Title: Geocaching Around A College Campus: The Amazing Race

Author: Michelle Kinzel

Affiliation: San Diego Mesa College, San Diego, CA

Contact Info: kinzelm@cox.net

Figure 1. High school student using GPS unit to navigate to the next clue in The Amazing Race.

Description of Activity: Students will learn how to perform basic skills using a Garmin GPS unit; mark waypoints, navigate to a waypoint, use the compass and 'go to' functions to estimate distance to a pre programmed point, change GPS data to find hidden locations. Students will work in teams and help each other as they learn new GPS skills and gain a working understanding of georeferenced data, using clues and team work to solve problems, and how objects are oriented in space.

Content: Satellite technology, basic physics of GPS satellites and hand held GPS units, georeferenced data, relative location of objects in space, collecting georeferenced data and using math and thinking skills to solve clues.

Goals:

1. Familiarize students with the basic functions and physics of GPS hand held data.

2. Teach students basic navigational skills using hand held GPS units.

3. Experience varying latitude and longitude and become familiar with georeferenced data.

4. Have fun and win prizes!

Figure 2. Team of students using problem solving skills to find the next clue (latitude/longitude location).

Figure 3. The victorious students showing off their prizes!

Mesa College GPS Race Rules

1. Please BE QUIET outside classrooms and offices. Do not run or shout or talk loudly near doors and windows.

2. No one should be in roadways or parking lots. If general traffic flow can happen in that area, STAY OUT OF IT!! Remember, drivers in cars will not be looking for you, and with a GPS unit in your hand, you will be looking down, and not at your surroundings like usual. Please be aware of traffic and hazards.

3. Do not walk in planters, landscaped areas or through planters. Be respectful of your surroundings and go around obstacles, not through them.

Tips and Tricks

1. When the GPS unit beeps, you are getting closer to the waypoint. At this point you should begin to use your powers of observation and use the clues in your sheet to help find your next location.

2. For the math calculations, you will only be adding or subtraction whole numbers that you find after the decimal point in the waypoint. You will not change the numbers to the left of the decimal point.

32.80359	117.17226
32.80339	117.17212

ALL of your latitude waypoints will begin with 32.xxxxx and ALL of your longitude will begin with 117.xxxxx. All answers will have 5 digits to the right of the decimal. Program all digits into your GPS unit!

Here is an example- You have navigated to this waypoint.

32.80359	117.17226

How many stairs do you see here? 10 stairs.

Take the number of stairs and multiply by 32.

Add the result to BOTH latitude and longitude to find you next waypoint.

Calculation

Step 1. 10 x 32 = 320

Step 2. Consider ONLY the digits to the right of the decimal points (underlined below). ALL of your waypoints will start with 32.xxxxx and 117.xxxxx. Only the underlined part shown below will change.

32.<u>80359</u>	117.<u>17226</u>

Step 3. Add 320 to '80359', 80359 + 320 = 80679

Step 4. Add 320 to '17226', 17226 + 320 = 17546

Step 5. Take your new 5 digit number and place it to the right of your latitude and longitude numbers (which do not change for any of this GPS waypoint race).

Your next waypoint will be 32.80679 N and 117.17546

Step 6. Program this waypoint into your GPS unit as a next location.

Step 7. Use the 'Go To' function to start navigating to that point.

3. If a clue asks you to estimate the length of something, a useful tip is that your own foot is approximately 1 foot long. Also your arm span from tip to tip is the same length as the height of your body. If you are 5 feet tall, the distance between your fingertips, when stretched out to the sides, would be 5 feet.

4. Your clues should not take you off campus, or outside of the inner perimeter of campus. Refer to the attached map, we will start on a gray area (in a parking lot) and the rest of the race will be inside the white area in the middle of the map. If the unit is telling you to go outside the inner perimeter of campus, recheck your math.

5. As the unit counts down in distance, start looking around for your next clue. For example, if the clue is to find a bench, look around for benches (but as you approach, make sure the unit is still counting down in distance.

The Amazing Race Route

Clue 1) Navigate to this waypoint 32.80360, 117.17226

Find the parking spot reserved for special needs. If you park here, and do not have an authorized parking sticker, what is the minimum fine? _____

Step 1. Fine is $250

Step 2. Add just these numbers (250) to the digits to the right of the decimal point in these numbers, 32.79999 and 117.16872. Remember, the numbers to the left of the decimal point NEVER change, so you are only doing calculations with the digits on the right side of the decimal!

79999 + 250 = 80249, 16872 + 250 = 17122.

Step 3. Put your new digits to the right of the original decimals (32 and 117) and input this into your GPS unit.

Step 4. You will navigate to your next point, 32.80249 and 117.17122

Clue 2) Look at the top of the flag pole. What color is the star on the State of California flag? _____
This is the keyword you will give at the finish line!!!

The American Flag on top of the nearest flagpole has how many white stars? Multiply this by 100, and subtract the **product** from both of these digits (Hint: your product will have 4 digits).

32.(85438 - _____) = 32._____ new waypoint Answer ✓ = 32.80438

117.(22250 _____) = 117. _____ new waypoint Answer ✓ = 117.17250

Clue 3) Find the wooden bench. How many wooden boards are there?

Estimate how long the bench is in a whole number of feet**.** Multiply the number of boards by estimated length. Use this product and add it to the following waypoint for your next clue. Hint: It is closer to 50 than to 500.

