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SRI LANKA

Association of Accounting Technicians of Sri Lanka

Level I Examination - July 2022

Suggested Answers

A publication of the Education and Training Division

THE ASSOCIATION OF ACCOUNTING TECHNICIANS OF SRI LANKA

Level I Examination - July 2022

(102) BUSINESS MATHEMATICS AND STATISTICS

SUGGESTED ANSWERS

(Total 40 Marks)

Suggested Answers to Question One:

1.1   (3)

$$= -5x^2 - 4x + 12$$
$$= -5x^2 - 10x + 6x + 12$$
$$= -5x(x + 2) + 6(x + 2)$$
$$= \underline{(x + 2)(-5x + 6)}$$

(03 marks)

1.2   (4)

$S = X(1 + r)^n$ \qquad X = 50,000, \qquad r = 7\% = 0.07, \qquad n = 3

$S = 50,000 \times (1.07)^3$

$S = 61,252.15$

Total interest = 61,252.15 − 50,000 = **Rs.11,252**

(03 marks)

1.3   (4)

$Y = 0.33 + 0.667x$ \qquad X = 250

$Y = 0.33 + 0.667 \times 250$

$Y = 167.080$

The expected profit = **Rs.167,080**

(03 marks)

1.4   (4)

$$Q = \frac{q1}{q0} \times 100$$

$$Q = \frac{10}{12} \times 100 = 83\%$$

(03 marks)

1.5   (2)

No of Blue marbles   06
No of Green marbles 04
Total no of marbles   10

$P(\text{Blue}) = \frac{6}{10}$ \qquad $P(\text{Green}) = \frac{4}{10}$

P(Blue and Green) = $\frac{6}{10}$ $\times$ $\frac{4}{10}$ = $\frac{24}{100}$

(03 marks)

1.6   (2)

$$M_d = L_1 + \frac{(\frac{n}{2} - F_c)}{fm} \times c$$

$$Md = 27.5 + \frac{(30-20)}{12} \times 8$$

$$\underline{Md = 34.2}$$

(03 marks)

1.7   (1)

$T_n = ar^{n-1}$ a = 2,   r = 3,   n = 6
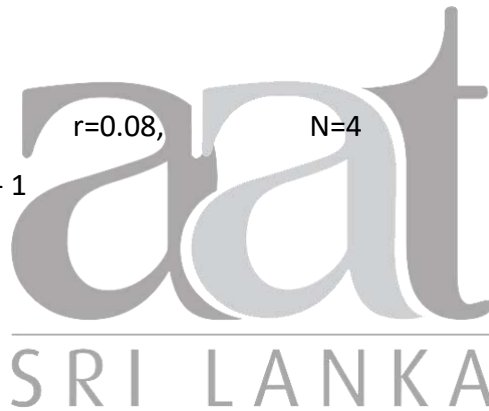
$T_6 = 2 \times 3^5$

$T_6 = 486$

(03 marks)

1.8   (4)

AER = $(1 + r/N)^N$ - 1   r=0.08,   N=4

AER = $(1 + 0.08/4)^4$ - 1

AER = 0.0824

AER = 8.24%

(03 marks)

1.9   (4)

$\hat{Y} = \hat{T} \times \hat{S}$

$\hat{Y} = 9{,}575 \times 0.86$

$\underline{\hat{Y} = 8{,}235}$

(03 marks)

1.10   (3)

PV of Annuity $= x \left(\frac{1}{r} - \frac{1}{r(1+r)^n} \right)$

PV of Annuity $= 14{,}000 \times \left(\frac{1}{0.09} - \frac{1}{0.09(1+0.09)^5} \right)$

x= 14,000,   n = 5,   r = 0.09

$\underline{PV = Rs.\,54{,}455}$

(03 marks)

1.11

A	$\longrightarrow$	**(4)**
B	$\longrightarrow$	**(3)**
C	$\longrightarrow$	**(2)**
D	$\longrightarrow$	**(1)**

(01 mark each, 04 marks)

1.12

1. Index numbers by their nature give only general indications of changes over a period.
2. Index numbers are based on sample data. If the sample units have not been selected randomly, index number will give wrong figures.
3. In case sample size is extremely limited, index number will give wrong figures.
4. At times, index number can be manipulated by those who are in authority. This is purposely done to support their viewpoint.
5. A number of formulas can be used in index number construction. These will give different results.
6. Index numers with the same base and items are useful for a short period. One has, therefore to ensure that index does not use very remote year as the base.
7. One who is interpreting an index number must be familiar with general aspects of the economy and factors relevant in this regard.
8. So many methods are used to calculate the index numbers and different methods give different results.

