Frogs, French Fries, and Faucets

Examining Proportions through Multiple Lenses

Participants will go on a journey analyzing proportional relationships through the use of tape diagrams, tables, and graphs all within a real-world context. We will move beyond the cross-multiplication algorithm as we explore alternative approaches to promoting multiplicative reasoning.

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IF YOU JUMPED LIKE A FROG: Iterating a Composed Unit

A 3" frog can jump 20 times its body length. How far could you jump if you hopped like a frog?

We will use a strip of paper to create iterations of a composed unit. To create the unit, fold one end of your strip over about 3 inches. Open the strip and label the unit as shown.

3"	
Frog	
5'	

Fold the end back up and continue to fold the strip by rolling the folded end over on to itself repeatedly.

Open up and label the top of the strip with the corresponding body lengths and the bottom of the strip with corresponding leaping distances.

3"	6"	9"	12"	15"	18"	
Frog						
5'	10'	15'	20'	25'	30'	

Use your strip to answer the following questions:

1) About how far could you leap if you could jump like a frog? _____

2) About how far could a newborn baby leap if she could jump like a frog? _____

3) About how far could a kindergartener leap if he could jump like a frog? (Assume the kindergartener is 42" tall). _____

4) If you were 15 times longer than a frog, then how far could you leap if you could jump like a frog? _____

5) About how far could a 7' tall basketball player leap if he could jump like a frog? _____

Use your strip and multiplicative reasoning to complete the table.

Body Length	1 ½ "	3"	60"	120"	180"		300"	
Leaping Distance		5'				400'		5280'

Explain what strategies you used to fill in the table.

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FRENCH FRIES: Reasoning up and Down

A small order of McDonald's french fries weighs about 75 grams. Complete the ratio table to determine the number of calories in a small order of fries if each fry weighs about 2 grams and contains 6.4 calories.

Serving size, g	2	4	20	5				
Total Calories	6.4							

Each value meal comes with a medium order of fries, weighing in at around 110 grams. Determine the calorie count in a medium order of fries.

Serving size, g	2							
Total Calories	6.4							

Super-size it! Determine the number of calories in a large order of fries (178 g) using a ratio table.

Serving size, g	2							
Total Calories	6.4							

Explain what strategies you used to complete each table.

What additional strategies might we expect students to use?

What essential understandings about ratio and proportion are promoted by these two activities?

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LEAKY FAUCETS: Making Connections

Situation A: A faucet is dripping in the boy's bathroom. Jason placed a measuring cup under the faucet to capture the water as it leaked from the faucet. After 8 minutes, he noticed 6 fluid ounces of water had accumulated in the cup. Knowing that the cup was empty when he began his experiment and that the water was dripping from the faucet at a constant rate, he created the following graph.
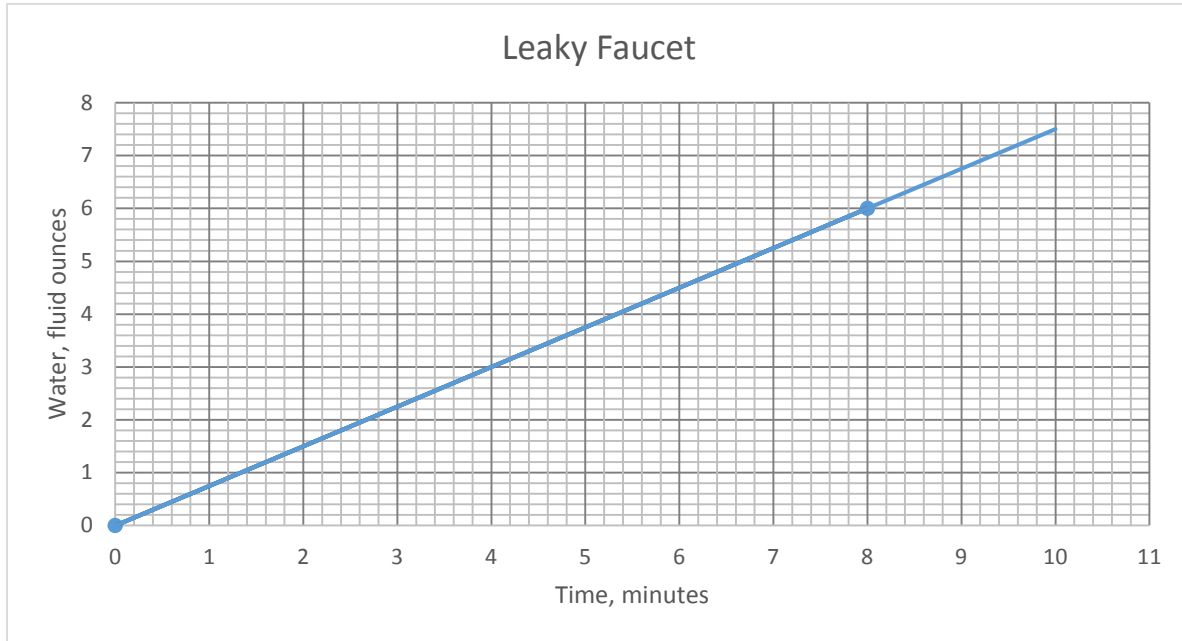
Use the graph to complete the table of values. You may have to use reasoning to fill in some of the values.

Time, minutes	1		2	4	6	8	12			40
Water, fl oz		1				6		12	18	

What rate was the water dripping from the faucet? Explain how that rate is represented in the table.

Interpret the slope in the context of the problem.

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Situation B: A faucet in the science lab was also dripping. Jason placed a measuring cup under the faucet and recorded the total amount of water in the cup over time. Fill in any missing information in his table and then graph the data on the same axis provided above (Leaky Faucet).

Time, minutes	1		3		10	12	15		30	
Water, fl oz		1		5			10	12		40

Which faucet is dripping at a faster rate? Use both tables and graphs to justify your response.

Extension: Looking Forward
Situation C: Suppose the cup Jason used to collect water from the faucet in the science lab already contained 1 fluid ounce of water. Draw a third line on the graph to represent this situation.

Write an equation for determining the amount of water, A, that will have dripped from the faucet in t minutes in Situation C.

At what time will the two cups described in Situation A and Situation C hold exactly the same amount of water? Justify your answer.

Which situations (A, B, C) represent proportional relationships? Justify your answer.

Looking Back…Looking Forward in Support of Student Learning

— What essential understandings about ratio and proportion can be reinforced with this activity?

— What important algebraic concepts are related to these activities?

References

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[Chapter 6 – Developing Concepts of Ratio and Proportion]

Link to McDonald's nutrition information:
http://www.mcdonalds.com/us/en/food/food_quality/nutrition_choices.html