

Question

Notes 1.2 : Using Estimation Techniques to Problem Solve

Does it make sense that a person could earn \$364,000 a year when they only make \$25 an hour?

Think - pairs - share

1) Round the world population (6,751,593,103) as follows:

a. to the nearest billion

7 billion

b. to the nearest ten-thousand

6,751,590,000

c. to the nearest hundred million

6,800,000,000

2) Round 3.141592, as follows:

a. to the nearest hundredth

3.14

b. to the nearest ten-thousandth

3.1416

c. to the nearest tenth

3.1

3) You and a friend ate lunch at Ye Olde Café. The check for the meal showed soup for \$2.40, tomato juice for \$1.25, a roast beef sandwich for \$4.60, a chicken salad sandwich for \$4.40, two coffees totaling \$1.40, apple pie for \$1.85, and chocolate cake for \$2.95.

a. Find an estimate for the bill.

Round to nearest \$
2 + 1 + 5 + 4 + 1 + 2 + 3 = \$18

Actual \$18.85

b. The total bill before tax was given as \$21.85. Is this amount reasonable? NO

4) A landscape architect who works full time earns \$52 per hour. (Full time work week is considered 40 hours)

a. Estimate the landscape architect's weekly salary.

$$\approx \frac{\$50}{\text{hour}} \cdot \frac{40 \text{ hours}}{\text{week}} = \frac{\$2000}{\text{week}}$$

b. Estimate the landscape architect's annual salary.

$$\frac{\$2000}{\text{week}} \cdot \frac{50 \text{ weeks}}{1 \text{ year}} \approx \frac{\$100,000}{\text{year}}$$

$$\frac{40 \text{ hour}}{\text{week}} \cdot \frac{50 \text{ wk}}{\text{year}} \approx \frac{2000 \text{ hr}}{\text{year}} \star$$

5) Your monthly rent is \$685 a month. Estimate your yearly rent.

$$\approx \frac{\$700}{\text{month}} \cdot \frac{12 \text{ month}}{\text{year}} \approx \frac{\$8400}{\text{year}}$$

6) An employee earns \$11.75 an hour. Estimate the annual income, assuming the employee works full-time.

$$\frac{\$12}{\text{hour}} \cdot \frac{40 \text{ hr}}{\text{week}} \cdot \frac{50 \text{ wk}}{\text{year}} \approx 12 \cdot \$2000 \approx \frac{\$24,000}{\text{year}}$$

7) An employee earns \$65,000 a year. Estimate the hourly wage, assuming the employee works full-time.

$$\frac{\$70,000}{\text{year}} \cdot \frac{1 \text{ year}}{2000 \text{ hr}} = \frac{70,000}{2000} \approx 35 \text{ \$ / hour}$$

8) You lease a car for \$520 a month for 3 years. Estimate the cost of the lease.

$$\frac{\$500}{\text{month}} \cdot 40 \text{ month} \approx \$20,000$$

9) Traveling between 45 and 55 miles per hour for 2 hours, estimate the distance traveled.

$$50 \frac{\text{miles}}{\text{hr}} \cdot 2 \text{ hr} \approx 100 \text{ miles}$$

10) Traveling between 60 and 80 miles per hour for 6 hours, estimate the distance traveled.

$$70 \frac{\text{miles}}{\text{hour}} \cdot 6 \text{ hours} = 420 \text{ miles}$$

Line graphs are often used to illustrate trends over time. Some measure of time, such as months or years, frequently appears on the horizontal axis. Amounts are generally listed on the vertical axis. Points are drawn to represent the given information. The graph is formed by connecting the points with line segments. Figure 1.5 is an example of a typical line graph. The graph shows the average age at which women in the United States married for the first time from 1890 through 2007.

What notice about graph?

