Name:________________________________

$I\ D$ $N\ O$	:							Sec : $No.$:	0 1 10 am	0 2 9 am	$Sr\ No$

$Time$ 180Min	$Seat$: $No.$:				$Marks$ 175	$Marks$: $Secured$:			

NOTE: SHOW ALL NECESSARY STEPS OF THE SOLUTION FOR ALL QUESTIONS INCLUDING THE MULTIPLE CHOICE QUESTIONS. NO FULL CREDIT WITHOUT COMPLETE SOLUTION.

The questions are not in any order of difficulty at all. All the questions may not carry equal number of marks.

Only the nonprogramable calculators are allowed.

In case of Multiple Choice Questions after your precise solution Check $(\surd)$ or Circle Ⓢ only the one right choice.

Write the simplified answer of each question at the specified place at the end of each question.

You are not allowed to use any Mobile phone or Pager during the examination.

Count that you have THIRTY-TWO Questions and Eighteen Pages in this Examination.

Compound Interest Formulae: Future Value = $S = P(1+r)^n$,Present Value = $P = A(1+r)^{-n}$. Effective Interest Formula: $r_e = \left(1+\dfrac{r}{n}\right)^n - 1.$

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

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

Present Value: $A = R.\left[\dfrac{1-(1+r)^{-n}}{r}\right].$

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

Present Value = $A = R.\left[1 + \dfrac{1-(1+r)^{-n+1}}{r}\right].$

$^nP_r = \dfrac{n!}{(n-r)!}$; $\begin{pmatrix} n \\ r \end{pmatrix} = {}^nC_r = \dfrac{n!}{r!\,(n-r)!}.$

$\#(A\cup B) = \#(A) + \#(B) - \#(A\cap B)$

Pr$obability$ Laws: $P(A) = \dfrac{n(A)}{n(S)}$, $P(A\cup B) = P(A) + P(B) - P(A\cap B)$. $P(A^c) = 1 - P(A)$.

Conditional Probability: $P(A/B) = \dfrac{P(A\cap B)}{P(B)}.$

Events A and B are Independent $\Longleftrightarrow$ $P(A\cap B) = P(A)P(B) \Longleftrightarrow P(A/B) = P(A) \Longleftrightarrow P(B/A) = P(B)$.$\mu = E(X) = \sum_{k=1}^{n}(x_k)f(x_k), E(X^2) = \sum_{k=1}^{n}(x_k)^2 f(x_k).$

$\sigma^2 = Var(X) = E\left[(X-\mu)^2\right] = E(X^2) - [E(X)]^2, \sigma =$ St.Dev.$(X) = \sqrt{Var(X)}.$

BINOMIAL DISTRIBUTION: $P(X=x) = \begin{pmatrix} n \\ x \end{pmatrix} p^x q^{n-x}$; $x = 0, 1, 2, 3, 4, \ldots, n$; $q = 1-p$. Mean $= \mu = np$; $Var(X) = \sigma^2 = npq.$

NORMAL DISTRIBUTION: $X \sim N(\mu, \sigma)$ $\Longrightarrow Z = \dfrac{X-\mu}{\sigma} \sim N(\mu = 0, \sigma = 1).$

1Q1. $(Marks: 4)$. Professor Tuff gave a $20 - question$ quiz. She summarized the class performance with the following frequency table:

Number of Correct Answers	Number of Students (f)	Mid−point (x)	$(f)(x)$
$0 - 5$	8		
$6 - 10$	14		
$11 - 15$	23		
$16 - 20$	10		
$S = Sum$	$S =$ ____		$S =$ ____

(Notice that for example 8 scores are in the interval $[0, 5]$, 14 scores are in the interval $[6, 10]$, and so on)

Estimate the AVERAGE (MEAN) of scores (the class average) by using the midpoint of each category (interval) as the actual marks.

Average = Mean =

$$\overline{x} = \frac{\sum_{i=1}^{k} f_i x_i}{\sum_{i-1}^{k} f_i} = \frac{\sum_{i=1}^{k} f_i x_i}{n} = \underline{\hspace{3cm}}.$$

where x_i is the mid-point of the corresponding ith inetrval.

and $n = \sum_{i-1}^{k} f_i$.

