

## CALCULATING DISTANCE (SAMPLE RESPONSES)

Due to rounding errors, inaccurate measuring tools, human error, etc. students' results will vary from what is shown below. Their results should only slightly vary though. Encourage students to write down rounded answers but to use the value from their calculator to decrease rounding errors. However, to keep the activity less cumbersome, encourage students to round degrees to the nearest whole degree.

Since you will see some variety in your students' work, the sample responses below will help show the potential variance by using two sets of values:

### (1) Software Results

- These are the results generated from the software used to create the graphics.
- The values displayed are all rounded to the nearest tenths place.

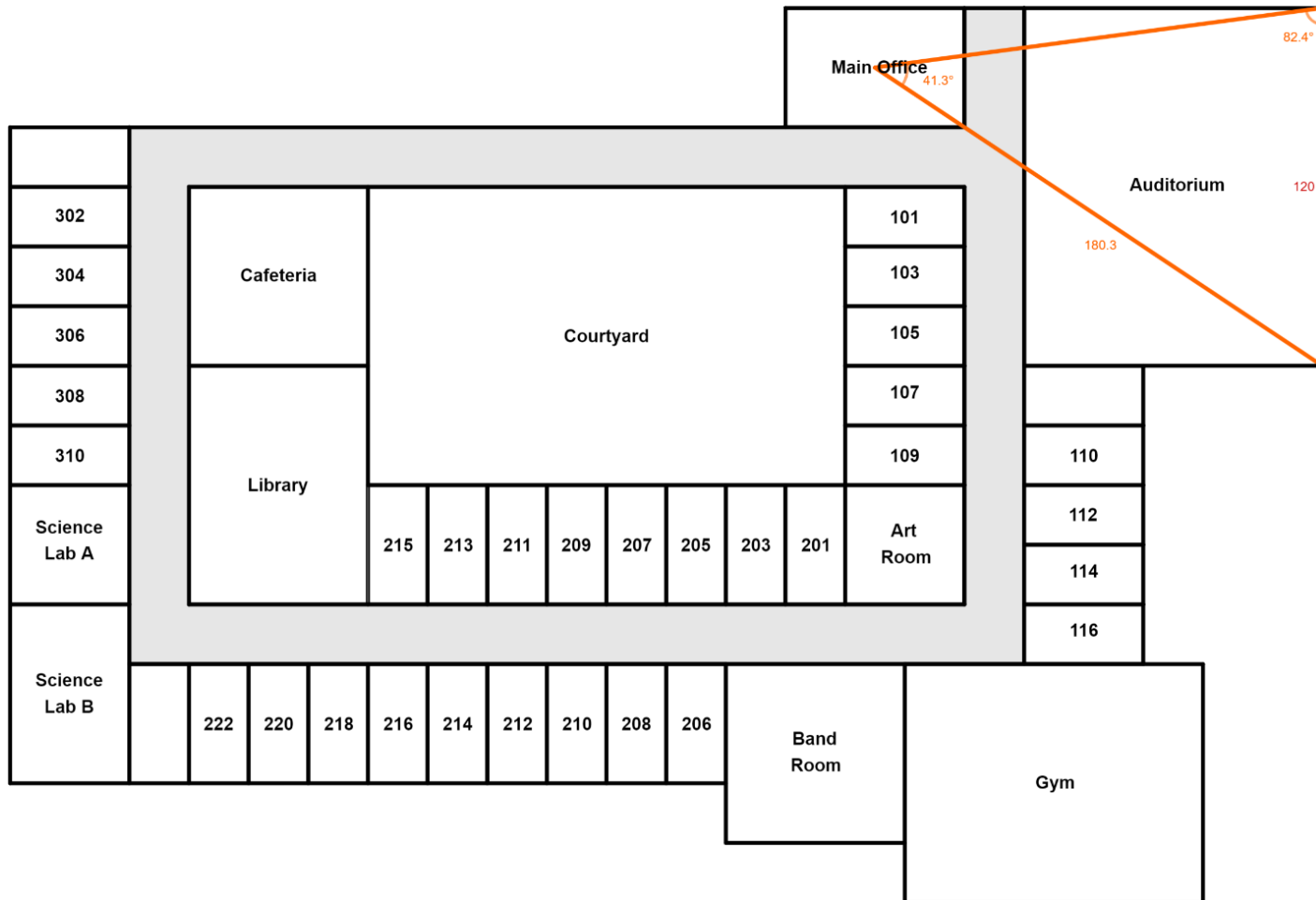