2) The line graphs in Figure 1.6 below show the percentage of high school seniors who used alcohol or marijuana during the 30 days prior to being surveyed for the University of Michigan's Monitoring the Future study.

a. Find an estimate for the percentage of seniors who used marijuana in 1990. 14%

b. In which five-year period did the percentage of seniors who used marijuana decrease at the greatest rate?
1985-1990

c. In which year labeled on the horizontal axis did 50% of the seniors use alcohol? 2000

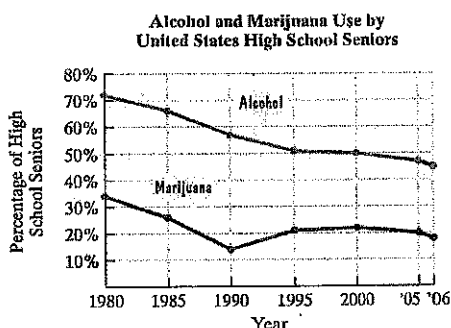


FIGURE 1.6

Group

3) The bar graph in Figure 1.7 below shows the average cost of tuition and fees for public four-year colleges, adjusted for inflation.

a. Find the yearly increase in tuition and fees. Round to the nearest dollar.

$$\approx \frac{6185 - 3362}{2008 - 2000} = \frac{2823}{8} = 352.875 \approx \boxed{\$353}$$

b. Write a mathematical model that estimates the average cost of tuition and fees, T , at public four-year colleges for the school year ending x years after 2000.

$$T = 3362 + 353(x)$$

c. Use the mathematical model from part (b) to project the average cost of tuition and fees at public four-year colleges for the school year ending in 2014.

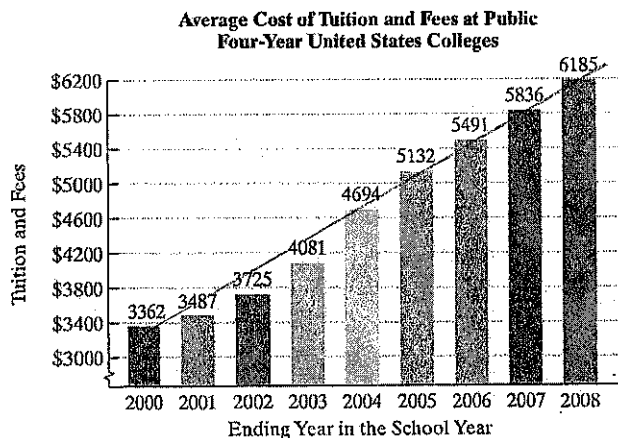
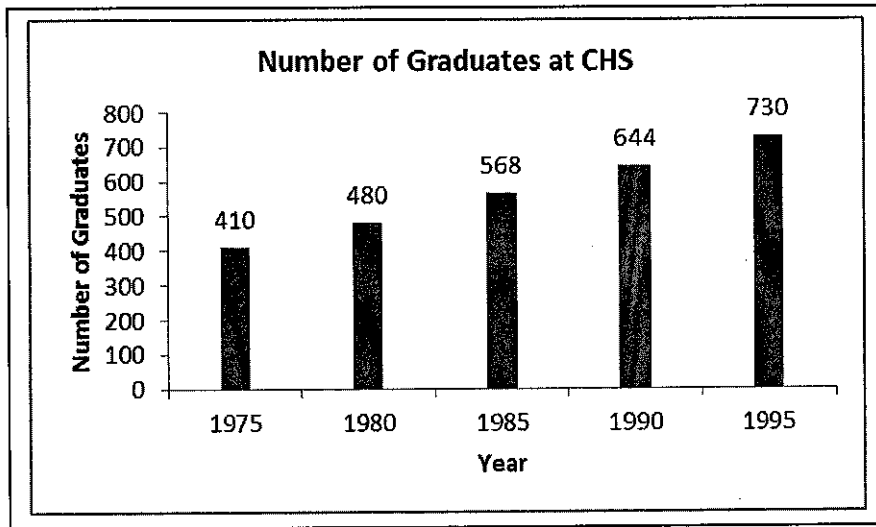


FIGURE 1.7
Source: The College Board

$$\begin{aligned} T &= 3362 + 353(14) \\ &= 3362 + 4942 \\ &= \$8304 \end{aligned}$$

4) Refer to the graph of the number of graduates at CHS from 1975 to 1995.



a) Estimate the yearly increase in the number of graduating students at CHS.

$$\frac{730 - 410}{1995 - 1975} = \frac{320}{20} = 16 \text{ additional students each year after 1975}$$

b) Write a mathematical model that estimates the number of graduating students at CHS, G , x years after 1975.

$$G = 410 + 16(x)$$

c) Use your mathematical model to estimate the number of graduating seniors in 2000. 25 years after 1975

$$G = 410 + 16(25) \approx 810 \text{ students grad. in 2000}$$