Then $\overline{x}$ is in the interval:

$Chice$	CHOICES	$Yes\,(\surd)$
$A \longrightarrow$	(8.0, 8.2]	
$B \longrightarrow$	(8.2, 8.5]	
$C \longrightarrow$	(8.5, 8.8]	
$D \longrightarrow$	(8.8, 9.1]	
$E \longrightarrow$	(9.1, 9.4]	
$F \longrightarrow$	(9.4, 9.7]	
$G \longrightarrow$	(9.7, 10.3]	
$H \longrightarrow$	(10.3, 10.6]	
$I \longrightarrow$	(10.6, 10.9]	
$J \longrightarrow$	(10.9, 11.2]	
$K \longrightarrow$	(11.2, 11.5]	
$L \longrightarrow$	(11.5, 11.8]	
$M \longrightarrow$	(11.8, 12.0]	
$N \longrightarrow$	$NONE\ of\ the\ ABOVE$ $Your\ Answer$ ↓ = ______ = ↑ $Write\ Answer$	

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

2Q.2.$(Marks: 4)$. Find the Mean, Median, Mode, and Range of the following scores on a $100 - point$ Math Test:

Scores: 66, 44, 99, 100, 44, 88, 33, 55, 44, 88, 78, 89.

Average: =

MEAN:...

MEDIAN:.......................................

MODE (S) if Exist:..

RANGE :......................................

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

3Q3. $(Marks:4)$.Find the STANDARD DEVIATION for the following set of numbers through completing the following table.

No.	Number (x_i)	Deviation from Mean $(x_i-\overline{x})$	Square of Deviation $(x_i-\overline{x})^2$
1	$x_1=$ 241		
2	$x_2=$ 248		
3	$x_3=$ 251		
4	$x_4=$ 252		
5	$x_5=$ 257		
6	$x_6=$ 287		
	$Sum=$ 1536		

$$Mean=\overline{x}=\frac{1536}{6}\equiv 256.$$

$Standard\ Deviation = s = \sqrt{\frac{\sum(x-\overline{x})^2}{n-1}}$

$=$ ....

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

4Q4. (Marks: 3). Prof. Mitchell gave a test to five students. He remembered four of the grades: $x_1=72$, $x_2=88$, $x_3=81$, and $x_4=67$ as well as the mean (average), $\overline{x}=78$. What was the other fifth grade x_5?

Grade: $x_5=$ ________________.

5Q5. $(Marks:4)$.Statement: The numbers of immigrants to the United States (in thousands) from selected parts of the world in 1990 are shown in the table.

Region	Immigrants	$(x-\overline{x})^2$
$EUROPE$	140	3600
$CANADA$	360	25600
$ASIA$	20	32400
$MEXICO$	180	400
$OTHER$ America	300	10000
$TOTAL$	1000	72000

$Note$ that

$$\text{Mean}=\overline{x}=\frac{1000}{5}=200 \text{ thousands}$$

$$\text{Standard Deviation}=\sqrt{\frac{\sum(x-\overline{x})^2}{n-1}}$$

$$s=\sqrt{\frac{72000}{4}}=134.164\cong 134$$

Question: Read each of the following statements very carefully. If the statement is True, then mark True, if the statement is False, then mark False and if statement is neither true nor false, then mark Neither true nor false.

(a) | TRUE | FALSE | NEITHER | | .Europe is within 1 (one) standard deviation from the Mean $(\overline{x}=200)$.

(b) | TRUE | FALSE | NEITHER | | . Mexico is more than 1 (one) standard deviation from the Mean $(\overline{x}=200)$.

(c) | TRUE | FALSE | NEITHER | | Asia is within 2 (two) standard deviations from the Mean $(\overline{x}=200)$.

(d) | TRUE | FALSE | NEITHER | | CANDADA is more than 2 (two) standard deviations from the Mean $(\overline{x}=200)$.

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

6Q6. $(Marks : 5)$. The augmented matrix of the system of linear equations

$$\begin{cases} x + y + z = 6 \\ 2x - y - z = 3 \\ x + 2y + 2z = 0 \end{cases}$$

is given by:

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 6 \\ 2 & -1 & -1 & 3 \\ 1 & 2 & 2 & 0 \end{array}\right].$$

Use the Elemenatary Row Operations to transform this matrix into Reduced Row Echelon Form:

$Elementary \quad Row \quad Operations$

$$\left[\begin{array}{ccc|c} \_\_ & \_\_ & \_\_ & \_\_ \\ \_\_ & \_\_ & \_\_ & \_\_ \\ \_\_ & \_\_ & \_\_ & \_\_ \end{array}\right]$$

$Elementary \quad Row \quad Operations:$

$$\left[\begin{array}{ccc|c} \_\_ & \_\_ & \_\_ & \_\_ \\ \_\_ & \_\_ & \_\_ & \_\_ \\ \_\_ & \_\_ & \_\_ & \_\_ \end{array}\right]$$

$Elementary \quad Row \quad Operations:$

$$\left[\begin{array}{ccc|c} \_\_ & \_\_ & \_\_ & \_\_ \\ \_\_ & \_\_ & \_\_ & \_\_ \\ \_\_ & \_\_ & \_\_ & \_\_ \end{array}\right]$$

$Elementary \quad Row \quad Operations:$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & \_\_ \\ 0 & 1 & \_\_ & \_\_ \\ 0 & 0 & \_\_ & \_\_ \end{array}\right].$$

7Q7. $(Marks : 5)$.Crop Planning. A farmer has at most 200 acres of farmland suitable for cultivating crops A, B, and C.

