Association of Accounting Technicians of Sri Lanka

Level I Examination - January 2022

Suggested Answers

(102) BUSINESS MATHEMATICS AND STATISTICS (BMS)

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THE ASSOCIATION OF ACCOUNTING TECHNICIANS OF SRI LANKA

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(102) BUSINESS MATHEMATICS AND STATISTICS

SUGGESTED ANSWERS

(Total 40 Marks) **SECTION - A**

Suggested Answers to Question One:

1.1 (3)

6y - 4 = 36 + y

6y – y = 36 + 4

5y = 40

x = 40/5

x = 8

(03 marks)

1.2 (2)

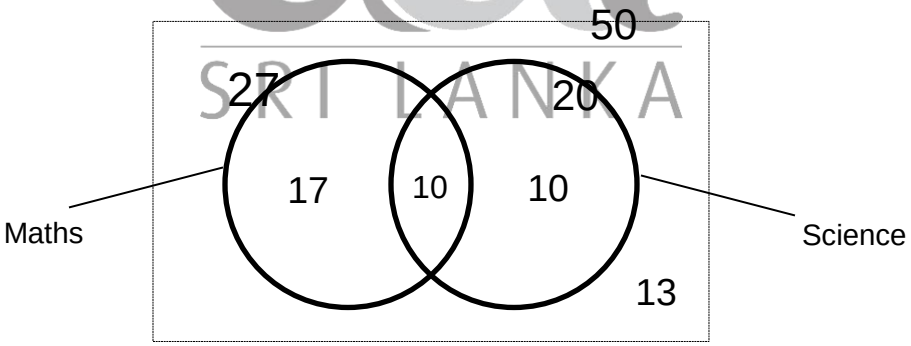
Simple Interest (I) = Pnr P = 45 000, r = 8.0% =0.08, n = 3

= 45 000 X 3 X 0.08

= **Rs.10 800**

(03 marks)

1.3 (4)



The probability that a student of this class attends only Mathematics tuition classes is: $\frac{17}{50}$

(03 marks)

1.4 (2)

$L_1 = 39.5$, $\Delta_1 = 38 - 20 = 18$ C = 10

$\Delta_2 = 38 - 26 = 12$

$$\boldsymbol{Mode\ (M_o) = L_i + \left[\frac{\Delta_1}{\Delta_1 + \Delta_2}\right] \times C}$$

$$M_o = 39.5 + \left[\frac{18}{18 + 12}\right] \times 10$$

$$\boldsymbol{M_o = 45.5}$$

(03 marks)

1.5 (4)

$$r = \frac{n\sum xy - \sum x . \sum y}{\sqrt{(n\sum x^2 - (\sum x)^2)(n\sum y^2 - (\sum y)^2)}}$$

$$r = \frac{6 \text{ X } 5{,}190 - 105 \text{ X } 240}{\sqrt{(6 \text{ X } 2{,}275 - 105^2)(6 \text{ X } 11{,}870 - 240^2)}}$$

= **+0. 9934**

(03 marks)

1.6 (1)

$$Q = \frac{q_1}{q_0} \times 100$$

$$Q = \frac{85}{50} \times 100$$

= **170%**

(03 marks)

1.7 (1)

E(X) = ∑ X × P

= (1 × 0.30) +(2 × 0.35) + (3 × 0.15) + (4 × 0.20)

= **2.25**

(03 marks)

1.8 (2)

$\boldsymbol{S = X(1 + r/N)^{n \times N}}$ x= 15,000 n = 3 r = 0.12 $N = 4$

$S = 15{,}000 \times (1 + 0.12/4)^{3 \times 4}$

S = 21,386.41

S = 21,386

(03 marks)

1.9 (3)

T = 2,759 - 177x

X value for year 2022 is 7

∴ T = 2,759 - 177×7

= 1,520

(03 marks)

1.10 (2)

Cost of product = $\frac{100}{115} \times 3{,}680 =$ **Rs. 3,200**

(03 marks)

1.11

A ⟶ **(3)**
B ⟶ **(1)**
C ⟶ **(4)**
D ⟶ **(2)**

(01 mark each, 04 marks)

1.12

1. Simple random sample
2. Stratified random sample
3. Cluster random sample
4. Systematic random sample

(02 marks)

1.13

$\mathbf{S_n} = \frac{n}{2}\{2a + (n-1)d\}$ a= - 4, d=7, n=20

$S_{20} = \frac{20}{2}\{2 \times (-4) + (20-1)7\}$

$S_{20} = 10(-8 + 133)$

= **1,250**

Alternative Answer:

1st Term = - 4

20th Term = - 4 + (19 × 7)

= 129

$\mathbf{S_{20}} = \frac{20}{2}(a + l)$

$= \frac{20}{2}(-4 + 120)$

= **1,250**

(02 marks)

1.14 False

(01 mark)

1.15 True

(01 mark)

(Total 40 marks)

End of Section A

Suggested Answers to Question Two:

