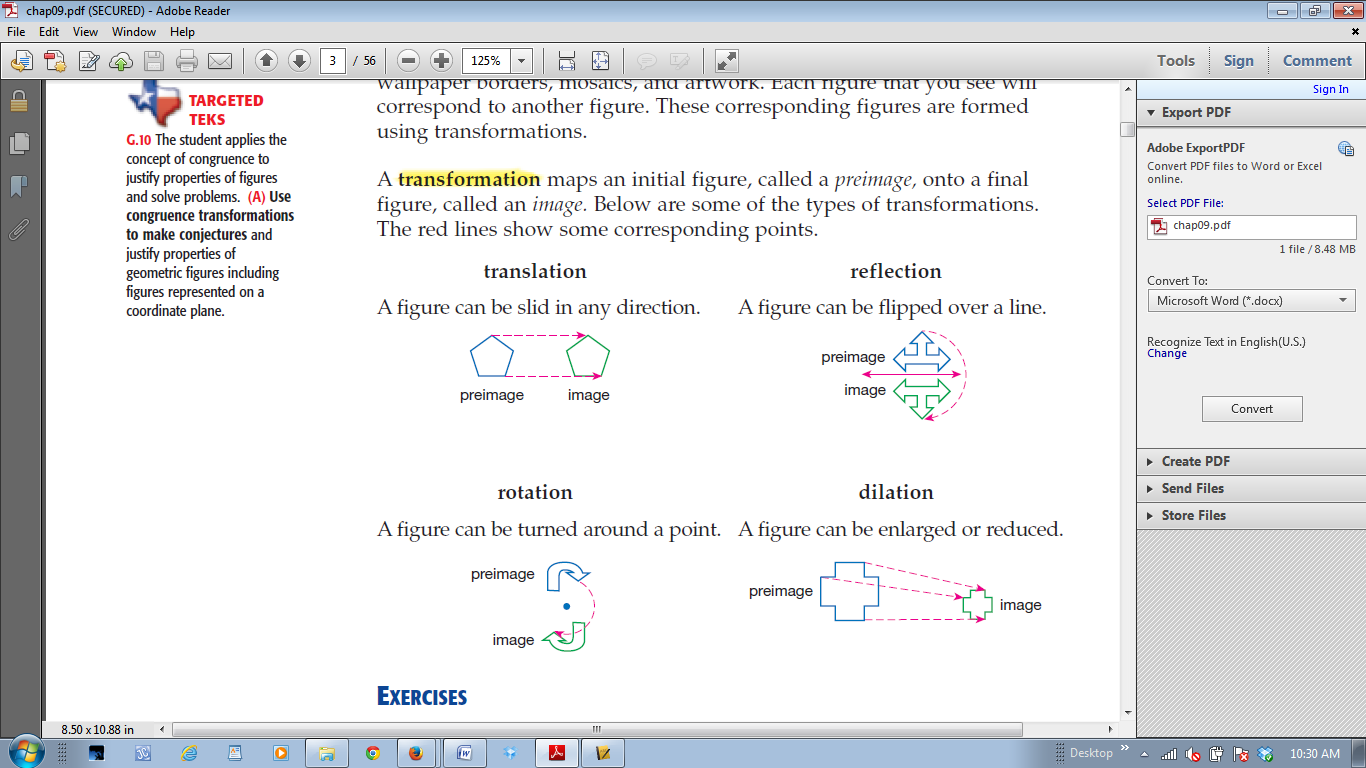
**Transformations:**

* “*Preimage*” - original image
* “*Image*” - new image
* “*Congruence Transformation*” – the new image is congruent to the preimage

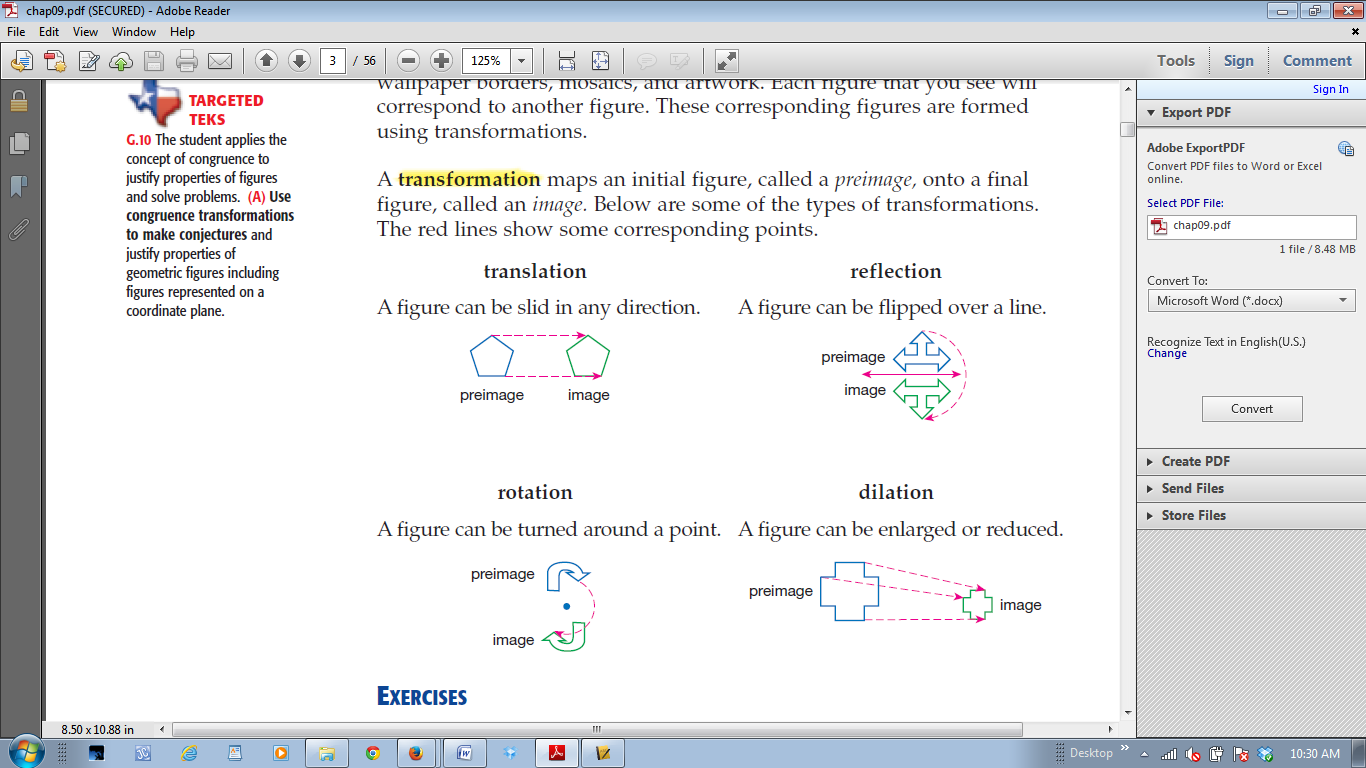
1. **Reflection**: The preimage reflected over a point, a line or a plane

