

Chapter 11

Consumer Mathematics



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 1

WHAT YOU WILL LEARN

- Percents, fractions, and decimals
- Percent increase, percent decrease, and percent markup and markdown
- Simple Interest
- Compound Interest
- Present Value



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 2

WHAT YOU WILL LEARN

- Fixed and open-ended installment loans
- Mortgages



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 3

Section 11.1

Percent



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 4

Percent

- The word percent comes from the Latin per centum, meaning “per hundred.”
- A *percent* is simply a ratio of some number to 100.

Example: $\frac{37}{100} = 37\%$



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 5

Procedure to Change a Fraction to a Percent

- Divide the numerator by the denominator.
- Multiply the quotient by 100 (which has the effect of moving the decimal point two places to the right).
- Add a percent sign.

Example: Change $\frac{19}{25}$ to a percent.

Solution: By following the steps above, $\frac{19}{25} = 76\%$.



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 6

Procedure to Change a Decimal Number to a Percent

- Multiply the decimal number by 100.
- Add a percent sign.

Example: Change 0.569 to a percent.

Solution: $0.569 = (0.569 \times 100)\% = 56.9\%$.



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 7

Procedure to Change a Percent to a Decimal Number

- Divide the number by 100.
- Remove the percent sign.

Example:

- Change 14% to a decimal number.
- Change $\frac{1}{4}\%$ to a decimal number.

Solution:

- $14\% = \frac{14}{100} = 0.14$

- $\frac{1}{4}\% = 0.25\% = \frac{0.25}{100} = 0.0025$



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 8

Percent Change

- The percent increase or decrease, or percent change, over a period of time is found by the following formula:

$$\text{Percent change} = \frac{\left(\begin{array}{c} \text{amount in} \\ \text{latest period} \end{array} \right) - \left(\begin{array}{c} \text{amount in} \\ \text{previous period} \end{array} \right)}{\text{amount in previous period}} \times 100$$

- If the amount in the latest period is greater than the amount in the previous period, the answer will be positive and indicate a percent increase.
- If the amount in the latest period is smaller than the amount in the previous period, the answer will be negative and indicate a percent decrease.



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 9

Example: Percent Change

The family membership enrollment at a fitness center was 805 families. Five years later, the enrollment was 875 families. Find the percent of change over the five year period.

- Solution:

$$\text{Percent change} = \frac{875 - 805}{805} \cdot 100$$

$$\gg 0.08696 \cdot 100$$

$$\gg 8.7$$

- There was about an 8.7% increase in the number of family memberships.



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 10

Percent Markup

- The following formula represents percent markup or markdown on cost.
 - A positive answer indicates a markup.
 - A negative answer indicates a markdown.

$$\begin{array}{l} \text{Percent} \\ \text{markup or} \\ \text{markdown} \\ \text{on cost} \end{array} = \frac{\text{selling price} - \text{dealer's cost}}{\text{dealer's cost}} \times 100$$



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 11

Example: Percent Markup

The Dusty Lens Camera Shop pays \$68.45 for a camera. They regularly sell them for \$157.99. At a weekend sale, they sold for \$142.88.

Find:

- the percentage markup on the regular price
- the percentage markup on the sale price
- the percentage decrease of the sale price from the regular price.



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 12

Solution:

- Percent markup = $\frac{157.99 - 68.45}{68.45} \times 100$
 $\approx 1.308 \times 100$
 ≈ 130.8
- Thus, the percent markup on the regular price was about 130.8%.



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 13

Solution (continued):

- Percent markup = $\frac{142.88 - 68.45}{68.45} \times 100$
 $\approx 1.087 \times 100$
 ≈ 108.7
- Thus the percent markup on the discounted price was about 108.7%.



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 14

Solution (continued):

- Percent decrease = $\frac{142.88 - 157.99}{157.99} \times 100$
 $\approx -0.0956 \times 100$
 ≈ -9.6
 - The sale price is about 9.6% lower than the regular price.



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 15

Example: Mortgage

Clark and Martha Nielson wish to buy a house for \$256,000. In order to avoid a PMI (Primary Mortgage Insurance) charge, they must pay 20% of the selling price as a down payment. Determine the amount of the down payment.

Solution: $x = 20\%$ of the selling price
 $= 0.20 (256,000)$
 $= \$51,200$

The Nielsons must have a down payment of \$51,200 to avoid PMI.