### (2) Rounded Degree Results

- These are the results from (a) rounding to the nearest degree yet (b) not rounding the side lengths.
- The side lengths in the table are written as rounded to three decimal places.

Also, these are sample responses, there is often more than one approach to a given question. For example, a student could use Law of Sines for every question below, since they have a tool to measure each angle. If you observe this happening, encourage students to try Law of Cosines when they feel that they can. The Evaluate portion of this lesson has a reflection question to get kids thinking about when they could have used Law of Cosines as a way to ensure that students think about the new formula they learned.

Notice that the results from rounding to the nearest degree are not significantly different than the result generated by the software. Keep in mind that the more rounding done throughout the activity, the further the results will differ for step 9. And remember, students are likely to be off a full degree when measuring with a protractor. Given the tools and resources available, this is totally acceptable and expected. If precision is of great importance to you, and you like a competition, consider giving a reward for the student who most closely matches this key.

Step 3



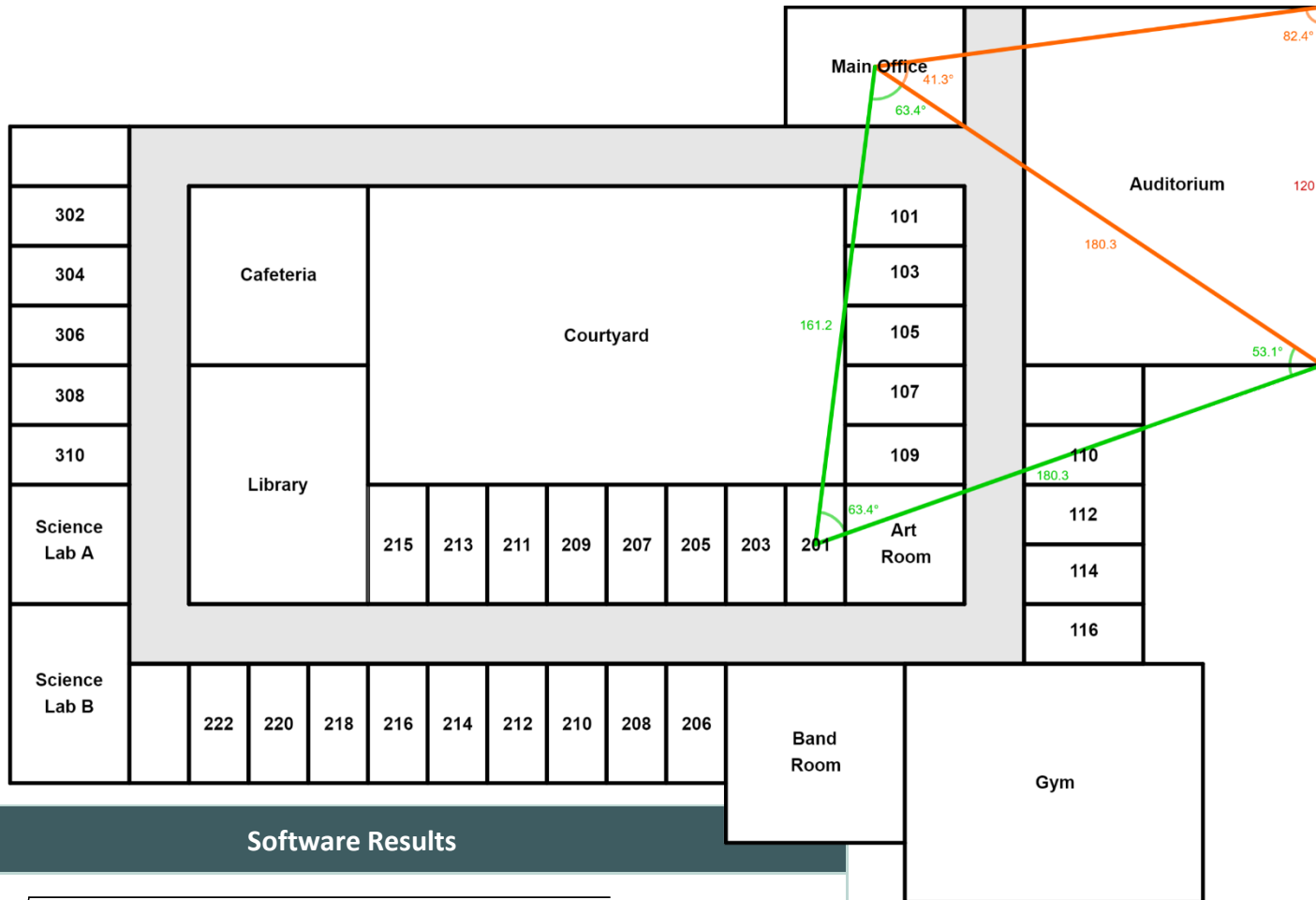
Software Results	Rounded Degree Results
$\frac{a}{\sin(82.4^\circ)} = \frac{120}{\sin(41.3^\circ)}$ $a = \frac{120 \sin(82.4^\circ)}{\sin(41.3^\circ)} = 180.3 \text{ ft.}$	$\frac{a}{\sin(82^\circ)} = \frac{120}{\sin(41^\circ)}$ $a = \frac{120 \sin(82^\circ)}{\sin(41^\circ)} = 180.221 \text{ ft.}$

Step 4



Software Results	Rounded Degree Results
$\frac{b}{\sin(63.4^\circ)} = \frac{180.3}{\sin(63.4^\circ)}$ $b = 180.3 \text{ ft.}$	$\frac{b}{\sin(63^\circ)} = \frac{180.221}{\sin(63^\circ)}$ $b = 180.221 \text{ ft.}$

Step 5



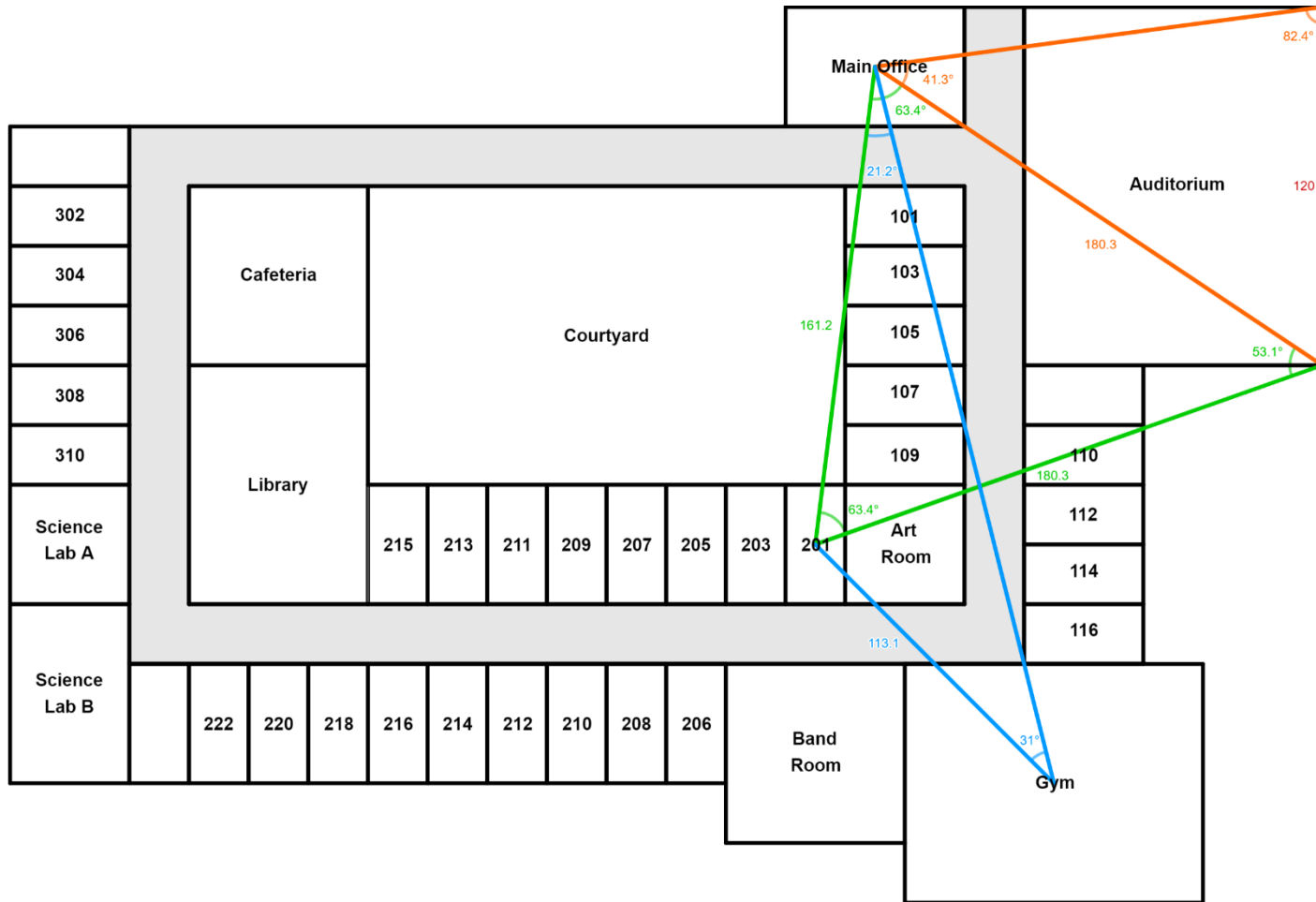
Software Results

$$c = \sqrt{(180.3)^2 + (180.3)^2 - 2(180.3)(180.3)\cos(53.2^\circ)} = 161.2 \text{ ft.}$$

