Reflections Lesson 2: Angles & Sides

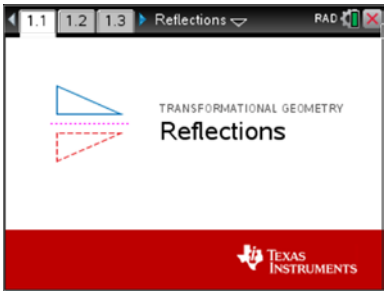
Student Activity

Name _____

Class _____

In this lesson, you will investigate the measures of angles and lengths of sides of triangles that have been reflected about different lines. Open the document: *Reflections.tns.*

It is important the Reflections Tour be done before any Reflections lessons.



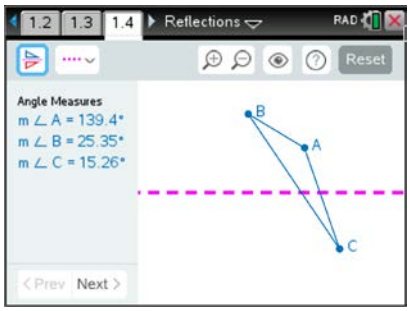
PLAY INVESTIGATE EXPLORE DISCOVER

Move to page 1.4. (ctrl ▶ three times)

On the handheld, press ctrl ▶ and ctrl ◀ to navigate through the pages of the lesson.
(On the iPad®, select the page thumbnail in the page sorter panel.)

1. Based upon previous observations, discuss with your group:
   If a triangle is reflected about a line, what appears to be true:
   a. About the angle measures in the triangles?

   b. About the side lengths in the triangles?



   Let's try to confirm or disprove these conjectures.
   Press menu to open the menu.
   (On the iPad®, tap on the wrench icon to open the menu.)
   Press 1 (1: Templates), 3 (3: Angles & Sides).
   Press menu to reopen the menu.
   Press 2 (2: Reflection Method), 2 (2: Movable Line).

2. Reflect ΔABC about the **slanted line** $\overleftrightarrow{PK}$. (click on or press R).
   Zoom in (+) or out (−) as needed.
   a. Record the Original angle measures (first measures displayed) in the first row of the table below.

   b. Investigate and mentally make note of Angle Measures by grabbing and moving each of the three vertices of ΔABC (A, B, C) and the entire shape (S) to create different shaped triangles. Record a set of data observed in row "Figure 1" in the following table.

Slanted Line	$m\angle A$	$m\angle B$	$m\angle C$	$m\angle A'$	$m\angle B'$	$m\angle C'$
Original						
Figure 1						

c. Is your conjecture about the angle measures still true?

d. Click on Next > or press) to see the lengths of the sides of the triangles.
Record the Original side lengths (first measures displayed) in the first row of the table below.

e. Investigate and mentally make note of Side Lengths by grabbing and moving each of the three vertices of ΔABC (A, B, C) and the entire shape (S) to create different shaped triangles. Record a set of data observed in row "Figure 1" in the following table.

Slanted Line	$\overline{AB}$	$\overline{BC}$	$\overline{CA}$	$\overline{A'B'}$	$\overline{B'C'}$	$\overline{C'A'}$
Original						
Figure 1						

f. Is your conjecture about the side lengths still true?

3. Before generalizing conjectures, explore with other types of lines.
a. Grab and move points P (P) or K (K) to change the line of reflection to a **horizontal line**.

Investigate and mentally make note of the Side Lengths by grabbing and moving each of the three vertices of ΔABC (A, B, C) and the entire shape (S) to create different shaped triangles.
Is your conjecture about the side lengths still true when the line of reflection is **horizontal**?

b. Click on < Prev or press (to see the angle measures of the triangles. Investigate and mentally make note of the Angle Measures by grabbing and moving each of the three vertices of ΔABC (A, B, C) and the entire shape (S) to create different shaped triangles.
Is your conjecture about the angle measures still true when the line of reflection is **horizontal**?

