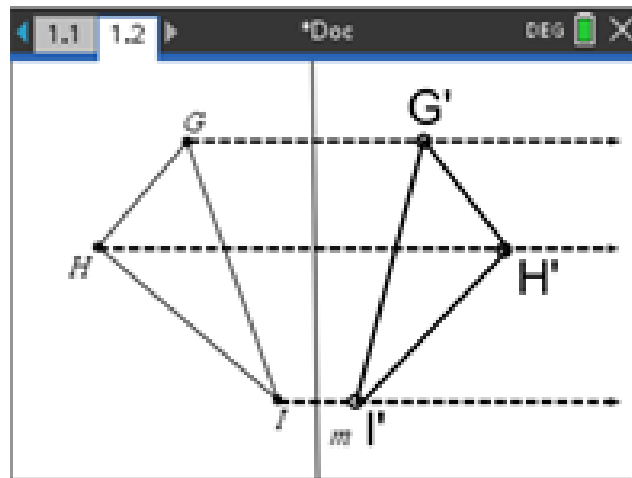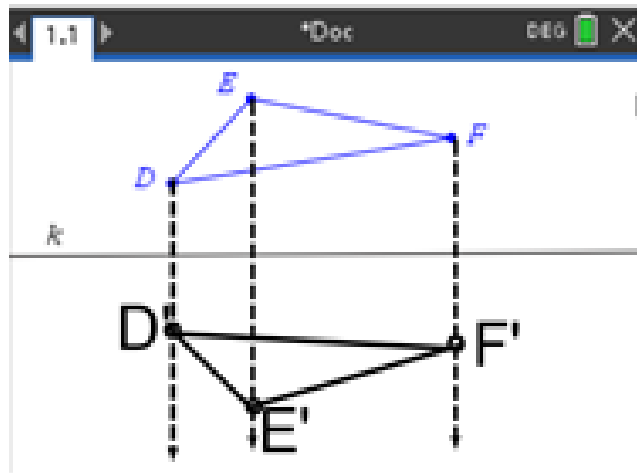
2. Using your conjectures,

a. reflect ΔDEF about line k.

Use a ruler or straightedge.

b. reflect ΔGHI about line m.

Use a ruler or straightedge.

3. a) After observing the angle measures being shown, what conjecture can you make?
If a triangle is reflected about any line, the corresponding angles have equal measures.
Key word – corresponding!

b) After observing the side measures being shown, what conjecture can you make?
If a triangle is reflected about any line, the corresponding sides have equal measures.
Key word – corresponding!

c) Note: do not say all the angles are equal, or do not say all the sides are equal. They aren't.
The sides and angles that correspond to one another have equal lengths and measures, respectively.

4. a) After observing the perimeters being shown, what conjecture can you make?
Why should this be true?
If a triangle is reflected about any line, the perimeter of the pre-image triangle is equal to the
perimeter of the image triangle.
Why? Since each pair of corresponding sides are equal in length, when those 3 sides are added
up, the sums will be the same. Also, since the triangles are congruent, their perimeters should be
the same.