Rounded Degree Results

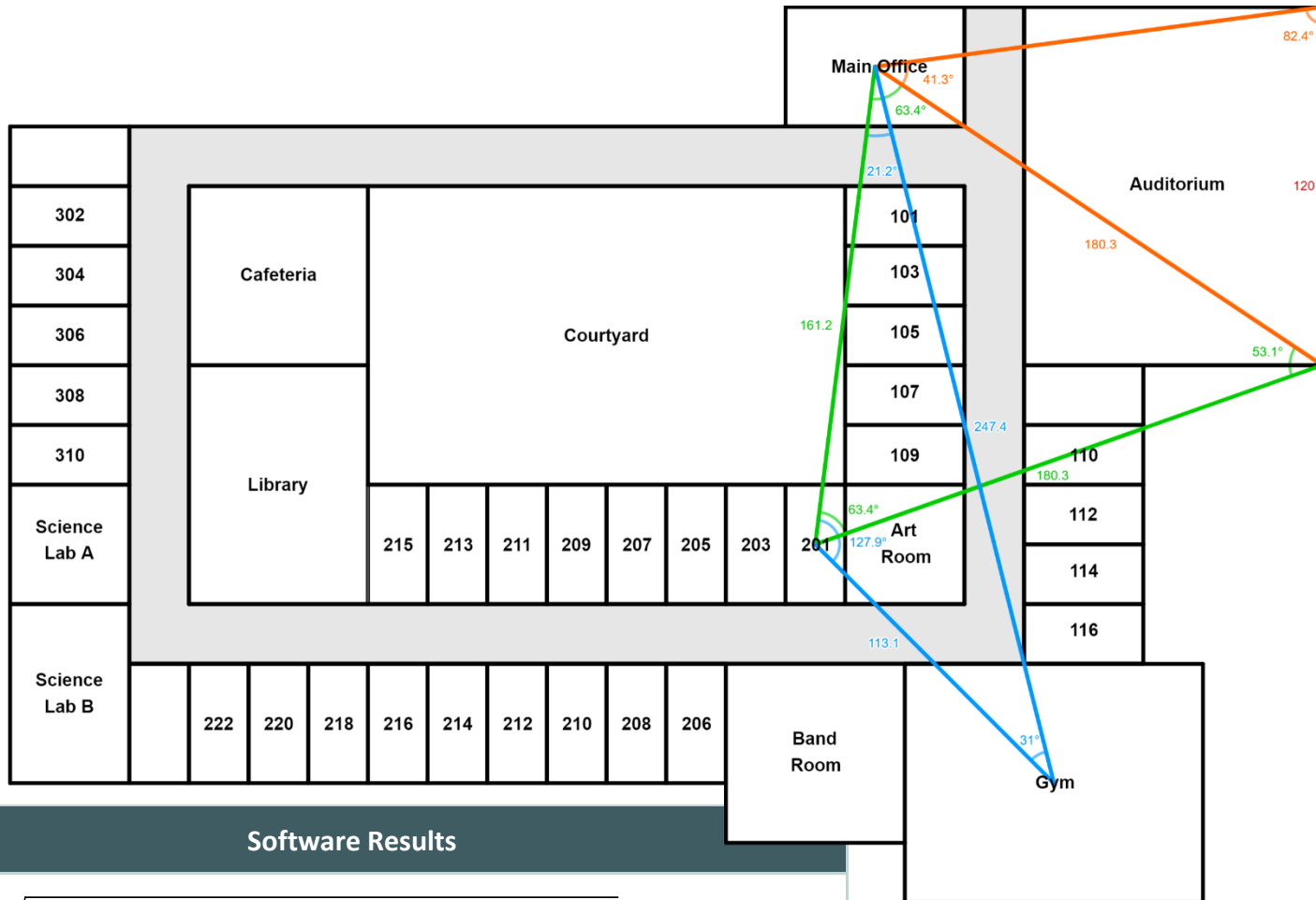
$$c = \sqrt{(180.221)^2 + (180.221)^2 - 2(180.221)(180.221)\cos(53^\circ)} = 160.828 \text{ ft.}$$

Step 6



Software Results	Rounded Degree Results
$\frac{d}{\sin(21.2^\circ)} = \frac{161.2}{\sin(31^\circ)}$ $d = \frac{161.2 \sin(21.2^\circ)}{\sin(31^\circ)} = 113.1 \text{ ft.}$	$\frac{d}{\sin(21^\circ)} = \frac{160.828}{\sin(31^\circ)}$ $d = \frac{160.828 \sin(21^\circ)}{\sin(31^\circ)} = 111.906 \text{ ft.}$

