



## Activity Overview

In this activity, students will explore the ratios of right triangles. Students will discover that they can find the measure of the angles of a right triangle given the length of any two sides.

## Topic: Right Triangles & Trigonometric Ratios

- Sine
- Cosine
- Tangent

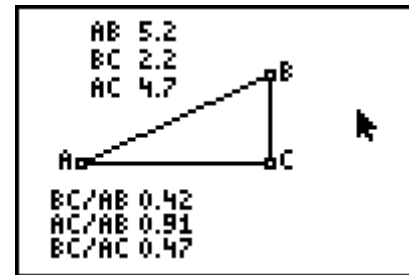
## Teacher Preparation and Notes

- This activity was written to be explored on the TI-84 with the Cabri™ Jr. and Learning Check applications.
- Before beginning this activity, make sure that all students have the Cabri™ Jr. and Learning Check applications, as well as the Cabri™ Jr. file *TRIG.8xv* and the Learning Check file *Trig.edc* loaded on their TI-84 calculators. In order to send the Learning Check file, you will need to use TI-Navigator. If TI-Navigator is not available, then give the trigonometric definitions to students.
- **To download the Cabri™ Jr. file, Learning Check file, and the student worksheet, go to [education.ti.com/exchange](http://education.ti.com/exchange) and enter “11576” in the keyword search box.**

## Suggested Related Activities

To download any activity listed, go to [education.ti.com/exchange](http://education.ti.com/exchange) and enter the number in the keyword search box.

- Ratios in Right Triangles (TI-84 Plus family) — 4054
- Introduction to Trigonometric Ratios (TI-Nspire technology) — 9350
- Sin, Cos, and Tan of Right Triangles (TI-84 Plus family) — 4625



This activity includes screen captures taken from the TI-84 Plus Silver Edition. It is also appropriate for use with the TI-83 Plus and TI-84 Plus but slight variances may be found within the directions.

### Compatible Devices:

- TI-84 Plus Family

### Software Application:

- Cabri™ Jr.
- TI-Navigator (optional)

### Associated Materials:

- RatiosOfRightTriangles\_Student.pdf
- RatiosOfRightTriangles\_Student.doc
- TRIG.8xv
- Trig.edc

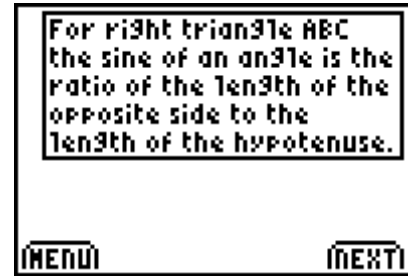
Click [HERE](#) for Graphing Calculator Tutorials.



### Problem 1 – Exploring Right Triangle Trigonometry

In *Trig.edc*, students are given the definitions for the sine, cosine, and tangent of a right triangle. Students should copy the definitions onto their accompanying worksheet. If TI-Navigator is not available to send the *Trig.edc* file, then give the definitions to students, or allow students to use a textbook (or other resource) to find the definitions of sine, cosine, and tangent.

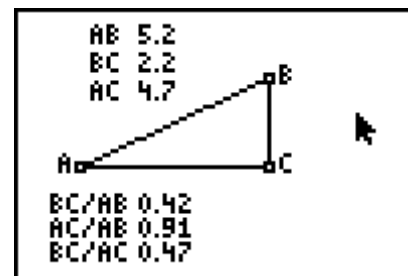
Students are asked to answer questions about sine, cosine, and tangent ratios on their accompanying worksheet.



### Problem 2 – Exploring the Sine Ratio of a Right Triangle

For this problem, students will investigate the sine ratio of two sides of a triangle. Students should start the *Cabri™ Jr.* application and open the file *TRIG.8xv*.

Students will collect data on their worksheets by moving point *B*. They will do this for four different positions of the point.

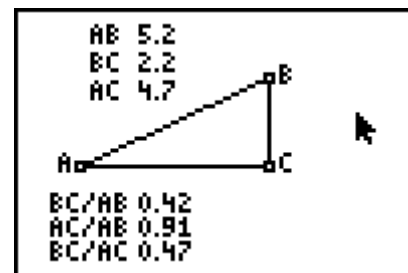


Students will discover that the ratio of *BC* to *AB* remains constant, no matter how large the triangle. Therefore, students will be able to use the inverse of sine to find the measure of the angles in  $\triangle ABC$ .

Students will need to answer several questions on their accompanying worksheets.

### Problem 3 – Exploring the Cosine Ratio of a Right Triangle

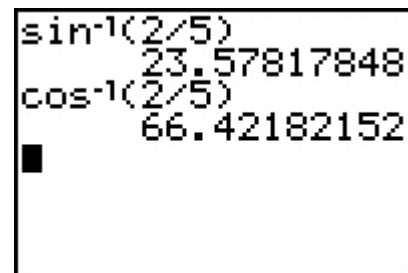
Students will repeat the exploration in Problem 2, but with the cosine ratio.



### Problem 4 – Applying the Sine, Cosine, and Tangent Ratios of a Right Triangle

In Problem 4, students are asked to apply what they have learned about how to find the measure of an angle of a right triangle given two sides of the triangle.

**Note:** Students need to make sure the calculator is set in Degree mode. To do this, press **[MODE]** and press **[ENTER]** on DEG.





### Solutions to Student Worksheet

- For right triangle  $ABC$ , the sine of an angle is the ratio of the length of the opposite side to the length of the hypotenuse.
- For right triangle  $ABC$ , the cosine of an angle is the ratio of the length of the adjacent side to the length of the hypotenuse.
- For right triangle  $ABC$ , the tangent of an angle is the ratio of the length of the opposite side to the length of the adjacent side.

4.  $\frac{3}{5}$       5.  $\frac{4}{5}$       6.  $\frac{3}{4}$       7.  $\frac{4}{5}$       8.  $\frac{3}{5}$       9.  $\frac{4}{3}$

10. Sample answers:

Position	$BC$	$AB$	$\frac{BC}{AB}$	$\sin^{-1} \frac{BC}{AB}$
1	2.76	6.88	0.40	$23.58^\circ$
2	2.45	6.11	0.40	$23.58^\circ$
3	1.88	4.69	0.40	$23.58^\circ$
4	1.27	3.17	0.40	$23.58^\circ$

- The ratio does not change.
- No, the angle does not change.
- $23.58^\circ$
- $66.42^\circ$

15. Sample answers:

Position	$AC$	$AB$	$\frac{AC}{AB}$	$\cos^{-1} \frac{AC}{AB}$
1	2.70	2.95	0.92	$23.07^\circ$
2	3.60	3.93	0.92	$23.07^\circ$
3	4.30	4.69	0.92	$23.07^\circ$
4	5.30	5.79	0.92	$23.07^\circ$

- |                                   |  |  |
|-----------------------------------|--|--|
| 16. $23.07^\circ$                 | 19. $A = 23.58^\circ, B = 66.42^\circ$ | 23. $A = 15.07^\circ, B = 74.93^\circ$ |
| 17. $66.93^\circ$                 | 20. $A = 21.8^\circ, B = 68.2^\circ$   | 24. $A = 42.83^\circ, B = 47.17^\circ$ |
| 18. $A = \tan^{-1} \frac{BC}{AC}$ | 21. $A = 23.96^\circ, B = 66.04^\circ$ | 25. $A = 45^\circ, B = 45^\circ$       |
|                                   | 22. $A = 53.13^\circ, B = 36.87^\circ$ | 26. $A = 29.05^\circ, B = 60.95^\circ$ |