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 16

Section 11.2

Personal Loans and Simple Interest



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 17

Personal Loans

- The amount of credit and the interest rate that you may obtain depend on the assurance that you can give the lender that you will be able to repay the loan.
- *Security* (or collateral) is anything of value pledged by the borrower that the lender may sell or keep if the borrower does not repay the loan.
- A *personal note* is a document (or agreement) that states the terms and conditions of the loan.



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 18

Interest

- *Interest* is the money the borrower pays to use the lender's money.
- *Simple interest* is based on the entire amount of the loan for the total period of the loan.
- Simple Interest Formula
 - $\text{Interest} = \text{Principal} \times \text{Rate} \times \text{Time}$
 $I = PRT$



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 19

Example: Calculating Interest and Payback Amount

Lillian needs to borrow \$1900 for tuition from a credit union. She obtains a 6-month loan with an annual simple interest rate of 5.5%.

- Calculate the simple interest on the loan.
- Determine the amount that Lillian will pay the credit union at the end of six months.



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 20

Solution

- $I = PRT$
 $I = \$1900 \times 0.055 \times 0.5$
 $I = \$52.25$
- The simple interest on \$1900 at 5.5% for 6 months is \$52.25.



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 21

Solution (continued)

- The amount to be repaid is equal to the principal plus the interest.

$$A = P + I$$

$$A = \$1900 + 52.25$$

$$A = \$1952.25$$

- To pay off her loan, Lillian will need \$1952.25.



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 22

The United States Rule

- The *United States rule* states that if a partial payment is made on the loan, interest is computed on the principal from the first day of the loan until the date of the partial payment.
 - The partial payment is used to pay the interest first; the rest of the payment is used to reduce the principal.
 - The balance due on the date of maturity is found by computing interest due since the last partial payment and adding this interest to the unpaid principal.



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 23

Banker's Rule

- The *banker's rule* is used to calculate simple interest when applying the United States rule.
- The banker's rule considers a year to have 360 days and any fractional part of a year is the exact number of days of the loan.

Example:

Determine the simple interest that will be paid on a \$700 loan at an interest rate of 6% for the period March 16 to October 16 using the Banker's rule.



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 24

Solution

- Referring to Table 11.1 on page 662 in your text book, March 16 is the 75th day of the year and October 16 is the 289th day of the year. The period of time in years is 214/360.

$$I = PRT$$

$$I = \$700 \times 0.06 \times \frac{214}{360}$$

$$I \approx \$24.97$$

- The interest is \$24.97.



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 25

Partial Payments

- Uses both Banker's Rule and United States Rule

Example:

The Sweet Tooth Restaurant borrowed \$3000 on a note dated May 15 with simple interest of 11%. The maturity date of the loan is September 1. The restaurant made partial payments of \$875 on June 15 and \$940 on August 1. Find the amount due on the maturity date of the loan.



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 26

Solution

- Calculate the interest to date at time of 1st partial payment

$$I_1 = PRT_1$$

$$I_1 = \$3000 \times 0.11 \times \frac{31}{360}$$

$$I_1 \approx \$28.42$$

- Remaining Principal = Principal + Interest - Payment

$$\begin{aligned} P_1 &= \$3000 + \$28.42 - \$875 \\ &= \$2153.42 \end{aligned}$$



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 27

Solution

- Calculate the interest to date at time of 2nd partial payment

$$I_2 = P_1RT_2$$

$$I_2 = \$2153.42 \times 0.11 \times \frac{47}{360}$$

$$I_2 \approx \$30.93$$

- Remaining Principal = Principal + Interest - Payment

$$\begin{aligned} P_2 &= \$2153.42 + \$30.93 - \$940 \\ &= \$1244.35 \end{aligned}$$



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 28

Solution

- Calculate the remaining interest due on the maturity date

$$I_3 = P_2RT_3$$

$$I_3 = \$1244.35 \times 0.11 \times \frac{31}{360}$$

$$I_3 \approx \$11.79$$

- Amount Due = Remaining Principal + Interest

$$\begin{aligned} P_3 &= \$1244.35 + \$11.79 \\ &= \$1256.14 \end{aligned}$$

- Total Interest = \$71.14 (as opposed to \$99.92)



Copyright © 2009 Pearson Education, Inc.

Chapter 11 Section 1 - Slide 29