\* Congruence Transformation



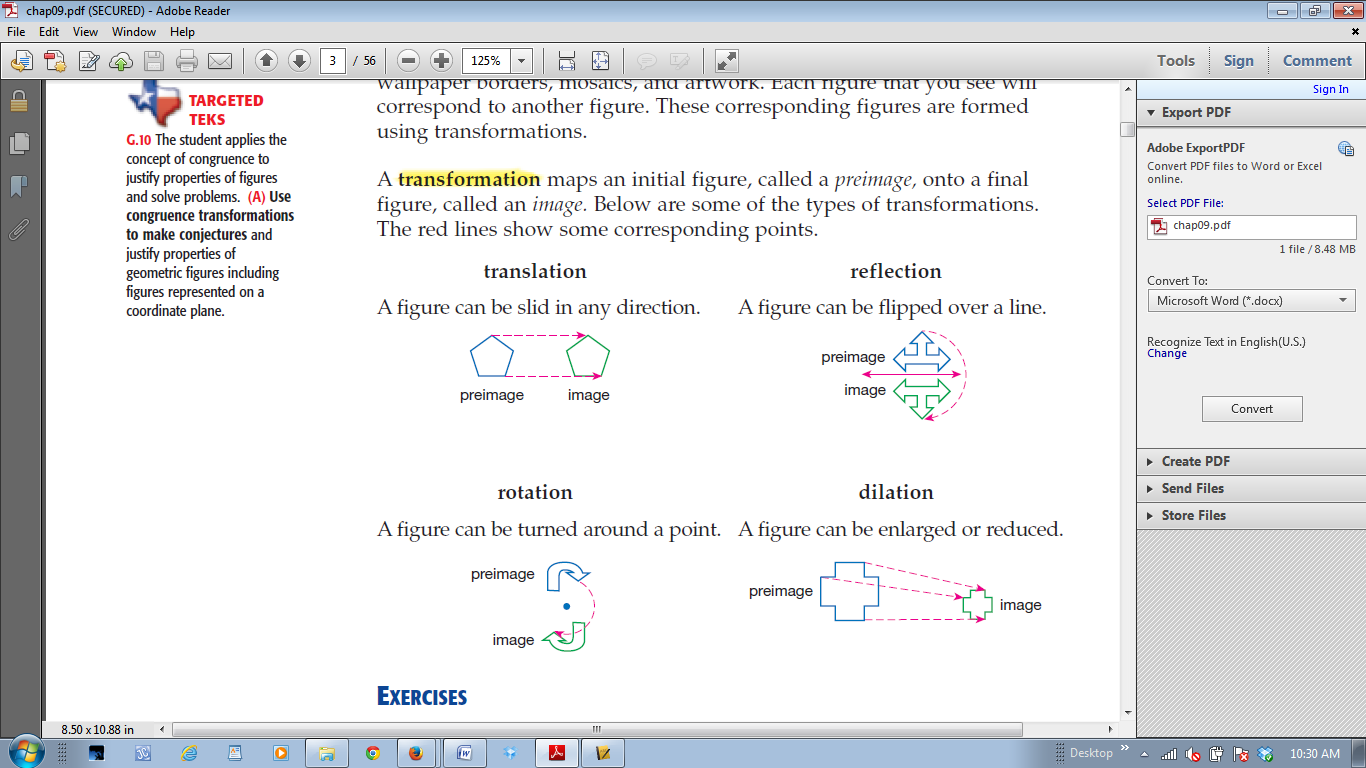
1. **Translation**: Moves all points of the preimage the same distance in the same direction