The cost for cultivating crops A, B, and C are \$ 40, \$ 50, and \$ 30 per acre, respectively.

The farmer has a maximum of \$ 18000 available for land cultivation.

Crops A, B, and C require 20, 30, and 15 hours per acre of labor, respectively, and there is a maximum of 4200 hours of labor available.

If the farmer expects to make a profit of \$ 70, \$ 90, and \$ 50 per acre on crops A, B, and C, respectively, how many acres of each crop should he plant in order to maximize his profit?

Let $x_1 =$ Number of acres of farmland to plant crop A.

Let $x_2 =$ Number of acres of farmland to plant crop B.

Let $x_3 =$ Number of acres of farmland to plant crop C.

Set up the constraints in the form of system of linear inequalities to maximize the profit P and then complete the following initial simplex table.

x_1	x_2	x_3	s_1	s_2	s_3	Z	$Cnst$
1	1	1	1	0	0	0	___
___	___	30	0	1	0	0	___
___	30	___	0	0	1	0	___
___	___	___	___	___	___	___	___
___	___	___	0	0	0	1	0
___	___	___	___	___	___	___	___

==

8Q8. $(Marks: 7)$. A coffee wholesaler blends together three types of coffee that sell for \$ 1.95, \$ 2.10, and \$ 2.25 per pound so as to obtain 100 pounds of coffee worth \$ 2.13 per pound.

If the wholesaler uses the same amount of the two higher-priced coffee, how much of each type must be used in the blend.

Let $x =$ Number of pounds of \$ 1.95 per pound coffee.

Let $y =$ Number of pounds of \$ 2.10 per pound coffee.

Let $z =$ Number of pounds of \$ 2.25 per pound coffee.

The system of linear equations:

$$\begin{bmatrix} \_\_ \; x + \_\_ \; y + \_\_ \; z = \_\_ \\ \_\_ \; x + \_\_ \; y + \_\_ \; z = \_\_ \\ \_\_ \; x + \_\_ \; y + \_\_ \; z = \_\_ \end{bmatrix}$$

SOLUTION

$x =$ ____ , $y =$ ____ , $z =$ ____.

==

9Q9. $(Marks: 2)$. Find the PIVOT element of the tableau.

	x_1	x_2	x_3	s_1	s_2	s_3	Z	$Cnst$
s_1	2	7	1	1	0	0	0	35
s_2	3	3	1	0	1	0	0	21
s_3	4	5	2	0	0	1	0	20
Z	-5	-8	-4	0	0	1		0

(A) $m_{11} = 2$ First Row & Firsr Column.

(B) $m_{12} = 7$ First Row & Second Column.

(C) $m_{13} = 1$ First Row & Third Column.

(D) $m_{21} = 3$ Second Row & First Column.

(E) $m_{22} = 3$ Second Row & Second Column.

(F) $m_{23} = 1$ Second Row & Third Column.

(G) $m_{31} = 4$ Third Row & Firsr Column.

(H) $m_{32} = 5$ Third Row & Second Column.

(I) $m_{33} = 2$ Third Row & Third Column.

(N) $Value$ $\downarrow$ No Above Choice is Correct.

ANS $m_{kn} =$ __ $k =$ ____th Row, $n =$ ____th Column

10Q10. $(Marks : 7)$. Use the Simplex Method to solve the following Standard Maximum Linear Programing Problem:

Maximize: $P = 2x_1 + x_2 + x_3$

subject to the constraints:

$$\begin{cases} x_1 + 2x_2 + 4x_3 \leq 20 \\ 2x_1 + 4x_2 + 4x_3 \leq 60 \\ 3x_1 + 4x_2 + x_3 \leq 90 \\ x_1 \geq 0, \quad x_2 \geq 0, \quad x_3 \geq 0 \end{cases}$$

The Initial Simplex Tableau:

x_1	x_2	x_3	s_1	s_2	s_3	P	$Cnst$
1	2	4	1	0	0	0	20
2	4	4	0	1	0	0	60
3	4	1	0	0	1	0	90
−2	−1	−1	0	0	0	1	0

Pivot on the pivot element $m_{11} = 1$, the first row and the first coumn:

(Complete the following simplex Table).

