Prince Sultan University

Department of Mathematical Sciences

Final Exam

Semester I, 2013 FALL (131)
2nd January, 2014
B

MATH 101 – Finite Mathematics

Time Allowed : 2 hours
Maximum Points: 100 points

Name of the student:	
ID number	**:**
Section	**:**
Instructor	**:**

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 14 problems, some with several parts and a total of 8 pages. Make sure your paper has all these problems.**

Question	Maximum score	Your Score
Q.1	15	
Q.2, Q.3	14	
Q.4, Q.5	16	
Q.6, Q.7, Q.8	15	
Q.9, Q.10, Q11	19	
Q.12, Q.13, Q.14	21	
Total	**100**	

40

Q.1 (15 points): Circle the correct answer.

1) In how many ways can a TV manager schedule 3 different commercials into 5 available time slots reserved for commercials?

(a) 15 (b) 120 (c) 10 (d) 60

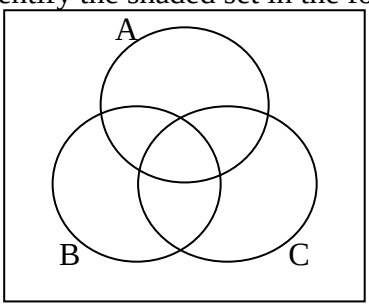
2) What is the total number of outcomes of the sample space of tossing 2 dice and a coin?

(a) 128 (b) 24 (c) 14 (d) 72

3) If E and F are mutually exclusive events, then $P(E|F) =$

(a) $P(F)$ (b) $P(E).P(F)$ (c) 0 (d) $P(E)$

4) Identify the shaded set in the following Venn Diagram.



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

(c) $A \cap \overline{B} \cap C$ (d) $(A \cap C) \cup (B \cap C)$

5) A jar contains 7 red balls, 2 green balls, 5 white balls and 8 yellow balls. Two balls are chosen from the jar one after the other **with replacement**. The probability of choosing one red and one yellow ball is:

(a) $\frac{8}{33}$ (b) $\frac{15}{22}$ (c) $\frac{28}{121}$ (d) $\frac{14}{121}$

6) An exam contains 6 "true or false" questions. What is the probability that a student guessing all the answers will get 4 answers correct?

(a) $\frac{2}{3}$ (b) $\frac{4}{64}$ (c) $\frac{15}{64}$ (d) $\frac{1}{3}$

7) The point of intersection for the two lines: $4x+3y=6$ and $2x-y=8$ is:

(a) $(\frac{3}{4},0)$ (b) $(3,-2)$ (c) $(\frac{3}{2},0)$ (d) $(2,-4)$

8) Find the market price for the given supply and demand equations.

$S = 32p + 1000$ $D = 1900 - 28p$

(a) $p=17$ (b) $p=48$ (c) $p=14$ (d) $p=15$

9) How many nine-letter words can be formed from the letters of the word "**Classroom**"?

(a) 3,024 (b) 90,720 (c) 362,880 (d) 387,420,489

10) **The basic variables** in the following simplex tableau are:

x	y	s_1	s_2	P	RHS
5	1	3	0	0	14
−3	0	4	1	0	10
4	0	3	0	1	26

(a) x, y, and (b) y, s_2, and P (c) x, s_1, and s_2 P (d) x, s_1, and P

Q.2 (8 points): A company is planning to introduce a new soft-drink container. The company estimates the first-year fixed costs for setting up the new production line at \$50,000, and the direct costs for each bottle will be \$1.5. The sales department estimates that 60,000 bottles can be sold during the first year at \$2 per bottle.

a) Find the linear cost function, $C(x)$ that will give the total costs of selling x bottles.

b) Find the revenue function, $R(x)$.

c) Find the profit function, $P(x)$.

d) Will there be a profit or a loss during the first year? Explain.

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

f) If 20,000 bottles have been produced, what is the additional cost of producing the 20,001 bottle?

g) What is the average cost of producing 40,000 bottles?

Q.3 (6 points): A market research firm determines that the demand for a particular product, in terms of purchases per thousand population, is 15 when the product is priced at $p = \$20$, but only 5 when the product is priced at $\$60$.

a) Find a linear demand function for this product in terms of the price p.

b) If the product were priced at \$20, what would be the demand?

c) At what price is the demand 0?

