



**Association of Accounting Technicians of Sri Lanka**

**Level I Examination - January 2023**

**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 2023**  
**(102) BUSINESS MATHEMATICS AND STATISTICS**  
**SUGGESTED ANSWERS**

(Total 40 Marks)

**SECTION - A**

*Suggested Answers to Question One:*

1.1 (4)

$$3 - \frac{2}{3}x = 1$$

$$2 = \frac{2}{3}x$$

$$\underline{\underline{X = 3}}$$

(03 marks)

1.2 (4)

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

$$x = 20\,000, \quad n = 3, \quad r = 0.08$$

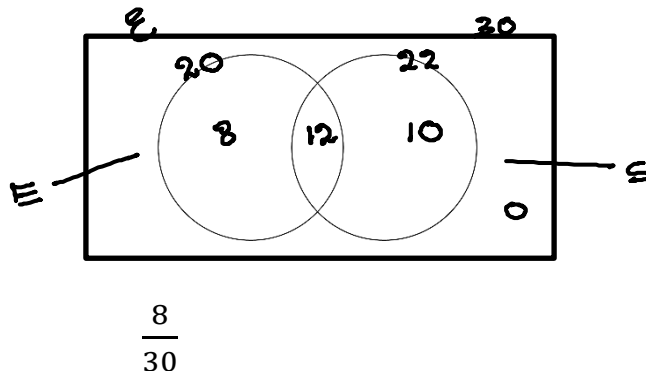
$$S = 20,000 \times 1.08^3$$

$$S = 25,194$$

$$\text{Interest} = 25,194 - 20,000 = \underline{\underline{\text{Rs. 5,194}}}$$

(03 marks)

1.3 (3)



(03 marks)

1.4 (1)

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

$$P = \frac{1,000}{1,200} \times 100 = \underline{\underline{83\%}}$$

(03 marks)

1.5 (1)

$$r = \frac{n \sum xy - \sum x \cdot \sum y}{\sqrt{(n \sum x^2 - (\sum x)^2)(n \sum y^2 - (\sum y)^2)}}$$
$$r = \frac{8 \times 160 - 44 \times 30}{\sqrt{(8 \times 284 - 44^2)(8 \times 120 - 30^2)}}$$
$$r = \frac{-40}{20,160}$$
$$= \underline{\underline{-0.28}}$$

(03 marks)

1.6 (2)

$$L_1 = 30.5,$$

$$\Delta_1 = 32 - 25 = 7 \quad C = 10$$

$$\Delta_2 = 32 - 30 = 2$$

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

$$M_o = 30.5 + \left[ \frac{7}{7 + 2} \right] \times 10$$

$$M_o = \underline{\underline{38.3}}$$

(03 marks)

1.7 (2)

$$P(X < 3) = 0.35 + 0.30 = \underline{\underline{0.65}}$$

(03 marks)

1.8 (2)

$$EAR = (1 + r/N)^N - 1$$

$$EAR = (1 + 0.12/2)^2 - 1 = \underline{\underline{12.36\%}}$$

(03 marks)

1.9 (2)

$$S = X(1 + r/N)^{n \times N} \quad x = 100,000, \quad n = 2, \quad r = 0.16, \quad N = 4$$

$$S = 100,000(1 + 0.16/4)^{2 \times 4}$$

$$\underline{\underline{S = Rs. 136,857/-}}$$

(03 marks)

1.10 (3)

$$Y = 2,439.80 - 145.4X$$

X value for year 2023 is 7

$$\begin{aligned}\therefore T &= 2,439.80 - 145.4 \times 7 \\ &= \underline{1,422}\end{aligned}$$

(03 marks)

1.11

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

(01 mark each, 04 marks)

1.12

$$23 + 27 = 50$$

The number of workers in this company who own a vehicle = 50

(02 marks)

1.13

$$T_n = ar^{n-1}$$

$$T_{12} = 3 \times 2^{12-1} = 6,144$$

$$T_{12} = 3(2)^{11} = \underline{6,144}$$

(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)

$$2x + 3y = 0 \text{ ————— } \textcircled{1}$$

$$3x + 4y = 5 \text{ ————— } \textcircled{2}$$

$$\textcircled{1} \times 3 = 6x + 9y = 0 \text{ ————— } \textcircled{3}$$

$$\textcircled{2} \times 2 = 6x + 8y = 10 \text{ ————— } \textcircled{4}$$

$$\textcircled{3} - \textcircled{4}$$

$$\underline{\underline{y = -10}}$$

$$\textcircled{1} \quad 2x + 3y = 0$$

$$2x + 3(-10) = 0$$

$$2x = 30$$

$$\underline{\underline{x = 15}}$$

**(03 marks)**

(b)

