Name: _____ Date: _____

Student Exploration: Investigating Angle Theorems

Vocabulary: complementary angles, linear pair, supplementary angles, vertical angles

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

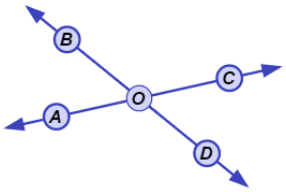
1. Tony has a collection of 200 sports cards. He counts and finds that 40 of them are football cards. What does this tell you about the rest of his collection?

   _____

2. Suppose Tony has only football and baseball cards. Now what can you say about the rest of his collection? _____

Gizmo Warm-up

In the *Investigating Angle Theorems* Gizmo, you can manipulate a dynamic figure to explore the properties of different angles.



1. In the Gizmo, select **Vertical angles** from the **Conditions** menu. You should see two intersecting lines like the ones shown to the right.

   A. Name the two pairs of angles that do not share a side. (They are nonadjacent.)

   _____ and _____ _____ and _____ Both pairs are **vertical angles**.

   B. Drag the points to resize the angles. What appears to always be true about the measures of the vertical angles? _____

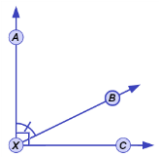
   Turn on **Show angle measures** and continue to resize to check if this is always true.

2. Select **Form a linear pair** to view a **linear pair** of angles (adjacent angles whose non-common sides form a straight line).

   A. Name the linear pair by naming the adjacent angles. _____

   B. Adjust the angles by dragging point *B*. What seems to always be true about the measures of a linear pair of angles? _____

   Turn on **Show angle measures**. Drag point *B* to check if this is always the case.

Activity A: **Complements and supplements**	Get the Gizmo ready: • Under **Conditions**, select **Complementary to congruent angles**. • Be sure **Adjacent** is selected.	

1. Both pairs of angles shown ($\angle AXB$ and $\angle BXC$, and $\angle DYE$ and $\angle EYF$) are **complementary**.

   A. Drag points *B* and *E* to view a variety of complementary angles. What is true about the measures of two complementary angles? _____

   B. What must be true about $\angle AXB$ and $\angle DYE$? _____

   Why? _____

   _____

   Turn on **Show angle measures** and drag point *B* to verify for a variety of angles.

   C. Select **Nonadjacent** and drag the points. Which two angle pairs are complementary?

   _____ and _____ _____ and _____

   D. What must be true about $\angle CXD$ and $\angle GZH$? _____

   Turn on **Show angle measures**. Experiment to see if this is always true.

   E. What is true of any pair of angles that are complementary to congruent angles?

   _____

2. Select **Complementary to same angle** and drag points *A*, *B*, *C*, and *D*.

   A. What are the two pairs of complementary angles in this figure?

   _____ and _____ _____ and _____

   B. What must be true about $\angle AOC$ and $\angle DOB$? _____

   Why? _____

   Turn on **Show angle measures** and drag the points to verify this.

   C. Select **Nonadjacent** and run a similar test. What is true about angles that are complementary to the same angle? _____

(Activity A continued on next page)

Activity A (continued from previous page)

3. Select **Supplementary to congruent angles**. Both angle pairs shown (∠*AXB* and ∠*BXC*, and ∠*DYE* and ∠*EYF*) are **supplementary** and form linear pairs.

   A. Drag points *B* and *E* to view a variety of supplementary angles. What can you say about the measures of two supplementary angles? _____

   B. What must be true about ∠*AXB* and ∠*DYE*? _____

      Why? _____

      _____

   C. Select **Nonadjacent** and run a similar test. What is true about angles that are supplementary to congruent angles? _____

4. Select **Supplementary to same angle**. Drag the points to view a variety of figures.

   A. Name two pairs of supplementary angles that contain ∠*BOC*.

      _____ and _____ _____ and _____

   B. What must be true about ∠*AOB* and ∠*COD*? _____

      Why? _____

      _____

      Turn on **Show angle measures** and create a variety of figures to verify this.

   C. Select **Nonadjacent** and run a similar test. What is true about angles that are supplementary to the same angle? _____

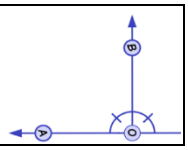
5. Select **Vertical angles** and turn on **Show angle measures**. Drag point *A* until ∠*AOB* is a right angle.

   A. What is true about the four angles formed? _____

      _____ Experiment to see if this is always true.

   B. Explain why this is always the case. _____

      _____

Activity B: **Using angle concepts**	Get the Gizmo ready: • Select **Supplementary and congruent** under **Conditions**.	

1. Drag the points to see several pairs of angles that are supplementary and congruent.

   A. What is true about the measures of angles that are supplementary and congruent?

   _____

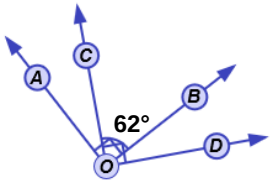
   Turn on **Show angle measures** to check. Then, select **Nonadjacent** to check that this also applies to nonadjacent angles.

   B. In the space to the right, use algebra to show why both angles must measure 90°.

2. Solve each problem. Show all of your work. Then, if possible, check in the Gizmo.

   A. Suppose $\angle AXB$ and $\angle BXC$ are complementary and congruent. What are their measures?

   C. Find the measures $\angle AOC$ and $\angle DOB$.



   B. Suppose $\angle AXB$ and $\angle BXC$ form a linear pair. If $\angle AXB$ is a right angle, what is $m\angle BXC$?

   D. Find the values of x and y.