Name: _____Caleb McWhorter — Solutions_____

MATH 100

Fall 2022

HW 13: Due 10/31

Problem 1. (10pt) Consider the 2022–2023 federal income tax brackets shown below. In the chart on the left below, only the brackets and tax levels are found. In the chart on the right below, the tax rate, bracket, and amount of taxes owed are shown.

Tax Rate	Taxable Income
10%	$0 – $10,275
12%	$10276 – $41,775
22%	$41,776 – $89,075
24%	$89,076 – $170,050
32%	$170,051 – $215,950
35%	$215,951 – $539,900
37%	$539,901 or more

Tax Rate	Taxable Income	Tax Owed
10%	$0 – $10,275	10% of taxable income.
12%	$10276 – $41,775	$1,027.50 plus 12% of amount over $10,275.
22%	$41,776 – $89,075	$4,807.50 plus 22% of amount over $41,775.
24%	$89,076 – $170,050	$15,213.50 plus 24% of amount over $89,075.
32%	$170,051 – $215,950	$34,647.50 plus 32% of amount over $170,050.
35%	$215,951 – $539,900	$49,335.50 plus 35% of amount over $215,950.
37%	$539,901 or more	$162,718 plus 37% of amount over $539,900.

Explain how the amount of tax owed in the chart on the right is computed by showing how the $1,027.50 and the $4,807.50 are obtained.

Solution. Each entry in the 'Tax Owed' column on the chart on the right is the tax owed from the previous brackets plus the tax owed in the 'current bracket.' For instance, the $1,027.50 in the second bracket is the tax owed from the initial $10,275 of taxable income:

$$0.10(\$10275 - \$0) = 0.10(\$10275) = \$1027.50$$

If you are in the third tax bracket, then you have paid...

$$0.10(\$10275 - \$0) + 0.12(\$41775 - \$10275) = 0.10(\$10275) + 0.12(\$31500) = \$1027.50 + \$3780 = \$4807.50$$

from the previous two tax brackets.

Problem 2. (10pt) Suppose that you place $8,520 into a bank account that earns 1.2% annual interest, compounded monthly. If you save this money in this bank account for 4 years, how much money do you have at the end of the 4 years? How much interest have you earned?

Solution. We know that if P dollars accumulating interest at an annual interest rate of r, compounded k times year, then the amount after t years is $P\left(1+\frac{r}{k}\right)^{kt}$. The initial amount of money is $P = \$8520$. The annual interest rate is $r = 0.012$, compounded each month, i.e. $k = 12$ times per year. Then after $t = 4$ years, we have...

$$\$8520\left(1+\frac{0.012}{12}\right)^{12\cdot 4} = \$8520(1.001)^{48} = \$8520(1.0491455) = \$8938.72$$

Therefore, the amount in the account after 4 years is $8938.72. Because the account began with $8,520, any additional money must have come from interest. But then the total interest earned is $8938.72 - \$8520 = \$418.72$.