Formulas

\[ A = P + (P \times APR \times Y) \]

\[ A = P \left(1 + \frac{APR}{n}\right)^{(nY)} \]

\[ A = Pe^{(APR \times Y)} \]

\[ P = \frac{A}{e^{(APR \times Y)}} \]

**APY = Total Return** = \( \frac{A - P}{P} \times 100\% \)

\[ A = PMT \left[ \left(1 + \frac{APR}{n}\right)^{(nY)} - 1 \right] \]

\[ PMT = \frac{A}{\left(1 + \frac{APR}{n}\right)^{(nY)} - 1} \]

**Annual Return** = \( \left[ \left( \frac{A}{P} \right)^{\frac{1}{Y}} - 1 \right] \times 100\% \)

\[ PMT = \frac{P\left(\frac{APR}{n}\right)}{1 - \left(1 + \frac{APR}{n}\right)^{(-nY)}} \]

\[ P = \frac{PMT \left[1 - \left(1 + \frac{APR}{n}\right)^{(-nY)}\right]}{\left(1 + \frac{APR}{n}\right)} \]
**Gross Income** = Sum of All Income

**Adjusted Gross Income** = Gross Income – Adjustments to Income

**Taxable Income** = Adjusted Gross Income – (Deductions and Exemptions)

**Total Income Tax** = Tax Calculated from Table – Tax Credits

**FICA Tax** = 7.65% of Wages

**Overall Federal Tax Rate** = \( \frac{\text{Total Income Tax} + \text{FICA Tax}}{\text{Gross Income}} \times 100\% \)

<table>
<thead>
<tr>
<th>2013 Marginal Tax Rates: Standard Deductions and Exemptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tax rate</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>10%</td>
</tr>
<tr>
<td>15%</td>
</tr>
<tr>
<td>25%</td>
</tr>
<tr>
<td>28%</td>
</tr>
<tr>
<td>33%</td>
</tr>
<tr>
<td>Deduct</td>
</tr>
<tr>
<td>Exempt</td>
</tr>
</tbody>
</table>

**Margin of Error Estimate** = \( \frac{1}{\sqrt{n}} \times 100\% \)
No questions will be answered during this exam.

If you consider a question to be ambiguous, state your assumptions in the margin and do the best you can to provide the correct answer.

You have **90 minutes (1.5 hours)** to complete this test.

**General Directions:**

- Any communication with any person (other than the instructor or a designated proctor) during this exam of any form, including written, signed, verbal, or digital, is understood to be a violation of academic integrity.

- All devices, such as computers, cell phones, cameras, and PDAs, must be turned off while the student is in the testing room.

- You may use any scientific calculator except a TI-89 or a TI-NSpire CAS.

- No part of this test may be removed from the examination room.

On my honor, I have neither given nor received inappropriate or unauthorized information at any time before or during this test.

**Student’s Signature:**

Do not write below this line.

<table>
<thead>
<tr>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Scantron</th>
</tr>
</thead>
<tbody>
<tr>
<td>Points</td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Earned</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Free Response Total** 40

**Multiple Choice Total** 60

**Test Score**
Multiple Choice Portion

There are 20 multiple choice questions. Each question is worth 3 points and has one correct answer. Use a number 2 pencil and bubble in the letter of your response on the Scantron sheet. For your own record, also circle your choice on your test since the Scantron will not be returned to you. Only the responses recorded on your Scantron sheet will be graded.

1. Students entering Cooper Library are asked the number of hours they spend texting each day. The researcher records this number for each individual entering the library. What is the best way to classify this study?

   A) Case-controlled
   B) Experimental
   C) Observational
   D) Double-blind
   E) Single-blind

   Answer: C

2. Financial advisors recommend saving $1,000,000 for retirement. Jane plans on retiring in 30 years. Jane will make a single deposit into a savings account with 7% APR compounded monthly. How much money would Jane need to deposit now to have $1,000,000 in 30 years? Round your answer to the nearest cent.

   A) $122,456.43
   B) $70,000
   C) $131,367.12
   D) $123,205.85
   E) $839,883.94

   Answer: D

3. How much money would you have after 10 years if you deposited $65 monthly in a savings plan earning 4% APR compounded monthly? Round your answer to two decimal places.