Elementary Row Operations :

x_1	x_2	x_3	s_1	s_2	s_3	P	$Cnst$
1	2	4	1	0	0	0	___
0	0	___	___	1	0	0	___
0	___	___	___	0	1	0	___
0	___	___	___	0	0	1	___

The Solution is:

Maximum Value P = ____________

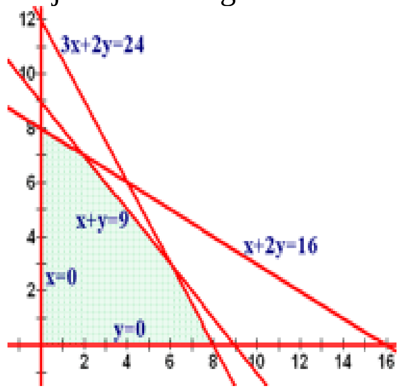
x_1 = ________________

x_2 = ________________

x_3 = ________________

11Q11. $(Marks : 6)$. Maximize $Z = 40x + 30y$

subject to the region indicated in the diagram



and described by the system of linear inequalities:

$$\begin{cases} x + 2y \leq 16 \\ x + y \leq 9 \\ 3x + 2y \leq 24 \\ x \geq 0 \;,\; y \geq 0 \end{cases}.$$

Find the corner points of the feasible region (solution set) of the system of linear inequalities:

Coordinates (x, y) Corner Points	$Z = 40x + 30y$	Maxi-*mum*
(____ , ____)		
(____ , ____)		
(____ , ____)		
(____ , ____)		
(____ , ____)		

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

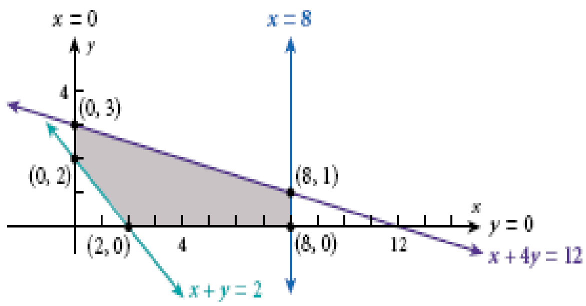


Fig. 1.

12Q12. $(Marks : 5)$.The region described in the diagram (Fig.: 1)

is described by:

$$(A).\begin{cases} x + 4y \le 12 \\ x \le 8 \\ x + y \le 2 \\ x \ge 0 \ , \ y \ge 0 \end{cases}$$

$$(B).\begin{cases} x + 4y \ge 12 \\ x \ge 8 \\ x + y \ge 2 \\ x \ge 0 \ , \ y \ge 0 \end{cases}$$

$$(C).\begin{cases} x + 4y \ge 12 \\ x \ge 8 \\ x + y \le 2 \\ x \ge 0 \ , \ y \ge 0 \end{cases}$$

$$(D).\begin{cases} x + 4y \le 12 \\ x \ge 8 \\ x + y \le 2 \\ x \ge 0 \ , \ y \ge 0 \end{cases}$$

$$(E).\begin{cases} x + 4y \ge 12 \\ x \le 8 \\ x + y \ge 2 \\ x \ge 0 \ , \ y \ge 0 \end{cases}$$

$$(F).\begin{cases} x + 4y \le 12 \\ x \le 8 \\ x + y \ge 2 \\ x \ge 0 \ , \ y \ge 0 \end{cases}$$

(N). NONE OF THE PREVIOUS CHOICES IS COORRECT.

13Q13. $(Marks : 5)$. (Supply and Demand). Suppose the equation for the monthly supply and demand of a certain product are given by:

$$Supply \ : \ q = 3p^2 - 4p$$

$$Demand \ : \ q = 24 - p^2$$

At the value of p for which supply equals demand, the market is said to be in equilibrium.

Find this value of p.

(Complete Solution is required).

$(A) \longrightarrow p = 1$

$(B) \longrightarrow p = 2$

$(C) \longrightarrow p = 3$

$(D) \longrightarrow p = 4$

$(E) \longrightarrow p = 5$

$(F) \longrightarrow p = 5$

$(G) \longrightarrow p = 7$

$(H) \longrightarrow p = 8$

$(I) \longrightarrow p = 9$

$(J) \longrightarrow p = 10$

$(K) \longrightarrow p = 11$

$(L) \longrightarrow p = 12$

$(N) \longrightarrow$ NONE OF THE ABOVE CHOICES.

$Write \ Your \ Answer = p =$ __________.

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

14Q14. $(Marks : 4)$. A prisoner can escape from the penitentiary (A correctional institution for those convicted of major crimes) by digging a tunnel under the east wall, climbing over the west wall, or hiding in a laundry truck leaving the north gate.

