Name:________________________________

$I \quad D$ $N \quad O$	:							$DR.$ $LATIF$	$Sec\ \#$ $9:20$	01 am	

$Time$ 180 Min	$Seat$: $No.$:				$Marks$ 174		.	$Serial$ _____	$Number$ _______

NOTE: 1. The questions are not in any order of difficulty at all. 2. All questions carry equal number of marks. 3. Only the nonprogramable calculators are allowed. 4. All types of PAGERS, OR MOBILES ARE NOT ALLOWED to be with you during the examination. 5. Use an HB 2 pencil. 6. Use a good eraser. Do not use the eraser attached to the pencil. 7. Write your name, ID number and Section number on the examination paper and in the upper left corner of the answer sheet. 8. When bubbling your ID number and Section number, be sure that bubbles match with the number that you write. 9. The test Code Number is already typed and bubbled in your answer sheet. Make sure that it is the same as that printed on your question paper. 10. When bubbling, make sure that the bubbled space is fully covered. 11. When erasing a bubble, make sure that you do not leave any trace of penciling. 12. Count that the Test has Twenty-Nine Questions and Eighteen Pages. 13. Please BUBBLE carefully only right answer letter (A or B or C or D or E) corresponding to the correct answer to each question in the enclosed computerized Omar Sheet, with pencil only. 14. Please do not leave any question unbubbled in the Answer Sheet. 15. Please check that the version of your question paper and the answer sheet enclosed with it matches correctly. The versions are 001, 002, 003, 004.

==

Compound Interest Formulae: $S = P(1+r)^n$, $P = A(1+r)^{-n}$.

Effective Interest Formula: $r_e = \left(1+\frac{r}{n}\right)^n - 1$.

Continuos Interest Formula: Present $P = Ae^{-rt}$. Effective Interest Formula: $r_e = e^r - 1$.

Ordinary Annuity Formulae (End): Future Value = $S = R.\left[\frac{(1+r)^n - 1}{r}\right]$.

Present Value: $A = R.\left[\frac{1-(1+r)^{-n}}{r}\right]$. Annuity Due Formulae (Beginning): Future Value = $S = R.\left[\frac{(1+r)^{n+1}-1}{r} - 1\right]$. Present Value = $A = R.\left[1 + \frac{1-(1+r)^{-n+1}}{r}\right]$.

${}^nP_r = \frac{n!}{(n-r)!}$; $\binom{n}{r} = {}^nC_r = \frac{n!}{r!(n-r)!}$. $\quad \#(A\cup B) = \#(A) + \#(B) - \#(A\cap B)$

Probability Laws: $P(A\cup B) = P(A) + P(B) - P(A\cap B)$. Conditional Probability: $P(A/B) = \frac{P(A\cap B)}{P(B)}$. Events A and B are Independent $\Longleftrightarrow P(A\cap B) = P(A)P(B) \Longleftrightarrow P(A/B) = P(A) \Longleftrightarrow P(B/A) = P(B)$. BINOMIAL DISTRIBUTION: $P(X=x) = \binom{n}{x} p^x q^{n-x}$; $x = 0, 1, 2, 3, 4, \ldots, n$; $q = 1-p$. Mean $= \mu = np$; $Var(X) = \sigma^2 = npq$.Normal Distribution: If X has a normal distribution with $mean$ μ and variance σ^2. Then $Z = \frac{X-\mu}{\sigma}$ has a standard normal distribution with $\mu = 0$ and $\sigma = 1$. $\mu = \sum xf(x)$, $E(X) = \sum x^2 f(x)$, $\sigma^2 = Var(X) = E(X^2) - [E(X)]^2$.

1Q1. The profit function is revenue minus cost; that is,

$P(x) = R(x) - C(x)$.

The weekly expenses of selling x bicycles in the Bike Shop are given by the cost function:

$C(x) = 1200 + 130x$

and revenue is given by:

$R(x) = 210x$.

Then the profit from selling 18 bicycles is:

$(A) \longrightarrow$ 2340

$(B) \longrightarrow$ 1140

$(C) \longrightarrow$ 1200

$(D) \longrightarrow$ 240

$(E) \longrightarrow$ 1440

==

2Q2. Optimal Land Use. A farmer has 1000 acres of land on which corn, wheat, or soybeans can be grown.

