

# DEPARTMENT OF MATHEMATICS

Ma 162 Final Exam (practice) April 30, 2013

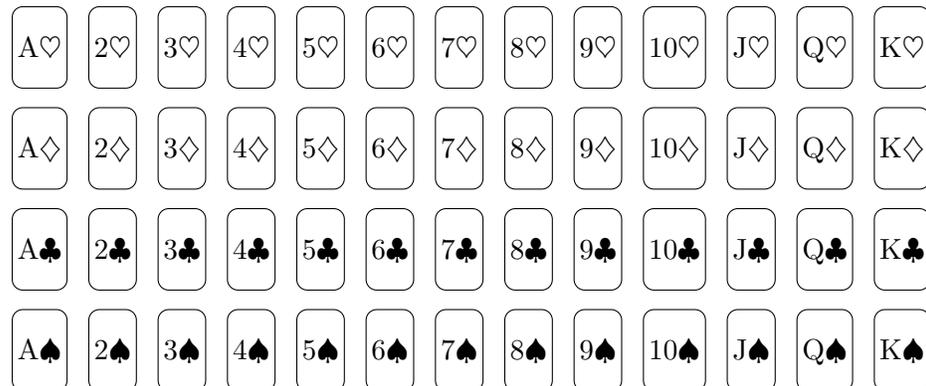
**Instructions:** No cell phones or network-capable devices are allowed during the exam. The test has been carefully checked and its notation is consistent with the homework problems and practice exam. No additional details will be provided during the exam.

Problem	Maximum Score	Actual Score
1	25	
2	25	
3	25	
4	25	
Total	100	

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

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

Standard 52 card deck:



1. Linear systems. Multiple choice. Clearly indicate the most correct choice in each row of answers. Unclear indications are worth no credit.

Which are possible values of  $x$  if  $x + y = 100$  and  $x - y = 18$ :

- (A) 0 (B) 18 (C) 37 (D) 59 (E) 71 (F) 100 (G) 118 (H) All of these (I) None of these

Which are possible values of  $x$  if  $x + y = 100$  and  $2x + 2y = 200$ :

- (A) 0 (B) 18 (C) 37 (D) 59 (E) 71 (F) 100 (G) 118 (H) All of these (I) None of these

Which are possible values of  $x$  if  $x + y = 100$  and  $2x + 2y = 118$ :

- (A) 0 (B) 18 (C) 37 (D) 59 (E) 71 (F) 100 (G) 118 (H) All of these (I) None of these

The word problem “Each product of type A requires 5 minutes of labor, 5 kilograms of silly putty, and results in \$5 of profit. Each product of type B requires 7 minutes of labor, 7 kilograms of silly putty, and results in \$7 of profit. How many of each type of product should be made in order to use 120 minutes of labor and 120 kilograms of silly putty?” results in the system of equations  $\{5x + 7y = 120, 5x + 7y = 120\}$ . In plain English, what does  $x = 17$  mean?

- (A) 17 minutes of labor remain  
(B) 17 kilograms of silly putty remain  
(C) The profit is \$17  
(D) Each product of type A costs \$17  
(E) Make \$17 in profit  
(F) Make 17 products of type A  
(G) Make type A until 17 minutes of labor remain, then make type B

A system of equations has had row operations applied until its matrix looks like the following. What are the possible values for  $y$ ?

$$\left[ \begin{array}{ccc|c} X & Y & Z & RHS \\ \hline 1 & 2 & 3 & 4 \\ 0 & 5 & 6 & 7 \\ 0 & 0 & 8 & 8 \end{array} \right]$$

- (A) 0 (B) 0.2 (C) 1 (D) 1.6 (E) 5 (F) 7 (G) 8 (H) All (I) None

2. Linear optimization. Multiple choice. Clearly indicate the most correct choice in each row of answers. Unclear indications are worth no credit.

Which of the following  $(x, y)$  pairs are feasible solutions to:

$$\{x \geq 0, y \geq 0, x + y \leq 10, 2x + y \leq 12\}?$$

Mark ALL that apply.

- Ⓐ (0, 0)   Ⓑ (0, 6)   Ⓒ (0, 10)   Ⓓ (-1, 11)   Ⓔ (2, 8)   Ⓕ (3, 3)   Ⓖ (6, 0)   Ⓗ (10, 0)

Which of the following  $(x, y)$  pairs are optimal feasible solutions to:

$$\text{“Maximize } 3x + 4y \text{ subject to } \{x \geq 0, y \geq 0, x + y \leq 10\}?$$

Mark ALL that apply.

