DEPARTMENT OF MATHEMATICS

Ma 162 Third Exam November 16, 2009

DO NOT TURN THIS PAGE UNTIL YOU ARE INSTRUCTED TO DO SO.

Instructions: Be sure your name, section number, and student ID are filled in below. Cell phones must be OFF and put away before you open this exam. You may use calculators (including graphing calculators, but no laptops or cellphone calculators) for checking numerical calculations. You must show your work to receive credit.
Put your answers in the answer boxes provided, and show your work.
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	12	
2	12	
3	12	
4	12	
5	12	
6	16	
7	12	
8	12	
Total	100	

Please fill in the information below.

NAME: _____ **Section:** _____
Last four digits of Student ID: _____

Useful formulas.

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: $r_{eff} = (1 + \frac{r}{m})^m - 1$.
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: $n(A \bigcup B) = n(A) + n(B) - n(A \bigcap B)$ Three sets: $n(A \bigcup B \bigcup C) = n(A)+n(B)+n(C)-n(A \bigcap B)-n(B \bigcap C)-n(C \bigcap A)+n(A \bigcap B \bigcap C)$.

1. Suppose that P, Q and R are sets with 94 , 67 and 84 members respectively. Calculate the indicated quantities. Display correct formulas or appropriate Venn diagrams.

   i) If $P \bigcap Q$ has 46 members, then $P \bigcup Q$ has $\boxed{}$ members.

   ii) If it is further known that $P \bigcap R$ has 56 members, then $P \bigcup R$ has $\boxed{}$ members.

   iii) If, in addition, $Q - R$ has 39 members, then $Q \bigcap R$ has $\boxed{}$ members.

   iv) Finally, if we are given that the intersection of all three sets P, Q, and R has 15 members, then the union of all three sets has $\boxed{}$ members.

2. Herbert knows that he will need $\$18,000$ after about 6 years from now to upgrade his machinery. He also hates the idea of giving interest to a lender and so decides to invest some of his own cash to build the fund.

a) How much would he have to invest now at 8% interest compounded annually to have that sum available? [ ]

Be sure to show the formula used.

b) How much would he have to invest now if the compounding was done bi-weekly instead? Assume 52 weeks in the year. [ ]

Be sure to show the formula used.

3. You are about to finance the purchase of a new house with a 20 year loan of 108 thousand dollars at 6.5% interest compounded monthly.

   What is your monthly payment and what is your total payout?

   Answer. Monthly Payment: ☐ dollars.

   Total payout: ☐ dollars.

   Be sure to show the formula used.

   b) Suppose another lender had offered the same loan with the same interest rate but for 30 years instead of 20 years. What will be the monthly payment and the total payout?

   Answer: Payment: ☐ dollars.

   Total payout: ☐ dollars.

4. Jimmy got a new job and is eager to replace his old car with a new one. But he does not want to take the responsibility of a new car loan. Therefore, he starts putting money into a savings account so he can buy a car after 3 years.

   Jimmy figures that he would need to have $12,000 saved, and he wishes to make monthly payments into an account paying 5% interest compounded monthly. Help him figure out the following.

   Be sure to show the formulas used.

   a) How much should Jimmy's monthly payment be? [ ]

   b) At the end of 3 years, Jimmy decides to continue with his old car for another year yet continue making the same payments, so he can get a better car. How much **additional money** will accumulate into the account? [ ]

5. In this problem, assume a 360 day year. "Rich Today!" will loan you 60% of your paycheck of \$500 for 7 days. After 7 days, you pay back the loan plus an interest of \$10.

   a) Calculate the annual simple interest rate for this service. Answer: [ ]

   per cent.

   Surprised? Now you know what a loan shark is!!

   b) Across the street, "We Pay! " will loan you 5% more of your paycheck but charge you an interest of \$11. Is this a lower rate? Explain your answer by comparing the rates. Be sure to show all work.

6. A survey of 100 College students revealed the following:

   - 53 students use the Radio for their news.
   - 45 students use TV for their news.
   - 49 students use the Internet for their news.
   - 26 students use both Radio and TV for their news.
   - 24 students use Radio and Internet for their news.
   - 22 students use TV and Internet for their news.
   - 18 students use all three news sources.

   Based on the above information, answer the following questions. You must show your calculations to receive credit.

   (a)How many students surveyed use none of the three news sources?

   Answer: [ ]

   (b)How many students surveyed use at least two of the three news sources?

   Answer: [ ]

7. Leena does not like to wear the same outfit twice. She has 5 different shirts, 7 different pants, and 8 different pairs of shoes.

   a) How many successive days can she wear her outfit without repetition? **Answer:**

   b) Leena goes out and buys two new shirts but unfortunately one of her shoes breaks down. **Now, how many days** can she go without repeating an outfit? **Answer**

8. There are 25 members in an executive committee. A subcommittee needs to be appointed for a special project. The subcommittee shall have a chairman, a public relations officer, a secretary and an accountant.

   Answer the following questions. Be sure to show your reasoning. Just numerical answers shall earn no credit.

   (a) How many different subcommittees can be formed from the executive committee?

   Answer:

   (b) Suppose that the regular chairman of the executive committee decides to appoint himself as the chairman of the sub committee, then how many different subcommittees can be formed?

   Answer:

1 Answer Key for exam3v-5

1. ◇ (i) 115
   ◇ (ii) 122
   ◇ (iii) 28
   ◇ (iv) 130

2. ◇ a) $11,343.05
   ◇ b) $11,146.31

3. ◇ a) Monthly Payment $ 805.22 Payout $ 193,252.55
   ◇ b)682.63 Total 245,748.04

4. ◇ a) Monthly saving $309.65
   ◇ Additional accumulation $4,416.10

5. ◇ a)171.43per cent
   ◇ b)174.07per cent Better? no!

6. ◇ (a) 7
   ◇ (b) 36

7. ◇ a) 280 days
   ◇ b) 343 days

8. ◇ (a) 303600
   ◇ (b) 12144