   A) $6,420.06
   B) $9,571.24
   C) $7,800.00
   D) $8,112.00
   E) $96.90

   Answer: B
4. If you deposit $10,000 into a simple interest account earning 3% APR for 5 years, how much interest will you earn each year?

A) $3,000  
B) $150  
C) $300  
D) $1,500  
E) $30

5. Which savings account below would yield the most interest in 1 year?  
(HINT: No calculations are necessary.)

A) 2% APR compounded monthly  
B) 2% APR compounded daily  
C) 2% APR compounded annually  
D) 2% APR simple interest  
E) 2% APR compounded continuously

6. You invest $1000 in an account with an APR of 4.75% compounded daily. Find your account balance in 4 years. Round your answer to the nearest cent.

A) $1209.23  
B) $1190.00  
C) $1208.80  
D) $6677.64  
E) $6685.89
7. Alan purchased a print in an art auction for $500. Three years later, he sold it for $50. What was Alan’s total return on his investment?

A) 900%
B) –900%
C) 9%
D) –90%
E) 90%

8. Jacob is married and files his taxes separately. He earned $80,000 in wages and additional investments this year. Jacob also contributed $6,000 to a tax-deferred IRA. What is Jacob’s adjusted gross income?

A) $73,900
B) $70,000
C) $66,100
D) $74,000
E) $80,000

9. Lara has a $150,000 mortgage loan at 5.5% compounded monthly for 30 years. Her monthly payment is $851.68. How much total interest will she pay over the life of the mortgage loan (30 years)?

A) $306,604.80
B) $156,604.80
C) $247,500.00
D) $105,504.00
E) $25,550.40
10. Sarah deposited $85 each month into a savings plan with 6.5% APR compounded monthly. After 10 years, Sarah’s savings plan account balance was $14,314.27. How much of her account balance was interest?

A) $4,114.27  
B) $10,200.00  
C) $55.25  
D) $4,314.27  
E) $13,464.27

11. A credit card company surveys a sample of its cardholders to determine their spending habits. It selects 1000 of its regular cardholders, 650 of its gold cardholders, and 250 of its platinum cardholders. What type of sampling is this?

A) Systematic sampling  
B) Convenience sampling  
C) Stratified sampling  
D) Importance sampling  
E) Simple random sampling

12. You have purchased a new car for $25,300.00. The terms of your loan state that you will make 60 monthly payments at an interest rate of 3.0% APR compounded monthly. When calculating your monthly payment amount, what value do you enter into the formula for the variable Y?

A) .03  
B) 12  
C) 60  
D) 5  
E) 25300
13. Jack wants to save $500,000 for his retirement in 25 years. He decides to make a deposit every month into a savings plan with 5% APR compounded monthly. How much money would Jack need to deposit each month to have $500,000 in 25 years? Round your answer to the nearest cent.

A) $839.62  
B) $948.45  
C) $1456.15  
D) $2292.95  
E) $436.75

14. You want to purchase a vehicle. You can afford to pay $350.00 per month. You want to have the vehicle loan repaid in 2 years. The interest rate your bank charges for a loan is 2.64% APR compounded monthly. What is the most you can afford to spend on a vehicle? Round your answer to the nearest dollar.

A) $8,177  
B) $8,189  
C) $7,955  
D) $7,122  
E) $8,173

15. A survey of 1500 adults (in the US) was conducted to determine what percentage of US citizens believe that reducing government spending will help the economy. The survey showed that 720 out of the 1500 adults surveyed believe that reducing government spending will help the economy. Identify the sample statistic in this study.

A) 48%  
B) 1500  
C) 108%  
D) 720  
E) 346
16. Sarah has $12,000 to deposit into a savings account paying 8% APR compounded quarterly. What is the APY for this account? Round your answer to two decimal places.

A) 8.24%
B) 8.33%
C) 7.62%
D) 8.30%
E) 7.57%

17. You have a 1-year $2000 fixed loan at 12% APR compounded monthly. Your monthly payment is $177.70. Complete the first month of the amortization table. Round your answers to the nearest cent.

