



# Math design project

## Design Your Own Mini-Golf course hole

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Math project combining geometry, trigonometry, fractions, probability, and data analysis.

### **Project overview**

Design a creative mini-golf hole. Use mathematics to determine the dimensions, angles, materials, and probability of success for different shots.

Collect or analyze data to identify relationships between variables.

**Final product:** A scaled drawing or physical model of your mini-golf course hole, supported by mathematical calculations and a written explanation.

## 1. Design and fractions

Create a scale drawing of your mini-golf course hole on graph paper.

Choose the overall dimensions of your hole.

Select a scale, such as  $\frac{1}{4}$  inch = 1 foot.

Calculate the actual dimensions from the drawing.

Express the portions of the hole occupied by greens, paths, water hazards, and obstacles as fractions.

Calculate the total area of your section





## 2. Calculate distances

Pythagorean theorem

Use right triangles to calculate the shortest distance between points on your hole.

Include a diagonal shot across a rectangular section.

Identify the two perpendicular sides and the hypotenuse.

Apply  $a^2 + b^2 = c^2$  to your calculations and explain how the result affects your design.

Example: A hole is 12 m long and 5 m wide. Calculate the diagonal distance from one corner to the opposite corner.



### 3. Design an angled shot

Sine law

Create a hole where the ball must travel around an obstacle or bounce toward the target at an angle.

Draw a triangle showing the ball's starting point, an obstacle, and the hole.

Label the known side lengths and angles.

Use the sine law to calculate a missing side or angle.

Explain how the result helps determine the best route for the ball.

Example: Two angles and one side of the triangle are known. Calculate the distance the ball must travel around the obstacle.

#### 4. Add a challenge hole

##### Probability

Design your hole with a risky shot, such as a narrow bridge, a moving obstacle, or a small target.

Define the possible outcomes of a shot.

Assign probabilities based on reasonable assumptions or collected trial data.

Calculate the probability of success and failure.

Determine the expected number of successful shots out of 20 attempts.

Explain whether the hole is fair, too easy, or too difficult.

Example: If a player has a  $\frac{3}{5}$  probability of making a shot, how many successful shots would you expect in 20 attempts?





## 5. Test the design

### Scatter charts

Investigate whether two variables are related.

Collect at least 10 data points from

Choose two variables, such as shot distance and number of strokes, or ramp angle and ball travel distance.

Create a scatter chart with labelled axes and units.

Describe whether the relationship is positive, negative, or shows little correlation.

Draw a line of best fit if appropriate and use it to make a prediction.

Example: Does increasing the distance of a shot increase the number of strokes needed to complete the hole?