

Name _____ Per. ____ Date: _____

Algebra 2B/Trig Unit 5 Rational Functions

Lesson I Investigation: Nonprofit Organization – adapted from Spring Board

The finance committee of a nonprofit summer camp for teens is setting the cost for a 5-day camp. The fixed cost for the entire camp is \$2,400 per day, and includes things such as rent, salaries, insurance, and equipment. An outside food services company will provide meals at a cost of \$3 per camper per meal.

Campers will eat three meals a day.

As a nonprofit camp, the camp must cover its costs, but not make any profit. The committee must come up with a proposal for setting the fee for each camper, based on the number of campers who are expected to attend each week.

1. Initially, the committee decides to calculate camper fees based on the fixed cost of the camp alone, without meals for the campers.
 - a. What is the total fixed cost for the five days?
 - b. Complete the table below to determine the fee per camper that will guarantee the camp does not lose money.

Number of Campers								
Fee per Camper								

- c. Graph the relationship between the fee per camper and the number of campers in attendance. Fee per Camper VS. Number of Campers.

- d. Write an algebraic rule for the fee per camper as a function of the number of campers in attendance.

2. Describe the features of the graph in Item 1C.

3. Based on your work so far, is there a minimum camper fee, not counting the cost of meals? If so, what is it? Explain.

4. What is the fee per camper if there are 2,000 campers?

5. The functions developed in Item 1 did not account for meals. Campers eat 3 meals per day at a cost of \$3 per camper per meal. The committee must determine a function that includes the cost of meals when setting the fee per camper.

- a. What will be the total cost for meals per camper each 5-day week?

- b. Complete the table below to determine the fee per camper that will guarantee the camp does not lose money.

Number of Campers	Fixed Cost Plus the Cost of Meals	Fee Per Camper
20		
40		
60		
80		
100		
120		
140		
160		
180		
200		

300		

500		

1000		
X		

- c. Graph the relationship between the fee per camper, including meals, and the number of campers.
- d. Write an algebraic rule for the fee per camper, including meals, as a function of the number of children in attendance.
6. Based on your work so far, is there a minimum camper's fee? If so, what is it? Show your work.
7. How does your answer to Item 5C differ from the one you gave for Item 3?

Investigation 2. - Challenge

8. The committee decides to award 30 scholarships to students who otherwise could not afford the camp. These scholarships included full use of facilities and all meals at no charge.
- a. To help account for the scholarships, complete the table below.

Number of Campers	Fixed Cost Plus the Cost of Meals	Number of Paying Campers	Fee per Paying Camper

- b. Graph the relationship between the fee per paying camper and the number of campers. Fee per paying Camper vs. Number of Campers.
- c. Write an algebraic model for the fee per paying camper as a function of the number of campers in attendance.
- d. What is the meaning of the numerator and the denominator in your model?
9. Based on your work so far, is there a minimum camper's fee? If so, what is it? Explain.

10. How does your graph differ from in Item 1b compared to the one in Item 5C?

11. Why is the new denominator $X-30$, rather than just X as before?

12. If the number of campers is 2000, what is the fee per paying camper? Why is this answer different from what it was before?

13. If the number of campers is 25, what is the fee per paying camper? What does your answer tell you about the limitations of this model?

14. Give the domain and range of the function for the fee per paying camper in the context of this problem. Write your answer using interval notation.

Domain:

Range:

Recall that as a nonprofit camp, the camp should not make any profit but still must cover its costs to stay in operation.

15. Last year the weekly camper fee was \$80. If the camp charges the same amount and grants 30 scholarships, what is the minimum number of paying campers that must attend so the camp does not lose money?

16. Express the number of campers as a function of the fee for each paying camper.

17. Use the model $f(x) = \frac{12,000 + 45x}{x - 30}$

and Desmos to find the minimum number of paying campers that must attend so the camp does not lose money if the weekly fee is \$100. Describe the process you used to find your answer.