SOLUTIONS

1.1 Variables and functions – Practice exercises

1. A 32 pound bag of dog food costs \$29.97, but a 8 pound bag costs \$11.28.

   (a) Identify and name the variables, including the units.

   P = weight of bag (pounds) ~ indep
   C = cost (\$) ~ dep

   (b) Which variable is dependent and which is independent?

   C P

   (c) What might a 16 pound bag of dog food cost? Explain the reasoning behind your guess.

   2 8lb bag cost $2 \times \$11.28 = \$22.56$
   $\frac{1}{2}$ 32lb bag cost $.5 \times \$29.97 = \$14.99$

   $\Rightarrow$ somewhere in between

   $\approx \$20$?

SOLUTIONS

2. Rent in the Riverside Neighborhood is expected to increase 7.2% each year. Average rent for an apartment is currently \$830 per month. *Story also appears in 3.4 #3*

(a) Identify and name the variables, including the units.

R = rent (\$) ~ dep
Y = time (years) ~ indep

(b) Explain the dependence using a sentence of the form "R is a function of Y"

(c) Which number is a constant in this story: the percent increase (7.2) or the apartment rent (830)?

(d) What is a realistic domain for this function? That means, for how many years might this sort of increase in rent continue? Express your answer as an inequality.

Just guessing—maybe 10 years?

$0 \le Y \le 10$

(e) What is the average rent expected to be in 1 year? In 2 years? In 3 years? Note that

$$7.2\% = \frac{7.2}{100} = 7.2 \div 100 = .072$$

Try figuring it out.

Start = \$830

One-year: $.072 \times \$830 = \$59.76$
$\$59.76 + \$830 = \$889.76$

Two-years: $.072 \times \$889.76 \approx \$64.06$ ← rounded down
$\$64.06 + \$889.76 = \$953.82$

Three-years: $.072 \times \$953.82 \approx \$68.67$
$\$68.67 + \$953.82 = \$1,022.49$

SOLUTIONS

3. Round each number up, down, or off to the precision indicated.
For a discussion of rounding, see Prelude: approximation

(a) My calculations show I'll need a cross brace around 9.388 feet long. I want the board to be long enough, so round up to the nearest foot.

9.388 ≈ 10 feet
round up

(b) Gas mileage is usually rounded down to the nearest one decimal place. What is the gas mileage for a car measured as getting 42.812 miles per gallon? What about a car getting 23.09 miles per gallon?

42.812 ≈ 42.8mpg
round down
23.09 ≈ 23.0mpg

(c) The original budget estimates for the new community center gym were rounded to the nearest hundred (that means ending in 00), so we want to round our bid of $148,214.79 to the nearest hundred.

$148,214.79 ≈ $148,200

(d) The population estimate was 4.2 million people, but revised estimates suggests 4,908,229 people. Report the revised estimate rounded appropriately.

4,908,229 ≈ 4.9 million

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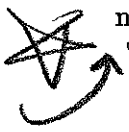
4. It's about time! In each story, time is one (or both) of the variables. Identify and name the variables, including units and dependence. *Stories also appear in 1.1 #5*



(a) The Nussbaums planted a walnut tree years ago when they first bought their house. The tree was 5 feet tall then and has grown around 2 feet a year.

W = height walnut tree (feet) ~ dep
Y = time since planted tree (years) ~ indep

(b) After his first beer, Stephen's blood alcohol content (BAC) was already .04 and as he continued to drink, his BAC level rose 45% per hour.

Story also appears in 2.4 Exercises and 3.4 #1

S = Stephen's BAC ~ dep
t = time he drinks (hours) ~ indep

(c) When McKenna drives 60 mph (miles per hour) it takes her 20 minutes on the highway to get between exits, but when traffic is bad it can take her an hour.

T = time between exists (min) ~ dep
S = speed she drives (mph) ~ indep
[The time depends on how fast she can drive.]

(d) The sun set at 6:00 p.m. today and I heard on the radio that it sets about 2 minutes earlier each day this time of year. *Hint: measure the sunset time in minutes after 6:00 p.m.*

S = sunset time (minutes after 6:00pm) ~ dep
D = days from now (days) ~ indep