Step 1: Inquiry Approaches to Learning

NEVADATEACH

Teach 1	Names of student(s) teaching:
Teach date: Teach time: Teach length:	Title of lesson: Constructing the Slope measurement

Concept statement/Main idea:

Construction of slope measurement

Standards for the lesson:

CCSSM.7.RP.1: Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, If a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction (1/2)/(1/4) miles per hour, equivalently 2 miles per hour.

and CSSM.7.RP.2a,b,d: Recognize and represent proportional relationships between quantities.

a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

c. Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.

d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate.

Objectives. Write objectives in LWBAT form.	Evaluation Write at least one question to match the objective you listed or describe what you will look at to be sure that students can do this.
Learners will be able to construct the measurement for slope as an indicator of "steepness" with 80% accuracy	1. Given a random picture of a building scenery, find the slope of two different elements and find the numerical value of the slope. Which of the two slopes is steeper? Why?

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Engagement

Estimated time:

Description of activity: Give each pair of learners a printed picture of a building / mountain / landscape scene that has at least two slopes in it.

What the teacher does	What the student does	Possible questions to ask students — think like a student and consider possible student responses
Provide learners with a variety of different pictures of things that have slope. It is a great idea to have mountains / hills / buildings that are familiar to the learners at first.	Finds two slopes on the picture they are given Answers questions	1. Can you find two different slopes in your picture? Where are they? 2. Share with your neighbor, can you find different slopes in their picture? 3. Do you agree that each picture has a steeper slope and a shallower slope? 4. Which is bigger? Why is it bigger? Define "bigger".

Resources needed:

Pictures from web printed out. At least 1 picture for every two learners.

Safety considerations:

None

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Exploration

Estimated time:

Description of activity: Learners calculate slope for their picture and 1 additional picture after trading.

What the teacher does	What the student does	Possible questions to ask students — think like a student and consider possible student responses
Provides sheet protectors, dry erase markers, graph paper. Asks questions and prompts and guides discussion.	1) Learners will take the pictures and draw using a ruler and pencil two lines on the picture representing two slopes. 2) Learner will then insert the picture into a sheet protector and using a dry erase marker duplicate the two lines onto the sheet protector. 3) Finally, learner will slide in graph paper on top of the picture.	1. Which of the two slopes you drew are steeper? 2. How do you know which is steeper? 3. How can we put a value on the "steepness" of the slopes you found? 4. What measurement will you use? 5. Where will you start measuring from? 6. Should the steeper slope have a big or smaller value in measuring? Why? 7. When measuring, does it matter where you start or end? Why? 8. What is the value of the steep slope? What is the value of the not steep slope? Which number is larger? Why? 9. Did the larger number correspond to the larger slope?

Resources needed:

Sheet protectors, graph paper, dry erase markers and erasers.

Safety considerations: None

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Explanation

Estimated time:

Description of activity: Learners explaining to each other, and other groups in class how to calculate slope.

What the teacher does	What the student does	Possible questions to ask students — think like a student and consider possible student responses
Encourage the learners to not give up, ask questions, demand and encourage responses. Guides conversation to the correct definition of slope.	Calculates slope and explains to other learners how to do calculation.	1. Why did you put the number you did on top of the fraction? 2. Why is that number in the denominator? 3. What happens if you switch the numbers? 4. If you switch the numerator and denominator, do they still correspond to the steeper slopes? 5. Does what you just said work for every measure of steepness? 6. Can you generalize your method so it will work in every case?

Resources needed:

The problems the learners just did. Everyone should have completed two different pictures.

Safety considerations:

None

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Elaboration

Estimated time:

Description of activity: Extending the activity beyond pictures to just lines.

What the teacher does	What the student does	Possible questions to ask students — think like a student and consider possible student responses
Hands out any collection of lines drawn on graph paper.	Calculates the slope of the lines using the methods described and agreed upon in class.	1. What happens to our number is the slope is downhill instead of uphill? 2. What if the slope is flat? 3. What if the slope is vertical? 4. Does the method you described previously work in the situations provided? 5. Why is the slope a proportion? 6. Does the method you described work in all of these cases? 7. Can you create a situation where the method you described didn't work?

Resources needed:

Slope / line handout.

Safety considerations:

None

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Evaluations

Estimated time:

Description of activity: Constant evaluation throughout the lesson, not just at end.

What the teacher does	What the student does	Possible questions to ask students — think like a student and consider possible student responses
Constantly listen to discussion and guide the learners in the direction to the correct understanding of slope.	Working, engaged in lesson and discussion.	1. Are you reducing the fractions correctly? 2. Does your calculation and your partner's calculation agree? 3. Do you really think that slope is bigger than that slope? 4. Can you put those slopes on the number line in order? 5. Can you put the entire classes slope values on a common number line? 6. Why is the vertical change divided by the horizontal change? 7. What happens to the value of the slope if we reverse the division? 8. Can you summarize the process?

Resources needed:

Prior work from the first 4 steps.

Safety considerations:

None

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Unknown by me

Slide Mountain, Washoe Valley

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Red Slate Mountain – near Mammoth Lakes