Prince Sultan University
Department of Mathematical Sciences

Final Exam

Semester I, 2007   Fall (071)
24th January, 2008
A

MATH 101 – Finite Mathematics

Time Allowed : $2\frac{1}{2}$ **hours**

Maximum Points: 100 points

Name of the student:	
ID number :	
Section :	
Instructor : Mr. Khaled Naseralla	

Important Instructions:

1. **You may use a scientific calculator that does not have programming or graphing capabilities.**
2. **You may NOT borrow a calculator from anyone.**
3. **You may NOT use notes or any textbook.**
4. **There should be NO talking during the examination.**
5. **Your exam will be taken immediately if your mobile phone is seen or heard**
6. **Looking around or making an attempt to cheat will result in your exam being cancelled**
7. **This examination has 18 problems, some with several parts.**
8. **There is a total of 8 pages. Make sure your paper has all these pages and problems.**

Question	Maximum score	Your Score
Q.1, Q.2 & Q.3	20	
Q.4, Q.5, Q.6 & Q.7	20	
Q.8, Q.9 & Q.10	15	
Q.11 & Q.12	14	
Q.13, Q.14 & Q15	16	
Q.16, Q.17 & Q18	15	
Total	**100**	

Q.1(6 points): Write *True* or *False* for each of the following statements.

1) If two events in a sample space have no outcomes in common, they are said to be independent.   _____

2) The empty set is a subset of itself.   _____

3) If E and F are independent events, then P(E ∪ F) = P(E) + P(F) - P(E)P(F).   _____

4) There is a 50% chance of rain today and a 50% chance of rain tomorrow. Assuming independence, there is a 75% chance of rain either today or tomorrow.   _____

5) No point other than a corner of the feasible region can be a solution to a linear programming problem.   _____

6) Matrices of the same dimensions can always be added.   _____

Q.2(10 points):   Circle the correct answer.

1) The final tableau for a standard maximum problem is:

p	x_1	x_2	s_1	s_2	RHS
0	1	0	−2	4	5
0	0	1	3	−1	3
1	0	0	3	2	25

The solution of the original problem is:

(a) x_1= 3 , x_2= 2 , $p_{max.} = 25$ (b) x_1= 5 , x_2= 3 , $p_{max.} = 25$

(c) x_1= 3 , x_2= 0 , $p_{max.} = 25$ (d) x_1= 0 , x_2= 0 , $p_{max.} = 25$

2) If the events A and B are independent and if $P(A/B) = 0.1$ and $P(B) = 0.3$, then $P(A)$ is:

(a) 0.1   (b) 0.03   (c) 0.3   (d) 0.4

3) There are 7 people up for 3 different awards. In how many ways can the awards be given if a person cannot receive more than one award?

(a) $C(7,3)$ (b) 21   (c) 7!3!   (d) $P(7,3)$

4) Find where the lines $3x + 4y = 10$ and $2x - y = 3$ intersect.

(a) (2,1)   (b) $(\frac{3}{2}, 0)$ (c) (2,−1)   (d) (3,−2)

5) Suppose that $P(A) = 0.4$, $P(B) = 0.3$, and $P(A \cap B) = 0.1$. Then $P(\overline{A \cup B}) =$

(a) 0.4   (b) 0.7   (c) 0.6   (d) 0.8

6) Determine which of the following matrices is(are) in Reduced Row Echelon Form($RREF$)

$$A = \begin{bmatrix} 1 & 0 & -1 & 3 & | & 1 \\ 0 & 1 & 4 & 2 & | & 1 \\ 0 & 0 & 0 & 1 & | & 3 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 0 & -1 & 0 & | & 1 \\ 0 & 1 & 4 & 0 & | & 1 \\ 0 & 0 & 0 & 1 & | & 3 \end{bmatrix}, \quad C = \begin{bmatrix} 1 & 0 & 0 & 0 & | & 1 \\ 0 & 1 & 0 & 0 & | & 1 \\ 0 & 0 & 0 & 1 & | & 3 \end{bmatrix}, D = \begin{bmatrix} 1 & 1 & 0 & 0 & | & 1 \\ 0 & 1 & 0 & 0 & | & 1 \\ 0 & 0 & 0 & 1 & | & 3 \end{bmatrix}$$

(a) C only   (b) B and C only   (c) A, B, and C only   (d) B, C, and D only

7) How many 4-letter words can be formed by rearranging the letters in the word " seek " ?

(a) 6   (b) 2^4 (c) 12   (d) 24

8) A large basket of fruit contains 3 oranges, 2 apples and 5 bananas. If a fruit is chosen at random, what is the probability of getting an orange or an apple?

