

Name _____

Date _____

EXPLORATIONS

Activity 14

Sin, Cos, and Tan of Right Triangles

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

1. Create a right triangle.
 - a. Construct a segment and label it \overline{AB} .
 - b. From the Construct Toolbar, select **Perpendicular Line**.
 - c. Move cursor to \overline{AB} until the message **Perpendicular to this segment** appears. Click once.
 - d. Move cursor to point A until the message **By this point** appears. Click once.
 - e. From the Points Toolbar, select **Point On Object**.
 - f. Create a point on the perpendicular line and label it C .
 - g. From the Draw Toolbar, select **Hide And Show**.
 - h. Hide line \overline{AC} .
 - i. Create segments \overline{AC} and \overline{CB} .

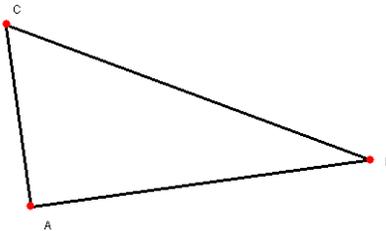


Figure 14.1

2. Measure and label all three interior angles of triangle $\triangle ABC$.
3. Measure and label all three side lengths of triangle $\triangle ABC$.
4. Calculate the ratio of the opposite side to the hypotenuse of $\angle ABC$.
 - a. From the Measure Toolbar, select **Calculate**.

- b. Click on the length of \overline{AC} .
 - c. Click on \div .
 - d. Click on the length of \overline{CB} .
 - e. Double-click on $=$.
 - f. Drag the dotted box to a corner of the screen.
 - g. From the Display Toolbar, select **Comments**.
 - h. Click on the result and change the word **result** to **opposite to hypotenuse of $\angle ABC$** .
5. Repeat these steps for the ratio of opposite (\overline{AB}) to hypotenuse (\overline{CB}) for $\angle ACB$ and label it **opposite to hypotenuse of $\angle ACB$** .
 6. Why did we not compute the ratio of opposite side to the hypotenuse for $\angle BAC$?

 7. Calculate the ratio of the adjacent side to the hypotenuse for $\angle ABC$ and label it **adjacent to hypotenuse of $\angle ABC$** .
 8. Calculate the ratio of adjacent side (\overline{AC}) to hypotenuse (\overline{CB}) for $\angle ACB$ and label it **adjacent to hypotenuse of $\angle ACB$** .
 9. Why did we not compute the ratio of the adjacent side to the hypotenuse for $\angle BAC$?

 10. Calculate the ratio of opposite side to adjacent side for $\angle ABC$ and label it **opposite to adjacent of $\angle ABC$** .
 11. Calculate the ratio of opposite side (\overline{AB}) to adjacent side (\overline{AC}) for $\angle ABC$ and label it **opposite to adjacent of $\angle ABC$** .
 12. Why did we not compute the ratio of opposite side to adjacent side for $\angle BAC$?

 13. Calculate the sin of $\angle ABC$.
 - a. From the Measure Toolbar, select **Calculate**.
 - b. Click on **SIN**.
 - c. Click on the angle measurement of $\angle ABC$.
 - d. Click on \downarrow .
 - e. Double-click on $=$ and hold the mouse button.
 - f. Drag the dotted box to the corner of the screen and click.
 - g. Change the word **result** to **sin of $\angle ABC =$** .
 14. Repeat the steps in #13 for the **sin of $\angle ACB$** .
 15. Calculate cos of $\angle ABC$.
 - a. Click on **COS**.
 - b. Click on the angle measurement of $\angle ABC$.
 - c. Click on \downarrow .

- d. Double-click on .
- e. Drag the dotted box to the corner of the screen and click.
- f. Change the word **result** to **cos of ABC =** .
16. Repeat the steps in #15 for the **cos of ACB**.
17. Calculate **TAN** of $\angle ABC$.
- a. Click on **TAN**.
- b. Click on the angle measurement of $\angle ABC$.
- c. Click on .
- d. Double-click on .
- e. Drag the dotted box to a corner of the screen and click.
- f. Change the word **result** to **tan of $\angle ABC =$** .
18. Repeat the steps in #17 for the **tan of $\angle ACB$** .
19. Complete the table below.

	$\angle ABC$	$\angle ACB$
Opposite to Hypotenuse		
Adjacent to Hypotenuse		
Opposite to Adjacent		
Sin		
Cos		
Tan		

20. Using the table, what ratio is the sin of an angle equal to?

21. Using the table, what ratio is the cos of an angle equal to?

22. Using the table, what ratio is the tan of an angle equal to?

23. Using the pointer, drag a vertex of the triangle.

24. Do the answers in #20 to #22 still hold true?

25. Is there a relationship between the sin and the cos? What is the relationship?

26. Using the pointer, drag vertex C so that $\angle ABC$ is less than 20 degrees. Record the measures below.

$$\sin \angle ABC = \underline{\hspace{2cm}} \quad \cos \angle ABC = \underline{\hspace{2cm}} \quad \tan \angle ABC = \underline{\hspace{2cm}}$$

27. Using the pointer, drag vertex C so that $\angle ABC$ is between 20 and 35 degrees. Record the measures below.

$$\sin \angle ABC = \underline{\hspace{2cm}} \quad \cos \angle ABC = \underline{\hspace{2cm}} \quad \tan \angle ABC = \underline{\hspace{2cm}}$$

28. Continue to drag vertex C so that $\angle ABC$ is getting larger.

29. What happens to the sin as the angle becomes larger?

30. What happens to the cos as the angle becomes larger?

31. What happens to the tan as the angle becomes larger?

32. If you change $\angle ACB$, do the relationships stated in #29 through #31 hold true?