Chapter 01 – Fundamental Concepts of Mathematics

(a)

$8x + 3y = 42$ ———— ①

$5x + 2y = 27$ ———— ②

① × 2 = $16x + 6y = 84$ ———— ③

② × 3 = $15x - 6y = 81$ ———— ④

③ - ④ = $84 - 81$

$\underline{\mathbf{x = 3}}$

① $8 \times 3 + 3y = 42$

$3y = 42 - 24$

$3y = 18$

$\underline{\mathbf{y = 6}}$

(04 marks)

Chapter 01 – Fundamental Concepts of Mathematics

(b)

Method 01-

Monthly salary for the end of 1st year = Rs. 75,000

Monthly salary for the end of 5th year,

$S = X(1 + n)^n$

$= 75,000 (1 + 0.05)^4$

$= 75,000 \times 1.05^4$

$= \underline{\mathbf{91,162.96}}$

Method 02-

Y1	=	75,000	=	75,000.00
Y2	=	75,000 × 1.05	=	78,750.00
Y3	=	78,750 × 1.05	=	82.687.50
Y4	=	82.687.50 × 1.05	=	86,821.87
Y5	=	86,821.87× 1.05	=	**91,162.92**

(03 marks)

Chapter 07 – Index Numbers and Forecasting

(c)

	q_1	q_0	p_1	p_0	p_0q_0	p_1q_0
A	450	600	120	80	48,000	72,000
B	300	400	250	175	70,000	100,000
C	850	750	60	40	30,000	45,000
					148,000	**217,000**

Laspeyre's Price Index (LP) $= \frac{\sum p_1 \times q_0}{\sum p_0 \times q_0} \times 100\ \%$

$= \frac{217\ 000}{148\ 000} \times 100\%$

= **146.62%**

(03 marks)
(Total 10 marks)

Suggested Answers to Question Three:

Chapter 03 – Financial Operative Measures for Business

(a)

Total Cost (TC) Function = Variable Cost + Fixed Cost

$= -q^2 + 24q + 100{,}000$

Total Revenue (TR) Function = Demand × Number of units

$= (49 - q) \times q$

$= 49q - q^2$

(03 marks)

(b)

Marginal Cost (MC) Function = $\frac{d\,(TC)}{dq}$

$\frac{d\,(TC)}{dq} = -q^2 + 24q + 100{,}000$

MC = - 2q + 24

Marginal Revenue (MR) Function = $\frac{d\,(TR)}{dq}$

$\frac{d\,(TR)}{dq} = 49q - q^2$

MR = 49 – 2q

(03 marks)

(c) At the Break Even Point;

TR = TC

$49q - q^2 = -q^2 + 24q + 100{,}000$

$49q - 24q = 100{,}000$

$25q = 100{,}000$

q = 4,000 units

∴ Break-even quantity = 4,000 units

(04 marks)
(Total 10 marks)

Suggested Answers to Question Four:

Chapter 05 – Comparing Two Quantitative Variables

(a) ∑ X =104 , ∑ Y=139 , ∑ XY =2,116, ∑ X^2 =1,466, n = 8

x	y	x^2	xy
8	5	64	40
10	10	100	100
9	8	81	72
12	15	144	180
14	16	196	224
15	20	225	300
16	25	256	400
20	40	400	800
104	**139**	**1,466**	**2,116**

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

$$b = \frac{(8 \times 2{,}116) - (104 \times 139)}{(8 \times 1{,}466) - 104^2}$$

$$b = \frac{16{,}928 - 14{,}456}{11{,}728 - 10{,}816}$$

$$b = \frac{2{,}472}{912}$$

b = 2.71

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

$$= \frac{\varepsilon y}{n} - \frac{b\varepsilon x}{n}$$

$$= \frac{139}{8} - [2.71 \times \frac{104}{8}]$$

$$= 17.375 - (2.71 \times 13)$$

$$= 17.375 - 35.23$$

a = -17.86

The equation,

$$Y = a + bx$$

$$Y = -17.86 + 2.71x$$

$$\boldsymbol{Y = 2.71x - 17.86}$$

(07 marks)

(b) Advertising cost is Rs.25,000/-.

If x = 25

$$y = 2.71x - 17.86$$
$$= (2.71x25) - 17.86$$
$$= 67.75 - 17.86$$
$$= \underline{\underline{\mathbf{49.89}}}$$

Expected sales quantity = **49,890**

(03 marks)

(Total 10 marks)

Suggested Answers to Question Five:

Chapter 04 – Data Presentation and Descriptive Measures

Interval	f	x	fx	x^2	fx^2
40 – 49	35	44.5	1,557.50	1,980.25	69,308.75
50 – 59	22	54.5	1,199.00	2,970.25	65,345.50
60 - 69	28	64.5	1,806.00	4,160.25	116,487.00
70 – 79	24	74.5	1,788.00	5,550,25	133,206.00
80 – 89	26	84.5	2,197.00	7,140.25	185,646.50
90 – 99	15	94.5	1,417.50	8,930.25	133,953.75
	150		**9,965.00**	**30,731.50**	**703,947.50**

