Directions:
This exam has 7 pages, including this page. Please make sure you have all 7 pages.

You have 65 minutes to complete this exam.

Please answer the following questions and make sure your answer are legible. If you don't show work and/or I can't follow it, I won't give partial credit. You may use a calculator (not the calculator function on other technology) and the Formula Sheet(s) that I provide you, nothing else. Good Luck.

There are 100 points on this test.

<table>
<thead>
<tr>
<th>Page</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Out Of</td>
<td>9</td>
<td>7</td>
<td>18</td>
<td>20</td>
<td>12</td>
<td>14</td>
<td>20</td>
<td>100</td>
</tr>
</tbody>
</table>

1. (3 points) Circle the best answer for each of the following:

(a) Xavier took out a Mortgage 12 years ago. Since then interest rates have gone down so a financial advisor suggested that he take out a new Mortgage for $97,381 to refinance his old mortgage. The $97,381 is the...
   1. Future Value (of the original Annuity)
   2. Present Value (of the original Annuity)
   3. Remaining Balance/Current Balance (of the original Annuity)

(b) Yadir has been contributing $185 every 2 weeks into his 401(k) retirement savings account for the past several decades. He currently has $331,753 in the account. The $331,753 is the...
   1. Future Value (of the Annuity)
   2. Present Value (of the Annuity)
   3. Remaining Balance/Current Balance (of the Annuity)

(c) Four years ago Zane bought a car. He borrowed $11,500 to buy his car, and has been making monthly payments of $325.27 to repay the loan. Today was his last payment. The $11,500 is the...
   1. Future Value (of the Annuity)
   2. Present Value (of the Annuity)
   3. Remaining Balance/Current Balance (of the Annuity)

2. (6 points) Fill in the blank with the correct vocabulary word:

(a) Annuity any collection of equal payments made at regular time intervals.
(b) Future Value Annuity Factor is the future value that would accumulate if each annuity payment was $1.
(c) Present Value Annuity Factor the present value if each annuity payment was $1.
3. (2 points) Indicate if each of the following is an Annuity or Not an Annuity:

(a) You and your roommate go grocery shopping on the first day of each month for apartment staples, when you get home you each pay half of the bill.
   - **Annuity**

(b) You and your roommate each pay $285 in rent each month.
   - Not Annuity

4. (4 points) Circle the best answer for each of the following.
   **You should be able to answer each without doing any math.**

(a) Ezra and Esther are each planning to save $5,000 in the next 5 years by making regular payments into savings accounts. Ezra’s account earns 2% interest, and Esther’s account earns 3% interest. Who will have to make higher monthly payments to reach their goal?
   1. Ezra will have higher monthly payments.
   2. Esther will have higher monthly payments.

(b) Oscar and Omar each took out a $5,000 loan for home repairs. Each man has a loan with a term of 3 years. Oscar’s loan has an interest rate of 5%, Omar’s loan has an interest rate of 7%. Who has higher monthly payments?
   1. Oscar will have higher monthly payments.
   2. Omar will have higher monthly payments.

(c) Ursula and Uli each took out a $150,000 mortgage at 3.5%. Ursula’s mortgage is a 20 year mortgage, and Uli’s mortgage is a 30 year mortgage. Who will have higher monthly payments?
   1. Ursula will have higher monthly payments.
   2. Uli will have higher monthly payments.

(d) Who will pay more in interest over the term of their mortgage, Ursula or Uli?
   1. Ursula will pay more in interest.
   2. Uli will pay more in interest.

5. (1 point) **True/False**: Even if you know how a stock’s price has grown in the past, there is no way to know for sure what it will do in the future.
6. (9 points) Nigel, Mary, and Sonya are partners in a small business called *We Think You Can Dance*, the company offers private dance lessons. This quarter they had a profit of $20,412 that they will divide amongst them. If partners have a 4:3:6 split,

(a) How much will Nigel receive in profits this quarter?  

(b) How much will Mary receive in profits this quarter? 

(c) How much will Sonya receive in profits this quarter? 

\[ \text{Total share: } 4+3+6=13 \] 

\[ \text{Profit/share = } \frac{20412}{13} = 1570.15 \] 

Nig. 4 \* 1570.15 = 6280.60 

Mar. 3 \* 1570.15 = 4710.45 

Son 6 \* 1570.15 = 9420.90

~ Bonus (1 pt): You may only answer this if you have finished the rest of the test. ~

Who among the partners would prefer that the profits were split evenly? 

even split \( \frac{20412}{13} = 1570.94 \) each, both Nigel & Mary would prefer that.

