Concurrency & the Circumcenter

ID: 11306

Time Required
45 minutes

Activity Overview

In this activity, students will explore the perpendicular bisectors of the sides of a triangle. Students will discover that the perpendicular bisectors are concurrent and that the point of concurrency is the circumcenter. Students should discover the relationship between the type of triangle and the location of the point of concurrency.

Topic: Circumcenter

- *Perpendicular Bisector Theorem*
- *Circumcenter*
- *Concurrent*
- *Point of Concurrency*
- *Circumscribed Circle*

Teacher Preparation and Notes

- *This activity was written to be explored with Cabri Jr.*
- *Problem 2 of this activity may be assigned as a homework assignment.*
- ***To download the student worksheet, go to education.ti.com/exchange and enter "11306" in the quick search box.***

Associated Materials

- *GeoWeek06_PerpTri_TI-84.doc*

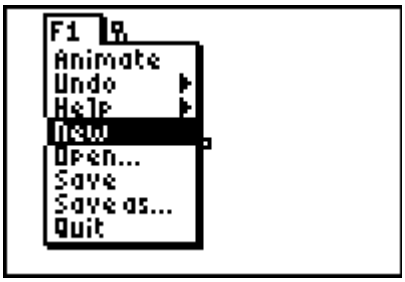
Suggested Related Activities

To download any activity listed, go to education.ti.com/exchange and enter the number in the quick search box.

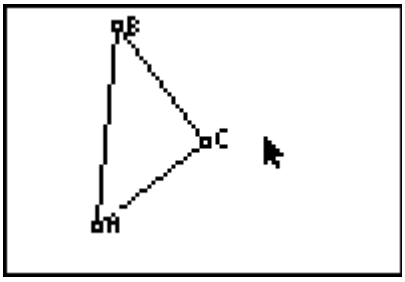
- *Circumscribing a Circle about a Triangle (TI-84 Plus) – 6868*
- *Exploring the Circumcenter of a Triangle (TI-84 Plus) – 6862*

Problem 1 – Exploring Perpendicular Bisectors of a Triangle

Students should first define the terms *concurrent and point of concurrency* using their textbook or another source. After opening Cabri Jr., student should press [Y=], select **New**, and then select the appropriate answer if asked to save changes.

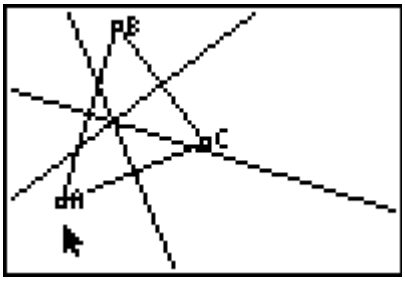


Students should create an acute triangle. To create a triangle, press [WINDOW], and then highlight **Triangle**. Press [ENTER]. Place a point somewhere on the screen using the cursor and by pressing [ENTER]. Drag a second point to the desired location and press [ENTER]. Finally, drag a third point to another location and press [ENTER]. The triangle is complete.

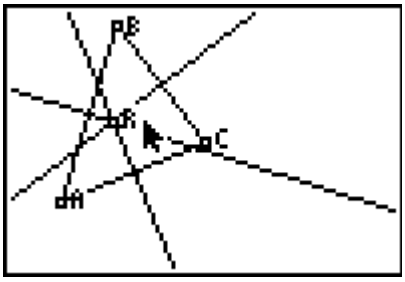


To name the triangle *ABC*, press [GRAPH], select **Alph-Num**, and press [ENTER]. Then, move the cursor to one of the vertices and, when the vertex starts flashing, press [ENTER] and use the keypad to name the points (for example, press [APPS] for *B*) and press [ENTER].

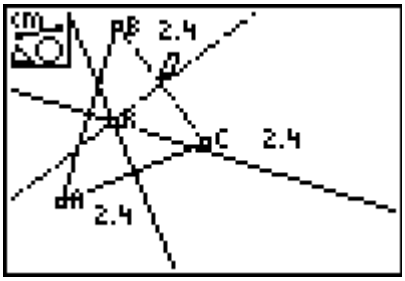
Next, students should create a perpendicular bisector for all three sides of △*ABC*. To construct a perpendicular bisector, press [ZOOM] and select **Perp. Bis.**. Move the cursor toward one of the sides of the triangle until it is highlighted. Press [ENTER] and the perpendicular bisector is formed. Repeat this for the other two sides of the triangle.



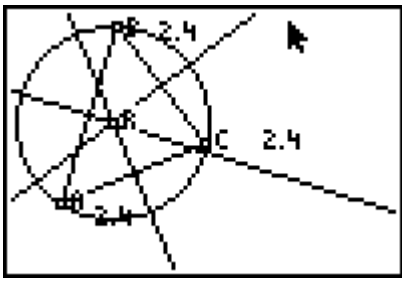
Now students should create a point at the intersection of the perpendicular bisectors. To create a point at the intersection, press [WINDOW] and select **Point > Intersection**. Move your cursor to the intersection of your lines until two lines are highlighted. Press [ENTER] and label this point *R*.



Next, students will need to find the distance from *R* to each of the three vertices of △*ABC*. To measure the distance from *A* to *R*, press GRAPH and select **Measure > D. & Length**. Move the cursor to point *A*. While point *A* is flashing, press ENTER. Move the cursor to point *R*. While point *R* is blinking, press ENTER. The hand tool will be activated and the measurement can be moved to an appropriate place on the screen. Press ENTER to place the measurement. Repeat for the distances from *B* to *R* and *C* to *R*.



Students will need to create a circle centered at *R* that goes through one point of your triangle. Press WINDOW and select **Circle**. Move the cursor to point *R* and press ENTER, and then move the cursor to point *A* (or point *B* or point *C*) and press ENTER.

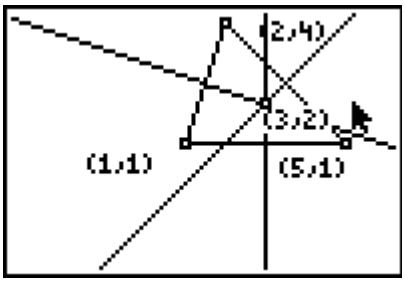


Student Worksheet Solutions

1. When three or more lines intersect at one point, the lines are said to be concurrent.
2. The point of concurrency is the point where the concurrent lines intersect.
3. They are concurrent.
4. Yes, a right triangle.
5. Yes, an obtuse triangle.
6. Yes, an acute triangle.
7. Distances will vary. The distances are all congruent or equal.
8. The circle goes through all three vertices.
9. The radius of the circle will vary, but is the same as the distance found in Question 7.

Problem 2 – An Application of the Circumcenter

Students are given two application problems involving the circumcenter of a triangle. Students are to find the circumcenter of the triangle formed by the three coordinate pairs.



Student Worksheet Solutions

10. The continuous flame should be located at the point (3, 2) on the grid. The radius is 2.23607 units or 2.23607(100) = 223.61 feet.
11. Locate at (3, 3.33) with a radius of 3.073(10) = 30.73 feet