A) | Month | Beginning Balance | Payment | Monthly Interest | Principal Reduction | Ending Balance |
---|---|---|---|---|---|
| 1 | $2000.00 | $177.70 | $240.00 | $62.30 | $2062.30 |

B) | Month | Beginning Balance | Payment | Monthly Interest | Principal Reduction | Ending Balance |
---|---|---|---|---|---|
| 1 | $2000.00 | $177.70 | $20.00 | $157.70 | $1842.30 |

C) | Month | Beginning Balance | Payment | Monthly Interest | Principal Reduction | Ending Balance |
---|---|---|---|---|---|
| 1 | $2000.00 | $177.70 | $20.00 | $177.70 | $1822.30 |

D) | Month | Beginning Balance | Payment | Monthly Interest | Principal Reduction | Ending Balance |
---|---|---|---|---|---|
| 1 | $2000.00 | $177.70 | $20.00 | $157.70 | $1822.30 |

E) | Month | Beginning Balance | Payment | Monthly Interest | Principal Reduction | Ending Balance |
---|---|---|---|---|---|
| 1 | $2000.00 | $177.70 | $177.70 | $0 | $2000.00 |
18. Benjamin is single with no dependents and earns $45,000 per year. This year he also earned $3,200 in interest and paid $2,000 into a tax-deferred IRA. If Benjamin claims the standard deduction, what is his taxable income for the year?

A) $46,200  
B) $40,100  
C) $42,300  
D) $36,200  
E) $45,000

19. Preston files his taxes as single and itemizes his deductions. His taxable income is $172,000. If Preston makes a $5000 contribution to a tax-deductible charity, how much would his total income tax be reduced by this contribution?

A) $1250  
B) $5000  
C) $1400  
D) $0  
E) $500

20. Google Inc. stock was first traded publicly in 2004. Suppose that at the Google initial public offering (in 2004) you purchased 500 shares for a total of $45,000. At the end of 2009 you sold all of your shares for a total of $195,000. What was the annual return on your investment in Google stock? Give your answer as a percentage rounded to two decimal places.

A) 27.68%  
B) 45.15%  
C) 23.26%  
D) 30.78%  
E) 34.08%
Free Response Portion

Show all necessary work. Verify that the answers carry the appropriate units.

Partial credit may be given for work towards the correct solution. However, if answers are shown without necessary work, YOU MAY RECEIVE LITTLE OR NO CREDIT FOR THE CORRECT ANSWER.

1. Lucy has $3500 to invest in a savings account for 5 years.
   a. Bank A offers Lucy an account earning 5.9% APR compounded monthly. How much will Lucy have in the Bank A account after 5 years? How much total interest (in $) will she earn on that account over the 5 years? Show your work and round your answers to the nearest cent.

   
   \[ A = 3500 \left(1 + \frac{0.059}{12}\right)^{12 \cdot 5} = 4,697.55 \]

   Interest earned = $4697.55 – $3500 = $1,197.55

   Bank A account balance: $\fbox{4,697.55}$

   Bank A interest earned: $\fbox{1,197.55}$

   b. Bank B offers Lucy an account earning 5.7% APR compounded continuously. How much will Lucy have in the Bank B account after 5 years? How much total interest (in $) will she earn on that account over the 5 years? Show your work and round your answers to the nearest cent.

   \[ A = 3500e^{(0.057 \cdot 5)} = 4,654.17 \]

   Interest earned = $4654.17 – $3500 = $1,154.17

   Bank B account balance: $\fbox{4,654.17}$

   Bank B interest earned: $\fbox{1,154.17}$

   c. In which bank should Lucy deposit her $3500? A OR B

   Circle your choice above.

   1 point for either the correct answer or an incorrect answer that follows parts a and b.

   Points earned on this question: [ ]

   Available points on this question: 9
2. Loan Repayment

Instructions:

1. Apply mathematical methods to solve the problem, showing all work. Round all answers to the nearest cent.
2. Interpret your results in a complete sentence or in a paragraph, answering the questions presented in the problem.

Arnold has a balance of $5100 on his credit card. The credit card APR is 18% (compounded monthly). If Arnold makes no additional charges to the card and he makes a monthly payment of $149.81, he will have the card paid off in 4 years.

Suppose Arnold decides to pay off the card in 2 years instead of 4 years. How much money will he save by paying off the credit card earlier? Explain why Arnold might decide to pay off the card over 4 years instead of paying it off 2 years earlier.

