**Math 8**

Name 1: ______________________________ Name 2:______________________________

# Pythagorean Staircase Design and Making:

**Learning Goal:** To use the Pythagorean relationship and theorem and build a staircase.

**Tasks:**

1. Make a blueprint for a staircase showing the total legs (rise and run) in relationship to the stringer length (hypotenuse) of your staircase (the frame of the whole flight of stairs). Show the legs (rise and run) for the individual stairs with their hypotenuse so you known how to make them all the same with right angles.
2. Use your drawing/measurements to **make** the staircase using popsicle sticks and hot glue (you will need to measure the popsicle sticks to consider their size in your design).
3. Measure your model of the stairs once completed—are all the measurements the same? Compare your theoretical (blueprint) to your actual (model). Write a reflection on what you notice about this comparison and the building process. If it was different, consider why it might have been so. What might you do next time if you were to redo it? What worked and didn't work?

| Criteria | All can do | Most can do | Some can try |
|---|---|---|---|
| Using Pythagoras as a design element | Show the set of stairs (the base) and single steps as a right triangle using Pythagorean relationship. | Include more right triangles in your design that are not part of the steps. | Include more right triangles in your design that are of different proportions. |
| Calculations using squares and square roots | Show all square and square root calculations of both steps and staircase (base). | Show all square and square root calculations for every right triangle in your design. | Show all square and square root calculations for all right triangles and surface areas of your model. |
| Blueprint | Sideview of base and steps are drawn and labeled with measurements and dimensions (remember units!). | Blueprint includes more than one view of the design (rear, front, top, bottom). All measurements and dimensions are shown. | Blueprint includes multiple views of design, including top view, which has all measurements, dimensions, and surface areas listed. |
| Model | Matches general shape of blueprint. Free-standing. | Measurements are nearly exact to blueprint. | Model demonstrates care, attention to detail, and is measured nearly exact. |
| Reflection | Shows the difference between theoretical (blueprint) and real measurements (model). Lists possible reasons. Measurements shown. | Explain difference between theoretical and real measurements with rational. What worked? What didn't work? | Explain methods for getting model closer to blueprint. What would be done differently if done again? |

**Submissions: (Check off each item as you complete them)**

- ☐ 1. **Blueprint** with calculations (attached or part of blueprint; contributions by partners must be _indicated and signed by each calculation/drawing_)
- ☐ 2. **Model** (Physical stair model with names of both partners)
- ☐ 3. **Reflection**/Final Comparison (Written or typed document)

*You will be graded on the following in place of a unit test:*

- ❖ Using the use of the Pythagorean relationship: form and measure right triangles associated with the design. You must demonstrate how and where you are creating right angles with Pythagoras.
- ❖ Calculations using squares and square roots: calculations (theoretical calculations) will be marked, not the accuracy of your model. Calculations must be accurate, and work must be shown. Do not forget to include units of measurement (I.e., cm, mm, $cm^2$, $mm^2$, etc.).
- ❖ Blueprint: all drawings must be neat and scalable (they must represent the dimensions of the model you are designing; if the drawing is a different size than the model, it must be scalable or proportionate). The point of view of your drawings must be labeled (sideview, top view, etc.)
- ❖ Model: your model must represent the blueprint. You must demonstrate an attempt to form right angles that are demonstrated in your blueprint and in your calculations. The model does not have to be perfect, but it must represent your design.
- ❖ Reflection: you will be graded based on your ability to identify differences between the theoretical (blueprint) design and the real model. Specific details and explanations are strongly encouraged. You must show the measurements of the real model to compare it with your theoretical blueprint.