



Author(s): Ben Lindeman			Lesson Title: Here We Go - Up The Ramp			
<i>Grade Span</i>			<i>ICLE Application Model</i>			
<i>K-4</i>	<i>5-8</i> <i>XX</i>	<i>9-12</i> <i>XX</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i> <i>XX</i>

Instructional Focus:

Number Operation and Concepts

Students use number, number sense, and number relationships in a problem-solving situation. Students communicate the reasoning used in solving these problems.

Geometry

Students apply geometric concepts, properties, and relationships in a problem-solving situation. Students communicate the reasoning used in solving these problems.

Measurement

Students use a variety of tools and techniques of measurement in a problem-solving situation. Students communicate the reasoning used in solving these problems.

Performance Task

In 1990, the United States Congress passes the **Americans with Disabilities Act**, which prohibited discrimination against people with disabilities and to guarantee them equal access to employment, public services, **public accommodations**, and telecommunications. In this task, you will deal with the public accommodations piece. This part of the act states that places of public accommodation must provide auxiliary aids and services when necessary to ensure equal access to people having disabilities. Accessible to public buildings is usually accomplished by installing wheelchair ramps. To complete this task, you will investigate ramp angles and construct a model of a ramp that might be used for accessing a building by persons with disabilities. The task is divided into three parts.

Part I: Investigation: Your first assignment is to locate a ramp in some building of the community. They can be found in a variety of buildings; e.g. hospitals, stores, government buildings, restaurants, etc. You are to measure the height of the ramp, the length of the ramp, and the distance that the foot of the ramp is from the building. Draw a side view of the ramp and label each of the dimensions, including units of measure. This side view need not be drawn to scale, but should look somewhat proportional to the actual ramp. Bring your drawing to class.

Part II: Designing a Ramp: Use the measures you obtained for your ramp to find the angle of the ramp (the angle the ramp makes with the horizontal). Show your work for this, including the trigonometric ratio that you use, on the drawing you brought to class. You may use your scientific calculator to perform your calculations. After your teacher divides your class into groups of 5 students each, discuss the ramps that you measured and decide upon a common angle that you will use to build a ramp that could be used by a person with disabilities to gain access to a public building. Now decide upon a fictitious building that you will design a ramp for. Identify a height for your ramp and the distance the foot of the ramp will be from the building. Next, each student is to construct a scale model of the side view of a ramp, using the degree measure for the angle chosen by your group. On your drawing indicate the scale that you use.

Part III: Building a Model: Construct a model of your ramp using any material that you wish (e.g. cardboard, tagboard, wood). Your model should be constructed using the scale that you used in the side view drawing of your design in Part II. Use a reasonable width

for your ramp, but that too must be used in your scale model. Show all calculations and ratios used to get the dimensions of your model.

Note to the teacher: Part I should be given to the class as an assignment several days in advance. They will need the time to locate a ramp and make the necessary measurements. Part III could be done in class or as an outside assignment.

ICLE Essential Skills

Perform *operations with signed* (positive and negative) *numbers*, including decimals, ratios, percents, and fractions (m1)

Use the technique of *dimensional analysis* to convert units of measure (e.g., convert km/hr to m/min) including drawing to scale and applying ratios. Understand and use various techniques for estimating, making and converting measure; and using these to perform dimensional analysis (m33)

Know the *basic trigonometric functions* and ratios (m18)

Understand the concepts of *right triangle trigonometry* and solve right triangles using basic trigonometric ratios (sine, cosine, tangent) (m57)

Scoring Guide:

Segment	4	3	2	1
Part I Investigation	The student locates a ramp in the community and obtains the required measurements. The side view is neatly drawn and labeled.	The student locates a ramp in the community and obtains the required measurements. The side view does not show proportionality to the original ramp and either not labeled or not drawn neatly with a straight edge.	The student locates and measures a ramp in the community, but just brings the measurements to class. He/she does not make a drawing of the side view.	The student does not complete the task, but makes a diagram of the side view, which has no measures on it.
Part II Designing a Ramp	The student finds the angle of the ramp using the correct measures and the correct trig ratio. Information needed for the ramp is accurate, and a neat, accurate scale drawing is made. The student demonstrates a thorough understanding of how trigonometry is used to solve right triangles.	The student finds the correct angle of the ramp, but the work is incomplete. Either the information needed for the ramp is not accurately or the scale drawing is poorly made. The student demonstrates good understanding of how trigonometry is used to solve right triangles, but does not work accurately and neatly.	The student finds the correct angle of the ramp, but shows no work. Both the information needed for the ramp is inaccurate and the scale drawing is poorly made. The student shows minimal understanding of how trigonometry is used to solve right triangles.	The student has errors in his/her work, but has computational/computer errors resulting in the incorrect ramp angle. Either the information or the scale model is missing. The student shows little, if any, understanding of how trigonometry is used to solve right triangles.
Part III Building a Model	The student builds a very nice model of the ramp and shows all calculations and ratios used to get the dimension needed to build the model.	The student builds a very nice model of the ramp, but does not show all calculations and ratios used to get the dimension needed to build the model.	The student's model is a bit "rough." Some minor errors occur in the calculations, some of which are missing. He/she does not show the trigonometric ratios used to obtain the necessary measures.	The student's model is very poorly constructed and does not represent the correct measures. It is obvious that little care was taken to be accurate or neat. Necessary calculations and trigonometry ratios are missing.

Keywords

English Language Arts	Mathematics	Science
Reading	Algebra Computation Math in Daily Life Proportions	Earth Science
Writing	Geometry Angles Geometry in Daily Life Relationships Problem Solving Spatial Sense Trigonometry Three-Dimensional Objects	Life Science

	Measurement Modeling	
Communications	Statistics	Chemistry
Literature	Calculus	Physics
Other	Trigonometry Calculators Geometric Relationships Ratios Scale Trigonometric Relationships Trigonometry in Daily Life	Other
	Other	