4 years: Total Payments = $149.81 \times \frac{12 \text{ months}}{\text{year}} \times 4 \text{ years} = $7,190.88

2 years: \[ \text{PMT} = \frac{5100 \left( \frac{.18}{12} \right)}{1 - \left( 1 + \frac{.18}{12} \right)^{-12 \times 2}} = $254.61 \]

Total Payments = $254.61 \times \frac{12 \text{ months}}{\text{year}} \times 2 \text{ years} = $6,110.64

(OR PMT \times 12 \times 2 = $6,110.71 Calculation must match work.)

Interest Savings = $7,190.88 – $6,110.64 = $1,080.24 \quad \text{(OR } $1,080.17\text{)}

Monthly Payment Increase = $254.61 – $149.81 = $104.80

Arnold will save $1,080.24 in interest by paying off the card in 2 years instead of 4 years. Arnold might decide to pay off the card over 4 years if he can’t afford the extra $104.80 per month.

2 points for 4 year pay-off total payments, units not required
3 points for 2 year pay-off payment amount (2 pts formula and substitutions, 1 pt answer)
2 points for 2 year pay-off total payments, units not required
1 point for interest savings calculation, implicit or explicit
1 point for stating savings in a sentence
1 point for explaining why one might choose a longer pay-off period
\(-\frac{1}{2}\) per answer not rounded correctly or if calculation doesn’t match work

Points earned on this question: ____________________
Available points on this question: 10
3. Ronald is head of household with a dependent child. He itemizes his deductions. His taxable income is $77,887. He is also entitled to a $700 tax credit.

   a. Compute Ronald’s Total Income Tax. Show ALL work and round your answer to the nearest cent.

   NOTE: You may find the following number line helpful in your calculations.

   ![Number Line]

   10%(12750) + 15%(48600 – 12750) + 25%(77887 – 48600) = $13,974.25

   Apply tax credit: Total Income Tax = $13,974.25 – $700 = $13,274.25

   Total Income Tax: $13,274.25

   b. Ronald’s wages were $99,000. Compute his FICA tax. Round your answer to the nearest cent.

      FICA = .0765 × $99,000 = $7,573.50

      FICA tax: $7,573.50

   c. Ronald also earned $1000 in interest. Compute his Overall Federal Tax Rate. Round the percentage to two decimal places.

      Fed. Tax Rate = \[
      \frac{13274.25 + 7573.50}{99000 + 1000} \times 100\% = \frac{20847.75}{100000} \times 100\% = 20.85\%
      \]

      Overall Federal Tax Rate: 20.85 %

   Points earned on this question: 3 points (2 pts formula and substitutions, following work, 1 pt answer)

   Available points on this question: 10

a. Identify the population in this study.

   **North Carolina voters**

   2 points, “NC Adults” or “NC Residents” or any reasonable answer okay

b. Find the margin of error. **Show work** and round your answer to one decimal place.

   \[
   \text{Margin of Error} = \frac{1}{\sqrt{1000}} \times 100\% = 3.2\%
   \]

   Margin of Error: 3.2 %

   3 points for MOE (2 pts formula and substitutions, 1 point answer)
   –1 if 342 used instead of sample size 1000
   –½ if answer not rounded correctly

   3 points for Sample Statistic (1 pt work, 2 pts answer)
   1 point for each endpoint in CI, work preferred but not required
   –½ if endpoints switched in interval

   Sample Statistic: 34.2 %

   Confidence Interval: [31.0 %, 37.4 %] (OR 31)

   Points earned on this question: | 
   Available points on this question: 10
Scantron (1 pt.)

Check to make sure your Scantron form meets the following criteria. If any of the items are NOT satisfied when your Scantron is handed in and/or when your Scantron is processed one point will be subtracted from your test total.

My Scantron:

- is bubbled with firm marks so that the form can be machine read;
- is not damaged and has no stray marks (the form can be machine read);
- has 20 bubbled in answers;
- has MATH 1010 and my Section number written at the top;
- has my Instructor’s name written at the top;
- has Test No. 2 written at the top;
- has Test Version A both written at the top and bubbled in below my CUID;
- and shows my correct XID written in and then bubbled in with a zero in the first column followed by the eight digits.