

# DEPARTMENT OF MATHEMATICS

Ma 162 Third Exam November 12, 2012

**Instructions:** No cell phones or network-capable devices are allowed during the exam. You may use calculators, but you must show your work to receive credit. If your answer is not in the box or if you have no work to support your answer, you will receive no credit. The test has been carefully checked and its notation is consistent with the homework problems. No additional details will be provided during the exam.

Problem	Maximum Score	Actual Score
1	24	
2	18	
3	26	
4	16	
5	16	
Total	100	

NAME: \_\_\_\_\_ Section: \_\_\_\_\_

Last four digits of Student ID: \_\_\_\_\_

- (1) Simple Interest:  $I = Prt$ . Accumulation:  $A = P(1 + rt)$ .
- (2) Compound Interest Accumulation:  $A = P(1 + i)^n$ . Present value:  $P = A(1 + i)^{-n}$ .
- (3) Effective rate:  $r_{\text{eff}} = (1 + \frac{r}{m})^m - 1$ .
- (4) Annuity: Sum:  $S = R \frac{((1+i)^n - 1)}{i}$ . Present value:  $P = R \frac{(1 - (1+i)^{-n})}{i}$ .
- (5) Set counting: Two sets:  $n(A \cup B) = n(A) + n(B) - n(A \cap B)$   
 $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$ .

For each part, you receive points for (1) showing the formula, (2) indicating which numbers go into the formula, (3) getting a number close to the right number, and (4) getting the right number.

1. (a) How much is \$2000 worth after 3 years of 15% APR (1.25% per month) interest compounded monthly?

(b) How much do you need to deposit now to have \$2000 after 3 years of 1% APR interest, compounded monthly?

(c) How much is ten years of \$150 monthly payments worth with 18% APR (1.5% per month) interest?

(d) How much do you need to deposit each month in order to have \$2000 after five years of 2% APR interest, compounded monthly?

(e) How much can you borrow now if you are willing to pay back \$150 per month at 3% APR (0.25% per month) interest, compounded monthly, for three years?

(f) How much does one need to pay each month in order to pay off a \$10,000 loan over five years at 3% APR (0.25% per month) interest, compounded monthly?

For each part, you receive points for (1) explaining your method, (2) explaining your method well, (3) getting a close answer, (4) getting the right answer.

2. Which is the cheaper way to pay the electric bill? The bill is \$130. One does not have the money now, but one will have the money in a month.

How much does each method cost total at the end of the month?

(a) Pay it late. The late fee is \$6.50.

(b) Put it on the credit card, and pay off that purchase and its interest in a month. 24% APR (2% per month).

(c) Pawn an iPhone for a month for \$130. The interest is 1% per month, but there is a \$5.00 processing fee.

(d) Get a pay-day loan at 468% APR (9% per week) and hope you have the money early.

(e) (2 points) Which is the cheapest option?

For each part, you receive points for (1) explaining your method, (2) explaining your method well, (3) getting a close answer, (4) getting the right answer.

3. Describe the financial journey of Bob and Carl:

(a) Bob decides to save \$200 per month at 2% per month interest for three years. How much will he have in the account after three years?

(b) After a year, Bob unfortunately realizes the interest rate was really 2% APR. How much is in the account now?

(c) If he actually wants the amount in part (a) to be there in time (so two more years), how much does he need to start investing per month now?

(d) So at the end of the three years, he has his money. Now he wants to withdraw the money, \$200 per month. Miraculously the interest rate is still 2% APR. How much money is left after three years of withdrawals?

(e) Carl deposits \$200 per month for three years at 2% APR, compounded monthly. He then withdraws \$200 per month for three years at 2% APR, compounded monthly. How much money is left in his account?

(f) (2 points) In plain English, why does Carl still have money left in his account?

For each part, you receive points for (1) explaining your method, (2) explaining your method well, (3) getting a close answer, (4) getting the right answer.

4. (a) 10% of those surveyed identified themselves as wealthy. 30% identified themselves as generally happy. 65% identified themselves as neither. What percentage of those surveyed would identify themselves as wealthy or generally happy, but not both?

(b) What percentage identified as generally happy but not wealthy?

(c) How many ways can you roll four standard (6-sided) dice without getting any twos on the top of a die?

(d) If you flip a coin 10 times, how many possible outcomes are there where the first three flips are heads? (For example, HHHTTTHTTT is one such outcome)

Answer 4 of the 5 parts. For each part, you receive points for (1) explaining your method, (2) explaining your method well, (3) getting a close answer, (4) getting the right answer.

5 (a) How many ways can the letters from MANAGEMENT be rearranged?

(b) How many ways can you arrange four letters from MONEY?

(c) How many ways can you arrange all of the letters of SUPERVISE if you alternate consonants and vowels?

(d) If you have 3 red strawberry pancakes, 2 orange orange pancakes, 4 plain yellow pancakes, and 3 red cherry pancakes, how many different flavor stacks can you make?

(e) If you are photographing your stack for a pancake magazine (so flavor doesn't matter, only color) how many possible stacks do you have to choose from?