**\*** Congruence Transformation



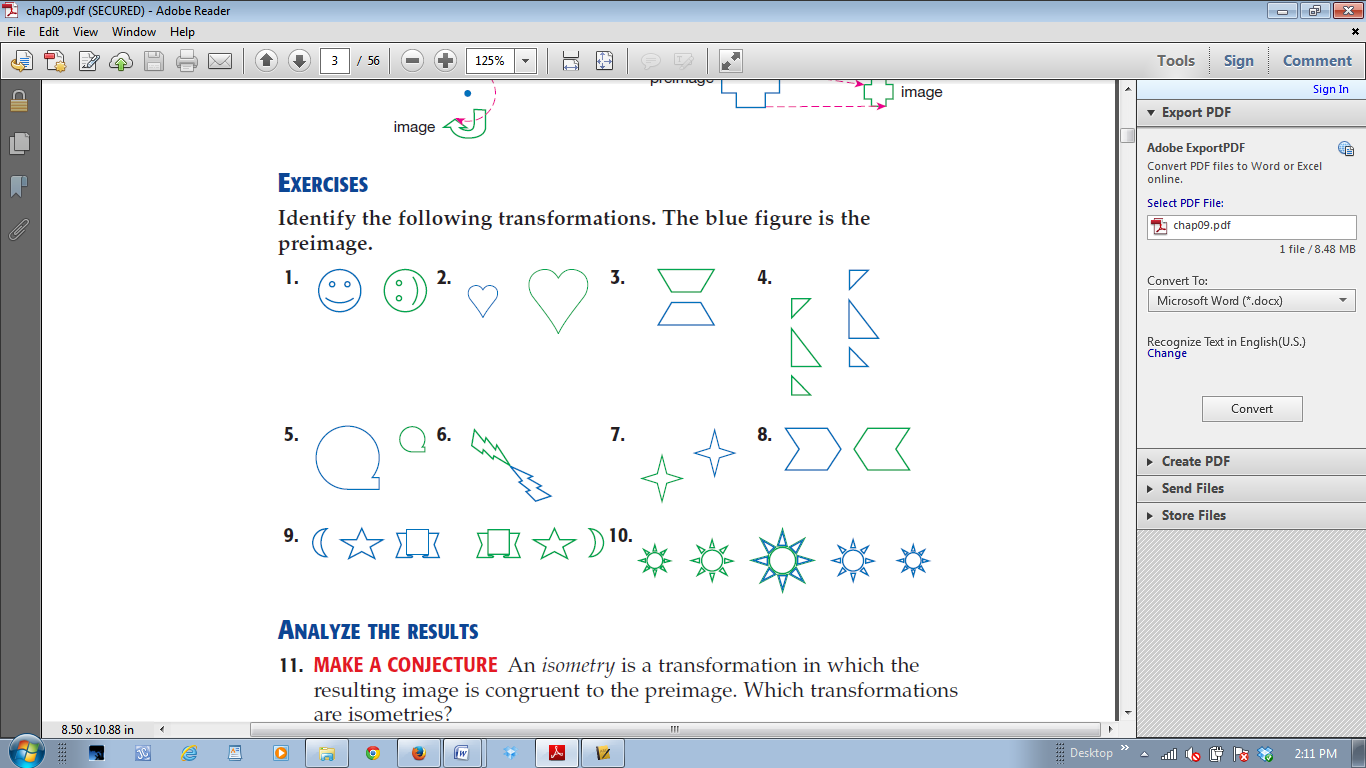
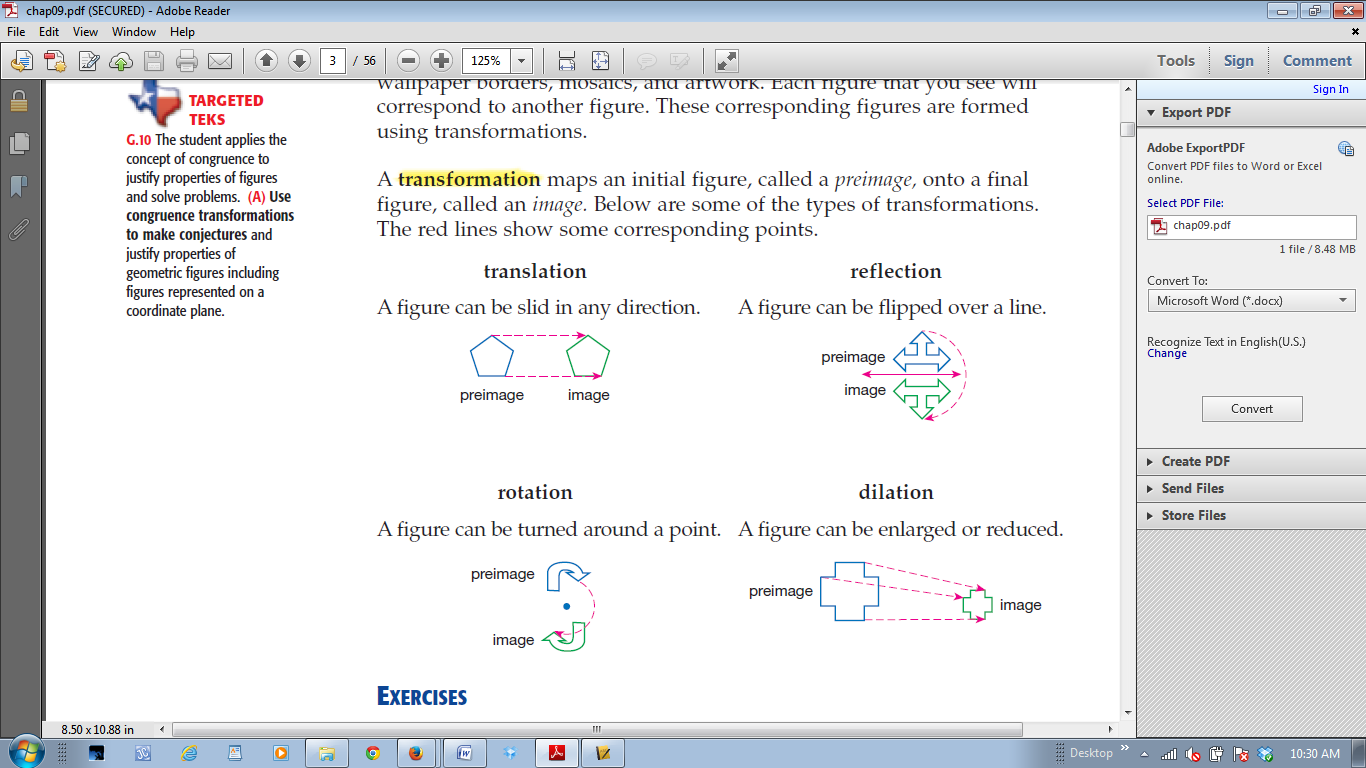
1. **Rotation**: Turns every point of a preimage the same direction and angle around a fixed point.

