Section 11.1 (Homework)

#53.  cost \$43.50

+tax 6%

a) 6\% \text{ of } \$43.50

0.06(43.50) = 2.61

b) 43.50 + 2.61 = 46.11

c) 15\% \text{ of } \$46.11

0.15(46.11) = 6.92

d) \$46.11 + 6.92 = 53.03
#55. Let \( x \) = number of A's on 2nd test

18 is 150\% of \( x \)

\[
18 = 1.50 \times x
\]

\[
\frac{18}{1.50} = \frac{1.80}{1.80} \quad x = 12\
\]

students
<table>
<thead>
<tr>
<th>Year</th>
<th>Milk Prod (Million of lbs)</th>
<th>( % ) change = ( \frac{\text{New} - \text{Old}}{\text{Old}} \times 100% )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>8059</td>
<td>( (9457-8059) \times 100% )</td>
</tr>
<tr>
<td>1970</td>
<td>9457</td>
<td>( \frac{9457}{8059} \times 100% = 17.3% )</td>
</tr>
<tr>
<td>1980</td>
<td>13577</td>
<td>( (13577-9457) \times 100% )</td>
</tr>
<tr>
<td>1990</td>
<td>20947</td>
<td>( \frac{13577}{9457} \times 100% = 43.6% )</td>
</tr>
<tr>
<td>2000</td>
<td>32240</td>
<td>( \text{etc.} )</td>
</tr>
</tbody>
</table>

Percent increase:

a.) from 1960 to 1970

b.) from 1970 to 1980
5. Bank discount note. Kwame Adebele borrowed $2500 for 5 months from his bank using US government bonds as security. The bank discounted the loan at 8% (they take 8% up front).

a. How much did Kwame pay the bank for the use of the money?

\[ i = Prt \]
\[ i = 2500 \cdot 0.08 \cdot \left( \frac{5}{12} \right) = \$83.33 \]

b. How much did he receive from the bank?

\$2500.00 - 83.33 = \$2416.67

c. What was the actual rate of interest he paid?

He paid $83.33 on $2416.67

\[ i = Prt \]
\[ 83.33 = (2416.67)(r)(\frac{5}{12}) \]
\[ 83.33 = 1006.95r \]
\[ \frac{83.33}{1006.95} = 0.08275... \times 100\% = 8.3\% \]
See Table 11.1 on p. 607

6. Find the exact time from the first date to the second date:

May 19 to Sept. 17

May 19 is the 139th day
Sept. 17 is the 260th day

260 - 139 = 121 days

7. Determine the due date of the loan, using the exact time if the loan is made on the given date for the given number of days:

July 5 for 210 days

July 5 is the 186th day
Dec. 31 is the 365th day
so far, 365 - 186 = 179

We need 210 - 179 = 31 more days

From Dec. 31, we need 31 more days
6th day of next year
Jan. 31 is 31 days later

The due date of the loan is Jan. 31
8. A partial payment is made on the date indicated. Use the US rule to determine the balance due on the note on the date of maturity:

<table>
<thead>
<tr>
<th>Principal</th>
<th>7500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate</td>
<td>12%</td>
</tr>
<tr>
<td>Effective date</td>
<td>Apr. 15</td>
</tr>
<tr>
<td>Maturity date</td>
<td>Oct. 1</td>
</tr>
<tr>
<td>Partial paymt.</td>
<td>$1000</td>
</tr>
<tr>
<td>Date</td>
<td>Aug. 1</td>
</tr>
</tbody>
</table>
1. Number of days between effective date and partial payment = 108.

\[ 213 - 105 = 108 \]

Date\# 213

Day\# 105

2. Interest on partial payment date = principal x rate x (no. of days in #1) / 360

\[ i = \frac{7500 \times 0.12 \times \frac{108}{360}}{ } \]

\[ i = 270 \]

3. Principal paid on partial payment date = partial payment - interest paid = 730.

4. New principal = original principal - amount paid in #3 = 6770.

\[ 7500 - 730 = 6770 \]
5. **NUMBER OF DAYS BETWEEN PARTIAL PAYMENT DATE AND MATURITY DATE**
   
   \[ \text{DATE} = \frac{61}{274} - \frac{213}{274} \]

6. **INTEREST IN MATURITY DATE = NEW PRINCIPAL x RATE x (NO. OF DAYS IN #5)**
   
   \[ \text{INTEREST} = 6770 \times 0.12 \times \frac{61}{360} = 137.66 \]

7. **BALANCE DUE ON MATURITY DATE = NEW BALANCE + INTEREST ON MATURITY DATE**
   
   \[ \text{BALANCE} = 6770 + 137.66 = 6907.66 \]
11.3 Compound Interest

**Investment** – use of money or capital for profit.

**Fixed investment** – amount invested as principal is guaranteed and interest is computed at a fixed rate. (ex. Savings accounts, certificates of deposits, government savings bonds)

**Variable investment** – neither the principal nor the interest is guaranteed. (ex. Stocks, mutual funds, commercial bonds)
Compound interest – interest that is computed on the principal and any accumulated interest.

\[ A = p\left(1 + \frac{r}{n}\right)^{nt} \]

with

- \( A \) = amount at time \( t \)
- \( p \) = principal
- \( r \) = annual rate of interest
- \( n \) = number of periods/year
- \( t \) = number of years
Effective annual yield (or annual percentage yield APY) is the simple interest rate that gives the same amount of interest as a compound rate over the same period of time.

[Compute $1(1 + \frac{r}{n})^{n(1)} - 1$: note that $p = 1$ and $t = 1$.]
If you want to have a certain amount of money $A$ in $t$ years, the amount $p$ which would have to be invested now is called the present value.

$$p = \frac{A}{(1 + \frac{r}{n})^{nt}}$$

with

$p = \text{present value}$

$A = \text{amount of money required in the future}$