(a) $\dfrac{7}{10}$ (b) $\dfrac{4}{5}$ (c) $\dfrac{1}{2}$ (d) None of the above

9) A box contains 10 white balls and 6 red balls. In how many ways can 4 balls be drawn from the box if exactly 3 balls are white?

(a) $C(10,3)$ (b) $P(10,3).P(6,1)$ (c) $C(10,3).C(6,1)$ (d) $P(10,3)$

10) A pair of dice is rolled once, what are the odds for rolling a sum of 4 ?

(a) 3 to 36   (b) 1 to 11   (c) 5 to 31   (d) 1 to 12

Q.3(4 points):   Find an equation of the line passing through $(-3,5)$ and is perpendicular to the line passing through $(6,2)$ and $(1,-8)$

3

Q.4(6 points): A company producing bottles estimates the fixed cost for setting up the production line at $50,000$ and the direct costs for each bottle will be 1.5. The sales department determined the selling price at 2 per bottle.

a) How many bottles must be sold to break even?

b) How many bottles must the company sell to make a profit of $30,000$?

Q.5(4 points): Let $A = \begin{bmatrix} 2 & 3 \\ 1 & -2 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 \\ 2 & 3 \end{bmatrix}$, and $C = \begin{bmatrix} 2 & 1 \\ 1 & 0 \\ 3 & 2 \end{bmatrix}$

Find $C.(A+B)$

Q.6(5 points): Mohammed invested an amount of money 8 years ago in an account that pays 8% per year compounded quarterly. His investment is now worth $25,000$. How much did he originally invest?

Q.7(5 points): If Jack deposits 150 at the end of each month in a savings account earning interest at the rate of 9% per year compounded monthly. How much will he have in his account at the end of 5 years?

4

Q.8(6 points): Consider the universal set $U = \{1,2,3,4,5,6,7,8,9,10\}$, $A = \{1,3,5,7,9\}$, $B = \{1,2,3,4,6,8\}$, and $C = \{3,10\}$

Find:

a) $A \cup \overline{B}$ b) $\overline{B} \cup \overline{C}$ c) $A \cap B \cap C$

Q.9(4 points): Given that A and B are subsets of U with $c(U) = 52$, $c(\overline{A} \cap \overline{B}) = 8$, $c(A) = 39$, and $c(B) = 10$.

Find $c(A \cap B)$.

Q.10(5 points): Solve the following system. Use any appropriate method.

$$x - y + z = 4$$
$$2x - y = 6$$
$$x + 2y - 3z = 8$$

Q.11(7 points): Use the simplex method to solve the following linear programming problem:

Maximize $P = 6x_1 + x_2$ subject to the constraints:

$$3x_1 + x_2 \leq 15$$
$$x_1 + x_2 \leq 10$$
$$x_1 \geq 0, x_2 \geq 0$$

Q.12(7 points): Use the simplex method to minimize $C = 3x_1 + 2x_2$ subject to the constraints:

(Use any appropriate method)

$$x_1 + x_2 \geq 10$$
$$x_1 - x_2 \leq 15$$
$$x_1 \geq 0, x_2 \geq 0$$

Q.13(4 points): 15 students are going hiking on their spring break. They plan to travel in three vehicles. One vehicle seating 7 students, one seating 5, and one seating 3 students. In how many ways can the students group themselves for their trip?

Q.14(8 points): A math class has a total of 50 students. 25 of them have dark hair, 32 have brown eyes, and 15 have both dark hair and brown eyes.
a) Draw a Venn Diagram representing the class above.
b) How many students in the class either dark hair or brown eyes?
c) How many students in the class have brown eyes but don't have dark hair.
d) Find the probability that a student in the class has brown eyes given that he has dark hair.

Q.15(4 points): In Europe, 88% of all households have a television.
51% of all households have a television and a VCR.
72% of all households have a VCR.
What is the probability that a household has a VCR given that it has a television?

Q.16(4 points): In a shipment of 100 televisions, 6 are defective. If a person buys 3 televisions from that shipment, what is the probability that 2 of them are defective?

Q.17(5 points): A basketball player hits 70% of his free throws. Assuming independence on successive throws, What is the probability of
a) missing the first throw and then scoring 3 in a row?
b) scoring 6 free throws out of 10, in any order?

Q.18(6 points): The following table summarizes the students attending a university:
A student is selected at random from the university.
a) Find the probability that the student is male.
b) Find the probability that the student is a female and studying business.
c) Find the probability that the student is a female, given that the student is a business student.

	Computer C	Business B	Total
Male, M	350	700	1050
Female, F	325	550	875
Total	625	1250	1875