**\*** Congruence Transformation

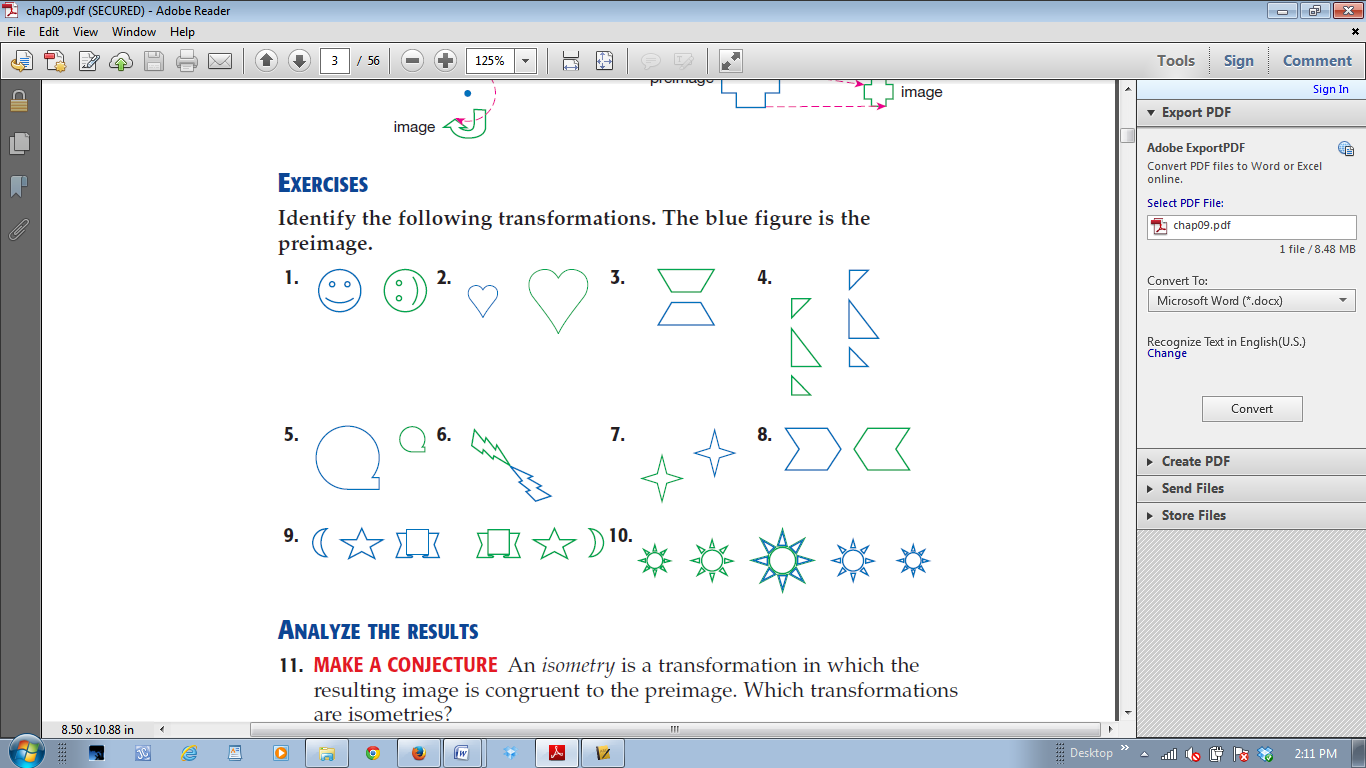
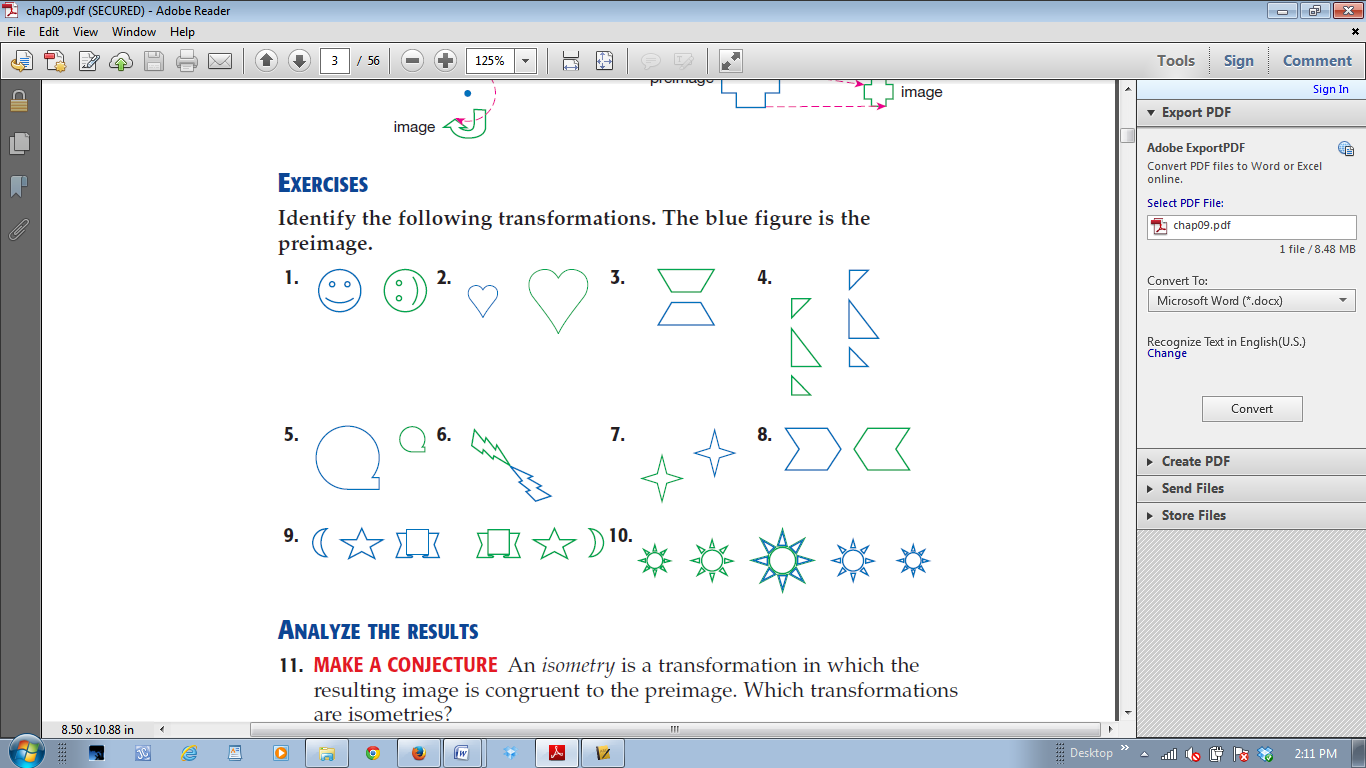
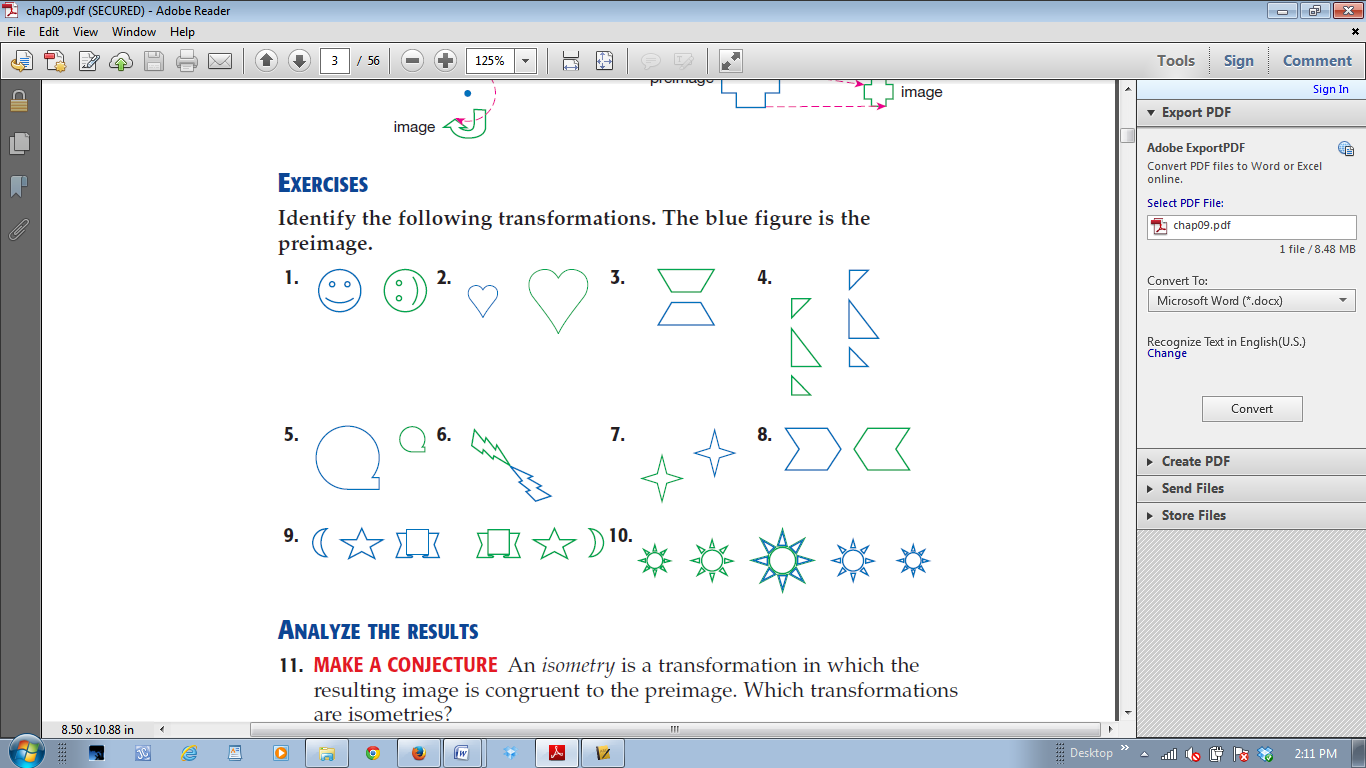