He can then proceed along the stream or along the back road to the highway intersection,

where he can take the north, south, east, or west highway.

Penitentiary $\longrightarrow$

$\longrightarrow$ Digging - East Wall $\longrightarrow$
$\longrightarrow$ Climbing -West Wall $\longrightarrow$
$\longrightarrow$ Laundry Truck - North Gate $\longrightarrow$

$\longrightarrow$

$\longrightarrow$ Stream $\longrightarrow$
$\longrightarrow$ Highway Intersection(back road) $\longrightarrow$

$\longrightarrow$

$\longrightarrow$

$\longrightarrow$ North Highway $\longrightarrow$
$\longrightarrow$ South Highway $\longrightarrow$
$\longrightarrow$ East Highway $\longrightarrow$
$\longrightarrow$ West Highway $\longrightarrow$

$\longrightarrow$ Disappeared.

(a). How many escape routes are possible.

Number of Escape Routes $=$ ____________

(b). If the north and west highways are blockaded (closed),

how many escape routes are possible?

Number of Escape Routes $=$ ____________

(c). If it known that the prisoner did not hide in the laundry truck and did not take the back road,

how many escape routes are possible?

$Number$ of Escape Routes $=$ ____________

(d) If it is known that the prisoner took the south highway,

how many escape routes are possible?

Number of Escape Routes $=$ ____________

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

15Q15. $(Marks : 5)$. Four girls and three boys are to be seated in a row.

(a) In how many different ways can they be seated?

Number of Ways $=$ ____________

(b) In how many different ways can they be seated if all the girls sit together and all the boys sit together?

Number of Ways $=$ ____________

(c) In how many different ways can they be seated if all the girls sit together?

Number of Ways $=$ ____________

(d) In how many different ways can they be seated if Mary and Joan have seats at the ends of the row?

Number of Ways $=$ ____________

(e) In how many different ways can they be seated if girls and boys alternate?

Number of Ways $=$ ____________

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

16Q16. $(Marks : 3)$ .A survey of 1000 shoppers at the SHOPMUCH mall indicated that 700 shopped at Highway Department Store,

600 shopped at Midway Department Store,

and 550 shopped at both stores.

(a) . How many of the shoppers did not go to either of these both stores?

$Neither \quad Highway \quad Dep.Store$
(Number of shoppers) $=$ ______
$Nor \quad Midway \quad Dep.Store$

(b) How many of the shoppers went exactly to one of these both stores.

Number of shoppers
who went exactly $=$ ____________
$to\ one$ of both $Stores$

(c) How many of the shoppers went to at least (minimum) one of these both stores.

Number of shoppers
who went to at least $=$ ____________
one of both $Stores$

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

17Q17. $(Marks : 6)$. Binomial Distribution. A certain system for betting on horses produces winners 40 % of the time.

(a) What is the probability the system produces exactly 3 winners out of 8 on a race day?

(BINOMIAL DISTRIBUTION:

$P(X = x) = \binom{n}{x} p^x q^{n-x};$

$x = 0,\ 1,\ 2,\ 3,\ 4,\ . . ., n;$

$q = 1 - p.)$

Probability: = ______________________.

(b) What is the probability the system produces at least (minimum) 2 winners out of 8 on a race day?

Probability: = ______________________.

(c) What is the probability the system produces at most (maximum) 2 winners out of 8 on a race day?

Probability: = ______________________.

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

18Q18. $(Marks: 6)$. (Employee Compensation). The incomes of industrial workers in a certain region are NORMALLY distributed with a mean of $\mu = \$\ 12500$ and a standard deviation of $\sigma = \$\ 1000$.

Find the probability that a randomly selected worker has an income between $\$\ 11000$ and $\$\ 14000$.

$\Pr obability := $ ____________________.

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

19Q19. $(Marks: 6)$.$(Academic$ Testing). Each question on a multiple $-$ choice test has 5 choices, only one of which is correct.

There are 100 questions together.

The passing grade is at least 60.

Estimate the probability by using the Normal distribution to the Binomial Approximation that someone who guesses at random on each question will pass the test.

$\Pr obability := $ ________________________.

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

20Q20. $(Marks: 7)$.Management. A sample shipment of five electric motors is chosen at random. Let X be a random variable denoting the number of defective electric motors in the sample of five electric motors.

The probability of exactly $X = 0,\ 1,\ 2,\ 3,\ 4,\ or$ 5 motors being defective is given in the following table.

$X =$ Number Defective	Probability
0	0.31
1	0.25
2	0.18
3	0.12
4	0.08
5	0.06

Find the probability that

(a) no more than 3 are defective.

$P(X \leq 3) \quad = \quad$ ______________

(b) at least (minimum) 3 are defective.

