Test #1 Tuesday, October 9

Project #1 Thursday, October 11
11.2 Personal Loans and Simple Interest

Credit or principal of the loan – money a bank is willing to lend.

Security or collateral – anything of value pledged by the borrower that the lender may sell or keep if the borrower does not repay the loan.

Cosigners – other persons who guarantee the loan will be repaid.
**Personal note** – document that states the terms and conditions of the loan.

**Interest** – money the borrower pays for the use of the lender’s money.

**Simple interest** – based on the entire amount of the loan for the total period of the loan.

Interest = principal x rate x time  \((I=prt)\)

where

- \(p\) = amount of money lent
- \(r\) = rate of interest expressed as a percent
- \(t\) = number of days, months, years, etc.

\((r\ \text{and}\ t\ \text{must correspond.})\)
1. **Ordinary interest** – on the due date of a simple interest note (or ordinary interest), the borrower must pay principal and interest.

2. **Discount note** – interest is paid at the time the borrower receives the loan (called the **bank discount**).
Examples

1. Find the simple interest:
   \( p = \$520, \ r = 6.5\%, \ t = 4 \text{ years} \)
   \[
   i = p \cdot r \cdot t = 520 \cdot (0.065) \cdot 4 = \$135.20
   \]

2. Find the simple interest:
   \( p = \$550.31, \ r = 8.9\%, \ t = 67 \text{ days} \)
   \[
   i = 550.31 \cdot (0.089) \cdot \left(\frac{67}{360}\right) = \$9.11
   \]
In the following, use the simple interest formula to find the missing value: \( i = prt \)

3. \( p=? \), \( r=6\% \), \( t=60 \text{ days} \), \( i=$6.00 \)

\[ i = prt \]
\[ .06 \times \frac{60}{360} \]
\[ b = p \times \left( \frac{.06}{360} \right) \]
\[ b = p \times .01 \]
\[ \frac{b}{.01} = p \Rightarrow p = 600.00 \]

4. \( p=$1650.00 \), \( r=? \), \( t=6.5 \text{ years} \), \( i=$343.20 \)

\[ i = prt \]
\[ 343.20 = 1650.00 \times (r) \times (6.5) \]
\[ 343.20 = 10725r \]
\[ r = \frac{343.20}{10725} = .032 \text{ or } 3.2\% \]
1. (8% each) Solve each of the following for \( x \):

   a. \( 8x - 10 = 6 \)

      \[
      \begin{align*}
      8x & - 10 = 6 \\
      \quad +10 & \quad +10 \\
      \quad 8x & = 16 \\
      \quad \frac{8x}{8} & = \frac{16}{8} = 2
      \end{align*}
      \]

      \( x = \boxed{2} \)

      Check

   b. \( 3(x - 4) = 5x + 6 \)

      \[
      \begin{align*}
      3(x-4) & = 5x+6 \\
      3x - 12 & = 5x + 6 \\
      \quad -5x & + 12 \\
      \underline{-5x+12} & \quad -5x+12 \\
      -2x & = 18 \\
      \quad -2x & = 18 \\
      \quad \frac{-2x}{-2} & = \frac{18}{-2} \quad \boxed{x = -9}
      \end{align*}
      \]

      \( 3(-13) = 5(-9) + 6 \)

      \( -39 = -45 + 6 \)

      \( -39 = -39 \)
2. (6%) Solve for \( y \): \( 2y - 5 = 4x \)

\[
\begin{align*}
2y - 5 &= 4x \\
2y &= 4x + 5 \\
\frac{2y}{2} &= \frac{4x + 5}{2} \\
y &= 2x + \frac{5}{2}
\end{align*}
\]
3. (6%) Graph the solution set of $3x - 2 > 4x + 3$ on the real number line.

\[
3x - 2 > 4x + 3 \\
-4x + 2 > 4x + 2 \\
-x > 5 \quad \text{(by -1)} \\
x < -5
\]
There are two of these problems on the test.
4. (6% each) Graph each of the following.

a. \[ y = -2x + 5 \]

