



Association of Accounting Technicians of Sri Lanka

Level I Examination - January 2021

Suggested Answers

(102) BUSINESS MATHEMATICS AND STATISTICS (BMS)

Association of Accounting Technicians of Sri Lanka

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THE ASSOCIATION OF ACCOUNTING TECHNICIANS OF SRI LANKA
Level I Examination - January 2021
(102) BUSINESS MATHEMATICS AND STATISTICS
SUGGESTED ANSWERS

(Total 40 Marks)

SECTION - A

Suggested Answers to Question One:

1.1 Government deduction = 100 - 45% = 55%
 Last 3 months bill = Rs.18,000
 Deducted amount = $18,000 \times \frac{55}{100}$
 = Rs.9,900

Answer (2) – Rs.9,900/-

(03 marks)

1.2

$$P = \frac{P_1}{P_0} \times 100$$

$$P = \frac{140}{80} \times 100 = \underline{175\%}$$

Answer (4) – 175%

(03 marks)

1.3

$$r = \frac{[n \sum xy - \sum x \cdot \sum y]}{\sqrt{\{[n \sum x^2 - (\sum x)^2] \times [n \sum y^2 - (\sum y)^2]\}}}$$

$$r = \frac{10 \times 130.64 - 25 \times 50}{\sqrt{(10 \times 65.68 - 25^2)(10 \times 260.48 - 50^2)}}$$

$$= \underline{+0.977}$$

Answer (1) – +0.977

(03 marks)

1.4 The mode is the most commonly occurring value in a distribution.

Mode = 17

Answer (4) - 17

(03 marks)

1.5 $S = xrn$ $S = \text{interest}$, $x = 75,000$, $r = 12$, $n = 2$

Interest = $75,000 \times 0.12 \times 2$

Interest = **Rs.18,000**

Answer (3) – Rs.18,000/-

(03 marks)

1.6 $x = 6,000$, $n = 5$, $r = 0.05$

$$PV = \frac{X(1 - (1 + r)^{-n})}{r}$$

$$PV = \frac{6,000(1 - 1.05^{-5})}{0.05}$$

$PV = \text{Rs. } 25,977 \text{ } \Omega \text{ } **25,980**$

Answer (4) – Rs.25,980/-

(03 marks)

1.7 $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cup B) = 0.38 + 0.22 - 0.06$

$P(A \cup B) = 0.54$

Answer (3) – 0.54

(03 marks)

1.8 $S = X(1 + r/N)^{n \times N}$ $x = 75,000$, $n = 2$, $r = 0.12$, $N = 4$

$S = 75,000 \times (1 + 0.12/4)^{2 \times 4}$

$S = 95,007.76$

$S = **Rs.95,008**$

Answer (1) – Rs.95,008/-

(03 marks)

1.9

Seasons (quarter)	Seasonal Index(S)	Trend (T)	Forecasted Sales (T×S)
1st	0.93	7,617	7,084
(03 marks) 2nd	0.84	7,764	6,522
3rd	1.09	7,912	8,624
4th	1.14	8,060	9,188

Answer (1) – 7,084, 6,522, 8,624, 9,188

(03 marks)

1.10 PV = 400,000, n = 5, r = 0.12

$$PV = \frac{X(1 - (1 + r)^{-n})}{r}$$

$$400,000 = \frac{X(1 - 1.12^{-5})}{0.12}$$

$$X = 400,000 \times \frac{0.12}{(1 - 1.12^{-5})}$$

$$\underline{X = \text{Rs. 110,964}}$$

Answer (3) = Rs.110,964

(03 marks)

1.11

- A → 3
B → 4
C → 1
D → 2

(04 marks)

1.12 $Sk = \frac{3(\bar{X} - Md)}{S}$

Sk = coefficient of skewness

\bar{X} = mean

Md = median

S = standard deviation

$$Sk = \frac{3(710 - 690)}{\sqrt{144}}$$

$$= \frac{60}{12}$$

$$= \underline{5}$$

(02 marks)