Each acre of corn costs $\$ 100$ for preparation, requires 7 days of labor, and yields a profit of $\$ 30$.

An acre of wheat costs $\$ 120$ to prepare, requires 10 days of labor, and yields $\$ 40$ profit.

An acre of soybeans costs $\$ 70$ to prepare, requires 8 days of labor, and yields $\$ 40$ profit.

Suppose the farmer has $\$ 10000$ for preparation and can count on enough workers to supply 8000 days of labor.

Let x represent the acres of corn, let y represent the acres of wheat, and let z represent the acres of soybeans.

Set up the linear programing problem by writing the constraints in the form of a system of linear inequalities to maximize the profit function $P = 30x + 40y + 40z$ without solution.

$$A.\begin{cases} x + y + z \geq 1000 \\ 100x + 120y + 70z \geq 10000 \\ 7x + 10y + 8z \geq 8000 \\ x \geq 0, \quad y \geq 0, \quad z \geq 0 \end{cases}$$

==================================

$$B.\begin{cases} x + y + z \leq 1000 \\ 100x + 120y + 70z \geq 10000 \\ 7x + 10y + 8z \leq 8000 \\ x \geq 0, \quad y \geq 0, \quad z \geq 0 \end{cases}$$

==================================

$$C.\begin{cases} x + y + z \leq 1000 \\ 100x + 120y + 70z \leq 8000 \\ 7x + 10y + 8z \leq 10000 \\ x \geq 0, \quad y \geq 0, \quad z \geq 0 \end{cases}$$

==================================

$$D.\begin{cases} x + y + z \geq 1000 \\ 100x + 120y + 70z \leq 10000 \\ 7x + 10y + 8z \leq 8000 \\ x \geq 0, \quad y \geq 0, \quad z \geq 0 \end{cases}$$

==================================

$$E.\begin{cases} x + y + z \leq 1000 \\ 100x + 120y + 70z \leq 10000 \\ 7x + 10y + 8z \leq 8000 \\ x \geq 0, \quad y \geq 0, \quad z \geq 0 \end{cases}$$

==

3Q3. Use the Simplex Method to solve the standard linear programing problem.

Maximize: $Z = x_1 + 3x_2 + x_3$,

subject to constraints:

$$\begin{cases} 4x_1 + x_2 + x_3 \leq 372 \\ x_1 + 8x_2 + 6x_3 \leq 2978 \\ x_1 \geq 0, \quad x_2 \geq 0, \quad x_3 \geq 0 \end{cases}$$

Initial Simplex Tableau:

$$\begin{bmatrix} 4 & 1 & 1 & 1 & 0 & 0 & : & 372 \\ 1 & 8 & 6 & 0 & 1 & 0 & : & 2978 \\ .. & .. & .. & .. & .. & .. & : & \cdots \\ -1 & -3 & -1 & 0 & 0 & 1 & : & 0 \end{bmatrix}$$

The Maximum Value of $Z =$

$(A) \longrightarrow 372$

$(B) \longrightarrow 2232$

$(C) \longrightarrow 2978$

$(D) \longrightarrow 1488$

$(E) \longrightarrow 1116$

==

4Q4. The demand function for a manufacturer's product is $p = f(q) = 800 - 2q$, where p is the price (in dollars) per unit when q units are demanded (per week).

Find the level of production that maximizes the manufacturer's total revenue.

$[\mathrm{Re}\, venue = r = qp]$

$(A) \longrightarrow 100$

$(B) \longrightarrow 125$

$(C) \longrightarrow 150$

$(D) \longrightarrow 175$

$(E) \longrightarrow 200$

==

5Q5. An automobile factory produces two models.

The first model requires 1 hour to paint and $\frac{1}{2}$ hour to polish.

The second requires 1 hour for each process.

During each hour that the assembly line is operating, there are 100 hours available for painting and 80 hours for polishing.

How many of the first model can be produced each hour if all the hours available are to be used?

$(A) \longrightarrow 70$

$(B) \longrightarrow 60$

$(C) \longrightarrow 50$

$(D) \longrightarrow 40$

$(E) \longrightarrow 30$

==

6Q6. One solution of the system

$$\begin{cases} x - y^2 & = 0 \\ 3x + 2y - 5 & = 0 \end{cases}$$

is $x = 1$ and $y = 1$.