b) After observing the areas being shown, what conjecture can you make?
Why should this be true?
If a triangle is reflected about any line, the area of the pre-image triangle is equal to the area of the
image triangle.
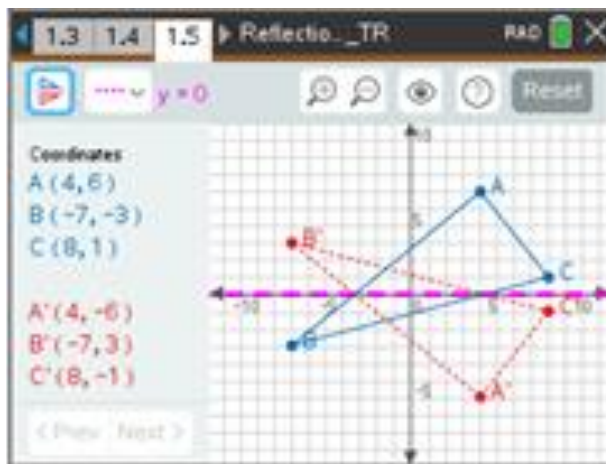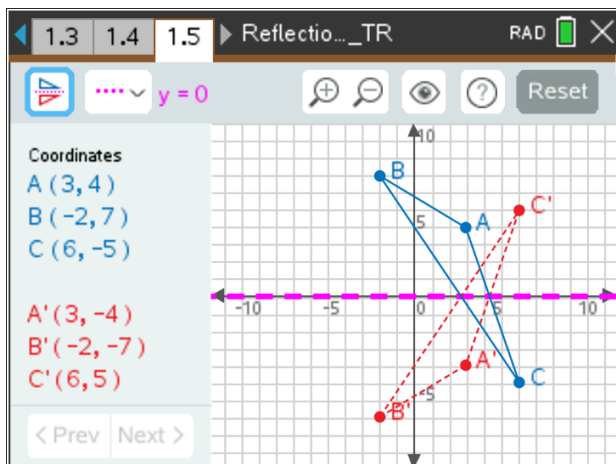**Why? Since the triangles are congruent, their areas should be the same.**

5. Grids and Coordinates   Reflecting about the x-axis.
a) Reflect $\triangle ABC$ about the x-axis

Draw your answer on the grid below.

b) Reflect $\triangle ABC$ about the x-axis

Draw your answer on the grid below.

Write the ordered pair for each point: Write the ordered pair for each point:

A **(3, 4)**   B **(– 2, 7)**   C **(6, – 5)**   A **(4, 6)**   B **(– 7, – 3)**   C **(8, 1)**

A' **(3, – 4)**   B' **(– 2, – 7)** C' **(6, 5)**   A' **(4, – 6)**   B' **(– 7, 3)**   C' **(8, – 1)**

c) Based on your observations, complete the following: When a triangle is reflected about the x-axis, the

x-coordinates remain the same and the **y-coordinates** are opposites of each other.

d) Rewrite the result from part c above with symbols. When a triangle is reflected about the x-axis, and a

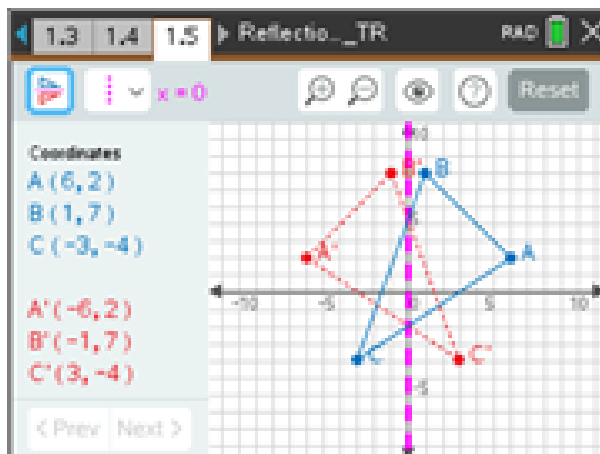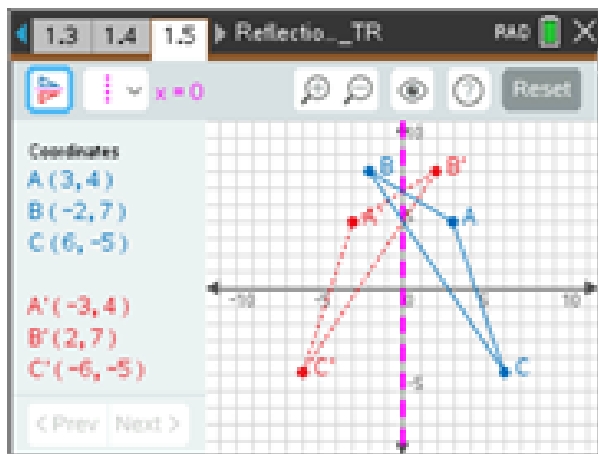point on the pre-image has coordinates (x, y), then the coordinates on the image will be **(x, – y).**

6. Grids and Coordinates   Reflecting about the y-axis.

a) Reflect $\triangle ABC$ about the y-axis   b) Reflect $\triangle ABC$ about the y-axis

Draw your answer on the grid below.   Draw your answer on the grid below.

