

DEPARTMENT OF MATHEMATICS

Ma162 Third EXAM Spring 2005

April 11, 2005

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

Be sure to show all work and justify your answers. Unsupported answers will get no credit, even when they are correct!

There are 6 problems and a total of 7 pages including this one. You are allowed the use of calculators.

Problem	Maximum Score	Actual Score
1	16	
2	16	
3	16	
4	20	
5	16	
6	16	
Total	100	

It is essential to fill in the following information precisely.

You may be charged 3 points, if you cannot state your own section number correctly.

NAME: _____ STUDENT #: _____

SECTION NO: _____

Formulas

Simple Interest: Interest. $I = Prt$, **Accumulation.** $A = P(1 + rt)$,

Compound Interest: Accumulation. $A = P(1 + i)^n$, **Present value:** $P = A(1 + i)^{-n}$

Annuity: Sum or future value $S = \frac{R((1 + i)^n - 1)}{i}$, **Present value:** $P = \frac{R(1 - (1 + i)^{-n})}{i}$

Set counts: Two set formula. $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

Three set formula. $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$.

1. (a) Jack wants to invest \$10,000 for 5 years. For various reasons he has narrowed his choices to the following two:
 - i. An annual rate of 4.8% compounded monthly for five years, or
 - ii. a simple interest of 5% for five years.

Which should he choose? Support your answer and round off all final calculations to the nearest cent.

- (b) What is the present value of \$10,000 ten years from now, if the annual rate of interest is 8% and the interest is compounded quarterly?
Round off your final answer to the nearest cent.

2. (a) Find the value after 10 years of an annuity if payments of \$200 are made monthly and the annual interest rate is 3% compounded monthly.
Round off your final answer to the nearest cent.
- (b) A student borrowed \$3,000 from a credit union toward purchasing a car. The annual interest rate is 12% compounded quarterly. If he makes payments at the end of each quarter, find his quarterly payment, if he needs to pay the loan off in 4 years.
Round off your final answer to the nearest cent.

3. (a) Let

$$U = \{1, 2, 3, 4, 5, 6\}, A = \{1, 3, 5\}, B = \{1, 4, 6\}, C = \{2, 3, 4\}.$$

Find the following sets:

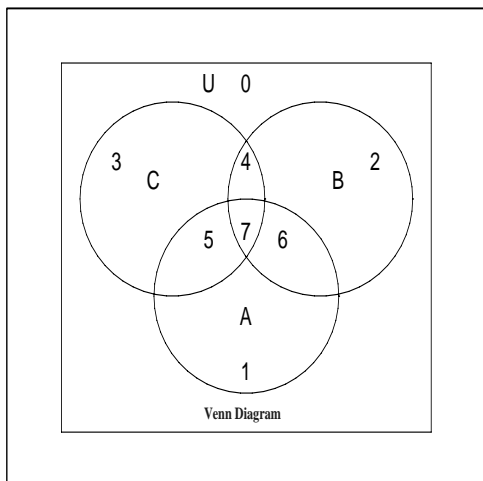
i. $A \cap B \cap C$.

ii. $A \cap (B^c)$.

iii. $C - (A \cup B)$.

(b) In the following Venn diagram each region is represented by the various numbered parts that it contains. Thus, for example, $A \cap B$ is represented by $\{6, 7\}$.

Find similar representations for each of the following sets.



$$A \cap (B \cup C)$$

$$(A \cup C)^c$$

$$(A \cup B) - C$$

4. (a) Let A and B be subsets of a certain universal set U . Suppose that A has 10 elements, B has 9 elements and $n(A \cup B) = 15$.

Compute the following:

i. $n(A \cap B)$.

ii. $n(B - A)$.

- (b) In a department store, 30 customers were surveyed about three new products A, B, C . It was determined that 12 customers had bought A , 13 had bought B and 14 had bought C . It was also determined that 4 had bought both A and B , 7 had bought both B and C and 6 had bought both A and C .

Finally, 2 customers had bought all three products.

Using the above information, answer the following questions. As usual, it is essential to show your work. Trial and error answers are not acceptable!

i. How many bought at least one of the three products?

ii. How many bought exactly one of the three products?

iii. How many did not buy any of the three products?

5. An exam consists of 12 multiple choice questions with four possible choices for each questions.
- (a) In how many different ways can a student complete the exam if he is required to answer every question?
- (b) In how many different ways can a student complete the exam if he does not have to answer every question?

6. A space shuttle crew consists of a shuttle commander, a pilot, three engineers, a scientist and a civilian. The shuttle commander and the pilot are chosen from 6 candidates, the three engineers are chosen from a pool of ten engineers, while there are three candidates for the scientist post. There are two eligible civilians.

How many different space shuttle crews can be formed?