1.13 a = 4, d = 3, n = 10

$$T_n = a + (n-1)d$$

$$= 4 + (10-1) \times 3$$

$$= 4 + 9 \times 3$$

$$= \underline{31}$$

(02 marks)

1.14 Statement is "True"

(01 mark)

1.15 Statement is "False"

(01 mark)

(Total 40 marks)

End of Section A

Suggested Answers to Question Two:**Chapter 1 - Fundamental Concepts of Mathematics**

(a)

$$\begin{aligned} 3(4x + 2) &= 30 \\ 12x + 6 &= 30 \\ 12x &= 24 \\ \underline{x} &= \underline{2} \end{aligned}$$

(03 marks)

(b)

$$3x + 5y = -7 \text{ --- } \textcircled{1}$$

$$11x - 8y = 27 \text{ --- } \textcircled{2}$$

$$\textcircled{1} \times 8 \rightarrow 24x + 40y = -56 \text{ --- } \textcircled{3}$$

$$\textcircled{2} \times 5 \rightarrow 55x - 40y = 135 \text{ --- } \textcircled{4}$$

$$\textcircled{3} \times \textcircled{4} \rightarrow 79x = 79$$

$$x = 1$$

Applying $x = 1$ to $\textcircled{1}$

$$3x + 5y = -7$$

$$3 \times 1 + 5y = -7$$

$$5y = -7 - 3$$

$$y = \frac{-10}{5}$$

$$y = -2$$

$$\underline{x = 1 \quad y = -2}$$

(04 marks)

(c)

$$x = 800, r = 5\%, n = 4, S = ?$$

$$S = x(1 + r)^n$$

$$S = 800(1 + 0.05)^3$$

$$= 800 \times 1.05^3$$

$$\underline{= \text{Rs.926.10}}$$

(03 marks)

(Total 10 marks)

Suggested Answers to Question Three:

Chapter 3 - Financial Operative Measures for Business

(a) (i)

$$TC = VC + FC$$

$$\underline{TC = 2q^2 - 12q + 12,000}$$

TC = Total cost

VC = Variable cost

FC = Fixed cost

Total Revenue Function (TR) = Demand Function x Number of Units

$$TR = D \times q$$

$$TR = (q + 8) \times q$$

$$\underline{TR = q^2 + 8q}$$

(04 marks)

(ii) Profit Function = TR - TC

$$= q^2 + 8q - (2q^2 - 12q + 12,000)$$

$$= q^2 + 8q - 2q^2 + 12q - 12,000$$

$$= -q^2 + 20q - 12,000$$

$$\frac{dp}{dq} = -2q + 20 = 0$$

$$2q = 20$$

$$\underline{q = 10}$$

$$\frac{D^2p}{Dq^2} = -2 < 0$$

$$\underline{q = 10}$$

Alternative Answer:

$$TR = q^2 + 8q$$

$$MR = 2q + 8$$

$$TC = 12,000 + 2q^2 - 12q$$

$$MC = 4q - 12$$

Profit is maximum, When MR = MC

$$2q + 8 = 4q - 12$$

$$X = 10$$

Number of units are 10

(03 marks)

(b)

$$TR = 2q^2 + 4q \quad TC = 2q^2 + 2q + 200,000$$

At the Break Even Point;

$$TR = TC$$

$$2q^2 + 4q = 2q^2 + 2q + 200,000$$

$$2q^2 - 2q^2 + 4q - 2q = 200,000$$

$$2q = 200,000$$

$$q = 100,000$$

Break-Even Quantity = 100,000 units

(03marks)

(Total 10 marks)

Suggested Answers to Question Four:

