Portfolio Answer Key: ADA Ramp Portfolio

**Geometry**

\*Please review document prior to using with students.

**Directions:** Use this worksheet to record your answers to the questions or problems for the ADA Ramp portfolio.

Where indicated, draw figures on a blank sheet of paper or on a sheet of graph paper. Be sure to label each sheet so that your teacher knows which answer goes with which question. You can scan these figures and submit them as individual documents with your portfolio worksheet, or you can take pictures of them and insert the pictures on the portfolio worksheet.

**Day 1**

|  |
| --- |
| Design a wheelchair ramp for an entrance that is between 12 and 30 inches above ground level. Your design must meet ADA guidelines. To submit your design, do the following: |
| **Question** | **Answer** |
| 1. State how many inches above ground level the door is and your chosen ramp angle.
 | Student answers will vary.\*ADA Guidelines: The maximum slope for wheelchair ramps is 1:12, meaning that for every inch of vertical rise, the ramp must extend at least 12 inches horizontally. Example: If the rise is 20 inches, the ramp should be at least 240 inches (20 feet) long. |
| 1. On a separate sheet of paper, provide a rough sketch of the ramp or ramp sections with labeled horizontal run, vertical rise, ramp length, and angle that the ramp makes with the ground. Below your sketch, include the calculations you made to determine the horizontal run and vertical rise of your ramp. Round all final answers to the nearest tenth.
 | Student answers will vary.Drawing:* The ramp length is the hypotenuse of the right triangle.
* The horizontal run is the adjacent side of the triangle (the side along the ground).
* The rise is the opposite side of the triangle (the vertical side).
* The angle, $$\theta  $$, is the angle the ramp makes with the ground.

Calculations:* Vertical Rise: initial rise height chosen
* Angle ($$\theta  $$) : initial angle chosen
* Horizontal Run (adjacent):
	+ $$\cos(\left(\theta \right))=\frac{horizontal run}{ramp length}$$
	+ Rearranged to $$horizontal run=ramp length⋅\cos(\left(\theta \right))$$
* Ramp Length (hypotenuse):
	+ $$\sin(\left(\theta \right))= \frac{rise}{ramp length}$$
	+ Rearranged to $$ramp length=\frac{rise}{\sin(\left(\theta \right))}$$
 |

**Day 2**

|  |
| --- |
| In Day 1, you designed a wheelchair ramp for an entrance that is between 12 and 30 inches above ground level. Now, you will create a side view scale drawing of your ramp as you practice communicating clearly. Do the following: |
| **Question** | **Answer** |
| 1. On a separate sheet of graph paper, create a side view **scale drawing** of the ramp you designed in Day 1. Neatly label all side lengths and angle measurements.
 | Student answers will vary.Students can model on paper or in GeoGebra.A ramp can be modeled as a right triangle where:* The **rise** (vertical side) is the height of the ramp, which is the entrance height above the ground.
* The **horizontal run** (base) is the distance along the ground from the start of the ramp to the end of the rise.
* The **ramp length** is the **hypotenuse** of the triangle, which is the ramp itself.
* The **angle** is the angle the ramp makes with the ground.
 |
| Imagine that you are submitting your design to a town committee that will need to approve your design before construction can begin. The committee needs to both understand your design and feel confident that it follows ADA guidelines. Do the following: |
| **Question** | **Answer** |
| 1. Describe your ramp and the dimensions of your ramp in words, as clearly as possible.
 | Student answers will vary.* Rise: The height of the entrance from the ground to the door is X inches.
* Horizontal Run: The ramp extends horizontally for X inches.
* Ramp Length: The length of the ramp is X inches, which is the hypotenuse of the right triangle.
* Angle: The ramp has been designed to meet a X-degree angle.
 |
| 1. Explain the relevant ADA guidelines and show how your ramp meets these guidelines.
 | Student answers will vary.Sample:The ramp has been designed to meet a X-degree angle to the ground, ensuring a gradual slope that complies with ADA standards. The angle has been chosen based on ADA guidelines, which recommend a slope ratio of 1:12 for wheelchair ramps. For every inch of rise, the ramp must extend 12 inches horizontally, resulting in the calculated dimensions. |

**Rubric**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Criteria**  | **Excellent (4)** | **Good (3)** | **Fair (2)** | **Poor (1)** | **Points Awarded** |
| **Rough Sketch of Wheelchair Ramp** | The portfolio project demonstrates a fully developed understanding of how to create a rough sketch of a wheelchair ramp that meets ADA guidelines for a chosen height. | The portfolio project demonstrates an adequate understanding of how to create a rough sketch of a wheelchair ramp that meets ADA guidelines for a chosen height. | The portfolio project demonstrates a basic understanding of how to create a rough sketch of a wheelchair ramp that meets ADA guidelines for a chosen height. | The portfolio project demonstrates an inaccurate understanding of how to create a rough sketch of a wheelchair ramp that meets ADA guidelines for a chosen height. | **\_\_/4** |
| **Calculations of Horizontal Run and Ramp Length** | The portfolio project demonstrates a fully developed understanding of how trigonometry can be used to find the horizontal run of the wheelchair ramp and the length of the wheelchair ramp. | The portfolio project demonstrates an adequate understanding of how trigonometry can be used to find the horizontal run of the wheelchair ramp and the length of the wheelchair ramp. | The portfolio project demonstrates a basic understanding of how trigonometry can be used to find the horizontal run of the wheelchair ramp and the length of the wheelchair ramp. | The portfolio project demonstrates an inaccurate understanding of how trigonometry can be used to find the horizontal run of the wheelchair ramp and the length of the wheelchair ramp. | **\_\_/4** |
| **Scale Drawing** | The portfolio project demonstrates a fully developed understanding of how to create a scale drawing that matches a rough sketch. | The portfolio project demonstrates an adequate understanding of how to create a scale drawing that matches a rough sketch. | The portfolio project demonstrates a basic understanding of how to create a scale drawing that matches a rough sketch. | The portfolio project demonstrates an inaccurate understanding of how to create a scale drawing that matches a rough sketch. | **\_\_/4** |
| **Description of Ramp and Explanation of ADA Guidelines** | The student provides a clear, logical, and precise description of the ramp’s dimensions, explanation of the relevant ADA guidelines, and explanation of how the wheelchair ramp meets the ADA guidelines. | The student provides an adequate description of the ramp’s dimensions, explanation of the relevant ADA guidelines, and explanation of how the wheelchair ramp meets the ADA guidelines. | The student provides a partial description of the ramp’s dimensions, explanation of the relevant ADA guidelines, and/or explanation of how the wheelchair ramp meets the ADA guidelines. | The student provides a limited description of the ramp’s dimensions, explanation of the relevant ADA guidelines, and/or explanation of how the wheelchair ramp meets the ADA guidelines. | **\_\_/4** |