LESSON 10.1

The Van Pool

You will need:

graph paper 

In the town of Braun a group of people decided to organize a van pool to get to and from work and school. They estimated mileage costs to be about \$11 per day, so the total cost including the bridge toll would be \$12 per day round trip. Then they had to discuss how to share costs. They agreed that children and adults might have different fares.

1. **Exploration** Say there are three children and four adults in the van pool. Find several possible fares you could charge children and adults.

SHARING COSTS

In the following problems, let x stand for a child's daily fare, and let y stand for an adult's daily fare.

2. If only one adult and one child joined the van pool, there is more than one possible pair of values for x and y.
   a. List three possible (x, y) pairs.
   b. Plot these (x, y) pairs on coordinate axes.
   c. Make a graph showing all possible (x, y) pairs. Label the x-intercept and the y-intercept.

3. Repeat problem 2, assuming that one child and two adults join the van pool. Use the same axes for your graph.

4. Repeat problem 2, assuming that two adults and three children join the van pool. Use the same axes for your graph.

5. a. Write equations for the graphs you drew in problems 2-4.
   b. For each equation, interpret the coefficients of x and y and the constant term in terms of the situation.
   c. Find the x-intercept and the y-intercept on each of your graphs. Interpret them in terms of the situation.

NEGOTIATIONS

In this section, assume that the van pool has four children and three adults.

6. a. Make a table showing several possible (x, y) pairs representing the daily fare for children and adults. Draw a graph that shows all possible (x, y) pairs.
   b. Label and interpret the x-intercept and the y-intercept on your graph.
   c. Write an equation for the graph.

The members of the van pool discussed how to divide the cost among themselves. Some thought the adults' and children's fares should be different, and others thought they should be the same. They discussed several possible plans.

In each case described in problems 7-12:

a. Figure out what the daily fare for adults and for children would be. Show your work.

b. Plot a point on the graph from problem 6 to represent your solution.

7. Frances suggested that adults pay twice as much as children because they have more money.

8. John thought that adults should pay $1 more than children.

9. Kathleen said that adults should pay $2 more than children.

10. Joanna argued that there was no reason to have different fares, since an adult and a child each occupy one seat.

11. Allan thought it was unfair to have adults pay more than children, since adults take turns driving the van. He argued that children should pay twice as much as adults.

12. Louise remembered that van pools are exempt from the bridge toll, so she subtracted $1 from the total cost. She agreed with Allan that children should pay twice as much as adults.

INFLATION

The cost of commuting kept increasing. Since the van could legally carry nine people, including the driver, the members decided to let two more children join the pool. They had six children and three adults. Over the years, the cost went up, first to $14, then to $15, and finally to $18 per day.

13. On the same pair of axes, draw three graphs, one for each of the three values for the total cost.

14. Label each graph with its equation.

15. Assume that the adults' fare is twice the children's fare. Mark the points on your graph representing those fares for adults and children, if the total cost is the following amounts:

a. $14 b. $15 c. $18

16. Look at the three points you marked in problem 15. You should be able to connect all of them with a straight line.

a. Find an equation that fits your line.

b. Interpret your equation. (What do the coefficients mean in terms of the problem?)

17. Repeat problems 15-16, assuming that the children's fare is twice the adults' fare.

REVIEW/PREVIEW ***RECIPES***

These are the instructions on a can of orange juice concentrate.

> Mix one part juice concentrate with three parts water.

18. How much concentrate should you use to make

a. 6 cups of orange juice?

b. 10 cups of orange juice?

19. Using this recipe, how much of each ingredient would you need to make 160 cups of punch for the 80 people who are expected at the piano recital?

> **Piano Recital Punch**
>
> *Mix:*
>
> 4 parts iced tea, sweetened
> 4 parts apple juice
> 4 parts cranberry juice
> 2 parts orange juice
> 1 part lemon juice
>
> *Garnish with lemon and orange slices.*

20. How much Piano Recital Punch could you make if you had an unlimited amount of the other ingredients but only

a. 3/4 cup of lemon juice?

b. 3 cups of orange juice?

REVIEW ***EXPONENTS***

21. Write without parentheses.

a. $(4x^2)^3$ b. $(4x^2y)^3$

22. Simplify each ratio.

a. $\frac{80 \cdot 2^{x+2}}{4 \cdot 2^x}$

b. $\frac{4 \cdot 2^{x+2}}{80 \cdot 2^{x+1}}$

c. $\frac{4 \cdot 2^{x+1}}{80 \cdot 2^{x+2}}$

23. Use your calculator to compare $3 \cdot 2^x$ and $2 \cdot 3^x$. Which is greater for different values of x? For what value of x are they equal?