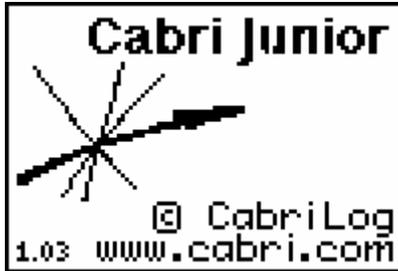


## Activity 22 – The Geometric Mean

First, turn on your TI-84 Plus and press the APPS key. Arrow down until you see Cabri Jr and press **ENTER**. You should now see this introduction screen.



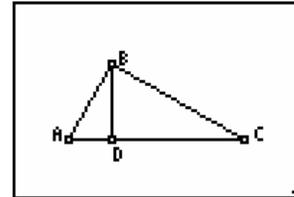
To begin the program, press any key. If a drawing comes up on the screen, press the **Y=** key (note the F1 above and to the right of the key – this program uses F1, F2, F3, F4, F5 names instead of the regular key names) and arrow down to NEW. It will ask you if you would like to save the changes. Press the **2nd** key and then enter to not save the changes.

We are now ready to begin.

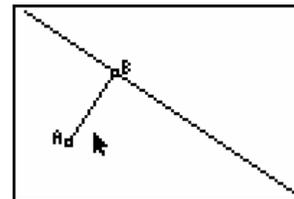
Consider a right triangle ABC with the right angle at point B. Since angle ADB = 90° and angle CDB = 90°. Using our previous work in similar triangles, we could conclude that  $\triangle ABC$  is similar to  $\triangle ADB$  and is similar to  $\triangle BDC$ . When we create proportions from the two smaller triangles we get:

$$\frac{AD}{BD} = \frac{BD}{DC}. \text{ Simplifying this we have } BD^2 = AD * DC.$$

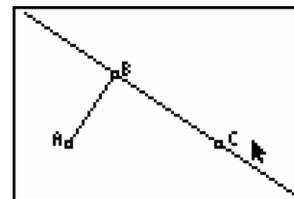
The line segment BD is called the **Geometric Mean** between AD and DC.



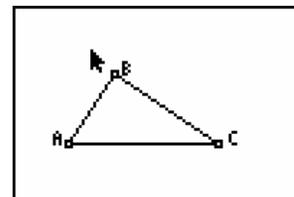
Construct line segment AB and a perpendicular to AB through B.



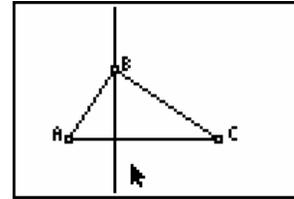
Use the Point On feature to add a point C on the perpendicular line.



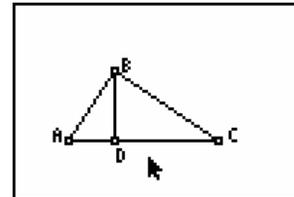
Hide the perpendicular line and construct line segments connecting A to C and B to C.



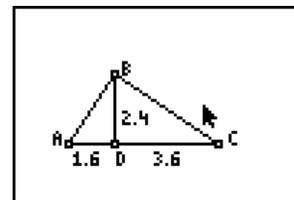
Construct a line that is perpendicular to AC through point B.



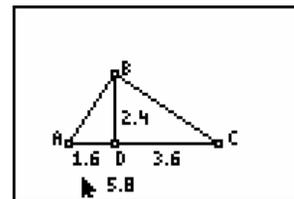
Construct the point of intersection of this perpendicular line and line segment AC. Label the point D. Construct a line segment connecting B to D.



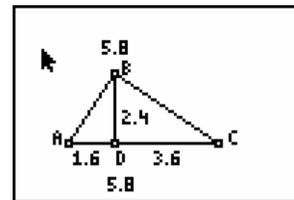
Construct line segments AD and DC. Measure the line segments AD, DC and BD.



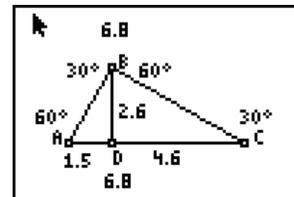
Use the Calculate feature to find the product of the lengths of AD and DC.



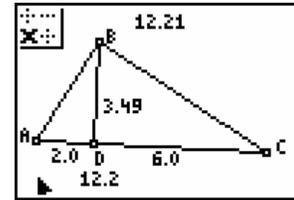
Use the Calculate feature again to find the square of BD. To do this, click on the measure of BD, press  $\times$  and click on the measure of BD again. What should happen is that the square of DB will be equal to the product of AD and DC.



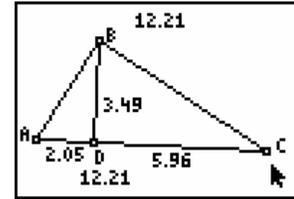
To verify that the triangles are similar, measure the angles in the diagram. All of the angles in this sketch have been measured.



Drag point A and point C so that  $AD = 2$  and  $DC = 6$ . It may be very difficult to get these values exactly due to the screen resolution. In this sketch, the accuracy of the lengths of AD and DC are shown to one decimal place.

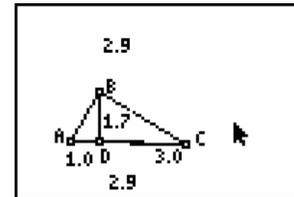


Press **CLEAR** and move your cursor over the measurements for AD and DC. Press **+** to increase the number of digits of accuracy. Now you can see that the lengths were not exactly  $AD = 2$  and  $DC = 6$ . They were both off a bit. Can you do better than this student? If you can then what you have accomplished is to construct a line segment, BD, that has length exactly  $\sqrt{12}$ .



(Note: Use the **-** key to decrease the amount of accuracy).

Manipulate your sketch again so that  $AD = 1$  and  $DC = 3$ . Note that the student in this sketch was off a bit again. If he had been able to drag points so that AD was exactly 1 unit and DC was exactly 3 units, what exact length is found in the measurement of BD?



Using this type of sketch, what lengths would you use for AD and DC in order to construct a line segment whose linear measurement is exactly a)  $\sqrt{10}$  b)  $\sqrt{6}$ .