Step 7



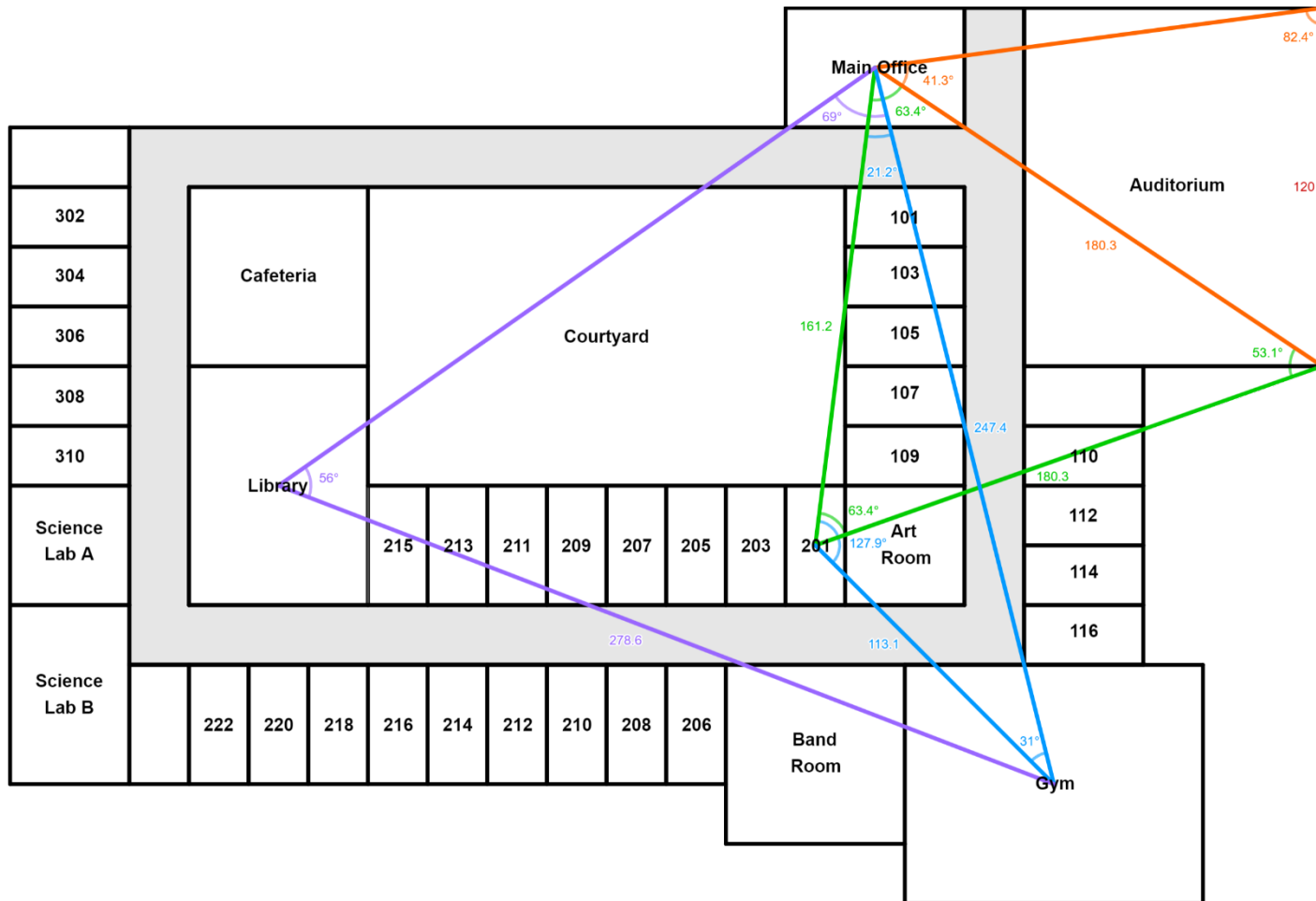
Software Results

$$f = \sqrt{(113.1)^2 + (161.2)^2 - 2(113.1)(161.2)\cos(127.9^\circ)} = 247.4 \text{ ft.}$$