$P(X \geq 3) \quad = \quad$ ______________

(c) Find $P(2X + 1 > 3)$.

$P(2X + 1 > 3) \quad = \quad$ ______________

(d) Find the expected number of defective items.

$E(X) \quad = \quad$ ______________

(e) Find the expected value of X^2.

$E(X^2) \quad = \quad$ ______________

(f) Find the Variance $Var(X) = \sigma^2 = E(X^2) - [E(X)]^2$.

$Var(X) \quad = \quad$ ______________

(g) Find the probability $P(2X - 6 = 0)$.

$P(2X - 6 = 0) \quad = \quad$ ____________

21Q21. $(Marks: 6)$.Social Scince. A Professor of Math 131 found that $85\ \%$ of the students in his class had passed a course in Algebra, $60\ \%$ had passed a course in Trigonometry, and $55\ \%$ had passed both courses.

Find the probability that a student selected randomly from Math 131 class has passed

(a) at least (minimum) one of the two courses [Algebra or Trigonometry or Both courses].(Complete Solution is Required).

$(K) \longrightarrow 0.55$

$(L) \longrightarrow 0.60$

$(P) \longrightarrow 1.00$

$(Q) \longrightarrow 0.85$

$(R) \longrightarrow 0.90$

$(S) \longrightarrow 1.45$

$(T) \longrightarrow 0.45$

$(S) \longrightarrow 0.51$

$(V) \longrightarrow 0.2805$

$(W) \longrightarrow 0.4675$

$(Y) \longrightarrow 0.30$

$(Z) \longrightarrow 0.10$

$(X) \longrightarrow NO\ \Pr evious\ Choice\ is\ Coorect.$

$Write\ \ Your\ \ Answer\ = \Pr ob. =$ _______.

(b) exactly one of the two courses of Algebra and Trigonometry. (Complete Solution is Required).

$(A) \longrightarrow 0.55$

$(B) \longrightarrow 0.60$

$(P) \longrightarrow 1.00$

$(Q) \longrightarrow 0.85$

$(M) \longrightarrow 0.90$

$(S) \longrightarrow 1.45$

$(T) \longrightarrow 0.35$

$(U) \longrightarrow 0.51$

$(V) \longrightarrow 0.2805$

$(W) \longrightarrow 0.4675$

$(Y) \longrightarrow 0.30$

$(Z) \longrightarrow 0.10$

$(N) \longrightarrow$ NONE OF THE ABOVE CHOICES.

$Write\ \ Your\ \ Answer = \Pr ob. =$ ________.

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

22Q22. $(Marks : 8)$. College Selection and Family Income. A survey of 175 students resulted in the data shown in Table, which shows the type of college the student attends and the income level of the student's family.

$\overrightarrow{College}$ Income ⇓	Private College	Public College	Total
High Income	14	11	25
Middle Income	25	55	80
Low Income	10	60	70
Total	49	126	175

Suppose a student in the survey is randomly selected.

(a) Find the probability that the student attends a public college, given that the student comes from a middle-income family.

$\Pr obability : =$ ____________________.

(b) Find the probability that the student is from a high-income family, given that the student attends a private college.

$\Pr obability : =$ ____________________.

(c) If the student comes from a high-income family, find the probability that the student attends a private college.

$\Pr obability : =$ ____________________.

(d) Find the probability that the student attends a public college or comes from a low-income family.

$\Pr obability : =$ ____________________.

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

23Q23. $(Marks : 10)$. Shooting Gallery. At a shooting gallery, suppose Bill, Jim, and Linda each take one shot at a moving target.

The probabilty that Bill hits the target is 0.50, and for Jim and Linda, the probabilities are 0.40 and 0.70, respectively.

Assume independence and find each of the following.

(a) The probability that none of them hit the target.

$\Pr obability : =$ ____________________.

(b) The probability that Linda is the only one of them that hits the target.

$\Pr obability : =$ ____________________.

(c) The probability that exactly one of them hits the target.

$\Pr obability : =$ ____________________.

(d) The probability that exactly two of them hit the target.

$\Pr obability : =$ ____________________.

(e) The probability that all of them hit the target.

$\Pr obability : =$ ____________________.

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

24Q24. $(Marks : 6)$. Equation of value. A debt of $\$ 3500$ due six years from now is instead to be paid off by three payments.

$\$ 600$ now, $\$ 1200$ in three years, and a final payment at the end of five years.

What would this payment $\$ x$ be if an interest of 8% compounded quarterly is assumed?

0 Years	1	2	3 Years	4	5 Years	6 Years
$\$ 600$			$\$ 1200$		$\$ x$	$\$ 3500$
Payment			Payment		Payment	Debt

Payment $x =$ __________________ Dollars.