(02 marks)

1.13

$$SK = \frac{3(\bar{X} - M_d)}{S} \qquad \overline{Coefficient\ of\ Skewness} = \frac{3\,(Mean - Median)}{Standard\ Deviation}$$

$$SK = \frac{3(74,500 - 83,000)}{1,900}$$

$$SK = \frac{-25,500}{1,900}$$

$$\underline{SK = -13.42}$$

(02 marks)

1.14   True

(01 mark)

1.15   False

(01 mark)

(Total 40 marks)

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End of Section A

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Suggested Answers to Question Two:

Chapter 01 – Fundamental Concepts of Mathematics

(a)

$$9a + 4b = 42 \quad \text{————} \quad ①$$

$$5a + 3b = 28 \quad \text{————} \quad ②$$

$$① × 3 = 27a + 12b \quad = 126 \quad \text{————} \quad ③$$

$$② × 4 = 20a + 12b \quad = 112 \quad \text{————} \quad ④$$

$$③ - ④ \quad => 7a = 14$$

$$\underline{\mathbf{a = 2}}$$

$$① => 9 × 2 + 4b = 42$$

$$18 + 4b = 42$$

$$4b = 42 - 18$$

$$4b = 24$$

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

(04 marks)

(b)

Assume that, the Profit of **business A** – Rs. x million.

Therefore Profit of **business B** – Rs. 2x million.

$$x + 2x = 6$$

$$3x = 6$$

$$x = 2$$

Profit of business A = Rs. 2 Million

Profit of business B = Rs. 4 Million

(03 marks)

(c)

	Male		Female
	3	:	5

Male => 3/8   Female => 5/8

Difference between two ratios is 2

$$\textbf{No of female employees} = \frac{120}{2} × 5 = \underline{\mathbf{300}}$$

Or difference 2X = 120

          X = 60

      60 x 5 = 300

(03 marks)
(Total 10 marks)

Suggested Answers to Question Three:

Chapter 03 – *Financial Operative Measures for Business*

(a)

(i)

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

                 = **$-q^2 + 32q + 496{,}800$**

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

               = $(400 - q)q$

               = **$400q - q^2$**

(03 marks)

(ii)   At the Break Even Point;

               TR = TC

        $400q - q^2 = -q^2 + 32q + 496{,}800$

          $400q - 32q = 496{,}800$

             $368q = 496{,}800$

            q = 1,350 units

∴ **Break-even quantity = 1,350 units**

(04 marks)

(b)

TC   = $4q^2 - 16q + 600{,}000$

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

        $\dfrac{d\,(TC)}{dq}$ = $4q^2 - 16q + 600{,}000$

        MC = 8q -16

When costs is minimize,

    $\dfrac{dTC}{dq} = 0$

  $8q - 16 = 0$

    $q = 2$

The cost-minimizing level of production/ output = 2,000 units

(03 marks)
(Total 10 marks)

Suggested Answers to Question Four:

Chapter 05 – Comparing Two Quantitative Variables

(a)

$\sum X = 5,950$ $\sum Y = 106$, $\sum XY = 82,030$, $\sum X^2 = 4,534,500$, $n = 8$

x	y	xy	x^2
660	11	7,260	435,600
750	14	10,500	562,500
650	12	7,800	422,500
730	13	9,490	532,900
540	6	3,240	291,600
900	18	16,200	810,000
870	17	14,790	756,900
850	15	12,750	722,500
5,950	**106**	**82,030**	**4,534,500**

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

$$b = \frac{(8 \times 82,030) - (5,950 \times 106)}{(8 \times 4,534,500) - 5,950^2}$$

$$b = \frac{656,240 - 630,700}{32,276,000 - 35,402,500}$$

$$b = \frac{25,540}{873,500}$$

b = 0.029

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

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

$$= \frac{106}{8} - [0.029 \times \frac{5,950}{8}]$$

$$= 13.25 - 21.57$$

a = -8.32

The equation,

$Y = a + bx$

$Y = -8.32 + 0.029x$

$Y = -8.32 + 0.029x$

(07 marks)

(b)

Annual income of a family is Rs.800,000/-.

Then,

Substitute x = 800

$$Y = -8.32 + 0.029x$$
$$Y = -8.32 + 0.029 \times 800$$
$$Y = -8.32 + 23.2$$
$$Y = \underline{\mathbf{14.88}}$$

Expected annual education expenditure = **Rs.14,880**

(03 marks)
(Total 10 marks)

Suggested Answers to Question Five:

Chapter 04 – Data Presentation and Descriptive Measures

(a)

Interval	f	x	fx	fx^2
20 – 29	8	24.5	196	4,802
30 – 39	6	34.5	207	7,141.50
40 - 49	5	44.5	222.5	9,901.25
50 – 59	21	54.5	1,144.5	62,375.25
60 – 69	14	64.5	903	58,243.50
70 – 79	6	74.5	447	33,301.50
	60		3,120	175,765