Q.4 (10 points): Use the simplex method to maximize $f = 2x + 3y$

subject to the constraints:
$$\begin{aligned} x + y &\le 8 \\ 2x + y &> 10 \\ x + y &\ge 4 \\ x \ge 0 &\ , \ y \ge 0 \end{aligned}$$

Q.5 (6 points): Consider the following system of linear equations:
$$\begin{aligned} 3x + 7y + 6z &= 26 \\ x + 2y + z &= 8 \end{aligned}$$

a) Use **Gaussian Elimination Method** to find the solution set for the system.

b) Give two possible solutions of the system.

Q.6 (6 points): Let $A=\begin{bmatrix}2 & 3\\ 1 & -2\end{bmatrix}$, $B=\begin{bmatrix}1 & 0\\ 2 & 3\end{bmatrix}$, and $C=\begin{bmatrix}2 & 1\\ 1 & 0\\ 3 & 2\end{bmatrix}$

a) Find $C.(A+I_2)$

b) Find A^{-1}

c) C^T

Q.7 (4 points): Let x be the number of miles, in thousands, that a particular tire is driven and $f(x)=2\left(1-\frac{x}{40}\right)$ be the depth of the tread in centimeters. Find the domain of this function.

Q.8 (5 points): The shaded region represents the solution set of the following linear programming problem:

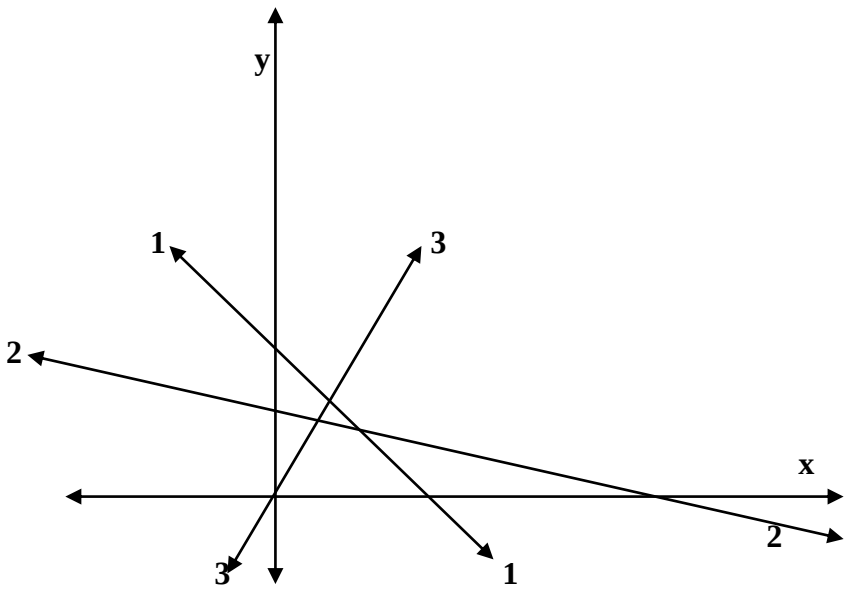
$x+y\le 9$ ⟶ **1**

$x+3y\le 15$ ⟶ **2**

$3x-y\ge 0$ ⟶ **3**

$x\ge 0\ ,\ y\ge 0$

Maximize the objective function $f=3x+2y$



Q.9 (6 points): In a box of 100 jackets, 6 are defective. In how many ways can a sample of 3 be drawn from the box, without replacements and without regard to order, if

a) All of the jackets drawn are good.

b) All are defective.

c) Exactly two are defective.

Q.10 (8 points): A pair of dice, one red and one green, is to be rolled.

a) Find the probability that a sum less than five is rolled.

b) Find the probability that a sum less than five and greater than ten will be rolled.

c) Find the probability that a sum of six or a double is rolled

d) Find the odds against a sum of five being rolled.

Q.11 (5 points): Four boys and three girls are arranged in a row. What is the probability that:

a) A boy will be seated in the left end seat?

b) A boy will be seated in the left end seat or a girl will be seated in the right end seat?

Q.12 (8 points): The following data refer to deaths involving firearms in the United States in 1997.

	Male	Female
Intentional	26,643	4,542
Unintentional	856	125

Based on these data, what is the probability that a person who was killed:

a) Was a male?

b) Was a male and killed intentionally?

c) Was a female or killed unintentionally?

d) Was killed intentionally **given** that the person was a female?

Q.13 (6 points): Three marbles are drawn, in succession and without replacement, from a box containing four red and five green marbles. Find the probability that:

a) The first marble drawn will be red and the last two green

b) The first marble drawn will be red, the second green, and the third red

c) All three marbles will be red

Q.14 (7 points): It is known that flu vaccines are 95% effective. Suppose that two people who live in different parts of the country take flu vaccines. What is the probability that:

a) Both will get the flu?

b) Neither will get the flu?

c) At least one will get the flu?