---

For questions 7 - 10, make sure you think carefully about which annuity formula(s) are appropriate. Make sure you write down any \( a_{n|i} \) or \( s_{n|i} \) values you use.

7. (9 points) Tim and Sue have a 14 year old son. They would like to plan a special surprise for when he graduates college (in 8 years). They would like to have $10,000 saved in an account that earns \( 5\frac{3}{4}\% \) interest at the end of the 8 years to pay for this surprise. They plan to make regular quarterly payments into this account. If they open the account and make their first payment today, how much should each quarterly payment be?

\[ FV = PMT \times s_{n|i} (1+i) \]

FV = 10,000

\[ PMT = ? \]

\[ n = 8 \times 4 = 32 \]

\[ i = .0575/4 \]

\[ s_{n|i} = (1+i)^n - 1 \]

\[ (1+.0575/4)^{32} - 1 = \]

\[ (1.0575/4) \]

\[ = 10,27094135 \]

\[ \text{Annuity Due} \]

\[ * \text{saving} / FV / s_{n|i} / \text{starting from nothing, building up to} \]

\[ 10,000 = PMT \times 40.7990 \]

\[ 10,000 = PMT \times (1+0.0575/4) \]

\[ 244.7990... = PMT \]

Each quarter they should deposit \( \$244.79 \)
8. (10 points) Fatima wants to buy a car and plans to take out a 3 year loan. She has $4,000 saved up for a downpayment, and she qualifies for an interest rate of 4.15%. If the car she wants is $16,955...

(a) How much will Fatima need to borrow with the loan?
(b) What will her monthly payments be?

\[ \text{PV} = \text{PMT} \times a_{36}^{12} \]
\[ PV = 12955 \]
\[ \text{PMT} = ? \]
\[ n = 3 \times 12 = 36 \]
\[ i = 0.0415/12 \]
\[ a_{36}^{12} = \frac{(1 + 0.0415/12)^{36} - 1}{(1 + 0.0415/12)^{36} - 1} = \frac{33.79 + 33503}{33.79 + 33503} \]
\[ \text{PMT} = \frac{12955}{33.79 + 33503} \]
\[ \text{PMT} = 383.55 \]

9. (10 points) Sasha has been setting aside $7 a week into an account that earns 5% interest. If she has been adding money to this account for the past 10 years,

(a) How much is in the account today?
(b) How much interest has Sasha earned?

\[ FV = \text{PMT} \times S_{n}^{i} \]
\[ FV = ? \]
\[ \text{PMT} = 7 \]
\[ n = 10 \times 52 = 520 \]
\[ i = 0.05/52 \]
\[ S_{n}^{i} = \frac{(1 + 0.05/52)^{520} - 1}{(0.05/52)} \]
\[ = 674.2582547 \]
\[ FV = 7 \times 674.2582547 \]
\[ FV = 4719.81 \]
\[ \text{amt in account today} \]
\[ \text{Sasha deposited} \ $7 \times 52 \times 12 = 3640 \text{ into the account} \]
\[ \text{Interest} = 4719.81 - 3640 = 1079.81 \]
\[ \text{she earned in interest} \]
\[ I = 4719.81 - \text{PMT} \times n \]
10. (12 points) Here are some $a_{n|i}$ and/or $s_{n|i}$ values that should help you with this question:

| $n$ | $i$ | $a_{n|i}$ | $s_{n|i}$ |
|-----|-----|-----------|-----------|
| 216 | .04/12 | $153.7993761$ | $315.5924483$ |
| 240 | .0388/12 | $166.7567576$ | $361.8697619$ |

Chris and Liz have 18 years left on their mortgage. Their monthly payments are $791.30, and their interest rate is 4%.