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

25Q25. $(Marks : 6)$. Find the present value of an ordinary annuity of $\$ \ 540$ every month for seven years at the rate of $12 \ \%$ compounded monthly?

Present Value: =________________ Dollars.

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

26Q26. $(Marks : 5)$. Suppose the consumers will purchase q units of a product at a price of $\left(\frac{232}{q} + 329\right)$ dollars per unit.

What is the Minimum number of units q that must be sold in order that sales revenue be at least (minimum) $\$ \ 6812.$ (Complete Solution is Required).

$(A) \longrightarrow q = 5$

$(B) \longrightarrow q = 10$

$(C) \longrightarrow q = 15$

$(D) \longrightarrow q = 20$

$(E) \longrightarrow q = 25$

$(F) \longrightarrow q = 30$

$(G) \longrightarrow q = 35$

$(H) \longrightarrow q = 40$

$(I) \longrightarrow q = 45$

$(J) \longrightarrow q = 50$

$(K) \longrightarrow q = 60$

$(L) \longrightarrow q = 232$

$(M) \longrightarrow q = 329$

$(N) \longrightarrow NONE \ \ OF \ \ THE \ \ ABOVE.$

$Write \ \ Your \ \ Answer \ = \ q =$ ________.

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

27Q27. $(Marks: 4)$. Profit. The daily profit for the garden department of a store from the sale of trees is given by $P(x) = -3x^2 + 252x + 144$, where x is the number of trees sold. Find the number of trees x sold in order to Maximize the profit. (Complte Solution is Required).

$(A) \longrightarrow x = 1$

$(B) \longrightarrow x = 6$

$(C) \longrightarrow x = 21$

$(D) \longrightarrow x = 22$

$(E) \longrightarrow x = 24$

$(F) \longrightarrow x = 34$

$(G) \longrightarrow x = 40$

$(H) \longrightarrow x = 42$

$(I) \longrightarrow x = 45$

$(J) \longrightarrow x = 50$

$(K) \longrightarrow x = 52$

$(L) \longrightarrow x = 84$

$(M) \longrightarrow x = 144$

$(P) \longrightarrow x = 252$

$(N) \longrightarrow NONE$ OF THE ABOVE CHOICES.

$Write\ Your\ Correct\ Answer = x =$ ________.

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

28Q28. $(Marks: 5)$.(Production). A luggage manufacturer produces three types of luggage: economy, standard, and deluxe.

The company produces 1000 pieces of luggage at a cost of \$ 20, \$ 25, and \$ 30 for the economy, standard, and deluxe luggage, respectively.

The manufacturer has budget of \$ 20700.

Each economy luggage requires 6 hours of labor, each standard luggage requires 10 hours of labor, and each deluxe model requires 20 hours of labor.

The manufacturer has a maximum of 6800 hours of labor available.

If the manufacturer sells all the luggage, consumes the entire budget, and uses all the available labor, how many of each type of luggage should be produced?

Let x denote the number of types of economy luggage.

Let y denote the number of types of standard luggage.

Let z denote the number of types of deluxe luggage.

Then set up the system of linear equations (without solution):

$$\begin{cases} \_\_\_\_\ x + \_\_\_\_\ y + \_\_\_\_\ z = \_\_\_\_ \\ \_\_\_\_\ x + \_\_\_\_\ y + \_\_\_\_\ z = \_\_\_\_ \\ \_\_\_\_\ x + \_\_\_\_\ y + \_\_\_\_\ z = \_\_\_\_ \end{cases}$$

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

29Q29. $(Marks : 6)$ .Nutrition People. A dietition in a hospital is to arrange a special diet using three foods, X, Y, and Z.

Each ounce of food X contains 20 units of calcium, 10 units of iron, 10 units of vitamin A, and 20 units of cholesterol.

Each ounce of food Y contains 10 units of calcium, 10 units of iron, 15 units of vitamin A, and 24 units of cholesterol.

Each ounce of food Z contains 10 units of calcium, 10 units of iron, 10 units of vitamin A, and 18 units of cholesterol.

If the minimum daily requirements are 300 units of calcium, 200 units of iron, and 240 units of vitamin A,

how many ounces of each food should be used to meet the minimum requirements and at the same time minimize the cholesterol intake?

Let $x =$ Number of ounces of food X.

Let $y =$ Number of ounces of food Y.

Let $z =$ Number of ounces of food Z.