(a) Mean $= \frac{\sum fx}{\sum f}$

$= \frac{9,965}{150}$

$= \underline{\underline{\mathbf{66.43}}}$

(03 marks)

(b)

Standard Deviation $= \sqrt{\frac{\sum fx^2}{\sum f} - \bar{x}}$

$= \sqrt{\frac{703,947.50}{150} - 66.43^2}$

$= \sqrt{4,692.983 - 4,412.945}$

$= \sqrt{280.038}$

$= \underline{\underline{\mathbf{16.734}}}$

(04 marks)

(c)

Coefficient of Variation (V) $= \frac{\boldsymbol{Standard\ Deviation}}{\boldsymbol{Mean}} \times \mathbf{100}\%$

$$= \frac{16.734}{66.43} \times \mathbf{100}\%$$

$$= \underline{\mathbf{25.19}}$$

(03 marks)
(Total 10 marks)

End of Section B

Suggested Answers to Question Six:

Chapter 02 – Financial Mathematics for Business

(A)

(a)

Method 1:

$$A = \frac{SR^n (R-1)}{R^n - 1}$$

$$= \frac{120{,}000 \times (1+0.08)^3 (1+0.08-1)}{(1+0.08)^3 - 1}$$

$$= \frac{12{,}093.2352}{0.259712}$$

= 46,564.02

Method 2:

Year	Amount Borrowed	Amount Settled	D.F. (8%)	Pre- Payment
0	120,000	-	1.000	-
1	-	A		
2	-	A	2.577	2.277A
3	-	A		

2.577 A = 120,000

$$A = \frac{120{,}000}{2.577}$$

A = **46,565.77**

(03 marks)

(b) Amortization Table:

Year	Outstanding amount at the Beginning	Interest (8%)	Repayment	Outstanding amount at the End
1	120,000	9,600	46,564	83,036
2	83,036	6,643	46,564	43,115
3	43,115	3,449	46,564	-

(03 marks)

(B)

Chapter 02 – Financial Mathematics for Business

(a)

	0	1	2	3
Option 1				
Cash Flow	(500,000)	200,000	200,000	200,000
D.F. (10%)	1.000	0.909	0.826	0.751
Present Value	(500,000)	181,800	165,200	150,200
NPV (Option 1)				**(2800)**
Option 2				
Cash Flow	(350,000)	150,000	150,000	150,000
D.F. (10%)	1.000	0.909	0.826	0.751
Present Value	(350,000)	136,350	123,900	112,650
NPV (Option 2)				**22,900**

(06 marks)

(b)

	Option 1	Option 2
Investment	500 000	350 000
NPV	**(2800)**	**22,900**

The highest NPV is 22,900. Therefore Option 2 must be selected.

(02 marks)

Chapter 06 – Probability and its Applications

(C)

A - Student passes a written exam

B - Student passes a practical exam

P (A) = ½ P (B) = 1/3 P (A∩B) = 1/4

P (B/A) - Probability that a student passes the practical exam given that he passed the written exam.

$$\mathbf{P(B/A)} = \frac{\mathbf{P(A \cap B)}}{\mathbf{P(A)}}$$

$$= \frac{1/4}{1/2}$$

$$= \frac{1}{4} \times \frac{2}{1}$$

$$= \frac{\mathbf{2}}{\mathbf{4}} \ \boldsymbol{or} \ \frac{\mathbf{1}}{\mathbf{2}}$$

(03 marks)

(D)

X: Weights of babies born in a hospital (Kg)

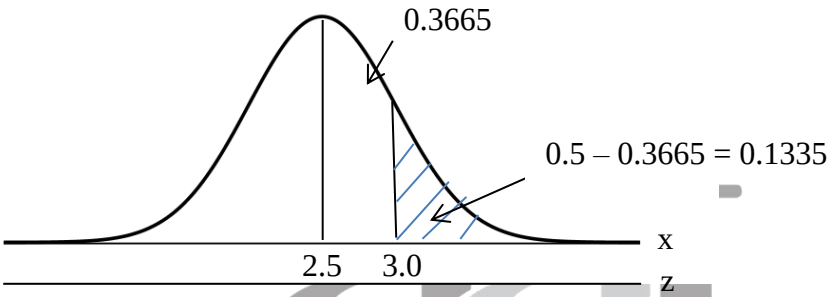
μ=2.5 σ =0.45

$$z = \frac{X - \mu}{\sigma}$$

$$z = \frac{X - 2.5}{0.45}$$

$$z = \frac{3 - 2.5}{0.45}$$

$$z = 1.11$$



Pr(X > 3) = 0.5 - 0.3655

= **0.1335**

= **13.35%**

*** The probability that a randomly chosen new born baby in this hospital has weight more than 3 kg is 0.1335 or 13.35%.**

(03 marks)

(Total 20 marks)

End of Section C

Notice:

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