Examination 2

Directions: You have 55 minutes from the start of class to finish this exam. Use your time wisely. Do your own work. No calculators, textbooks, or other aids permitted. Show all work!

1. Use the given information to answer the posed questions. You'll need the Marginal Tax Rates chart on the formula sheet to complete this question.

   Wages: $82,000
   State Taxes Paid: $1,000
   Interest on a Home Mortgage: $4,000
   Charitable Donations Totaling: $500
   Bank Account Interest Earned: $700
   Tips Earned: $350
   Filing status: Single

   a. Do you suggest that this person itemize? Why or why not? **(3 pts)**

      First, this person is entitled to a standard deduction of $5,150 (by "single" column in the table). Now, their itemized deductions are:

      ID = State Taxes + Interest on Mortgage + Charity

      So, ID = $1,000 + $4,000 + $500 = $5,500.

      Since $5,500 > $5,150, this person SHOULD itemize.

   b. What is this person's gross income (GI)? **(5 pts)**

      In this problem, GI = Wages + Interest Earned + Tips, so

      GI = $82,000 + $700 + $350 = $83,050.

      Gross income is the TOTAL monies earned by an individual.

   c. Adjusted Gross Income (AGI) = what? (circle your answer) **(2 pts)**

      i. AGI = gross income – adjustments – deductions
      ii. AGI = gross income + deductions
      iii. AGI = gross income – deductions – exemptions
      iv. AGI = gross income – adjustments ***
      v. AGI = gross income – deductions

   d. Assuming Terry has a taxable income of $100,000 and has a filing status of "single," set up the computation for the marginal taxes she owes. Note: she has no tax credits. **(10 pts)**

      Since we are given the TAXABLE INCOME (TI), we can immediately go to the Marginal Tax Table. She is single, so we use the "single" column. TI already includes any deductions and exemptions, so ignore them. We have Marginal Income Taxes of:

      MT = .1 x $7,550 + .15 x ($30,650 - $7,550)
      + .25 ($74,200 - $30,650) + .28 ($100,000 - $74,200)

      This is our answer. Since she has no tax credits, we don't' need to subtract anything from this number.

2. Solve the following algebraic equations for the indicated variable. You must show work and be organized.
   a. Solve the compound interest formula for the APR. **(8 pts)**

Solution:

$A = P \times (1 + APR)^y$ is the compound interest formula.

First, divide P to the other side to get :

$$\frac{A}{P} = (1 + APR)^y$$

We want to isolate APR, but we have $1 + \text{APR}$ raised to the power y. We "undo" the power by taking the y root :

$$\left(\frac{\text{A}}{\text{P}}\right)^{\frac{1}{y}} = 1 + APR$$

This kills the power on the left. Now subtract 1 from both sides to isolate APR :

$$\left(\frac{\text{A}}{\text{P}}\right)^{\frac{1}{y}} - 1 = APR$$

Now, we can swap sides and write :

$$APR = \left(\frac{A}{P}\right)^{\frac{1}{y}} - 1$$

This is the hardest of the three parts in this problem.

   b. Solve the following for 'x': $3x + 5 = 2x$ **(7pts)**

Solution:

We have : $3x + 5 = 2x$

Subtracting 5 from both sides gives :

$3x = 2x - 5$

Subtracting 2x from both sides gives :

$x = -5$

We can check our answer: x = -5, so we substitute this answer for x in the original equation. We have 3(-5) + 5 = 2(-5). So, -15 + 5 = -10. Thus, -10 = -10. This is true, so our answer is correct!

c. Solve the following for 't': $2t - 100 = 100$ **(5 pts)**

Solution:

$2t - 100 = 100$

so, add 100 to both sides:

$2t = 100 + 100 = 200$

$2t = 200$

Now, divide both sides by two

$t = 100$

We can check our answer. If t = 100, then substituting t = 100 into the original equation gives: 2 x 100 – 100 = 100. So, 200 – 100 = 100. Therefore, 100 = 100. Since this is true, our answer is correct!