Another solution is $x = \alpha$ and $y = \beta$. Then $\alpha - \beta =$

$(A) \longrightarrow \dfrac{24}{25}$

$(B) \longrightarrow \dfrac{40}{9}$

$(C) \longrightarrow 28$

$(D) \longrightarrow 2$

$(E) \longrightarrow 0$

==

7Q7. The supply and demand equations for a product are

$p = \dfrac{1}{10}q + 20$

and $p = 200 - \dfrac{1}{2}q,$

respectively, where q represents the number of units and p represents the price per unit in dollars. The equilibrium price is

$(A) \longrightarrow$ \$ 10

$(B) \longrightarrow$ \$ 20

$(C) \longrightarrow$ \$ 30

$(D) \longrightarrow$ \$ 40

$(E) \longrightarrow$ \$ 50

==

8Q8. 219TB6.5.2 By using matrix reduction, solve the system:

$$\begin{cases} x - y - 3z - 4u &= 3 \\ 3x + y - z + 4u &= 5 \end{cases}, \text{ then}$$

$(A) \longrightarrow x = 3 - 6u,\ y = 4 - u,\ z = -\ 2 + 3u,\ u = u$

$(B) \longrightarrow x = 3 - 6u,\ y = 4 + u,\ z = -\ 2 + 3u,\ u = u$

$(C) \longrightarrow x = -1 + u,\ y = 3u,\ z = 6 + 2u,\ u = u$

$(D) \longrightarrow x = -1 + z - u,\ y = 4 + 2z + u,\ z = z,\ u = u$

$(E) \longrightarrow x = 2 + z,\ y = -1 - 2z - 4u,\ z = z,\ u = u$

==

9Q9. A trust fund for a $12 - year\ -old$ child is being set up so that when the child is 21 years old there will be \$ 24000.

If the fund earns interest at the rate of 7.25 % compounded quarterly, how much money should be paid into the fund initially?

$(A) \longrightarrow$ \$ 11589.25

$(B) \longrightarrow$ \$ 13568.65

$(C) \longrightarrow$ \$ 12571.05

$(D) \longrightarrow$ \$ 11235.85

$(E) \longrightarrow$ \$ 13450.50

==

10Q10. A debt of \$ 12000, which is due 10 years from now, is instead to be paid off by four payments: \$ 3000 now, \$ 2000 in 3 years, \$ 2000 in 6 years, and a final payment at the end of 8 years.
What would this payment be if an interest rate of 5.5 % compounded semiannually is assumed?

$(A) \longrightarrow$ \$ 1282.91

$(B) \longrightarrow$ \$ 1385.78

$(C) \longrightarrow$ \$ 1128.24

$(D) \longrightarrow$ \$ 1425.20

$(E) \longrightarrow$ \$ 1185.49

==

11Q11. A student must select two courses in the liberal arts and three courses in the social sciences. There are six arts courses and ten social science courses, all of which are different, from which the student may choose.

How many selections are possible.

$(A) \longrightarrow 6$

$(B) \longrightarrow 135$

$(C) \longrightarrow 750$

$(D) \longrightarrow 1800$

$(E) \longrightarrow 21600$

==

12Q12. If X is a binomial random variable involved with six independent trials, and the probability of success on any trial is $\frac{1}{4}$, then the probability that $X = 2$ is

$(A) \longrightarrow \frac{2}{4^6}$

$(B) \longrightarrow \frac{9}{4^6}$

$(C) \longrightarrow \frac{81}{4^6}$

$(D) \longrightarrow \frac{1215}{4^6}$

$(E) \longrightarrow \frac{2430}{4^6}$

==

13Q13. From a group of 10 men and 10 women, two people are randomly selected to form a committee. If X is the number of women on the committee, then $P(X=2)=$

$(A) \longrightarrow \frac{1}{5}$

$(B) \longrightarrow \frac{5}{38}$

$(C) \longrightarrow \frac{9}{38}$

$(D) \longrightarrow \frac{7}{380}$

$(E) \longrightarrow \frac{17}{380}$

==

14Q14. A company has 7 senior and 5 junior officers.