Chapter 5 - Comparing Two Quantitative Variables

(a) $\sum X = 420$, $\sum Y = 360$, $\sum XY = 27,354$, $\sum X^2 = 33,408$, $n = 6$

x	y	x^2	xy
38	42	1,444	1,596
42	44	1,764	1,848
60	52	3,600	3,120
80	71	6,400	5,680
90	75	8,100	6,750
110	76	12,100	8,360
420	360	33,408	27,354

$$b = \frac{n \sum XY - \sum X \cdot \sum Y}{(n \sum X^2 - (\sum X)^2)}$$

$$b = \frac{(6 \times 27,354) - (420 \times 360)}{(6 \times 33,408) - (420^2)}$$

$$b = \frac{164,124 - 151,200}{200,448 - 176,400}$$

$$b = \frac{12,924}{24,048}$$

b = 0.54



$$a = \bar{Y} - b\bar{X}$$

$$a = \frac{360}{6} - \left[0.5374 \times \frac{420}{6}\right]$$

$$a = 60 - 37.56$$

a = 22.38

Therefore least square regression line is,

$$Y = a + bx$$

Y = 22.38 + 0.54x

(07 marks)

(b) Healthcare expense is Rs.75,000/-.

Then substitute $x = 75$

$$Y = 22.38 + 0.54x$$

$$Y = 22.38 + 0.54 \times 75$$

Y = 62.88

Average life expectancy = **63 years**

(03 marks)

(Total 10 marks)

Suggested Answers to Question Five:

Chapter 4 - Data Presentation and Descriptive Measures

(a) **Median**

$$n = 40$$

$$\frac{n}{2} = 20,$$

$$L_1 = 19.5, Fc = 5, fm = 15,$$

$$\text{Median Class} = 29.5 - 19.5$$

$$\text{Md} = L + \frac{\frac{n}{2} - Fc}{fm} \times c$$

$$\text{Md} = 19.5 + \frac{(20 - 5)}{15} \times 10$$

$$\text{Md} = \underline{\underline{29.5}}$$

Median of the monthly salary = Rs.29,500

(03 marks)

(b) **Mean**

Monthly Salary (Rs.'000)	Mid Point x	No. of Employees	fx	fx^2
10 - 19	14.5	5	72.5	1,051.25
20 - 29	24.5	15	367.5	9,003.75
30 - 39	34.5	8	276	9,522
40 - 49	44.5	4	178	7,921
50 - 59	54.5	5	272.5	14,851.25
60 - 69	64.5	3	193.5	12,480.75
		$\Sigma f = 40$	$\Sigma fx = 1,360$	$\Sigma fx^2 = 54,830.00$

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f} = \frac{1360}{40} = \underline{\underline{34}}$$

(03 marks)

(c) Standard Deviation = $\sqrt{\frac{\Sigma fx^2}{\Sigma f} - \left[\frac{\Sigma fx}{\Sigma f}\right]^2}$

$$\begin{aligned} \text{Standard Deviation} &= \sqrt{\frac{54,830}{40} - \left[\frac{1,360}{40}\right]^2} \\ &= \sqrt{1,370.75 - 34^2} \\ &= \sqrt{1,370.75 - 1,156} \\ &= \sqrt{214.75} \\ &= \underline{\underline{14.65}} \end{aligned}$$

OR

$$\begin{aligned} &= \sqrt{\frac{\Sigma fx^2}{\Sigma f} - x^2} \\ &= \sqrt{\frac{54,830}{40} - 34^2} \\ &= \sqrt{1,370.75 - 1,156} \\ &= \sqrt{214.75} \\ &= \underline{\underline{14.65}} \end{aligned}$$

(04 marks)

(Total 10 marks)

End of Section B

Suggested Answers to Question Six:

(A)

Chapter 2 - Financial Mathematics for Business

(a)