1. **Dilation**: The preimage is enlarged or reduced in size

**\*** NOT a Congruence Transformation



**Example 1**: Identify the following transformations

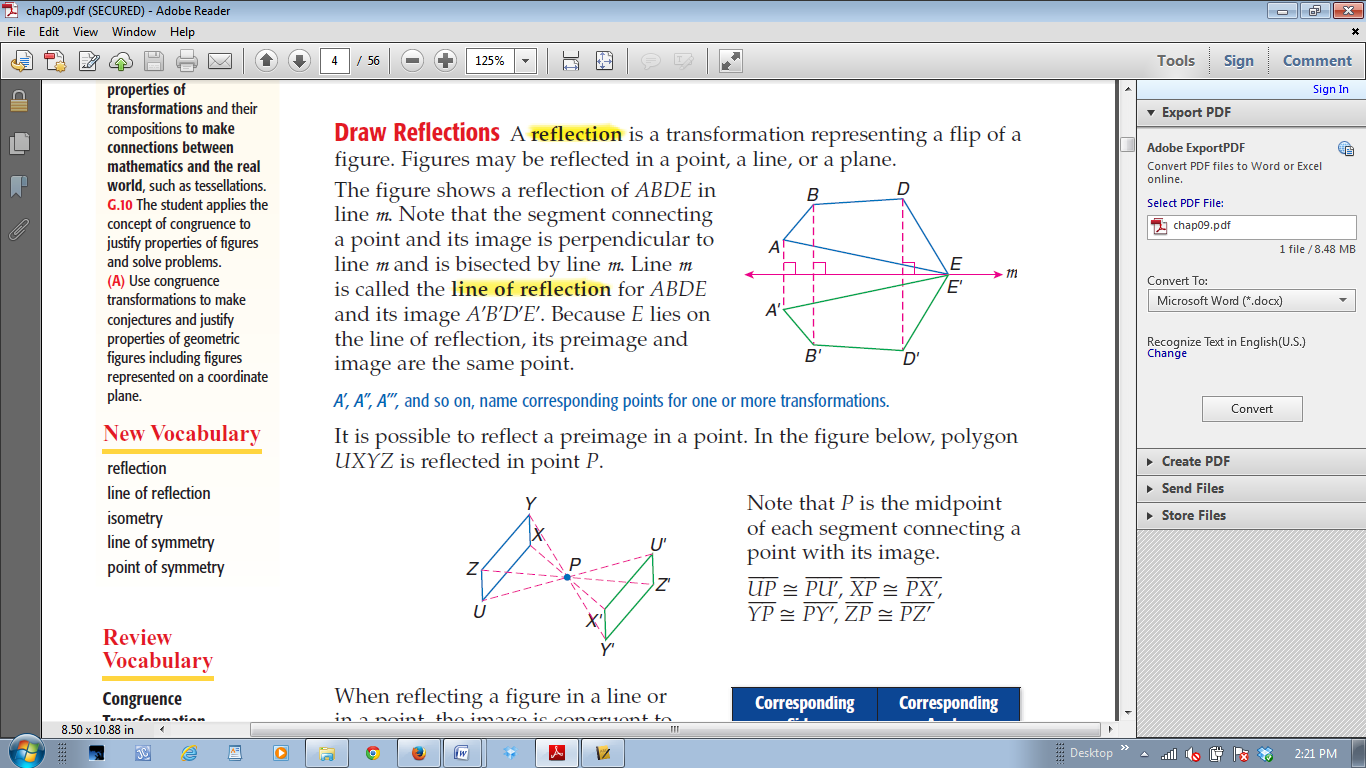


a) b) c) d)

