

DEPARTMENT OF MATHEMATICS

Ma162 Final EXAM Spring 2005

May 4, 2005

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

Be sure to show all work and justify your answers.

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	20	
2	8	
3	12	
4	20	
5	20	
6	20	
Total	100	

It is essential to fill in the following information precisely.

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

Be sure that you give your exam paper to your own instructor or your TA. You may not get credit for the exam otherwise.

NAME: _____ STUDENT #: _____

SECTION NO: _____

1. Fred Foy has \$100,000 to invest in stocks, bonds and a money market account. The stocks have an expected return rate of 10% per year, the bonds pay 6% per year and the money market earns 2% per year.

Fred insists that the money in the money market funds should equal the sum of 20% of the amount invested in stocks and 10% of the amount invested in bonds.

Fred wants to allocate the \$100,000 among the three investments in order to provide an expected income of \$8,000 per year.

Use x, y, z to denote the amounts invested in stocks, bonds and money market respectively.

Answer the following questions.

(a) Write down a linear equation in x, y, z relating to the total investment.

(b) Write down a linear equation relating to the expected annual income.

(c) Write down additional linear equation(s) as needed to express the remaining conditions on the investments.

(d) Construct an appropriate augmented matrix to solve all the linear equations constructed above. It is not necessary to operate on this matrix any further at this point.

(e) Solve the linear equations represented by the following augmented matrix.

$$\left[\begin{array}{ccc|c} x & y & z & RHS \\ 1 & 1 & 1 & 100 \\ 5 & 3 & 1 & 400 \\ 2 & 1 & -10 & 0 \end{array} \right]$$

2. Perth mining company operates two mines for the purpose of extracting gold and silver.

The Saddle mine costs \$14,000 per day to operate and it yields 50 ounces of gold and 3,000 ounces of silver each day. The Horseshoe mine costs \$16,000 per day to operate and yields 75 ounces of gold and 1,000 ounces of silver each day.

The company management has a target of at least 650 ounces of gold and at least 18,000 ounces of silver.

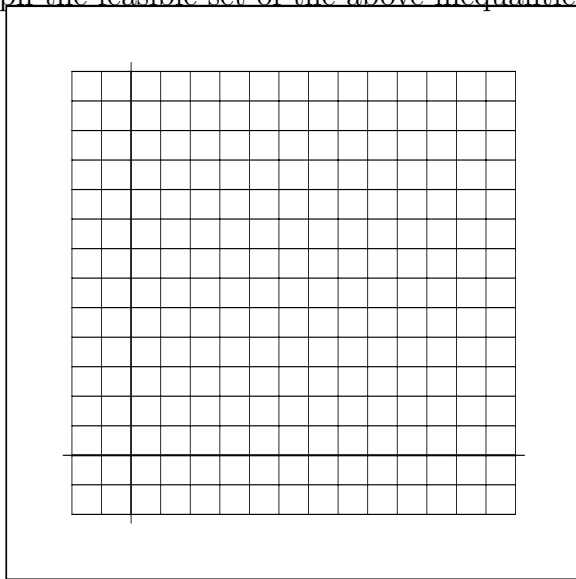
Set up a linear programming problem whose solution will determine how many days each mine should be operated to reach the target while minimizing the cost of operation.

You must define all the variables and list all the constraints. It is not necessary to solve the problem.

3. Consider these inequalities and answer the questions below.

$$x + y \leq 6, 2x + y \leq 8, x \geq 0, y \geq 0.$$

(a) Graph the feasible set of the above inequalities on the given graph paper.



(b) List all the corner points of the feasible set. Be sure to mark them on your graph as well.

(c) Determine the maximum value of $2x + 6y$ on the above feasible set.

4. In a group of 110 people, it is determined that 52 drink coffee, 41 drink tea and 39 don't drink either. A person is selected at random.

Answer the following:

(a) Compute the probability that the selected person drinks at least one of coffee or tea.

Answer:_____

(b) Compute the probability that the selected person drinks both coffee and tea.

Answer:_____

(c) Compute the probability that the selected person drinks only coffee.

Answer:_____

(d) In this experiment of selecting one person at random, are the events "is a coffee drinker" and "is a tea drinker" independent? Be sure to explain your answer.

5. A bin in the hi-fi department of a bargain outlet contains 120 cassette tapes of which 15 are known to be defective. A customer randomly selects 7 of the tapes.

Answer the following:

(a) Describe the sample space and determine the number of elements in the sample space.

(b) Find the probability that exactly 2 of the chosen tapes are defective.

(c) Find the probability that at least 1 of the chosen tapes is defective.

(d) Find the probability that none of the chosen tapes are defective.

6. In a high school there are 400 seniors of which 250 are female. 70% of the females and 50% of the males have their driver's licences.

A student is chosen at random from the senior class.

Answer the following:

(a) What is the probability that the chosen student is a female with a driver's licence?

(b) What is the probability that the chosen student is a male with a driver's licence?

(c) What is the probability that the chosen student has a driver's licence?

(d) Given that the chosen student does not have a driver's licence, what is the probability that the student is a male?