(a) What is the remaining balance (current balance) on their mortgage?

\[
PV = PMT \cdot a_{n|i}
\]

\[
PV = ?
\]

\[
PMT = 791.30
\]

\[
n = 18 \cdot 12 = 216
\]

\[
i = .04/12
\]

\[
a_{n|i} = 153.7993761
\]

\[
PV = 791.30 + 153.7993761 = 121791.34 \text{ is remaining bal. on (old) mortgage}
\]

(b) Chris and Liz also have a car loan at 4.9%. They have 22 payments of $279 remaining, and their remaining balance on the car loan is $6,408.47. They plan to consolidate their existing mortgage and their car loan into a new 20 year mortgage at 3.88%.

i. How much are Chris and Liz paying each month for their current loans (current mortgage and car payments)?

ii. How much do they need to borrow for their new mortgage?

iii. What will their new monthly payments be?

\[
PV = PMT \cdot a_{n|i}
\]

\[
PV = 121791.34 + 6408.47 = 128109.91
\]

\[
a_{n|i} = 166.7567576
\]

\[
New \text{ Monthly Payment} = 761.24
\]

Bonus (1 pts): You may only answer this if you have finished the rest of the test.

(a) How much will Chris and Liz spend repaying their loans if they keep things they way they are? How much will Chris and Liz spend repaying their loans if they consolidate/refinance into the new mortgage?

\[
\text{Old Way: } (791.30 \cdot 216) + (279 \cdot 22)
\]

\[
= 170930.80 + (6138)
\]

\[
= 177068.60
\]

\[
\text{New Mort.}\]

\[
761.24 + 240
\]

\[
= 144377.60
\]
11. (14 points) Refer to the hand out for information on 2014 Taxes.

Dakota and Ryan are married (and will file their taxes jointly). They have one child who they will claim as a dependent. Together, in 2014, Dakota and Ryan made $94,731. They paid $9,000 in state and local taxes and donated $1,500 to charity, and had no other deductions.

(a) How many personal exemptions can Dakota and Ryan claim?

3

(b) What is their taxable income for 2014?

\[3 \times 3,950 = 11,850\]

\[\text{State Ded} = 9,000 + 150 = 10,150\]

\[\text{std Ded} = 12,400\]

\[\text{Taxable Income} = 94,731 - 11,850 - 12,400 = 70,481\]

(c) What tax bracket are Dakota and Ryan in?

15% bracket

(d) What is Dakota and Ryan’s federal income tax for 2014?

\[\text{Am+ over 11,150} = 70,481 - 11,150 = 59,331\]

\[15\% \times 59,331 = 7,414.965\]

\[\text{Tax} = 815 + 7,414.65 = 8,230.65\]

(e) If Dakota and Ryan had a total of $9,115 withheld from their paychecks for federal income taxes, will they get a refund or will they owe money?

owe

(f) How much is their refund or amount owed?

\[8,130.65 - 9,115 = -$964.65\]
12. (8 points) In Pennsylvania, grocery items and (most) clothing items are exempt from sales tax. The general sales tax rate (which also applies to prepared food) is 6%. Christina bought the following items at the store:
- Prepared Sushi $6.50
- Orange Juice $3.49
- Pancake Mix $4.18
- Notebook $3.79

What was her total bill, including tax?

\[ T = P(1 + r) \]
\[ T = 10.29 (1 + 0.06) \]
\[ T = 10.91 \]
\[ \text{Bill} = 10.91 + 7.67 = \$18.58 \]

13. (12 points) Microsoft stock is currently trading at $48.68 a share.\(^1\)

(a) In November they will pay a quarterly dividend of $0.31 a share, what is the current dividend yield for Microsoft stock?

(b) If you bought one share of the stock 2 years ago (in November 2012) for $28.83, and sell it today, what compound annual growth rate (rate of return) did this investment earn?

\[ I = PRT \]
\[ I = \text{dividend} = 0.31 \]
\[ P = \text{selling price of stock} = 48.68 \]
\[ R = ? \]
\[ T = \frac{1}{4} \]
\[ 0.31 = 48.68 \times R \times \frac{1}{4} \]
\[ \frac{0.31}{48.68 \times \frac{1}{4}} = R \]
\[ R = 0.2942 \ldots \approx 29.42\% \]

\[ i = \left( \frac{FV}{PV} \right)^{\frac{1}{n}} - 1 \]
\[ FV = 48.68 \]
\[ PV = 28.83 \]
\[ n = 2 \]
\[ i = \left( \frac{48.68}{28.83} \right)^{\frac{1}{2}} - 1 \]
\[ i = 29.44\% \]

Bonus (1 pt): You may only answer this if you have finished the rest of the test.

Assuming the dividend yield you found in part (a) was the average dividend yield for the entire time you owned the stock, (approximately) what is the total rate of return on your investment?

\[ 29.44 + 2.55 = \frac{32.49}{2} = 32.49\% \]

\(^1\)At the close of the market Friday Nov. 7.