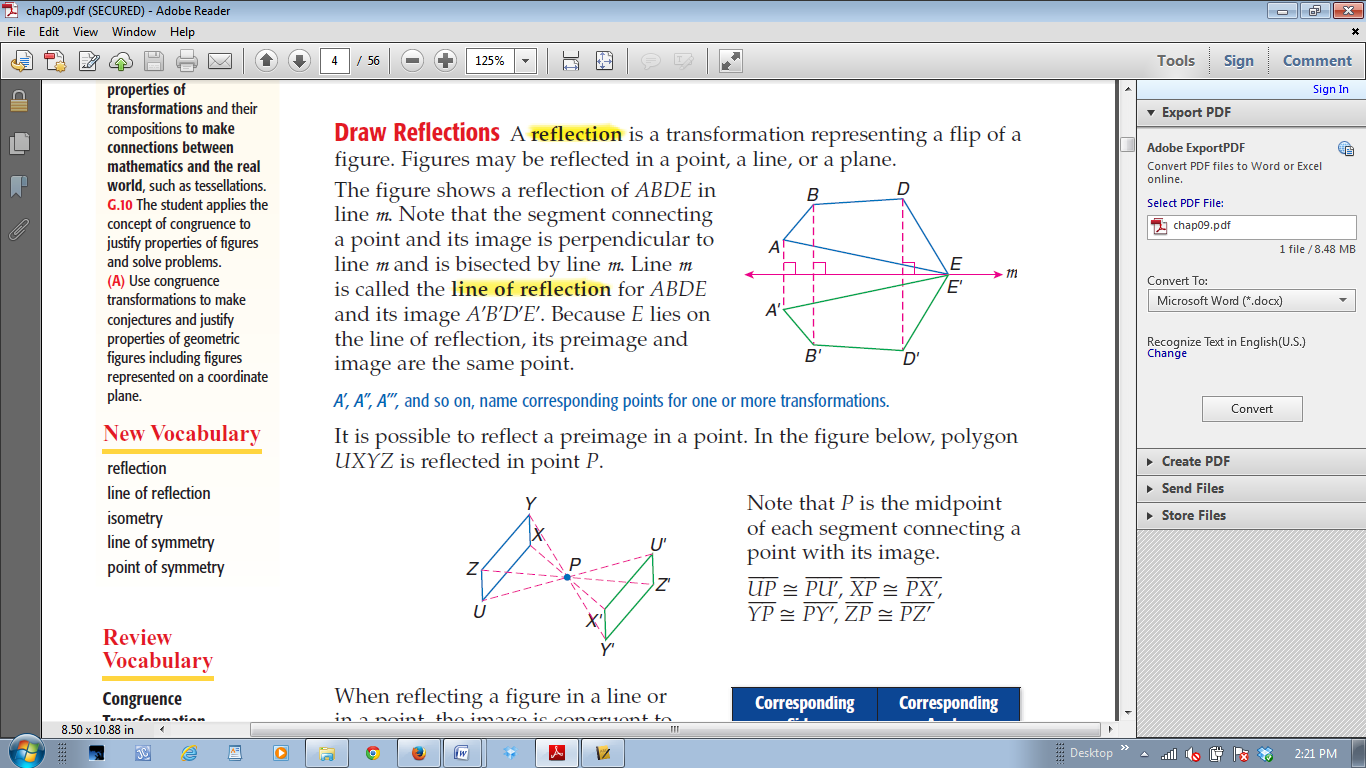
\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_

**Reflections:**

1) **Line of Reflection**:



* Reflection of ABDE over line *m*
* The segment connecting the corresponding points on the preimage and the image are perpendicular to line *m* and are bisected by line *m*
* Line *m* is called the **Line of Reflection** for ABDE and its image A’B’D’E’



2) **Point of Reflection**:

* Reflection of UXYZ over line *P*
* Point *P* is the midpoint of the segment connecting the corresponding points on the preimage and the image
* Point *P* is called the **Point of Reflection** for UXYZ and its image U’X’Y’Z’

**Example 2**: Triangle KMN has vertices K(2, -4), M(-4, 2), and N(-3, -4).

a) Graph KMN and its image b) Graph KMN and its image

reflected over the x-axis reflected about the origin



**Translations:**

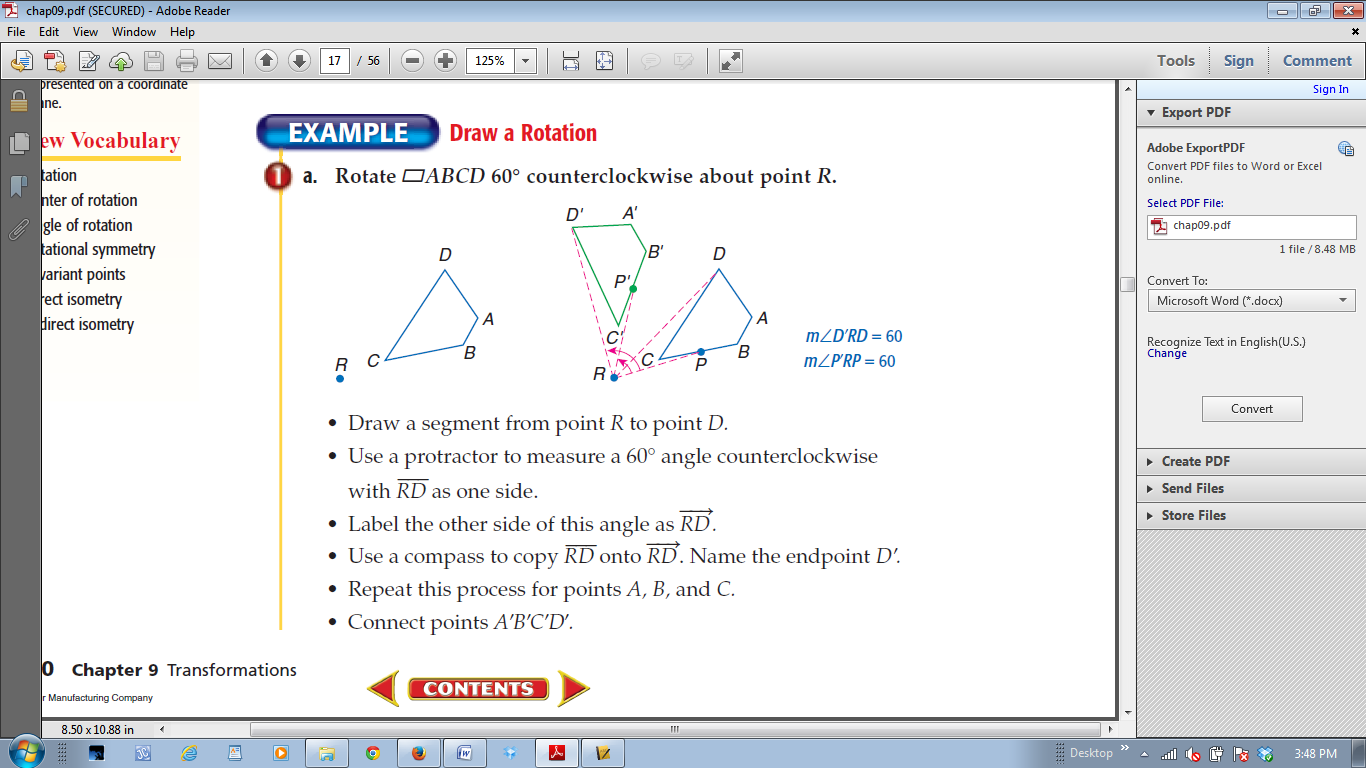
* A transformation is written as: (x, y) (x + a, y + b) where ‘a’ is the distance moved horizontally and ‘b’ is the distance moved vertically.