There are two of these problems on the test.
b. \[ 4x - 3y = 12 \]

\[
\begin{array}{c|cc}
  x & y & (x, y) \\
  \hline
  0 & -4 & (0, -4) \\
  3 & 0 & (3, 0) \\
\end{array}
\]
5. (8%) Graph the inequality \( y \leq 2x + 1 \)

\[
y \leq 2x + 1
\]

Write: \( y = 2x + 1 \)

\[
\begin{array}{c|c|c}
\text{x} & \text{y} & (x, y) \\
0 & 1 & (0, 1) \\
-\frac{1}{2} & 0 & (-\frac{1}{2}, 0)
\end{array}
\]

\(-1 = 2x + 1 \quad -\frac{1}{2} \leq x\)

"\( \leq \)" solid line

Check \((0, 0)\): \( y \leq 2x + 1 \)

\( 0 \leq 2(0) + 1 \quad \text{true} \)

shade this side
6. (10%) Solve the system by the substitution method or the addition method.

\[
2x + 3y = 16 \\
-x + 4y = 3
\]

\[
2x + 3y = 16 \\
-x + 4y = 3
\]

\[\text{Multi. by 2}\]

\[
-2x + 8y = 6
\]

\[
2x + 3y = 16 \\
x = \frac{5}{4}
\]

\[
y = \frac{2}{4}
\]

*Check*

\[
y = 2 \\
\text{Substitute into 1 equation}
\]

\[
2x + 3y = 16
\]

\[
2x + 3(2) = 16
\]

\[
2x + 6 = 16
\]

\[
x = 5
\]
7. (12%) Graph the system of linear inequalities and indicate the solution set.

\[ y < -x + 3 \]
\[ y > 2x - 1 \]

Write: \[ y = -x + 3 \]

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>(x, y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3</td>
<td>(0, 3)</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>(3, 0)</td>
</tr>
</tbody>
</table>

"<" dashed line

Check (0, 0) in \[ y < -x + 3 \]

\[ 0 < -0 + 3 \]

true \[ 0 < 3 \]

shade this side

Write: \[ y = 2x - 1 \]

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>(x, y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-1</td>
<td>(0, -1)</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>(1, 0)</td>
</tr>
<tr>
<td>1/2</td>
<td>0</td>
<td>(1/2, 0)</td>
</tr>
</tbody>
</table>

">" dashed line

Check (0, 0) in \[ y > 2x - 1 \]

\[ 0 > 2(0) - 1 \]

true \[ 0 > -1 \]

shade this side
(3½ each) Use one of the following terms in each of your answers: variable, constant, ratio, proportion, consistent, inconsistent, graph, vertices, feasible region, objective function, equivalent equations, solution, collinear.

a. A ____________ is a statement of equality between two proportions.

b. A system of equations that has no solution is said to be ____________.

c. Points are ____________ if they all lie on the same line.

variable
constant
ratio
proportion
consistent
inconsistent
graph
vertices
feasible region
objective function
equivalent equations
solution
collinear
d. In a linear programming program, the ______ is the region bounded on all sides which is the graph of the system of linear inequalities.

e. In a linear programming problem, the function to be maximized or minimized is called the ______.

f. In a linear programming problem, ______ are points where two or more boundaries intersect.

g. ______ are equations that have the same solution.
9. (15%) The set of constraints and profit formula for a linear programming problem are:

\[
\begin{align*}
  x &\geq 0 \\
  y &\geq 0 \\
  x + 3y &\leq 10 \\
  2x + y &\leq 10 \\
  P &= 4x + y
\end{align*}
\]

\[y\]
\[x\]

a. Draw the graph of the constraints and determine the vertices of the polygonal region.

- Give the vertices: \((0,0), (5,0), (0, \frac{10}{3}), (4,2)\)

b. Use the vertices to determine the maximum profit.

<table>
<thead>
<tr>
<th>Vertices</th>
<th>(P = 4x + y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>((0,0))</td>
<td>0</td>
</tr>
<tr>
<td>((5,0))</td>
<td>20 (\text{max})</td>
</tr>
<tr>
<td>((0, \frac{10}{3}))</td>
<td>(\frac{10}{3} = 3.33)</td>
</tr>
<tr>
<td>((4,2))</td>
<td>18</td>
</tr>
</tbody>
</table>