Rounded Degree Results

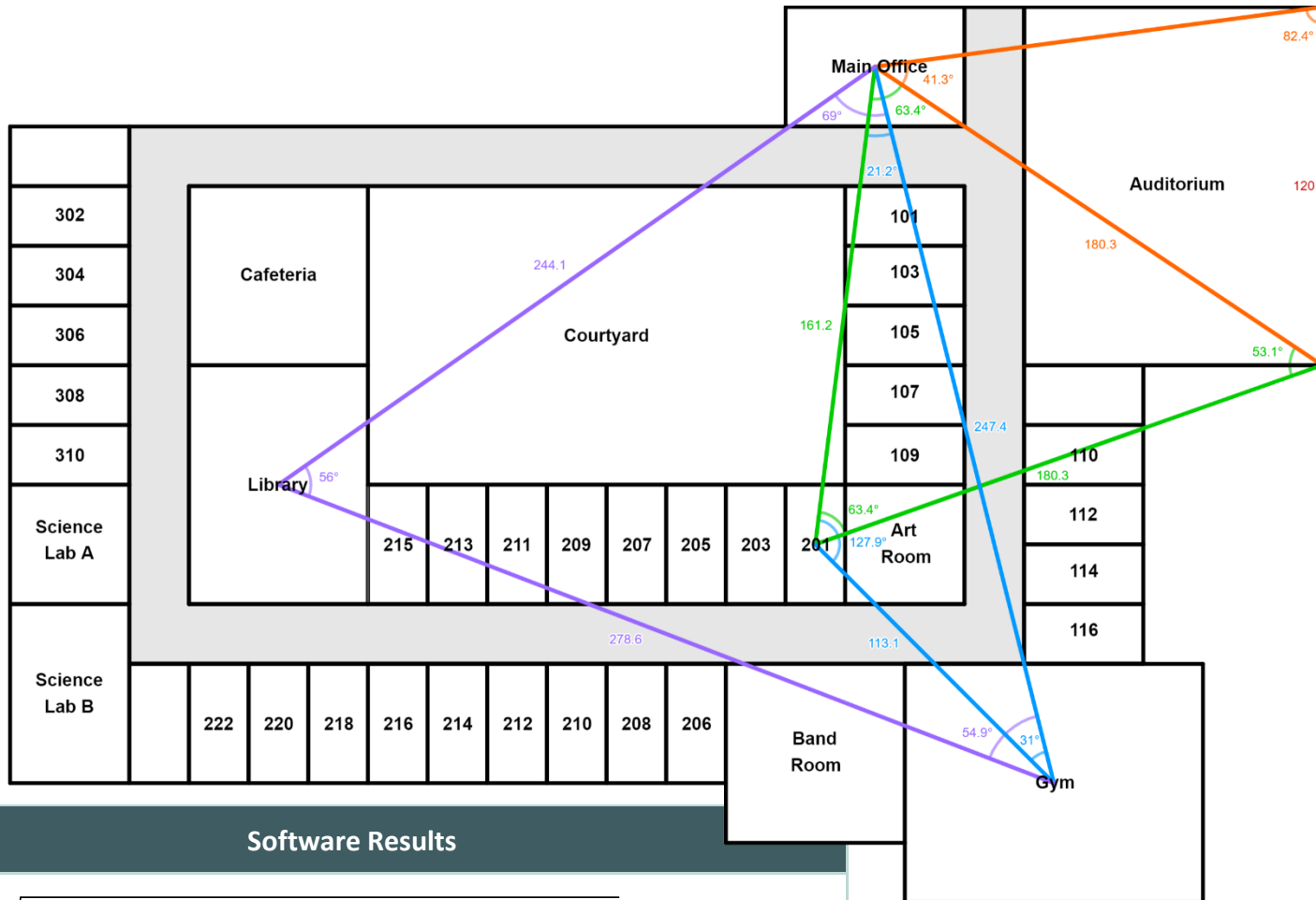
$$f = \sqrt{(111.906)^2 + (160.828)^2 - 2(111.906)(160.828)\cos(128^\circ)} = 246.068 \text{ ft.}$$

Step 8



Software Results	Rounded Degree Results
$\frac{g}{\sin(69^\circ)} = \frac{247.4}{\sin(56^\circ)}$ $g = \frac{247.4 \sin(69^\circ)}{\sin(56^\circ)} = 278.6 \text{ ft.}$	$\frac{g}{\sin(69^\circ)} = \frac{246.068}{\sin(56^\circ)}$ $g = \frac{246.068 \sin(69^\circ)}{\sin(56^\circ)} = 277.097 \text{ ft.}$

Step 9



Software Results

$$h = \sqrt{(278.6)^2 + (247.4)^2 - 2(278.6)(247.4)\cos(54.9^\circ)} = 244.1 \text{ ft.}$$

Rounded Degree Results

$$h = \sqrt{(277.097)^2 + (246.068)^2 - 2(277.097)(246.068)\cos(55^\circ)} = 243.134 \text{ ft.}$$