**Example 3:** Triangle QRS has vertices Q(-4, 2), R(3, 0), and S(2, 6). Graph QRS and its image for the translation (x, y) (x + 4, y – 5)

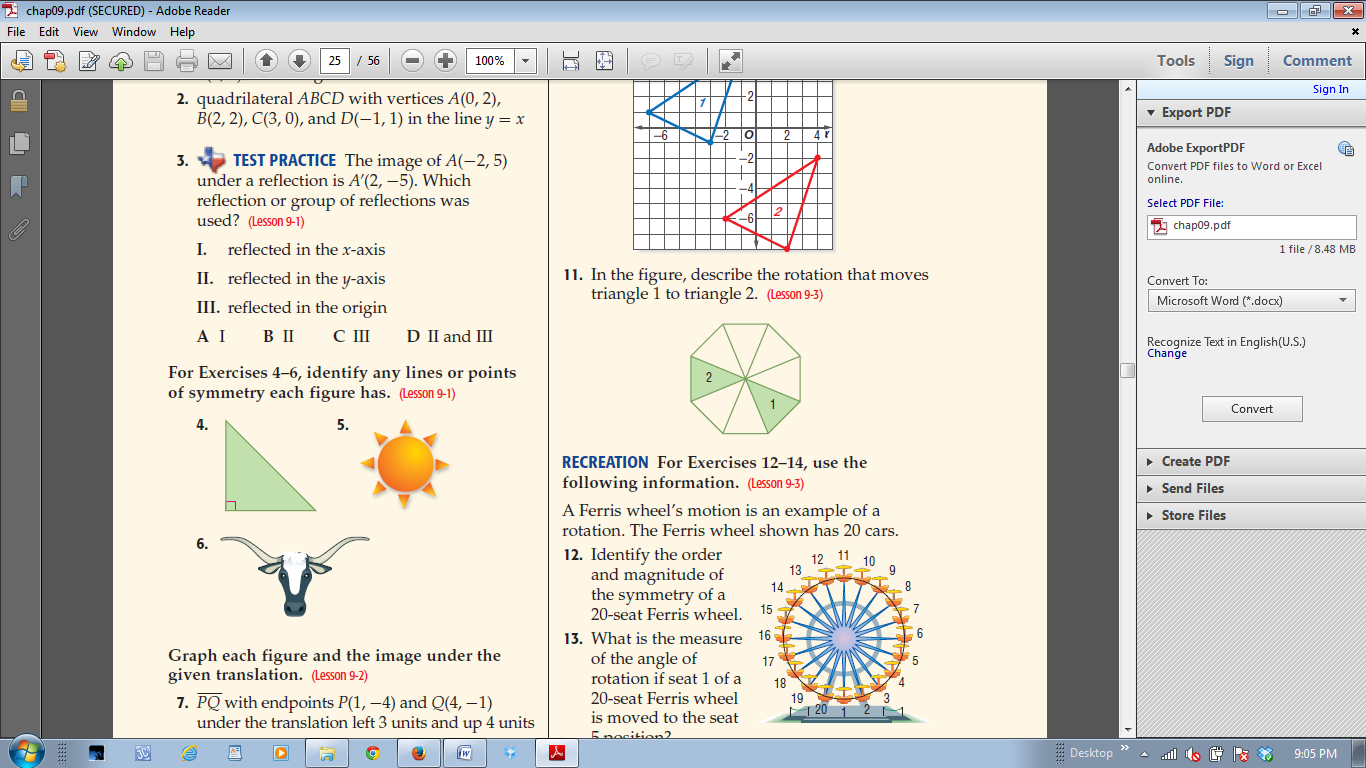
**Rotations:**

* Transformations that turn every point of a preimage the same direction and angle through a fixed point called the *“****Center of Rotation****”*
* The number of degrees that each point on the preimage is rotated is called the *“****Angle of Rotation****”*
* Rotations can be either *clockwise* or *counterclockwise*

**Example 4:** ABCD is rotated 60° counterclockwise about point R



**Example 5:** Describe the rotation that moves triangle 1 to triangle 2. How many degrees is the rotation? Is it clockwise or counterclockwise?



Angle of Rotation = \_\_\_\_\_\_\_

Direction = \_\_\_\_\_\_\_

**Example 6:** Draw the rotation image of ΔBCD by reflecting the triangle in the x-axis and then the y-axis. The vertices of ΔBCD are B(-3, 5), C(-3, 3), and D(-5, 3).

How many degrees is the rotation from ΔBCD to ΔB’’C’’D’’? In which direction?