Write the ordered pair for each point: Write the ordered pair for each point:

A **(3, 4)**   B **(– 2, 7)**   C **(6, – 5)**   A **(6, 2)**   B **(1, 7)**   C **(– 3, – 4)**

A' **(– 3, 4)**   B' **(2, 7)**   C' **(– 6, – 5)**   A' **(– 6, 2)**   B' **(– 1, 7)**   C' **(3, – 4)**

c) Based on your observations, complete the following: When a triangle is reflected about the y-axis, the

y-coordinates remain the same and the **x-coordinates** are opposites of each other.
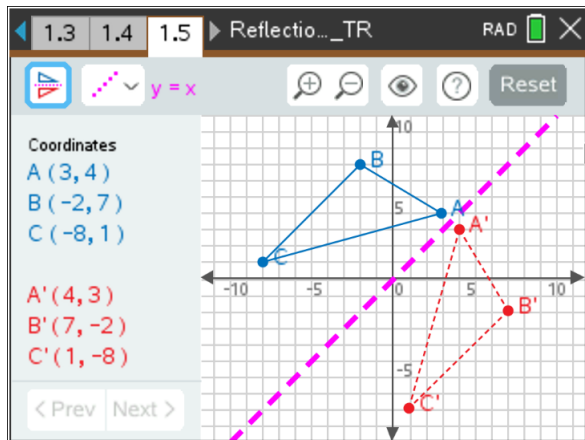
d) Rewrite the result from part c above with symbols. When a triangle is reflected about the y-axis, and a

point on the pre-image has coordinates (x, y), then the coordinates on the image will be **(– x, y).**

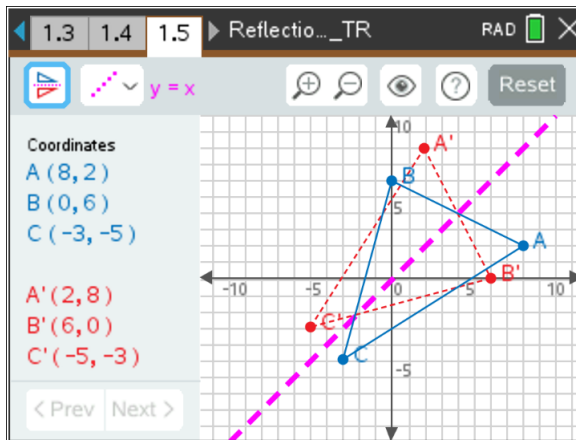### 7. Grids and Coordinates   Reflecting about the line y = x.

a) Reflect $\triangle ABC$ about the line y = x

Draw your answer on the grid below.

b) Reflect $\triangle ABC$ about the line y = x

Draw your answer on the grid below.

Write the ordered pair for each point:

A **(3, 4)**   B **(– 2, 7)**   C **(– 8, 1)**

A' **(4, 3)**   B' **(7, – 2)**   C' **(1, – 8)**

Write the ordered pair for each point:

A **(8, 2)**   B **(0, 6)**   C **(– 3, – 5)**

A' **(2, 8)**   B' **(6, 0)**   C' **(– 5, – 3)**

c) Based on your observations, complete the following: When a triangle is reflected about y = x, the

coordinates of the points are interchanged (switched).

d) Rewrite the result from part c above with symbols. When a triangle is reflected about y = x, and a

point on the pre-image has coordinates (x, y), then the coordinates on the image will be **(x , y).**

8. Summary about Reflections
a – c. When a geometric figure (like a triangle, quadrilateral, …) is reflected about any line:

a) Corresponding angles have **the same measure**.

b) **Corresponding** sides have **the same length**.

c) The two figures are **congruent** to each other.

