5

BASIC TYPES OF QUANTITATIVE COMPARISONS

1. Identify the type of quantitative comparison used in each of the following statements.
   a. "Yesterday, New York City received 5.5 inches of snow."
   b. "Ian Thorpe's margin of victory in the 400-meter freestyle was 0.74 seconds."
   c. "A panel of independent tasters preferred new Wheat Whistles 3 to 1 over their regular snack."
   d. "The Dow Jones Industrial Average dropped 0.6% since this morning's opening."
   e. "On sale, the scanner cost $10 less than the suggested list price."
   f. "Cornstarch has twice the thickening power of flour; for each teaspoon of flour called for in a recipe, substitute on half teaspoon of cornstarch."
   g. "Median income for the metro region was $31,750."
   h. "At 6'3", Joe is two standard deviations taller than the average adult man."
   i. "Sixty-eight percent of registered voters turned out for the primary election."
   j. "State U was seeded first in the tournament."

2. In the 2000 presidential election, Al Gore received 50,996,116 votes while George W. Bush received 50,456,169 votes.
   a. Write a sentence to describe the ranks of the two candidates.
   b. Calculate the difference between the number of votes each candidate received. What impression does that information alone convey?
   c. Calculate the percentage difference between the number of votes each candidate received. What impression does that information give?

3. Indicate whether each of the following statements is correct. If not, rewrite the second part of the sentence to agree with the first.
   a. "Brand X lasts longer than Brand T, with an average lifetime 60% as long as Brand T's."
   b. "Mean attendance at Root4 U increased 25% since last year, from 4,000 to 5,000 fans per game."
   c. "The ratio of flour to butter in shortbread is 2:1; it uses twice as much butter as flour."
   d. "At this time of year, reservoirs are usually 90% full. Currently, with reservoirs at 49% of capacity, water levels are only about 54% of normal."
   e. "Nadia's test score was higher than 68% of students nationwide $(Z = 1.0)$.

f. "A panel of 200 consumers rated ISP A four to one over ISP B. In other words, four more panelists preferred Company A as their Internet service provider."

g. "Matt is in the 91st percentile for height. He is among the tallest 10% of boys his age."

h. "Valueland is advertising 15% off everything in the store. That $200 camera will cost only $170."

i. "The value of mutual fund ABCD tripled since last year, going from 100 to 33."

4. In the 1999 Diallo case in New York City, 41 bullets hit the victim. Write down the criteria that you would intuitively use to interpret that number. Against what are you comparing the number of bullets?

5. Each of the following statements correctly describes part of table 5A, but each description is incomplete. Fill in the missing information.

Table 5A. Median income by race and Hispanic origin of householder, United States, 2011

Race/Hispanic origin	Median income
White	$52,214
Black	$32,229
Asian/Pacific Islander	$65,129
Hispanic (can be of any race)	$38,624

Source: US Bureau of the Census, 2012. Income, Poverty and Health Insurance Coverage in the United States: 2011, Table A. Median Household Income. Available online at http://www.census.gov/newsroom/releases/archives/income_wealth/cb12-172.html#tablea

a. "In the US in 2011, median income for Asian households was about twice as much."

b. "Median income for Hispanic households was $6,395 more."

c. "White households rank second."

d. "The percentage difference for Asian households was 20%."

6. Use table 5B to perform the tasks listed below.

Table 5B. Price per gallon for regular unleaded gasoline at selected gas stations, June 2012 and June 2013

Gas station	June 2012	June 2013
AAA	$3.45	$3.71
Bosco	$3.37	$3.75
Cargo	$3.48	$3.68
Dart	$3.30	$3.66
Essow	$3.46	$3.74

a. Rank the stations from highest to lowest gas price for each of the two dates.

   b. Write a description of the distribution of prices in each year. Use difference and ratio in your description to convey the differences between the two distributions.

   c. Describe how you might use rank in conjunction with difference or ratio in deciding where to buy gas.

7. For each of the phrases listed below
   a. identify other phrases on the list that have the same meaning;
   b. write the equivalent dollar value, assuming comparison against a price of $200;
   c. write the corresponding ratio. For statement i, for example, the ratio would be 0.25.

      i.   "25% of the original price"
      ii. "costs 25% less than …"
      iii. "costs 25% more than …"
      iv. "priced 25% off"
      v.   "125% of the original price"
      vi. "marked down 75%"
      vii. "75% of the original price"
      viii. "costs 75% as much as …"

8. The homicide rate in the US dropped from 5.6 homicides per 100,000 persons in 2002 to 4.2 per 100,000 in 2012. Calculate and write sentences to describe
   a. the differences between the homicide rates in the two periods;
   b. the ratio of the homicide rates in the two periods;
   c. the percentage change between the two periods using
      i. the 2002 rate as the denominator;
      ii. the average of the two rates as the denominator.

9. In table 5C, fill in the z-score for height for each boy in the sample.

Table 5c. Heights of a sample of six-year-old boys

Name	Height (cm)	Z-score
David	117.51	
Jamal	113.90	
Ryan	124.81	
Luis	115.45	
JC	112.73	

Note: Standard population: mean = 115.12 cm; SD = 4.78 cm.

   a. Describe how Ryan's, Luis's, and JC's heights compare to the national norms for boys their age based on their z-scores. (See table 5.3 in *Writing about Numbers*, 2nd Edition, 108, for ways to avoid using "z-scores" as you write).

b. Two boys have heights that are about equidistant from the mean—one above and one below average. Who are they and about how far are their heights from those of average six-year-old boys?

c. A new boy, Mike, joins the class. He is one standard deviation taller than the average boy his age. How tall is Mike?

10. One thousand people lived in Peopleland in 2010 and the population was growing at an annual rate (r) of 2.0% per year.

Table 5D. Population of Peopleland, 2010–2020

Year	Population	Increase from previous year	Cumulative increase since 2010	Percentage change since 2010
2010	1,000			
2011				
2012				
2013				
2014				
2015				
2016				
2017				
2018				
2019				
2020				

a. Use the formula $P_t = P_0 \times e^{rt}$ to fill the population for each year into table 5D. The year 2010 is year 0, t is the number of years since 2010, r (the annual growth rate, expressed as a proportion) is 0.02, and e is the base of the natural logarithms.

b. Calculate the increase in population from the preceding year for each year in the table. Write a sentence explaining the pattern of annual population increase across the 10-year period.

c. The cumulative increase is the total number of people added to the population since 2010. How many more people live in Peopleland in 2020 than in 2010?

d. Calculate the percentage change relative to 2010 for each year. Write a sentence to describe the percentage change in population between 2010 and 2020.

e. What is the ratio of the population size for 2020 compared to 2010? How does that ratio relate to the percentage change over that 10-year period?

f. How do the annual rate of growth and the percentage change between 2010 and 2020 relate?