Essential Ideas

BIKES AND TRIKES

Kathryn counted 41 wheels in the preschool yard. All of them were on bikes and trikes. (She did not count training wheels.)

1. Make a table showing some possible numbers of bikes and trikes.

2. Jana counted a total of 16 bikes and trikes in the same yard. How many of each kind were there?

LETTERS AND CARDS

Bill is on vacation and wants to write to his friends. He is going to write letters and postcards, and wants to spend no more than $4.75 on postage. Postcard stamps are 19 cents, and letter stamps are 29 cents.

3. a. If Bill writes only cards, how many can he write?

b. If he writes only letters, how many can he write?

c. If he has 20 friends and wants to write as many letters and as few postcards as possible, how many of each kind should he send?

LINEAR EQUATIONS

4. Which of these equations have the same set of (x, y) solutions as each other? Make two groups. Show your work.

a. $2x + 3y = 0.4$ b. $10x = 2 - 15y$

c. $15x + 10y = 5$ d. $x + 1.5y = 0.2$

e. $y = -1.5x + 0.5$ f. $3x + 2y = 1$

5. Write in standard form, $y = 6x + 7$.

6. What is the equation of a line having slope 8 that passes through (9, 11)?

SYSTEM SOLVING

Solve each system. Check first to see if you can tell that the system has no solution or an infinite number of solutions.

7. $\begin{cases} 6m - 4b = 0 \\ 5m + 8b = 0 \end{cases}$ **8.** $\begin{cases} 4m - 3b = 2 \\ 3m + 4b = 5 \end{cases}$

9. $\begin{cases} 3a + 8b = 20 \\ 3a + b = 13 \end{cases}$ **10.** $\begin{cases} 6m - 2n = 12 \\ n = 3m - 4 \end{cases}$

LEGS

11. Jeanne saw some cows and chickens. She had nothing to do, so she counted their legs and heads, over and over. Here are her results.

The first time: 93 legs, 31 heads

The second time: 66 legs, 16 heads

The third time: 82 legs, 29 heads

She counted accurately only one time. Which time was it? How many cows and how many chickens were there? Comment.

12. Jonathan saw some three-legged stools and four-legged chairs. He was bored, so he counted their legs. There were 59 legs. Then he put six pennies on each stool, and eight nickels on each chair. (He thought it would make a good math problem.)

a. He used 118 coins. Can you tell how many chairs and stools there were? Explain.

b. The total value of the coins was $3.74. Can you tell how many chairs and stools there were? Explain.

c. How many of each kind of coin did he use?

GOING NUTS

The G. Ale Bar Company also sells nuts. Cashews are $4.95 a pound, and peanuts are $1.95 a pound.

13. Ginger was asked to create a mix of cashews and peanuts that would cost $2.95 a pound. What percent of the mix should be peanuts and what percent should be cashews?

CREATING SYSTEMS OF EQUATIONS

14. Create a system of equations that has the solution $x = 2$, $y = 7$. Compare your answer with other students' answers.

15. Create two different systems of equations that have the solution $x = 4$, $y = -1$. Compare answers.

16. Explain your strategy for making up a system of equations having a given (x, y) solution.

17. Make up a word problem having two variables. The problem should have a unique solution. You might use one of the following themes: different-sized bottles or cans, alien creatures having different numbers of eyes or arms. Or choose anything else you want. Be creative, but make sure the math works out.

EQUATIONS AND GRAPHS

18. The graphs of $y = 2x + 3$ and $y = -4x - 5$ meet at a point having x-coordinate -4/3. Solve the system.

$$\begin{cases} y = 2x + 3 \\ y = -4x - 5 \end{cases}$$

19. One of (2.5, 0.5) and (0.5, 2.5) is the solution to the system $\begin{cases} 6x + 2y = 8 \\ 9x - y = 2 \end{cases}$

Where do the graphs of $6x + 2y = 8$ and $9x - y = 2$ intersect?

POINTS ON A LINE

Susan connected (6, 0) to (2, 10) with a rubber band on her geoboard. (5, 3) and (4, 5) appeared to be on the line she formed. She wondered whether they really were.

20. Find the equation of the line through (6, 0) and (2, 10). Use algebra to check whether (5, 3) and (4, 5) are on it.

21. Mark thought the question could be answered without finding the equation of a line, by using the slope of the line connecting one point to another. Use his method and explain it.

A HEIGHT-WEIGHT FORMULA?

Many people do not like to reveal their weight, but most people don't mind telling their height. Lewis thought it would be useful to have a formula giving weight as a function of height. Lewis is 5 feet 6 inches tall and weighs 141 pounds. He made up a formula that relates his weight (in pounds) to his height (in inches).

$$W = 2(H) + 9$$

22. Verify that this formula works for Lewis's height and weight.

23. Lewis's friend Doug weighs 162 pounds and is 6 feet 1 inch tall. Does Lewis's formula work for Doug? Explain.

24. Find a formula that works for both Lewis and Doug.

25. Find two people who will tell you their height and weight. Find a formula that relates their weights to their heights.

26. Check whether the formula you found in problem 25 works to predict your weight from your height. Comment.