Word Problem - Interest Rate

Last Updated: 2/9/14

MAT 128, Section 1.4, Number 82, Page 127
Intermediate Algebra, 11th Edition, Marvin L. Bittinger, 2011, Pearson Education

Problem:

Lillian is about to invest $20,000, part at 3% [interest rate] and the rest at 4% [interest rate]. What is the most she can invest at 3% and still be guaranteed at least $650 in interest per year?

Solution:

Let:

x = Amount of *money* invested at 3% interest rate
y = Amount of *money* invested at 4% interest rate

Write **Equation 1** based on wording of problem:

$x + y = 20{,}000$ ⇨ Amount of *money* invested at 3% and 4% interest rate = $20,000

Rewrite Equation 1 into **Equation 2** to isolate y:

$y = 20{,}000 - x$ ⇨ Amount of *money* invested at 4% interest rate

WHY THIS IS DONE

The problem wants to know what is the most amount of money Lillian can invest at 3% interest rate... Since we let x = 3%, the variable we want to solve for eventually is x (in Equation 4). We need to set up Equation 4 so that it is in "terms of x". To do so, we must isolate y in Equation 2 so that all terms, including x, can then be substituted into the y variable of Equation 4.

Continued ↗

Write **Equation 3**:

$.03x + .04y = 650$

⇨ **1st term .03*x*:** the 3% interest portion of the \$20,000
⇨ **2nd term .04*y*:** the 4% interest portion of the \$20,000
⇨ **3rd term 650:** sum of 3% and 4% interest of the \$20,000 to guarantee at least \$650 in total interest

Write **Equation 4**:

$.03x + .04(20{,}000 - x) = 650$

⇨ Substitute $20{,}000 - x$ for y from Equation 2 to get Equation 4 in "terms of x" with no y variable left over

Simplify Equation 4:

$$.03x + 800 - .04x = 650$$
$$-.01x = -150$$
$$x = 15{,}000$$

WHY THIS IS DONE

The goal is to solve for one variable, in this case x. Substitute the y expression $20{,}000 - x$ from Equation 2 into the y variable of Equation 4. Now there is only one variable to solve, x, which is the variable that represents the 3% interest portion of the \$20,000.

Final Answer:

Lillian can invest at most **\$15,000** at 3% interest rate to be guaranteed at least \$650 in interest per year.

Courtesy of **George Hartas**
Resource: Yahoo! Answers - User Battleaxe