[This worksheet is homework. Keep it with your other homework to be included in homework checks.]

1. Gasoline Problem. A local gas station charges \$1.10 per gallon if you also pay \$4.00 for a car wash.

(a). Let x be the number of gallons of gas you buy. ⟵ The variable is defined in words.

Write an expression for the total number of dollars you pay.

(b). How much, total, would you pay if you bought:
i. 12 gallons;

ii. 20 gallons?

(c). Suppose that your total bill was \$13.57. How many gallons of gas did you get?

2. Donuts Problem. Drenchin Donuts sells donuts for 20 cents each, plus 15 cents for the box in which they come. So the total number of cents you pay is 20 times the number of donuts, plus 15.

(a). Let x be _____ ⟵ Define the variable in words.

Then write an expression for the number of cents you pay for x donuts.

(b). How much will you pay for:
i. 12 donuts;

ii. 100 donuts?

iii. What assumption must you make about the box in order for the answer to (ii) to be reasonable?

(c). Write an equation stating that the number of cents you pay is 355. Then solve the equation to find out how many donuts you get for \$3.55.

3. Delivery Problem. Bill Dupp's Lumber Yard charges \$.50 for each cubic foot (ft^3) of sand you buy, plus \$6.00 to deliver the sand. So the total number of dollars you pay is 0.50 times the number of cubic feet, plus 6.

(a). Let x be the number of cubic feet. ⟵ The variable is defined in words.

Then write an expression for the number of dollars you pay for x ft^3 of sand, delivered.

(b). How much would you pay to get 258 ft^3 delivered?

(c). Write an equation stating that you pay \$17.50 to get x ft^3 of sand delivered. Then solve the equation for x.

(d). How much sand could you get, delivered, for \$100?

4. Plumbers' Wages Problem. Drane and Route Plumbing Co. charges \$42 per hour, plus \$35 for the service call.

(a). Let x be _____ ⟵ Define the variable in words.

Then write an expression for the number of dollars you must pay if they work for x hours.

(b). How much would you pay for:

i. 3 hours;

ii. $4\frac{1}{2}$ hours?

(c). Write an equation stating that the amount you pay is \$140. Then solve the equation to find out how long they worked.

(d). How long did they work if the bill is \$56?

5. Taxi Fare Problem. When the meter in a taxi is first turned on, it reads \$1.20. As the taxi travels, \$1.60 is added for each mile driven.

(a). Let x be _____ ⟵ Define the variable in words.

Then write an expression for the number of dollars the meter reads after x mi.

(b). How much would you pay to ride:

i. 5 mi;

ii. 13 mi?

(c). Write an equation stating that you paid \$12.40. Then solve the equation to find out how far you rode.

(d). How far could you ride for \$33.20?

6. Dump Truck Problem. Doug Upp must shovel a pile containing 50 ft^3 of sand into a dump truck. With each scoop, he decreases the size of the pile by $\frac{1}{6}$ ft^3.

(a). Let x be _____ ⟵ Define the variable in words.

Then write an expression for the number of cubic feet of sand left in the pile after x scoops.

(b). How much sand is left after:

i. 12 scoops;

ii. 100 scoops?

(c). Doug takes a rest when 20 ft^3 of sand remain. Write an equation stating that 20 ft^3 remain. Then solve the equation to find out how many scoops Doug has shoveled before he rests.

7. Gasoline Consumption Problem. Suppose that the gas tank of a car holds 12 gallons, and that the car uses $\frac{1}{20}$ of a gallon per mile.

(a). Let x be the number of miles the car has gone since the tank was filled. ⟵ The variable is defined in words.

Then write an expression for the number of gallons left after x miles.

(b). How many gallons are left after:

i. 100 mi;

ii. 170 mi?

(c). Write an equation stating that 5 gallons are left. Then solve it to find out how far the car has gone when 5 gallons remain.

(d). How far has the car gone when it runs out of gas?

8. Food Consumption Problem. According to studies conducted during World War II, a working person consumes 30 fewer calories (cal) per day for each 1° rise in the Celsius temperature. Suppose that a person consumes 3600 cal per day at 0°C.

(a). How many calories would the person consume at:

i. 1°C;

ii. 5°C;

iii. T°C, where T is a variable?

(b). Evaluate the expression you wrote in (iii) of part (a) if:

i. T is 21;

ii. T is -10.

(c). Write an equation stating that the consumption is 2400 cal. Then solve it to find the temperature.

(d). At what temperature would the person consume 4200 cal?

9. Expansion Gap Problem. When bridges are built in expressways, a small gap is left between the bridge sections so that the bridge will have room to expand. As the temperature goes up, the bridge sections expand and the width of the gap goes down. Suppose that the gap is 21 millimeters (mm) at a temperature of 0°C and decreases by 0.4 mm for every 1°C increase in temperature.

(a). How wide will the gap be if the temperature is:

i. 1°C

ii. 5°C

iii. T°C, where T is a variable?

(b). Evalutate the expression you wrote in (iii) of part (a) if:

i. T is 30;

ii. T is 17;

iii. T is -10.

(c). Write an equation which says that the gap is 7 mm. Then find the temperature at which the gap is 7 mm.

(d). At what temperature will the gap be:

i. 23 mm;

ii. completely closed?

10. Celsius and Fahrenheit Temperature Problem. To convert Celsius temperature to Fahrenheit temperature, you multiply the Celsius temperature by $\frac{9}{5}$, then add 32. Let C be the number of Celsius degrees.

(a). Write an expression representing the number of Fahrenheit degrees.

(b). Find the Fahrenheit temperature for:
i. 35° Celsius; ii. $-20°$ Celsius.

(c). Write and solve equations to find C if the Fahrenheit temperature is:
i. 59°; ii. 14°

11. Temperature Inside the Earth Problem. The temperature inside the earth is assumed to increase by about 10° Celsius for every kilometer beneath the surface. Suppose that the temperature at the surface is 24°. Let x be the number of kilometers beneath the surface.

(a). Write an expression for the number of degrees at a depth of x kilometers.

(b). Find the temperature inside a coal mine 1.3 kilometers deep.

(c). Find the temperature at the bottom of an oil well 5 km deep.

(d). Write an equation stating that the temperature at the bottom of a diamond mine is 61°C. Then solve the equation to find the depth of the mine.

(e). At what depth would water boil (100°C)?

Additional Homework: Section 1.1, p. 63: #23-29(odd), 43-53(odd)