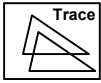


Name: \_\_\_\_\_

Date: \_\_\_\_\_



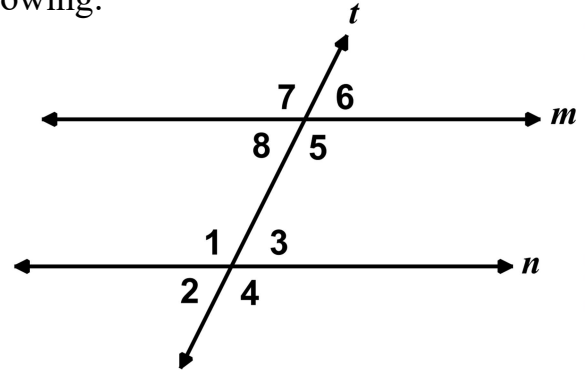
## RIGID MOTIONS AND PARALLEL LINES N-GEN MATH<sup>®</sup> 8



In this unit we have studied transformations that are **rigid motions**, such as translations and rotations. These rigid motions preserve lengths and angle measurements. We can use these to understand the congruent angle pairs that are created in parallel line. First, some review.

**Exercise #1:** In the diagram, lines  $m$  and  $n$  are parallel and are crossed by transversal line  $t$ . The eight angles formed are shown numbered. Answer the following:

(a) List all **corresponding angle pairs**.



(b) Give the two pairs of **alternate interior angles**.

(c) What is true about corresponding angle pairs and alternate interior angle pairs?

To explain why corresponding angle pairs and alternate interior angle pairs are congruent we return to two specific types of transformations: translations and rotations by  $180^\circ$ .

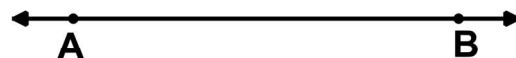
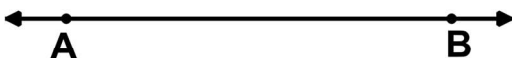
**Exercise #2:** For each of the following, use appropriate geometric tools (tracing paper and a compass) to do the following transformations of line  $\overline{AB}$ . Label the images  $\overline{A'B'}$ .

(a) translate  $\overline{AB}$  such that A maps to C

(b) rotate  $\overline{AB}$  about point C by  $180^\circ$

C.

C.



As we can see in *Exercise #2*, translations produce parallel lines as do rotations by  $180^\circ$ . We can now use these facts to understand what we saw in *Exercise #1(c)*.

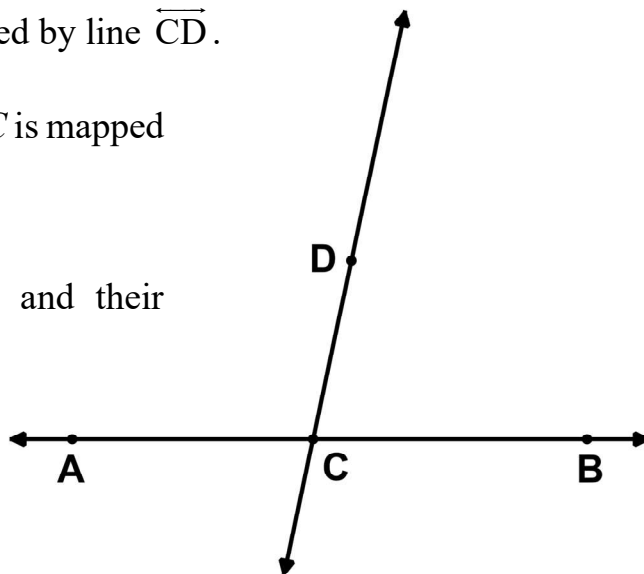
**Exercise #3:** On the diagram below line  $\overleftrightarrow{AB}$  is crossed by line  $\overleftrightarrow{CD}$ .

(a) Translate  $\angle DCB$  and  $\angle DCA$  along  $\overleftrightarrow{CD}$  so that  $C$  is mapped to  $D$ . Label the images  $\angle D'C'B'$  and  $\angle D'C'A'$ .

(b) What must be true about the original angles and their images? Why?

(c) What must be true about  $\overleftrightarrow{AB}$  and  $\overleftrightarrow{A'B'}$ ?

(d) Translations help to show that what types of angle pairs created by parallel lines are equal in measure?



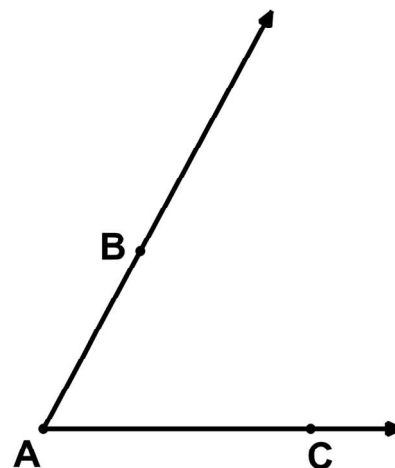
**Exercise #4:** In the diagram below do the following:

(a) Rotate  $\angle BAC$  by  $180^\circ$  about point  $B$ . Label the image  $\angle B'A'C'$ .