It wants to form an ad hoc legislative committee.

In how many ways can a $4-officer$ committee be formed so that it is composed of at least 2 senior officers?

$(A) \longrightarrow 495$

$(B) \longrightarrow 35$

$(C) \longrightarrow 175$

$(D) \longrightarrow 210$

$(E) \longrightarrow 420$

==

15Q15. Quality Control. A shipment of 60 game players, including 9 that are defective, is sent to a retail store.

The receiving department selects 10 at random for testing and rejects the whole shipment if 1 or more in the sample are found to be defective.

What is the probability that the shipment will be rejected?

$(A) \longrightarrow 0.83$

$(B) \longrightarrow 0.67$

$(C) \longrightarrow 0.17$

$(D) \longrightarrow 0.75$

$(E) \longrightarrow 0.55$

==

16Q16. From a survey involving 1000 university students, a market research company found that 750 students owned laptops, 450 owned cars, and 350 owned cars and laptops.

Suppose that a university student is selected at random.

Let α be the probability that the student owns either a car or a laptop or both?

Let β be the probability that the student owns neither a car nor a laptop?

Then the product of α and β is

$\alpha\beta = \alpha \times \beta =$

$(A) \longrightarrow 0.3375$

$(B) \longrightarrow 0.1275$

$(C) \longrightarrow 0.2625$

$(D) \longrightarrow 0.8725$

$(E) \longrightarrow 0.6375$

==

17Q17. Test Scores. The scores on a national achievement test are normally distributed with mean $\mu = 500$ and standard deviation $\sigma = 100$.

What percentage of those who took the test had a score between 300 and 700?

$$\left[\begin{array}{c} \underline{Z = Z - Score} : P(Z < 0) = 0.500;\ P(0 < Z < 1.00) = 0.3413; \\ P(0 < Z < 2.00) = 0.4772;\ P(0 < Z < 3.00) = 0.4987. \end{array} \right]$$

$(A) \longrightarrow 50\ \%$

$(B) \longrightarrow 60\ \%$

$(C) \longrightarrow 75\ \%$

$(D) \longrightarrow 95\ \%$

$(E) \longrightarrow 85\ \%$

==

18Q18. A computer hardware company placed an ad for its new modem in a popular computer magazine. The company believes that the ad will be read by $35\ \%$ of the magazines's readers and that $4\ \%$ of those who read the the ad will buy the modem.

Assume that this is true, and find the probability that a reader of the magazine will read the ad and buy the modem.

Let R denote the event "read ad" and B denote "buy modem". Then $P(R \cap B) =$

$(A) \longrightarrow 0.0986$

$(B) \longrightarrow 0.014$

$(C) \longrightarrow 0.0875$

$(D) \longrightarrow 0.343$

$(E) \longrightarrow 0.624$

==

19Q19. *Shooting Gallery* At a shooting gallery, suppose Bill, Jim, and Linda each take one shot at a moving target. The probability that Bill hits the target is 0.7, and for Jim and Linda, the probabilities are 0.6, and 0.7, respectively. Assume independence. Let α be the probability that exactly one of them hits the target and let β be the probability that exactly two of them hit the target. Then the sum $\alpha + \beta =$

$(A) \longrightarrow 0.222$

$(B) \longrightarrow 0.448$

$(C) \longrightarrow 0.67$

$(D) \longrightarrow 0.9856$

$(E) \longrightarrow 0896$

==

20Q20. (Ordinary Annuity). Mary decides to put aside $\$ 100$ at the end of every month in an insurance fund that pays 8 % compounded monthly.

After making 8 monthly deposits (payments), how much money does Mary have?

The amount S after 8 months is in the interval:

$(A) \longrightarrow [800,\ 820)$

$(B) \longrightarrow [820,\ 830)$

$(C) \longrightarrow [830,\ 840)$

$(D) \longrightarrow [840,\ 850)$

$(E) \longrightarrow [850,\ 900)$

==

21Q21. If money earns interest at an annual rate of $8\ \%$ compounded continuously, then the present value (in dollars) of $\$\ 10000$ due at the end of five years is

$(A) \longrightarrow 10000e^{-0.4}$

$(B) \longrightarrow 10000e^{0.4}$

$(C) \longrightarrow \dfrac{e^{0.4}}{10000}$

$(D) \longrightarrow 10000\,(1.08)^{-5}$

$(E) \longrightarrow 10000\,(1.08)^{5}$

==

22Q22. Production.