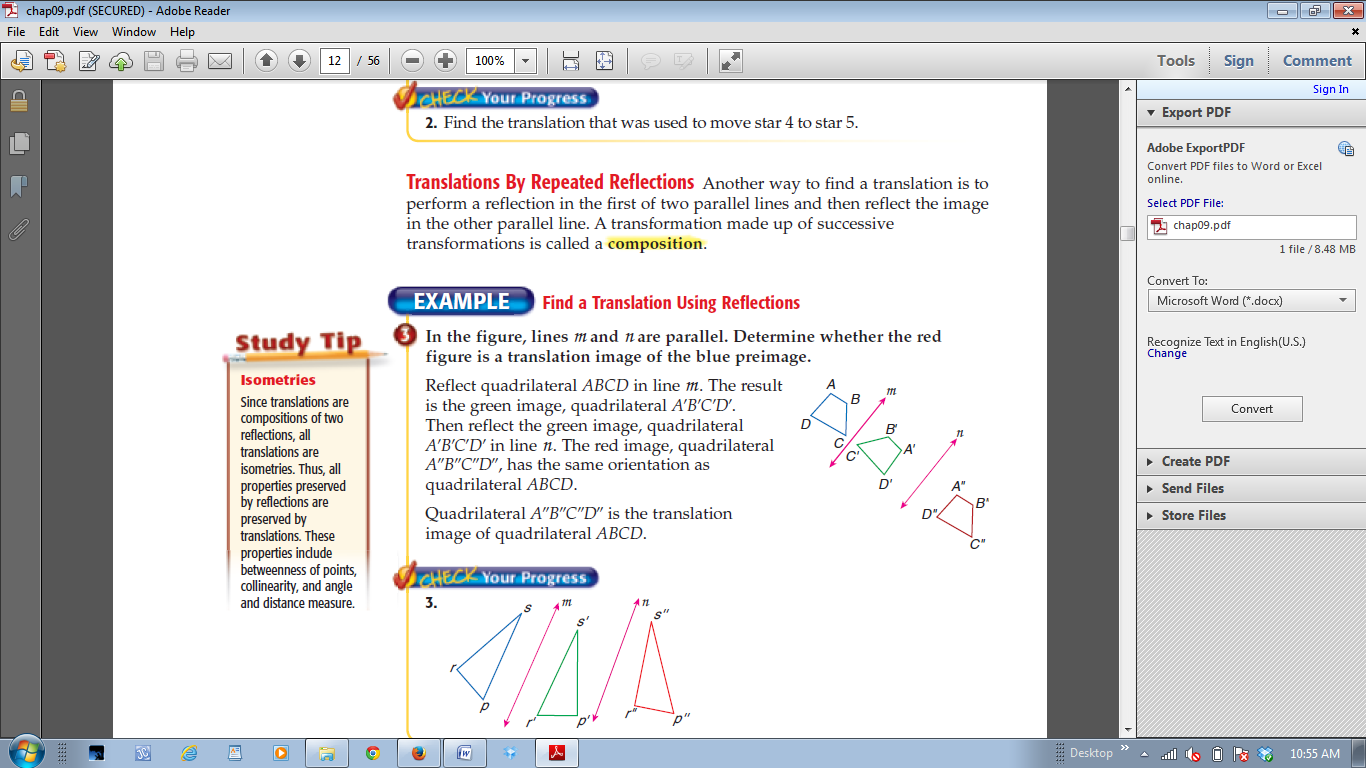


Angle of Rotation = \_\_\_\_\_\_\_

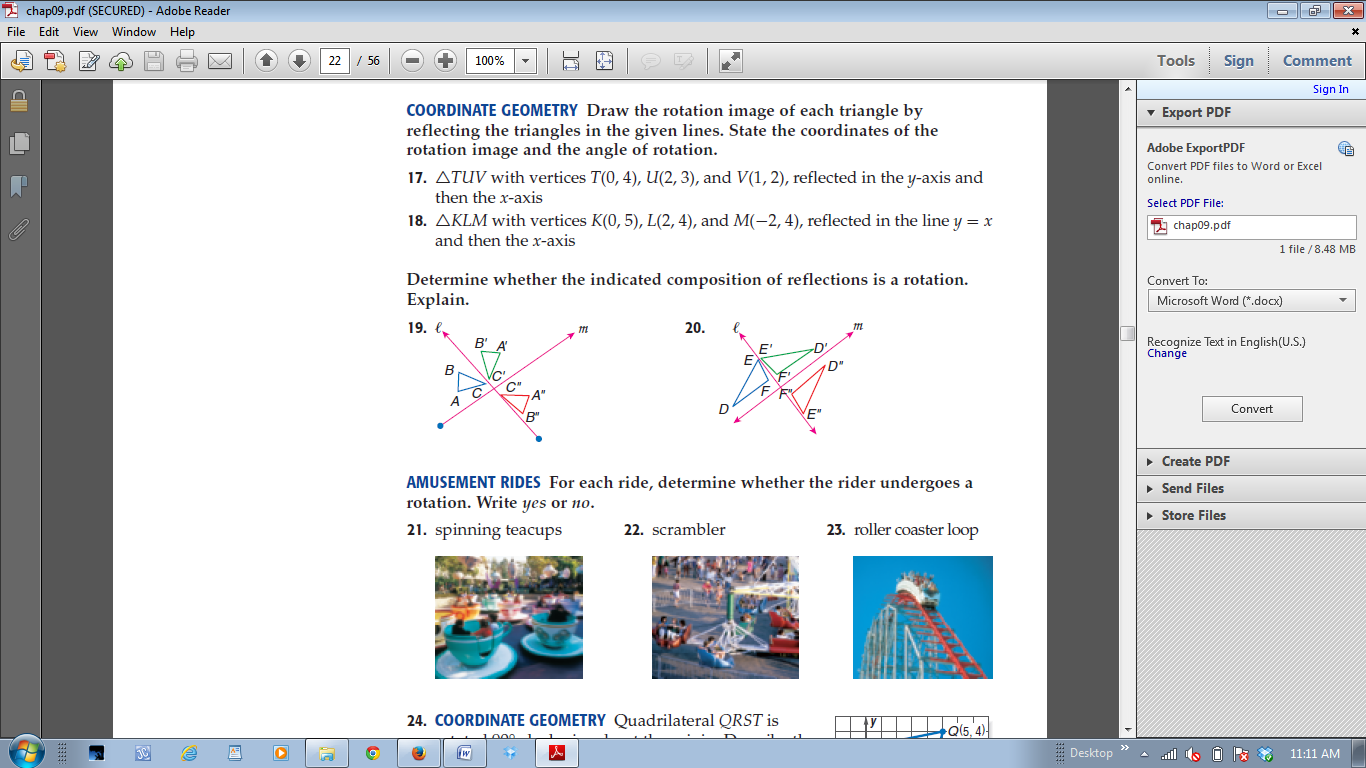
Direction = \_\_\_\_\_\_\_**Compositions:**

* A transformation made up of successive transformations

**Example 7**: Reflecting ABCD over the first parallel line (line m) and then reflecting the new image A’B’C’D’ over the second parallel line (line n) results in a translation of ABCD to A’’B’’C’’D’’



**Example 8**: Reflecting ABC over the first perpendicular line (line l ) and then reflecting the new image A’B’C’ over the second perpendicular line (line m) results in a 180 ° rotation of ABC to A’’B’’C’’.



**Example 9**: Determine whether the composition of reflections is a rotation, a translation, or neither.

