

Name \_\_\_\_\_

Date \_\_\_\_\_

EXPLORATIONS

### Activity 3

#### Exterior and Interior Angle Theorem

Construct the geometric object by following the instructions below, and then answer the questions about the object.

1. Create a triangle and label it  $\triangle ABC$ .
2. From the Measure Toolbar, select **Angle**.
3. Measure the three interior angles of the triangle and label the measurements.
4. From the Measure Toolbar, select **Calculate**.
5. To calculate the sum of the three angles enter the following into the calculator:
  - a. When the message **This number** appears, click on the value of  $\angle BAC$ .
  - b. Click on **+** on the Calculate Toolbar.
  - c. When the message **This number** appears, click on the value of  $\angle ABC$ .
  - d. Click on **+** on the Calculate Toolbar.
  - e. When the message **This number** appears, click on the value of  $\angle BCA$ .
  - f. Double-click on **=** and drag the dotted box onto the screen.
  - g. Double-click where you want the result to appear.

6. What is the sum of the three interior angles?

\_\_\_\_\_

7. Alter the triangle by dragging one of the vertices of the triangle.

8. What is the sum of the three interior angles?

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9. Continue to drag one vertex. Does the sum ever change?

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10. What can you conclude about the sum of the measures of the interior angles of a triangle?

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11. From the Lines Toolbar, select **Line**.

12. Move the pencil to point  $A$  until the message **By this point** appears. Click once.

13. Move the pencil to point  $C$  until the message **By this point** appears. Click once. You should have a line through points  $A$  and  $C$ .

14. From the Points Toolbar, select **Point On Object**.

15. Create a point outside the triangle on line  $\overline{AC}$  and label this new point  $D$ .

16. Select **Pointer** and drag point  $D$  so that  $C$  is between  $A$  and  $D$ .

17. From the Measure Toolbar, select **Angle**.

18. Measure and label  $\angle BCD$ .

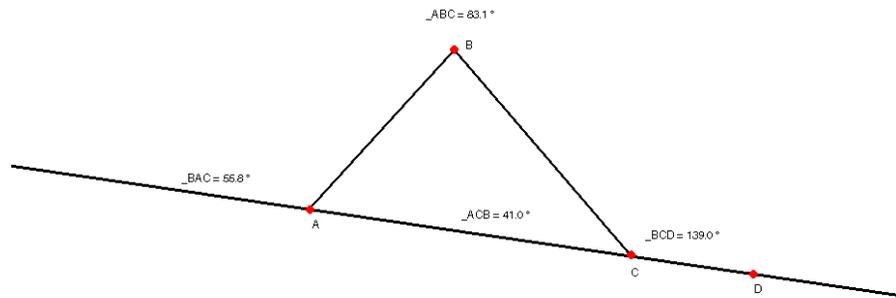


Figure 3.1

19. From the Measure Toolbar, select **Calculate**.

20. Click on the following to add  $\angle BAC$  and  $\angle ABC$ . (These angles are called *remote interior angles* to  $\angle BCD$  because they are not adjacent to the angle.)

a. Click on the value of  $\angle BAC$ .

b. Click on **+** on the Calculate Toolbar.

c. Click on the value of  $\angle ABC$ .

d. Double-click on **=** on the Calculate Toolbar.

e. Drag and double-click where you want the result to appear on the screen.

21. Create a table.

a. From the Measure Toolbar, select **Tabulate**.

b. Click where you want the upper left corner of the table to appear.

c. Drag the lower left corner to create a table that is four columns by six rows.

d. Click when you have finished.

e. From the Measure Toolbar, select **Tabulate**.

f. Click on the numeric value on  $\angle BCD$  when the message **Tabulate this value** appears.

g. Repeat for the sum of  $\angle BAC$  and  $\angle ABC$ .

22. Alter the triangle by dragging on the vertices.

23. From the Measure Toolbar, select **Tabulate**.
24. Click on the numeric value of  $\angle BCD$  to enter into the table.
25. Alter the triangle again and record in the table.
26. Record the values of the table in the chart below.

$\angle BCD =$	Sum of $\angle BAC$ and $\angle ABC$

27. How does the sum of  $\angle BAC$  and  $\angle ABC$  compare to  $\angle BCD$  ?

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28. From the Lines Toolbar, select **Line**.
29. Create a line through points  $B$  and  $C$ .
30. From the Points Toolbar, select **Point On Object**.
31. Create a point outside triangle  $\triangle ABC$  on line  $\overline{BC}$  and label it  $F$ , so that  $B$  is between  $F$  and  $C$ .
32. From the Measure Toolbar, select **Angle**.
33. Measure and label  $\angle ABF$ .
34. What two angles are  $\angle ABF$ 's remote interior angles ?

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35. Calculate their sum.

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36. How does their sum compare to the  $m\angle ABF$ ?

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37. Alter your triangle by dragging one of its vertices.
38. How does the sum of  $\angle BAC$  and  $\angle BCA$  compare to  $m\angle ABF$ ?

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39. What can you conclude is the relationship between an exterior angle and the sum of its two remote interior angles?

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