(b) What must be true about  $\angle BAC$  and  $\angle B'A'C'$ ?

(c) What must be true about  $\overleftrightarrow{AC}$  and  $\overleftrightarrow{A'C'}$ ?

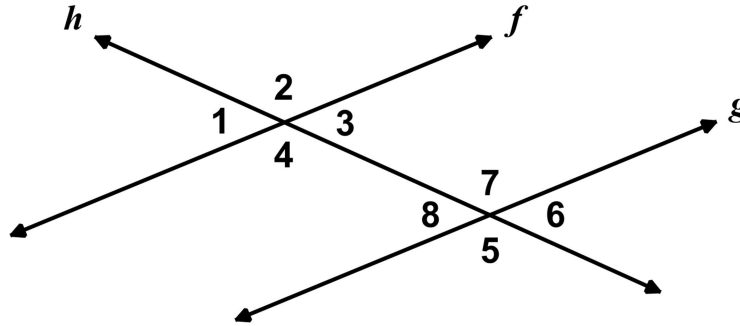
(d) What kind of angle pair are  $\angle BAC$  and  $\angle B'A'C'$ ?



**RIGID MOTIONS AND PARALLEL LINES**  
**N-GEN MATH<sup>®</sup> 8 HOMEWORK**

**FLUENCY**

1. In the diagram below line  $f$  is parallel to line  $g$ . Both are crossed by line  $h$ .

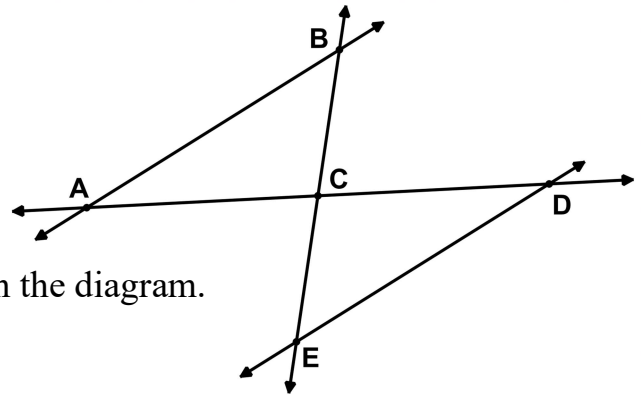


- (a) List all pairs of corresponding angles.      (b) List all pairs of alternate interior angles.

- (c) If  $m\angle 1 = 45^\circ$  then find the measures of the other seven angles.      (d) If  $m\angle 3 = 2x + 3$  and  $m\angle 7 = 5x + 2$  then solve for the value of  $x$  algebraically.

2. In the diagram below, line  $\overline{DE}$  is the image of line  $\overline{AB}$  after a rotation by  $180^\circ$  about point  $C$ . Lines  $\overline{BE}$  and  $\overline{AD}$  have been drawn.

- (a) What must be true about  $\overline{AB}$  and  $\overline{DE}$ ?



- (b) List two alternate interior angle pairs shown on the diagram.



3. In the diagram shown, line  $\overleftrightarrow{EF}$  has been translated along line  $\overleftrightarrow{MN}$  such that point E is mapped to point J, point G to point K, and point F to point H.

(a) What is true about line  $\overleftrightarrow{EF}$  and its image line  $\overleftrightarrow{JH}$ ?

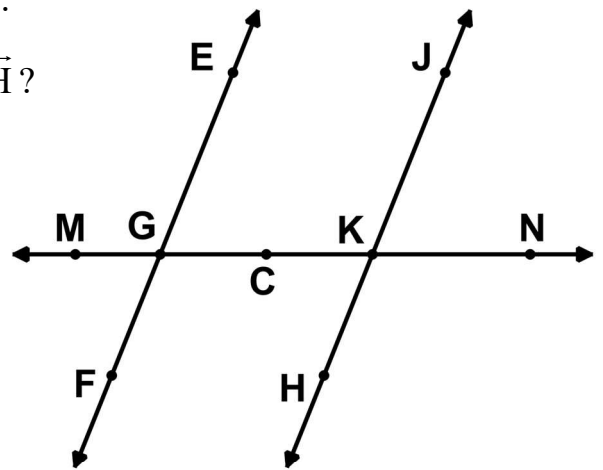
(b) Name corresponding angles for each of the following:

$\angle EGN$  corresponds to \_\_\_\_\_

$\angle NGF$  corresponds to \_\_\_\_\_

$\angle MGE$  corresponds to \_\_\_\_\_

$\angle FGM$  corresponds to \_\_\_\_\_



## REASONING

In the above diagram C is the midpoint of segment  $\overline{GK}$ . Answer the following questions based on what we already know about the diagram.

- Why would a rotation of point G by  $180^\circ$  about point C be mapped to point K?
- If  $\angle MGE$  was rotated about point C by  $180^\circ$  what angle would it be mapped onto?
- What type of angle pair would this be? (See Unit 2 Lesson 6 if needed.)
- If the measure of  $\angle MGE$  is given by  $10x - 2$  and the measure of its image in #5 is  $7x + 37$ , then solve for the value of  $x$ .

