

Show all work on a separate sheet of paper.

1) CHILDHOOD WEIGHT

A baby weighs 10 pounds at birth, and three years later the child's weight is 30 pounds. Assume that childhood weight W (in pounds) is linearly related to age t (in years).

a. Write two ordered pairs that relate the above information to each other.

HINT: Instead of (x, y) , our ordered pairs will be (t, W)

b. Express W (y-value) in terms of t (x-value). This means find a linear equation that models childhood weight. You have the points from (a), so find the slope, then use point-slope formula.

c. What is the child's weight on their 6th birthday? ($t = 6$, find W)

d. How old is the child when they weigh 70 pounds? ($W = 70$, find t)

2) LOAN REPAYMENT

A college student receives an interest-free loan of \$8,250 from a relative. The student will repay \$125 per month until the loan is paid off. Express the amount P (in dollars) remaining to be paid in terms of time t (in months).

a. Instead of (x, y) , our ordered pairs will be _____.

b. Write two ordered pairs.

c. Find the linear equation that expresses the amount P (in dollars) remaining to be paid in terms of time t (in months).

d. After how many months will the student owe \$5000?

e. How long will it take to pay off the loan?

3) WAGES

A manufacturer pays its assembly line workers \$11.50 per hour. In addition, workers receive a piecework rate of \$.75 per unit produced.

a. Write a linear relationship for the hourly wage W in terms of the number of units, x , produced per hour.

b. How many units are produced per hour if the hourly wage is \$19?

4) HOUSE APPRECIATION

Six years ago a house was purchased for \$89,000. This year it was appraised at \$125,000. Assume that the value V of the house after its purchase is a linear relationship of time t (in years).

Let the time six years ago be 0. $(0, 89000)$

- Express V in terms of t .
- How many years after the purchase date was the house worth \$103,000?

5) TEMPERATURE

The freezing point of water is 0°C or 32°F , and the boiling point is 100°C or 212°F . Express F in terms of C .

6) NUTRITION

There are approximately 126 calories in a 2-ounce serving of lean hamburger and approximately 189 calories in a 3-ounce serving.

- Write a linear equation for the number of calories in lean hamburger in terms of the size of the serving.
- Use this equation to estimate the number of calories in a 5-ounce serving of lean hamburger.

7) AUTOMOTIVE TECHNOLOGY

The gas tank of a certain car contains 16 gallons when the driver of the car begins a trip. Each mile driven by the driver decreases the amount of gas in the tank by 0.032 gallons.

- Write a linear equation for the number of gallons of gas in the tank in terms of the number of miles driven.
- Use your equation to find the number of gallons in the tank after driving 150 miles.

8) AIR TEMPERATURE

The relationship between the air temperature T (in F°) and the altitude h (in feet above sea level) is approximately linear for $0 \leq h \leq 20,000$. If the temperature at sea level is 60° , an increase of 5000 feet in altitude **lowers** the air temperature about 18° .

- Write the linear equation that expresses T (y -value) in terms of h (x -value).
- Use the above equation to approximate the air temperature at an altitude of 15,000 feet.
- Approximate the altitude at which the temperature is 0° .

9) RECORDS

In 1930, the record for the 400-meter run was 48.6 seconds. In 1970, it was 43.8 seconds. Let R represent the record in the 400-meter run and t the number of years since 1930.

- a. Write a linear equation that relates R in terms of t .
- b. When will the record be 40 seconds?

10) FLYING LESSONS

Flying lessons cost \$645 for an 8 hour course and \$1425 for a 20 hour course. Both prices include a fixed insurance fee.

- a. Express cost, C , in terms of the length, h , of the course.
- b. What is the fixed insurance fee?

11) SALES

A vendor has learned that, by pricing caramel apples at \$1.25, sales reach 133 caramel apples per day. Raising the price to \$2.25 will cause the sales to fall to 81 apples per day. Let y be the number of caramel apples the vendor sells at x dollars each. Write a linear equation that models the number of caramel apples sold per day when the price is x dollars each.

12) TELECOMMUNICATIONS

A cellular phone company offers several different options for using a cellular telephone. One option, for people who plan on using the phone only emergencies, cost the user \$4.95 per month plus \$0.59 per minute for each minute the phone is used.

- a. Write a linear equation for the monthly cost of the phone in terms of the number of minutes the phone is used.
- b. Use your equation to find the monthly cost of using the cellular phone for 13 minutes in one month.

13) CELL PHONE RATES

Suppose you have a cellular phone with a rate plan that cost \$20 per month, with no additional charge for the first 30 minutes of use, and the \$0.40 for each minute or fraction of a minute after the first 30 minutes.

- a. Write an equation that gives the monthly cost C to talk for x minutes, if x is less than or equal to 30 minutes.
- b. Write an equation that gives the monthly cost C to talk for x minutes, if x is greater than 30 minutes.

14) COMPUTERS

On the basis of data from the US Department of Commerce, there were 24 million homes with computers in 1991. The average rate of growth in computers in homes is expected to increase by 2.4 million homes per year through 2005. Write a linear equation for the number of computers in homes in terms of the year. Use your equation to find the number of computers that will be in homes in 2001. Let $t = 0$ in 1991.

15) SALES COMMISSIONS

A person applying for a sales position is offered alternative salary plans. Plan A: A base salary of \$1,200 per month plus a commission of 4% of the gross sales per month Plan B: A base salary of \$1,400 per month plus a commission of 3% of the gross sales for the month.

- For each plan, write an equation that expresses monthly earnings as a function of gross sales, y .
- Graph both equations on the same set of axes.
- For what gross-sales values is plan B preferable?

16) ON-LINE SERVICE

A computer on-line service charges a flat monthly rate of \$20 or a monthly rate of \$5 plus 15 cents for every hour spent on-line. For each plan, write an equation for the monthly rate, y , in terms of the number of hours spent on-line. How many hours on-line each month will make the two options have the same monthly charge?

17) CHEMISTRY

At sea level, the boiling point of water is 100. At an altitude of 2 km, the boiling point of water is 93. Write a linear equation for the boiling point of water in terms of the altitude above sea level. Use your equation to predict the boiling point of water on the top of Mount Everest, which is approximately 8.85 km above sea level. Round to the nearest degree.

18) CHILDHOOD GROWTH

For children between ages 6 and 10, height (in inches) is frequently a linear function of age (in years). The height of a certain child is 48 inches at age 6 and 50.5 inches at age 7.

- Express the child's height in terms of his/her age.
- Sketch the line in part (a), and interpret the slope.
- Predict the height of the child at age 10.