The manufacturer of an automobile requires painting, drying, and polishing.

The Rome Motor Company produces three types of cars: the Centurion, the Tribune, and the Senator.

Each Centurion requires 8 hours for painting, 2 hours for drying, and 1 hour for polishing.

A Tribune needs 10 hours for painting, 3 hours for drying, and 2 hours for polishing.

It takes 16 hours of painting, 5 hours of drying, and 3 hours of polishing to prepare a Senator.

If the company uses 240 hours for painting, 69 hours for drying, and 41 hours for polishing in a given month, how many of each type of car are produced?

Let $x =$ number of Centurion,

$y =$ number of Tribune,

$z =$ number of Senator.

Set up the system of linear equations without solution.

$$A.\begin{cases} 8x + 2y + z = 240 \\ 10x + 3y + 2z = 69 \\ 16x + 5y + 3z = 41 \end{cases}$$

$$B.\begin{cases} 8x + 10y + 16z = 240 \\ 2x + 3y + 5z = 69 \\ x + 2y + 3z = 41 \end{cases}$$

$$C.\begin{cases} 8x + 16y + 10z = 240 \\ 2x + 5y + 3z = 69 \\ x + 3y + 2z = 41 \end{cases}$$

$$D.\begin{cases} 8x + 10y + 16z = 41 \\ 2x + 3y + 5z = 69 \\ x + 2y + 3z = 240 \end{cases}$$

$$E.\begin{cases} 16x + 10y + 8z = 240 \\ 3x + 2y + 5z = 69 \\ x + 3y + 2z = 41 \end{cases}$$

==

23Q23. Find $Mode$, $Median$, and $Mean$ of

the Data Set: 4, 5, 5, 5, 6, 6, 7, 10, 15 .

Then the PRODUCT of $Mode$, $Median$, and $Mean$ is equal to:

$(A) \longrightarrow$ 270

$(B) \longrightarrow$ 252

$(C) \longrightarrow 240$

$(D) \longrightarrow 210$

$(E) \longrightarrow 180$

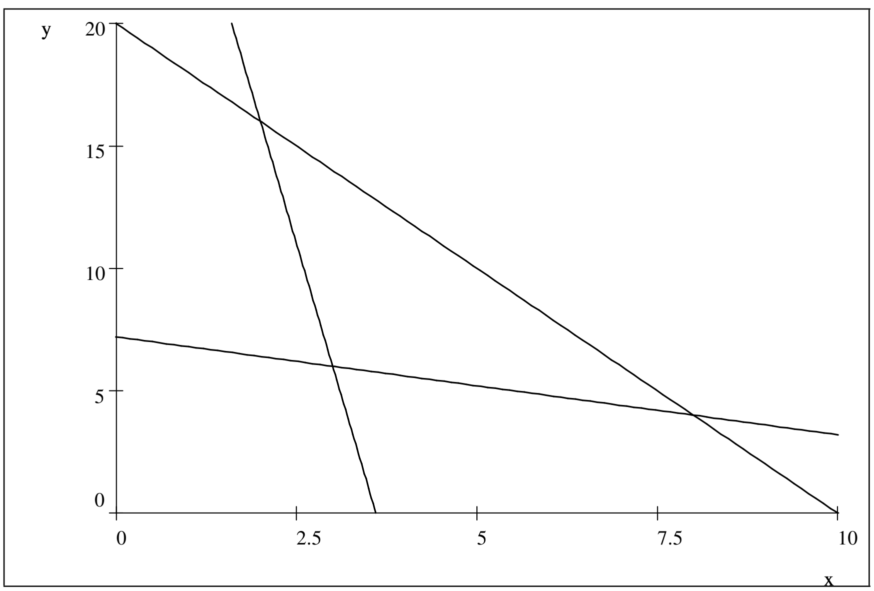
==

24Q24. Use Geometric (Graphical) Method to solve the following Linear programing problem.