- Ⓐ (0, 0)   Ⓑ (0, 6)   Ⓒ (0, 10)   Ⓓ (-1, 11)   Ⓔ (2, 8)   Ⓕ (3, 3)   Ⓖ (6, 0)   Ⓗ (10, 0)

What is the value of  $X$  in the basic solution indicated by this RREF for a linear optimization problem?

$$\left[ \begin{array}{ccccc|c} X & Y & Z & U & P & RHS \\ \hline 1 & 2 & 3 & 1 & 0 & 4 \\ 5 & 6 & 7 & 0 & 1 & 8 \end{array} \right]$$

- Ⓐ 0   Ⓑ 1   Ⓒ 2   Ⓓ 3   Ⓔ 4   Ⓕ 5   Ⓖ 6   Ⓗ 7   ⓘ 8

How does one check that the basic solution from an RREF is feasible?

- Ⓐ Check the right hand side for negative numbers: should be none  
 Ⓑ Check the right hand side for negative numbers: should be at least one  
 Ⓒ Choose the lowest non-negative ratio  
 Ⓓ Check the bottom row for negative numbers: should be none  
 Ⓔ Check the bottom row for negative numbers: should be at least one

How does one check that the basic solution from an RREF is optimal (maximum profit) if we already know the basic solution is feasible?

- Ⓐ Check the right hand side for negative numbers: should be none  
 Ⓑ Check the right hand side for negative numbers: should be at least one  
 Ⓒ Choose the lowest non-negative ratio  
 Ⓓ Check the bottom row for negative numbers: should be none  
 Ⓔ Check the bottom row for negative numbers: should be at least one

3. Probability. Multiple choice. Clearly indicate the most correct choice in each row of answers. Unclear indications are worth no credit. Percentages may be rounded.

100 raffle tickets are sold, but only 10 are winners. Most people bought 3 tickets. What percentage of 3 ticket combinations include at least one winning ticket?

- (A) 0.07%    (B) 10%    (C) 25%    (D) 27.1%    (E) 27.3%    (F) 30%    (G) 70%

An experiment consists of rolling three (fair, six-sided) dice and recording the largest number. What percentage of rolls will result in recording 5?

- (A) 5%    (B) 16.67%    (C) 28.24%    (D) 50.00%    (E) 57.87%    (F) 83.33%

An online banking account uses a 6 digit (each digit is from 0,1,2,...,9) PIN, but does not allow repeating digits. A customer service representative receives a call, but the caller gives the wrong PIN. The caller says they just had the digits in the wrong order, and the customer service representative sees this is true. What percentage of possible PINs have the same digits (but not necessarily the same order) as the PIN 123456?

- (A) 0.00476%    (B) 0.0476%    (C) 0.476%    (D) 4.76%    (E) 47.6%    (F) 476%

Choose the event with the highest probability when flipping a coin 7 times:

- (A) Getting at least 3 heads  
(B) Getting at least 4 of the same side in a row  
(C) Getting all heads  
(D) Getting the same number of heads as tails  
(E) Getting heads on the first and last flip

Choose the event with the highest probability when drawing 5 cards from a standard deck:

- (A) Getting only hearts (♥)  
(B) Getting only aces (A)  
(C) Getting four aces (A)  
(D) Getting only numbers (2,3,4,5,6,7,8,9,10)  
(E) Getting no hearts (♥)

4. Conditional probability. Multiple choice. Clearly indicate the most correct choice in each row of answers. Unclear indications are worth no credit. Percentages may be rounded.

It is known that 1% of products have defects and that the probability of any two products having defects are independent. Batches of 20 products are shipped out if, when 3 products are tested, none of the 3 have defects. What percentage of batches that pass this test actually contain defective products?

- (A) 1.00%      (B) 3.00%      (C) 15.00%      (D) 15.71%      (E) 17.51%      (F) 25.00%

12% of those surveyed watched Top Chef, but only 8% watched both Top Chef and Chopped. What percentage of Top Chef watchers do not watch Chopped?

- (A) 4%      (B) 25%      (C) 33%      (D) 67%      (E) 88%      (F) 92%

An experiment consists of rolling three fair dice. A “double” is when two or more dice show the same number. What percentage of doubles have at least one 1?

- (A) 0.46%      (B) 1.67%      (C) 16.67%      (D) 32.29%      (E) 44.44%      (F) 50.00%

Cards are drawn randomly from a standard deck. Suppose you’ve already drawn 5 cards. Under which condition are you most likely to draw a heart (♥)?

- (A) If all of the first five cards were hearts  
(B) If four of the first five cards were hearts  
(C) If three of the first five cards were hearts  
(D) If two of the first five cards were hearts  
(E) If one of the first five cards was a heart  
(F) If none of the first five cards were hearts

Cards are drawn randomly from a standard deck. Suppose you’ve drawn 5 cards, all diamonds (♦). What is the probability the next card drawn is a heart?

- (A) 17%      (B) 20%      (C) 25%      (D) 28%      (E) 30%