32.(80374 +) = 32._____

117.(17093 +) = 117._____

Clue 4) These bike racks have an unusual geometric shape. Which formula would calculate the area enclosed by the black iron stands? Pick the correct letter, and use the waypoint answer below for your next waypoint!

a. Area = s^2 b. Area = b x h c. Area = ½ b x h d. Area = $2 \pi r^2$

a. 32.80360, 117.17226 b. 32.79999, 117.16872 c. 32.80471,117.17045 d. 32.11111, 117.11111

Clue 5) Look up and find the very tall pole. What 2 colors are painted on the pole? White and _____ (should be the same color you got for an answer in #2).

Your next waypoint is 32.80498 and 117.16946

Clue 6) Find the concrete bench closest to this sign

The backrest on top of this bench is in what geometric shape?

a. Square (4 sides) b. Rectangle (4 sides) c. Trapezoid (4 sides) d. Triangle (3 sides)

Multiply the number of sides by 1111 and add the product these numbers for your next waypoint.

32.77119, 117.13463

Clue 7) How many bikes can you lock up here (1 bike per slot)?

Multiply this number of bikes by 100 and subtract the product from this waypoint for the next clue

32.82023, 17.18340

Clue 8) For the tennis courts, who has first priority to sign up? (Do not go inside the courts, look around or through the chain link fence). Use the waypoints next to the correct answer for your next GPS entry.

a. Mesa College PE and Athletic practice 32.80403, 117.17053

b. General Public 32.80358, 117.17209

c. Mesa College Faculty 32.80445, 117.17252

d. Serena Williams *seriously???*

Clue 9) How many people in the mural near Building F-100 are holding hands under the United Nations Symbol?

This is the final answer (number of people holding hands)….take this answer, and the keyword from clue #2 to the booth near the LRC to win the race!! Look for the balloons and table for GIS Day.

The Amazing Race Route 1 - Answer Key

Clue 1) Navigate to this waypoint 32.80360, 117.17226

Find the parking spot reserved for special needs. If you park here, and do not have an authorized parking sticker, what is the minimum fine? ____$250___

Step 1. Fine is $250

Step 2. Add just these numbers (250) to the digits to the right of the decimal point in these numbers, 32.79999 and 117.16872. Remember, the numbers to the left of the decimal point NEVER change, so you are only doing calculations with the digits on the right side of the decimal!

79999 + 250 = 80249, 16872 + 250 = 17122.

Step 3. Put your new digits to the right of the original decimals (32 and 117) and input this into your GPS unit.

Step 4. You will navigate to your next point, 32.80249 and 117.17122

Clue 2) Look at the top of the flag pole. What color is the star on the State of California flag? - ___Red___ ***This is the keyword you will give at the finish line!!!***

The American Flag on top of the nearest flagpole has how many white stars? Multiply this by 100, and subtract the **product** from both of these digits (Hint: your product will have 4 digits).

32.(85438 - _____) = 32._____ new waypoint Answer ✓ = 32.80438

117.(22250 _____) = 117. _____ new waypoint Answer ✓ = 117.17250

Clue 3) Find the wooden bench. How many wooden boards are there? 6 boards, 9 feet long

Estimate how long the bench is in a whole number of feet**.** Multiply the number of boards by estimated length. Use this product and add it to the following waypoint for your next clue. Hint: It is closer to 50 than to 500. **9 X 6 = 54 feet**

32.(80374 +) = 32._____

117.(17093 +) = 117._____

Clue 4) These bike racks have an unusual geometric shape. Which formula would calculate the area enclosed by the black iron stands? Pick the correct letter, and use the waypoint answer below for your next waypoint!

a. Area = s^2 b. Area = b x h **c. Area = ½ b x h** d. Area = $2 \pi r^2$

a. 32.80360, 117.17226 b. 32.79999, 117.16872 c. 32.80471,117.17045 d. 32.11111, 117.11111

Clue 5) Look up and find the very tall pole. What 2 colors are painted on the pole? White and ___Red__ (should be the same color you got for an answer in #2).

Your next waypoint is 32.80498 and 117.16946

Clue 6) Find the concrete bench closest to this sign

The backrest on top of this bench is in what geometric shape?

a. Square (4 sides) b. Rectangle (4 sides) c. Trapezoid (4 sides) **d. Triangle (3 sides)**

Multiply the number of sides by 1111 and add the product these numbers for your next waypoint.

32.77119, 117.13463

Clue 7) How many bikes can you lock up here (1 bike per slot)? 16 bikes

Multiply this number of bikes by 100 and subtract the product from this waypoint for the next clue

32.82023, 17.18340

Clue 8) For the tennis courts, who has first priority to sign up? (Do not go inside the courts, look around or through the chain link fence). Use the waypoints next to the correct answer for your next GPS entry.

a. Mesa College PE and Athletic practice 32.80403, 117.17053

b. General Public 32.80358, 117.17209

c. Mesa College Faculty 32.80445, 117.17252

d. Serena Williams *seriously???*

Clue 9) How many people in the mural near Building F-100 are holding hands under the United Nations Symbol? 14 people

This is the final answer (number of people holding hands)….take this answer, and the keyword from clue #2 to the booth near the LRC to win the race!! Look for the balloons and table for GIS Day.

Final Answers are Red and 14 people