Set up the Minimum Linear Programming Poblem (without solution):

Minimize ($C = Cholesterol$)

$C =$ ______ $x +$______ $y +$______ z.

subject to the constraints:

$$\_\_\_\_ \; x + \_\_\_\_ \; y + \_\_\_\_ \; z \underbrace{\leq or \geq}_{\substack{\uparrow \\ Check}} \_\_\_\_$$

$$\_\_\_\_ \; x + \_\_\_\_ \; y + \_\_\_\_ \; z \overbrace{\leq or \geq}^{\substack{Check \\ \downarrow}}_{\substack{\uparrow \\ Check}} \_\_\_\_$$

$$\_\_\_\_ \; x + \_\_\_\_ \; y + \_\_\_\_ \; z \overbrace{\leq or \geq}^{\substack{Check \\ \downarrow}}_{\substack{\uparrow \\ Check \\ one}} \_\_\_\_$$

$$x \geq 0 \quad , \quad y \geq 0, \quad z \geq 0$$

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

30Q30. $(Marks : 5)$. If interest is compounded continuously, at what annual rate will a principal of P triplete (Three times) in 18 years? Give your answer to the nearest percent. (Complete Solution is required).

$(A) \longrightarrow r = 2\ \%$

$(B) \longrightarrow r = 3\ \%$

$(C) \longrightarrow r = 4\ \%$

$(D) \longrightarrow r = 5\ \%$

$(E) \longrightarrow r = 6\ \%$

$(F) \longrightarrow r = 7\ \%$

$(G) \longrightarrow r = 8\ \%$

$(H) \longrightarrow r = 9\ \%$

$(I) \longrightarrow r = 10\ \%$

$(J) \longrightarrow r = 11\ \%$

$(K) \longrightarrow r = 12\ \%$

$(L) \longrightarrow r = 13\ \%$

$(M) \longrightarrow r = 14\ \%$

$(P) \longrightarrow r = 15\ \%$

$(N) \longrightarrow$ NONE OF THE ABOVE CHOICES.

$Write \;\; Your \;\; Answer = r =$ _________%

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

31Q31. $(Marks : 5)$. Suppose that consumers will demand $q = 100$ units of a product when the price is $p = \$\ 10$ per unit, and $q = 120$ units when the price is $p = \$\ 8$ per unit.

Assuming that price p and quantity q are linearly related,

find the price at which $q = 90$ units are demanded.

(Complete Solution is required).

$(A) \longrightarrow p = \$\ 3$

$(B) \longrightarrow p = \$\ 4$

$(C) \longrightarrow p = \$\ 5$

$(D) \longrightarrow p = \$\ 6$

$(E) \longrightarrow p = \$\ 7$

$(F) \longrightarrow p = \$\ 8$

$(G) \longrightarrow p = \$\ 9$

$(H) \longrightarrow p = \$\ 10$

$(I) \longrightarrow p = \$\ 11$

$(J) \longrightarrow p = \$\ 12$

$(K) \longrightarrow p = \$\ 13$

$(L) \longrightarrow p = \$\ 14$

$(N) \longrightarrow$ NONE OF THE ABOVE CHOICES.

$Write\ \ Your\ \ Answer = p =$ \$_________

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

32Q32. $(Marks : 11)$.. Read each of the following statements very carefully. Then mark TRUE or FALSE for each of the following statements. You must have to mark at least (minimum) Four statements to be True and at least Four statements to be False.

(A) | TRUE | OR | FALSE | You are given a binomial distribution with $n = 16$ and $p = 0.80$. Then the standard deviation is equal to $\sigma = 2.56$.

(B) | TRUE | OR | FALSE | In a linear programing problem, there may be more than one point that maximizes or minimizes the objective function.

(C) | TRUE | OR | FALSE | The number of different permutations of 4 different objects made from 6 different objects is equal to 4096.

(D) | TRUE | OR | FALSE | The inequality $35q - (21q + 70000) > 0$ has a solution $q > 45000$.

(E) | TRUE | OR | FALSE | Toss a die six times and then toss a coin six times, then the sample space has exactly 2985984 sample points.

(F) | TRUE | OR | FALSE | A cafeteria offers a Combo, which consists of a choice of sandwich and a drink. If there are 5 different sandwiches and 4 different drinks avaiable, then the different number of Combos are equal to 20.

(G) | TRUE | OR | FALSE | If two nonempty events in a sample space are mutually exclusive (disjoint), then they are always Dependent.

(H) | TRUE | OR | FALSE | Every linear programming problem must have a solution.

(J) | TRUE | OR | FALSE | The pivot element is sometimes not in the $(last)$ objective row.

(K) | TRUE | OR | FALSE | One way to solve a minimum linear programing problem is to first solve its dual, which is a maximum linear programing problem.

(L) | TRUE | OR | FALSE | If A and B are two events in a sample space such that $n(A) = 10$, $n(B) = 20$, and $n(A \cap B) = 5$, then $n(A \cup B) = 25$.