Minimize and Maximize : $z = 3x + y$

subject to

$$\begin{cases} 2x + y \leq 20 \\ 10x + y \geq 36 \\ 2x + 5y \geq 36 \\ x , y \geq 0 \end{cases}$$



Let M and m denote the maximum and minimum values of $z = 3x + y$, respectively.

Then the SUM $M + m =$

$(A) \longrightarrow 37$

$(B) \longrightarrow 43$

$(C) \longrightarrow 50$

$(D) \longrightarrow 56$

$(E) \longrightarrow 30$

==

25Q25. Suppose that consumers will demand 100 units of a product when the price is $\$ \ 10$ per unit, and 120 units when the price is $\$ \ 8$ per unit.

Assuming that price p and quantity q are linearly related, find the price at which 90 units are demanded.

$(A) \longrightarrow \$ \ 7$

$(B) \longrightarrow \$ \ 9$

$(C) \longrightarrow \$ \ 11$

$(D) \longrightarrow \$ \ 12$

$(E) \longrightarrow \$ \ 13$

==

26Q26. A company will manufacture a total of 5000 units of its product at plants A and B.

At plant A the unit cost for labor and material combined is $\$ \ 2.50$, while at plant B it is $\$ \ 3.00$.

The fixed costs at plant A are $\$ \ 6000$ and at plant B they are $\$ \ 8000$.

Between the two plants the company has decided to allot no more than $\$ \ 28000$ for total costs.

The minimum of units that must be produced at plant A is

$(A) \longrightarrow 1871$

$(B) \longrightarrow$ 2000

$(C) \longrightarrow$ 2500

$(D) \longrightarrow$ 2545

$(E) \longrightarrow$ 2546

==

27Q27. Age. Ten years ago a father was six times as old as his son.

Ten years from now he will be twice (two times) as old as his son.

Let $m =$ present age of father

and let $n =$ present age of his son.

Then the SUM of their ages $m + n =$

$(A) \longrightarrow$ 45

$(B) \longrightarrow$ 50

$(C) \longrightarrow$ 55

$(D) \longrightarrow$ 60

$(E) \longrightarrow$ 65

==

28Q28. Television call Letters. Television station call letters consist of either 3 or 4 letters and must begin with either K or W.

If there are no other restrictions, how many maximum number of call letters are possible ?

(Examples: $KLT, KWW, WTT, KKK,$

$KTK, WWW,$ KWWW, KKKK, WTWM, WKKK, KMMN, WKTT, KWYW, KABW, WECD, WXYZ, KAWZ, KYDT etc).

$(A) \longrightarrow 36504$

$(B) \longrightarrow 35152$

$(C) \longrightarrow 47525504$

$(D) \longrightarrow 474552$

$(E) \longrightarrow 28800$

==

29Q29. A die is loaded so that
$P(1) = P(2) = P(3) = \dfrac{1}{4} = 0.25,$
$P(4) = P(5) = P(6) = \dfrac{1}{12}.$
Let $A = \{1, 2\}$, $B = \{2, 3\}$,
$C = \{3, 4\}$, $D = \{4, 5\}$, $E = \{5, 6\}$.

Then which one of the following statements is FALSE.

$(A) \longrightarrow$ A and B are Independent.

$(B) \longrightarrow$ A and C are Dependent.

$(C) \longrightarrow$ C and D are Dependent.

$(D) \longrightarrow$ A and E are Dependent.

$(E) \longrightarrow$ D and E are Independent.

==

Qn#	A	B	C	D	E	Marks
1				$\surd$		D
2					$\surd$	E
3					$\surd$	E
4					$\surd$	E
5				$\surd$		D
6		$\surd$				B
7					$\surd$	E
8					$\surd$	E
9			$\surd$			C
10	$\surd$					A
11				$\surd$		D
12				$\surd$		D
13			$\surd$			C
14					$\surd$	E
15	$\surd$					A
16		$\surd$				B
17				$\surd$		D
18		$\surd$				B
19			$\surd$			C
20	$\surd$					A
21	$\surd$					A
22		$\surd$				B
23				$\surd$		D
24		$\surd$				B
25			$\surd$			C
26		$\surd$				B
27			$\surd$			C
28	$\surd$					A
29					$\surd$	E
Sum						174