d) The original figure (the one we start with) is called the **pre-image**

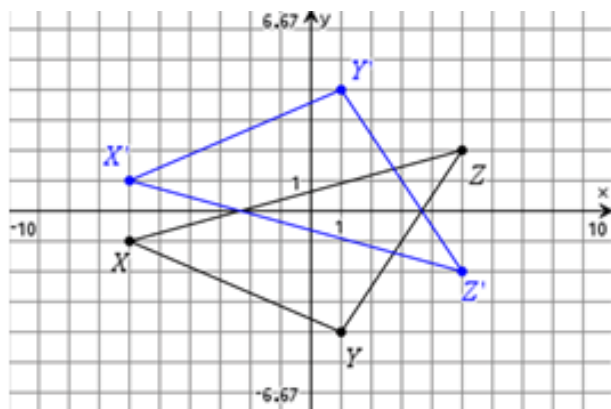while the reflected figure is called the **image**.
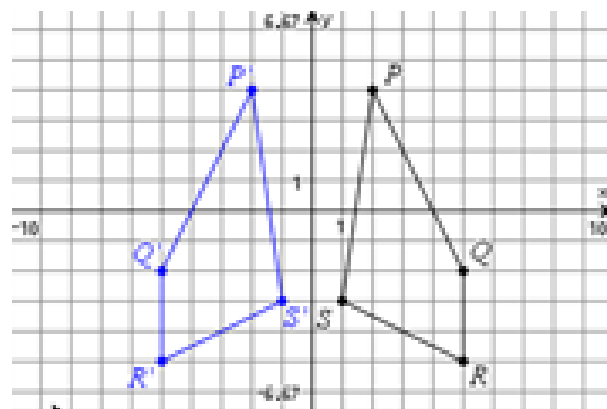
9. Exercises

a) The perimeter of a triangle is 36 cm. What is the perimeter of the image triangle if it is reflected about

the y-axis? **36 cm**

b) The area of a quadrilateral is 45 sq in. What is the area of the image quadrilateral if it is reflected about
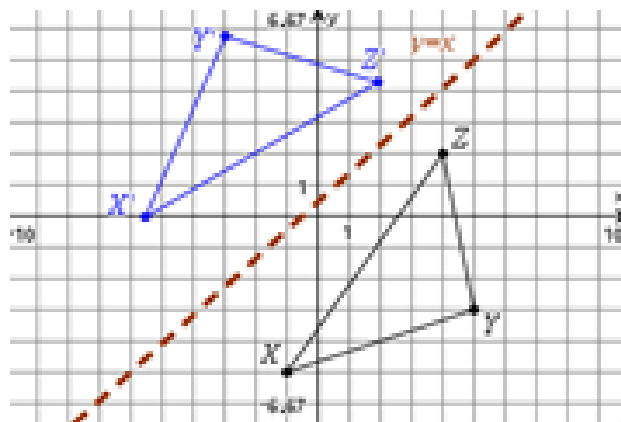
the line y = x? **45 sq in**
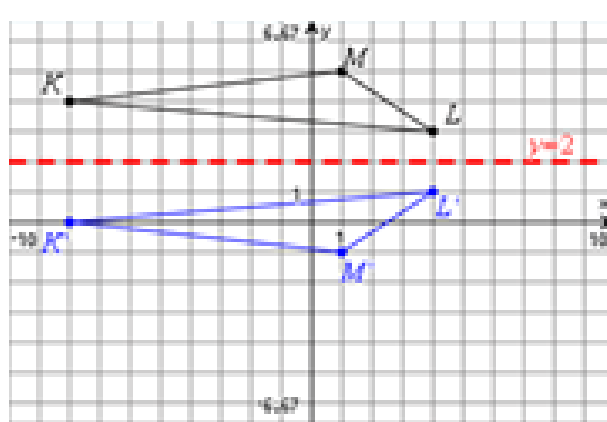
c) Reflect $\triangle ABC$ about the
x-axis.

d) Reflect PQRS about
the y-axis.

e) Reflect $\triangle XYZ$ about y = x.

f) Reflect $\triangle KLM$ about the line y = 2.

10. A point on a triangle has coordinates (a, b), what are the coordinates of the corresponding point on its image, if the triangle is reflected about:

a) the y-axis?

b) the line y = x?

c) the x-axis?

   (− a, b)

(b, a)

(a, − b)