L_1 = 49.5, $\Delta_1 = 21 - 5 = 16$ $\Delta_2 = 21 - 14 = 7$ C = 10

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

$$M_o = 49.5 + \left[\frac{16}{16 + 7}\right] \times 10$$

$$= 49.5 + 6.96$$

$$\mathbf{M_o = 56.46}$$

Mode class is 50-59

(03 marks)

(b) Mean $= \dfrac{\sum fx}{\sum f}$

$= \dfrac{3{,}120}{60}$

$= \underline{\mathbf{52}}$

(03 marks)

(c)

Standard Deviation = $\sqrt{\dfrac{\sum fx^2}{\sum f} - \overline{x}}$

$$= \sqrt{\dfrac{175,765}{60} - 52^2}$$

$$= \sqrt{2,929.42 - 2,704}$$

$$= \sqrt{225.42}$$

$$= \underline{\mathbf{15.01}}$$

(04 marks)
(Total 10 marks)

End of Section B

Suggested Answers to Question Six:

| Chapter 02 – Financial Mathematics for Business |

(A)

$$\text{Installment} = \frac{P \, x \, r \, (1+r)^n}{(1+r)^n - 1}$$

$$= \frac{600,000 \, x \, 0.10(1.10)^5}{(1.1)^5 - 1}$$

$x = \textbf{Rs. } 158,278/\text{-}$

Annual installment of the loan = Rs. 158,278

(03 marks)

| Chapter 02 – Financial Mathematics for Business |

(B)
(a)

	0	1	2	3
Project X				
Cash Flow	(600,000)	250,000	250,000	250,000
D.F. (10%)	1.000	0.909	0.826	0.751
Present Value	(600,000)	227,250	206,500	187,750
NPV (Option 1)				**+21,500**
Project Y				
Cash Flow	(800,000)	380,000	350,000	300,000
D.F. (10%)	1.000	0.909	0.826	0.751
Present Value	(800,000)	345,420	289,100	225,300
NPV (Option 2)				**+59,820**

(04 marks)

(b)

	Option X	Option Y
Investment	600 000	800 000
NPV	**21,500**	**59,820**

The highest NPV is 59,820. Therefore Project Y must be selected.

(02 marks)

(C)

Chapter 06 – Probability and its Applications

(a) The probability that the employee is a male - P(Male) = $\frac{45}{100} = \frac{9}{20} = 45\% = \underline{\textbf{0.45}}$

(02 marks)

(b) The probability that the employee is a female, given that she is a manager

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

$$= \frac{7}{15}$$

$$= 0.47$$

(02 marks)

(D)

Chapter 06 – Probability and its Applications

(a)

x	p	xp
0	0.125	0
1	0.375	0.375
2	0.375	0.75
3	0.125	0.375
		1.5

$$E(X) = \sum X \times P$$

$$= \underline{\textbf{1.5}}$$

(03 marks)

(b) X : Weight of a fish caught by a fisherman (kg)

μ=7.5   σ =1.8

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

$$Z = \frac{X - 7.5}{1.8}$$

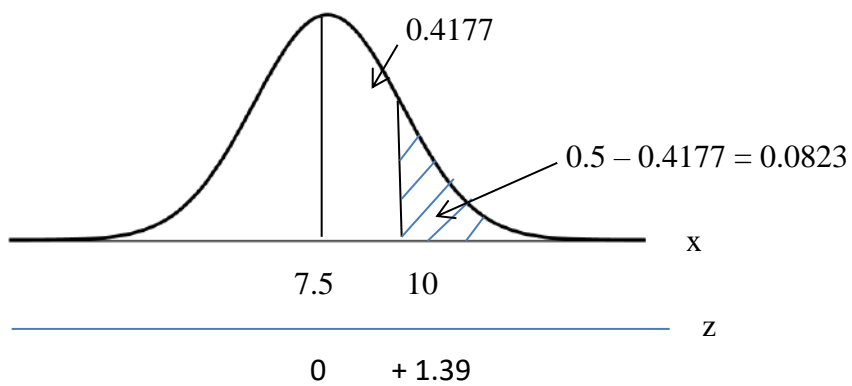**X=10,**

$$Z = \frac{10 - 7.5}{1.8}$$

$$Z = \frac{2.5}{1.8}$$

$$= 1.388 \; or \; 1.39$$

$$\underline{\textbf{Z = 0.4177}}$$

$$Pr(X > 10) = 0.5 - 0.4177$$

$$= 0.0823$$

$$= \underline{\textbf{8.23\%}}$$

* The probability that the fisherman is catching a fish whose weight is more than 10 kg is 0.0823 or 8.23%.

(04 marks)

(Total 20 marks)

End of Section C

Notice:

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