Year	Project A	Project B	DF @10%	Project A PV	Project B PV
0	(160,000)	(130,000)	1	(160,000)	(130,000)
1	20,000	45,000	0.909	18,180	40,905
2	50,000	65,000	0.826	41,300	53,690
3	90,000	50,000	0.751	67,590	37,550
				(32,930)	2,145

$$\begin{aligned} NPV_A &= PV-I \\ &= -160,000 + 127,070 \end{aligned}$$

$$\underline{\underline{NPV = -32,930}}$$

$$\begin{aligned} NPV_B &= PV-I \\ &= -130,000 + 132,145 \end{aligned}$$

$$\underline{\underline{NPV = +2,145}}$$

$$\text{So, NPV of Project A} = \underline{\underline{-32,930}}$$

$$\text{NPV of Project B} = \underline{\underline{+2,145}}$$

OR

Project A

$$NPV = \frac{20,000}{1.1^1} + \frac{50,000}{1.1^2} + \frac{90,000}{1.1^3} - 160,000$$

$$\begin{aligned} NPV &= 127,122.46 - 160,000 \\ &= \underline{\underline{-32,877.54}} \end{aligned}$$

Project B

$$NPV = \frac{45,000}{1.1^1} + \frac{65,000}{1.1^2} + \frac{50,000}{1.1^3} - 130,000$$

$$\begin{aligned} NPV &= 132,193.84 - 130,000 \\ &= \underline{\underline{2,193.84}} \end{aligned}$$

(06 marks)

(b) NPV is positive for project B. Project A has a negative NPV.

Therefore, company should invest in project B.

(02 marks)

(B)

Chapter 6 - Probability and its Applications

X	P(X)	XP(x)
2	0.14	0.28
3	0.13	0.39
4	0.23	0.92
5	0.24	1.20
6	0.26	1.56
	1.00	4.35

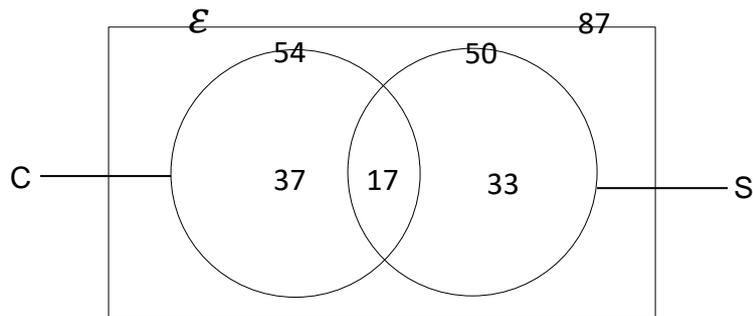
$$E[X] = \sum X \times P(x) = \underline{\underline{4.35}}$$

(04 marks)

(c)

Chapter 6 - Probability and its Applications

(a)



ϵ – All the people in a survey
 C – People who are having a computer
 S – People who are having smart phone

(03 marks)

(b)
$$P\left(\frac{S}{C}\right) = \frac{P(S \cap C)}{PC} = \frac{17}{54}$$

(02 marks)

(D)

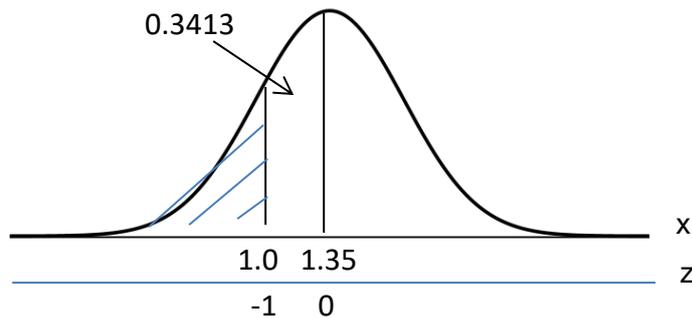
Chapter 6 - Probability and its Applications

X : time taken to service a car (hours)

$\mu=1.35$ $\sigma=0.35$

$$Z = \frac{(X - \mu)}{\sigma}$$

$$Z = \frac{x-1.35}{0.35}$$



$$Z = \frac{1-1.35}{0.35}$$

$$Z = -1.0$$

Probability = $(X < 1.0)$
 = $0.5 - 0.3413$
 = **0.1587 or 15.87%**

The probability that the car servicing center takes less than one hour to service a car is 0.1587 or 15.87%.

(03 marks)
(Total 20 marks)

End of Section C

Notice:

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