

Lecture 6: Chapter 3

Sections 3A: Percentages

September 12, 2005

Percentages are a Form of Fractions

Consider the following:

Example 1. In a recent poll conducted by CNN, it was found that 44% of those surveyed agreed with the war on Iraq.

- Another way to interpret this statement is that 44 of out of every 100 persons interviewed agreed with the war on Iraq. So 44% is just an alternative way to say $44/100$.
- Given a population n and a percentage expressed in fraction form p , we can obtain a numerical value for p percent of the population by multiplying n and p .

Example 2. If 89% of Utah's 1,500,000 homeowners currently pay on a mortgage, how many total Utahans pay on a mortgage?

Solution:

Describing Change with Percents

- We will use the following example to motivate the upcoming definitions:

Example 3. In January company A made a \$2000 profit and the following month they made a \$3000 profit. What is the absolute and relative change in profits from January to February for company A ?

Solution:

The absolute change is \$1000. There relative change is 50%.

Definition 1. The **absolute difference** describes the actual increase or decrease from a **reference value** to a **new value**.

$$\text{absolute change} = \text{new value} - \text{reference value}$$

Definition 2. The **relative difference** is a fraction that describes the size of the absolute change in comparison to the reference value.

$$\text{relative change} = \frac{\text{absolute change}}{\text{reference value}} = \frac{\text{new value} - \text{reference value}}{\text{reference value}}$$

and can be converted to a percent by multiplication by 100.

Example 4. Boeing stock dropped from 67.51 dollars per share to 65.34 dollars per share. What are the absolute and relative differences in the stock?

Comparing with Percents

Example 5. The basic computer costs \$1000 and the high-end model costs \$1400. Find the absolute and percentage difference between the two computers.

Solution:

The absolute difference is \$ 400. The percentage difference is 40%.

Definition 3. The **absolute difference** is the actual difference between the compared value and the reference value:

$$\text{absolute difference} = \text{compared value} - \text{reference value}$$

Definition 4. The **relative difference** describes the size of the absolute difference as a fraction of the reference value:

$$\text{relativedifference} = \frac{\text{absolute difference}}{\text{reference value}} = \frac{\text{compared value} - \text{reference value}}{\text{reference value}}$$

Example 6. If Johnny makes \$40,321 annually and Sam makes \$30,497, find the absolute and relative differences of Sam's salary compared to Johnny's.

Percents of Percents

- Sometimes it is useful to consider percentage changes in values that are already percents.

Example 7. The interest rate at the local bank changed from 2% to 3%. We may say that the percentage increased one percentage point, or increased 50%.

- When you see a change or difference expressed in **percentage points**, you can assume it is an **absolute** change or difference. If it is expressed with the % sign or the word percent, it should be considered a **relative** change.

Percentage Problems

1. Buying a Dress: You decide to go to the store and buy your favorite dress for the cost of \$45.99 plus Provo's 6.25% sales tax. How much do you pay?

Solution:

How much do you pay in tax?

What is the total?

2. School Admissions: The admission rate to BYU for 2004 was down 6% to 50.3% in 2005. What was the percentage rate in 2004?

Solution:

new rate =

previous rate =

3. Taxes: If taxes are decreased by 15% 3 times, what is the total decrease relative to the original tax rate?

Solution:

4. Buying a Gun: You go to the local gun store where you find your favorite firearm normally priced at \$600 on sale for 150% off. How much do you pay for the gun?

Solution: