Success Center
Directed Learning Activity (DLA)

Word Problems: Investments

M103.1
Directed Learning Activity – Word Problems: Investments

Description: In this Directed Learning Activity (DLA), you will learn about word problems related to investments.

Prior Knowledge: In order to complete this DLA, you will need to know how to solve a linear equation containing decimals.

\[
\text{Solve for } x: \quad 0.04x + 650 - 0.065x = 562.50 \\
-0.025x + 650 = 562.50 \\
-0.025x = -87.5 \\
x = 3500
\]

Materials: A scientific calculator may be needed.

Directions: Please read the examples and answer the questions that follow carefully – and in order. Please do not skip ahead. If you have a question, please ask for help.

After reading the examples in the gray boxes, spend some time thinking about what is being presented. After you feel you understand the examples, try to answer the practice questions.

When you are finished, review the DLA with a tutor. Don’t worry, you are not being graded. This is a learning activity, and you are not expected to know everything.

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Investment Problems

Part One: Introducing Investment Problems

We are going to look at investing using a simple interest formula:

\[ I = Prt \]

\[ \text{Interest} = \text{Principal} \cdot \text{rate} \cdot \text{time} \]

The Principal is the amount invested into an account.
The rate is the annual percentage rate for an account in decimal form.
The time is the number of years the account has had the principle investment.
The investment problems we are going to deal with involve one year, so \( t=1 \).

\[ I = Pr(1) \quad \rightarrow \quad I = Pr \]

The formula we will now use is: \( I = Pr = \text{Principal} \cdot \text{rate} \)

As you go through the problem and questions, please try and fill in the shaded regions.
Problem 1: Manuel has $10,000 to invest for one year. Manuel is considering two investment options. Investment A, a low-risk bond fund, pays 4% interest for the year. Investment B, a worldwide technology fund, pays an average of 6.5% interest for the year.

(a) If Manuel invests all his money at 4%, how much interest does he earn in one year?

\[ I = Pr = (10,000)(0.04) = 400 \]

(b) If Manuel invests all his money at 6.5%, how much money does he earn in one year?

\[ I = Pr = (10,000)(0.065) = \text{_______} \]

(c) Thus the interest earned on any combination of investments in the low risk bond fund and the worldwide technology fund will be between

\[ \text{__________} \] and \[ \text{__________} \]

(d) If Manuel invests \textbf{half} his money at 4% and \textbf{half} at 6.5%, how much money does he earn? What is his average rate of return (average value)?

\[
\begin{array}{|c|c|c|c|}
\hline
\text{Accounts} & \text{Principal} & \text{Interest Rate} & \text{Interest} \\
\hline
1 & 5,000 & 0.04 & 200 \\
2 & & 0.065 & \\
1 \text{ and } 2 \text{ Together (Total)} & 10,000 & & \\
\hline
\end{array}
\]

\[ I = Pr, \text{solving for } r \text{ gives us } r = \frac{I}{P} = \text{_______} \text{ average value} \]

(e) If Manuel invests $3,000 of his money at 4% and the rest at 6.5%, how much interest will he earn in one year? What is his average rate of return?

\[
\begin{array}{|c|c|c|c|}
\hline
\text{Accounts} & \text{Principal} & \text{Interest Rate} & \text{Interest} \\
\hline
1 & 3,000 & 0.04 & 120 \\
2 & & 0.065 & \\
1 \text{ and } 2 \text{ Together (Total)} & 10,000 & & \\
\hline
\end{array}
\]

\[ \text{Average rate of return } = r = \frac{I}{P} = \text{_______} \]
(f) Suppose Manuel invests $5,000 at 4%, how much does he have left to invest at 6.5%?
$10,000 - $5,000 = $5,000

(g) Suppose Manuel invests $2,000 at 4%, how much does he have left to invest at 6.5%?
$10,000 - $2,000 = $8,000

(h) Suppose Manuel invests $7,000 at 4%, how much does he have left to invest at 6.5%?
$10,000 - $7,000 = $3,000

(i) Suppose Manuel invests $x$ dollars at 4%.

i. The amount of money Manuel invests at 4%. $X$

ii. The amount of money Manuel invests at 6.5%. $10,000 - X$

Part Two: Forming Equations to Solve Investment Problems

Now let’s try and answer a question using an equation:

(j) Suppose Manuel earned $562.50 in interest for one year. How much money did he invest at each interest rate?

<table>
<thead>
<tr>
<th>Accounts</th>
<th>Principal</th>
<th>Interest Rate</th>
<th>Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$X$</td>
<td>0.04</td>
<td>$0.04X$</td>
</tr>
<tr>
<td>2</td>
<td>$10,000-X$</td>
<td>0.065</td>
<td>$0.065(10,000-X)$</td>
</tr>
<tr>
<td>1 and 2 Together (Total)</td>
<td>10,000</td>
<td></td>
<td>562.50</td>
</tr>
</tbody>
</table>

The equation formed from the last column from the table is:

$$0.04x + 0.065(10,000 - x) = 562.50$$

Now we can solve the equation.

$$0.04x + 650 - 0.065x = 562.50$$
$$-0.025x + 650 = 562.50$$
$$-0.025x = -87.5$$
$$x = 3500$$

Ten thousand minus 3500 equals 6,500

Since $x$ is the Principal for the 4% account,

$3,500 was invested at 4% and $6,500 was invested at 6.5%
(k) Suppose Manuel wants to earn an average rate of return of 5%. How much should he invest at each interest rate?

<table>
<thead>
<tr>
<th>Accounts</th>
<th>Principal</th>
<th>Interest Rate</th>
<th>Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>0.065</td>
<td></td>
</tr>
<tr>
<td>1 and 2 Together (Total)</td>
<td>$10,000</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Equation: \[ 0.04x + 0.065(10,000 - x) = 500 \]

Solve: 

Since \( x \) is the Principal for the 4% account,

$6,000 was invested at 4% and $4,000 was invested at 6.5% 

Part Three: Solving Investment Problems

Problem 2: Mary has two accounts to choose from, one at 5.5% and the other at 7%. Mary invested $2,000 more in the 7% account than the 5.5% account. If the total interest for one year was $827.50, then how much was invested in each account?

<table>
<thead>
<tr>
<th>Accounts</th>
<th>Principal</th>
<th>Interest Rate</th>
<th>Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X</td>
<td>0.055</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>$2000 + X</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>1 and 2 Together (Total)</td>
<td></td>
<td></td>
<td>$827.50</td>
</tr>
</tbody>
</table>

Equation: \[ 0.055x + 0.07(2,000 + x) = 827.5 \]

Solve: 

Since \( x \) is the Principal for the 5.5% account,

$5,500 was invested at 5.5% and $7,500 was invested at 7%
Problem 3: In one year, Dara made a total of $855 in interest from a 3% and a 2.5% account. If a total of $30,000 was invested, how much was invested in each account?

<table>
<thead>
<tr>
<th>Accounts</th>
<th>Principal</th>
<th>Interest Rate</th>
<th>Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 and 2 Together (Total)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Problem 4: a) Angie invested money into an 8% and a 6% account. The amount of money invested in the 8% account was twice the amount invested in the 6% account. If the total interest was $660, then how much was invested in each account?

<table>
<thead>
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<th>Accounts</th>
<th>Principal</th>
<th>Interest Rate</th>
<th>Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 and 2 Together (Total)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b) What is her average rate of return?

Answers: 3) $21,000 at 3% and $9,000 at 2.5%, 4) a) $3,000 at 6% and $6,000 at 8%, b) 7.3%
Part Four: Reflection

a) Name one thing that you understand better about investment problems as a result of completing this activity.

b) Name one thing that you still do not understand about investment problems.

c) Can you think of a way to apply investment problems to your real life?

d) Do you feel more or less confident about solving investment problems?

STOP. Please go over your work with a tutor at this time.
Tutor Feedback:

_______ The student completed the entire activity.

_______ The student attempted to answer every question.

_______ The student demonstrated an understanding of the processes of solving investment problems during the discussion of his/her work.

Additional Comments:

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

INSTRUCTOR/TUTOR SIGNATURE

STUDENT – DO NOT FORGET TO TURN THIS SHEET IN AT THE FRONT DESK!

You may not get credit for completing this DLA if you fail to leave this sheet with the front desk receptionist.