3. Consider the cost of the following trans-Atlantic flights:

Flight A: $900
Flight B: $1,000
Flight C: $800

a. Using flight C as the reference value, compute the absolute difference between flights A and C **(5 pts)**.

Since flight C is the reference value, we have:

AD = cost of flight A – cost of flight C

AD = $900 - $800 = $100

b. Using flight C as the reference value, compute the absolute difference between flights B and C **(5 pts)**.

With flight C as the reference, we have:

AD = $1000 - $800 = $200

c. What is the relative difference between the prices of flights B and A, using flight A as the reference value **(6 pts)**? You may leave the answer as a fraction.

We use flight A as the reference value, so we have:

AD = $1000 - $900 = $100

RD = AD/Reference = $100/$900 = 1/9.

You could write the RD as a percent or decimal, but in this case the fractional answer is adequate.

d. If the cost of flight B were to go up, but the price of flight A remained the same, what would this do to the **relative** difference between them if flight A were used as the reference value? Make sure you explain your answer! **(4 pts)**

The relative difference would go up as well. If you can't see this right away, just try a computation where you increase the cost of flight B but keep the cost of flight A the same:

AD = \$1800 - \$900 = \$900

So, now we'll have a relative difference of:

RD = \$900/\$900 = 9/9 = 1

Looking at part 'c', it should be obvious that 9/9 = 1 is larger than 1/9. After all, 1/9 is smaller than 1. So, by increasing the cost of flight B, we find the relative difference has increased. Notice that I increased the cost of flight B from \$1,000 to \$1,800. I could have chosen any number larger than \$1000, but I chose \$1,800 so the subtraction in AD would give me the reference value. Hence, I made the division dirt easy.

4. Clair wants to retire in 35 years. She determines she can set aside \$200 every two months for this 35 year period. She would like to know how much money she will have in her bank account (IRA) at the end of 35 years. Her IRA has the following properties:

Annual % Rate: 7%
Interest compounded every 2 months

Clair sets up the Savings Plan Formula as follows. Explain what is wrong with her setup. HINT: There are 4 errors. **(5 pts per error)**

$$A = PMT \times \frac{\left[\left(1+\frac{APR}{n}\right)^{-n\cdot y}+1\right]}{\frac{APR}{n}}$$

$$A = \$200 \times \frac{\left[\left(1+\frac{7}{2}\right)^{-2\cdot 35}+1\right]}{\frac{7}{2}}$$

Solution: There are four errors:

- First, the "+1" in the formula should be a "-1".
- Second, the APR is .07, not 7.
- Third, the exponent should NOT be negative.
- Fourth, the value of n = 6, NOT 2.

Here's the corrected setup:

$$A = PMT \times \frac{\left[\left(1+\frac{APR}{n}\right)^{n\cdot y}-1\right]}{\frac{APR}{n}}$$

$$A = \$200 \times \frac{\left[\left(1+\frac{.07}{6}\right)^{2\cdot 35}-1\right]}{\frac{.07}{6}}$$

5. Set up the continuous compounding formula with the following information and answer the posed question:

Annual Percentage Rate: 10%
Years = 5
Starting Principal = 500,000 yen

a. Set up the continuous compounding formula **(9 pts):**

Solution: $A = P \times e^{APR\times y}$ is the continuous compounding interest formula. So we have: $A = 500{,}000 \text{ yen} \times e^{.1\times 5}$

b. Now, suppose you have a bank account that pays APR = 10%. Your starting principal is 500,000 yen and you leave the money in the account for 5 years. The bank compounds interest once per year. Select the correct formula from the formula sheet and set it up with the given numbers **(9 pts)**.

Solution: $A = P \times (1+APR)^{y}$ is the formula of choice. So,

$A = 500{,}000 \text{ yen} \times (1+.1)^{5} = 500{,}000 \text{ yen} \times (1.1)^{5}$

c. TRUE OR FALSE: If you were to compute the answers in parts 'a' and 'b', the answer in part 'a' would be larger. Why did you choose your answer?(**2 pts)**

TRUE. Continuous compounding gives you the best interest return for a given APR. Since the APR, principal, and years are the same on both accounts, continuous compounding must give you more money in interest than compounding once per year.