4. Grab and move points P (P) or K (K) to change the line of reflection to a **vertical line**.
a. Investigate and mentally make note of Angle Measures by grabbing and moving each of the three vertices of ΔABC (A, B, C) and the entire shape (S) to create different shaped triangles.
Is your conjecture about the angle measures still true when the line of reflection is **vertical**?

b. Click on Next > or press [)] to see the lengths of the sides of the triangles.
Investigate and mentally make note of Side Lengths by grabbing and moving each of the three vertices of ΔABC ([A], [B], [C]) and the entire shape ([S]) to create different shaped triangles.
Is your conjecture about the side lengths still true when the line of reflection is **vertical**?

5. Grab and move points P ([P]) or K ([K]) to change the line of reflection to a **slanted line**.
Each person in the group should have a different line of reflection, some that slant up and some that slant down.
Also have the connected segments displayed by clicking on  or pressing [O] (Options menu). Use the directional arrows (▲ ▼ ◀ ▶) on the touchpad to highlight the box next to 'Connected Segments'.
Press the space bar ([␣]) to put a check mark. Press [esc] to close the menu.

a. Investigate and mentally make note of Side Lengths by grabbing and moving each of the three vertices of ΔABC ([A], [B], [C]) so that the image and pre-image triangles are on opposite sides of the line of reflection.
Move the line of reflection ([L]).
Is your conjecture about the side lengths still true when the line of reflection is **slanted**?

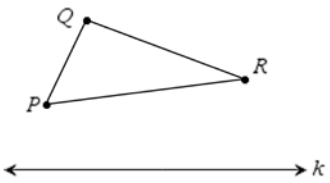
b. Click on < Prev or press [(] to see the angle measures of the triangles.
Investigate and mentally make note of the Angle Measures by grabbing and moving each of the three vertices of ΔABC ([A], [B], [C]) and the entire shape ([S]) to create different shaped triangles.
Move the line of reflection ([L]).
Is your conjecture about the angle measures still true when the line of reflection is **slanted**?

6. Many different triangles have been reflected about several different lines.
Generalize explorations and investigations by responding to the following:
a. If a triangle is reflected about any line, what appears to be true about the measures of the angles of the pre-image and image triangles?

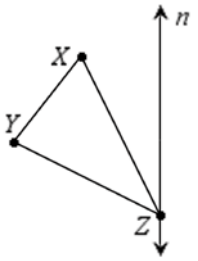
b. If a triangle is reflected about any line, what appears to be true about the lengths of the sides of the pre-image and image triangles?

7. Because the corresponding angles and the corresponding sides of the pre-image and image triangles are congruent, the triangles are congruent.
   Therefore, a reflection is a **rigid motion**, or an **isometry**.
   We also say that a reflection is a **distance-preserving** and an **angle-preserving** transformation.

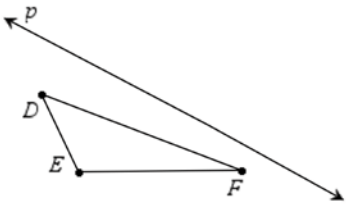
8. a. Sketch and label the reflection of ΔPQR about line k.



b. Sketch and label the reflection of ΔXYZ about line n.



9. Sketch and label the reflection of ΔDEF about line p.
   Use this sketch to answer the questions.



   a. If $m\angle D = 35^o$, $m\angle D' =$ _____.

   b. If EF = 8 cm, E'F' = _____.

   c. If $m\angle E = 120^o$, what other angle has a measure of 120^o? _____

   d. If DF = 3 in, what other segment has a length of 3 in? _____

   e. $\overline{EE'}$ _____ line p.

   f. $\overline{DD'}$ _____ $\overline{FF'}$.

   g. In a reflection, the pre-image and the image triangles are congruent. Therefore, a reflection is a _____. It is also called a _____ preserving and an _____ preserving transformation.