|                   |                |   |                |   |                |
|-------------------|----------------|---|----------------|---|----------------|
|                   | <b>A</b>       | : | <b>B</b>       | : | <b>C</b>       |
| <b>Ratio</b>      | 4              |   | 3              |   | 3              |
| <b>Proportion</b> | $\frac{4}{10}$ |   | $\frac{3}{10}$ |   | $\frac{3}{10}$ |

$$\text{(i) Total Investment} = 1,200,000 \times \frac{10}{3} = \text{Rs. 4,000,000}$$

**(02 marks)**

$$\text{(ii) Investment made by A} = 4,000,000 \times \frac{4}{10} = \text{Rs. 1,600,000}$$

Or

$$\text{Investment made by A} = 1,200,000 \times \frac{4}{3} = \text{Rs. 1,600,000}$$

**(02 marks)**

(c)

$$\text{Negative percentage for COVID-19} = 30\%$$

$$\text{No of employees negative for COVID-19} = 180$$

$$\text{No of employees positive for COVID-19} = 180 \times \frac{70}{30} = \underline{\underline{420}}$$

(03 marks)

(Total 10 marks)

### ***Suggested Answers to Question Three:***

#### ***Chapter 03 – Financial Operative Measures for Business***

(a)

$$\begin{aligned} \text{Total Cost (TC) Function} &= \text{Variable Cost} + \text{Fixed Cost} \\ &= \underline{\underline{5q^2 + 24q + 90,000}} \end{aligned}$$

$$\begin{aligned} \text{Total Revenue (TR) Function} &= \text{Demand} \times \text{Quantity} \\ &= (39 + 5q) \times q \\ &= \underline{\underline{39q + 5q^2}} \end{aligned}$$

(04 marks)

(b)

$$\begin{aligned} \text{Marginal Cost (MC) Function} &= \frac{d(\text{TC})}{dq} \\ \frac{d(\text{TC})}{dq} &= \frac{d(5q^2 + 24q + 90,000)}{dq} \\ \underline{\underline{\text{MC} = 10q + 24}} \end{aligned}$$

(02 marks)

(c) At the Break Even Point;

$$\text{TR} = \text{TC}$$

$$39q + 5q^2 = 5q^2 + 24q + 90,000$$

$$39q - 24q = 90,000$$

$$15q = 90,000$$

$$\underline{\underline{q = 6,000 \text{ units}}}$$

∴ Break-even quantity = 6,000 units

(04 marks)

(Total 10 marks)

**Suggested Answers to Question Four:**

**Chapter 05 – Comparing Two Quantitative Variables**

(a)  $\sum X = 42$  ,  $\sum Y = 4.57$  ,  $\sum XY = 27.65$  ,  $\sum X^2 = 280$  ,  $n = 8$

| x         | y           | xy           | x <sup>2</sup> |
|-----------|-------------|--------------|----------------|
| 3         | 0.41        | 1.23         | 9              |
| 4         | 0.59        | 2.36         | 16             |
| 1         | 0.18        | 0.18         | 1              |
| 5         | 0.65        | 3.25         | 25             |
| 4         | 0.57        | 2.28         | 16             |
| 7         | 0.69        | 4.83         | 49             |
| 10        | 0.84        | 8.4          | 100            |
| 8         | 0.64        | 5.12         | 64             |
| <b>42</b> | <b>4.57</b> | <b>27.65</b> | <b>280</b>     |

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

$$b = \frac{(8 \times 27.65) - 42 \times 4.57}{(8 \times 280) - 42^2}$$

$$b = \frac{221.2 - 191.94}{2,240 - 1,764}$$

$$b = \frac{29.26}{476}$$

$$\underline{\underline{b = 0.0615}}$$



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

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

$$= \frac{4.57}{8} - \left[0.0615 \times \frac{42}{8}\right]$$

$$= 0.571 - (0.0615 \times 5.25)$$

$$= 0.571 - 0.323$$

$$\underline{\underline{a = 0.25}}$$

Least Square Regression Line,

$$Y = a + bx$$

$$\underline{\underline{Y = 0.25 + 0.06x}}$$

(07 marks)

(b) Click and open the email when  $x = 900$

$$\begin{aligned}
 Y &= a + bx \\
 Y &= 0.25 + 0.06 \times \frac{900}{1,000} \\
 &= 0.25 + 0.06 \times 0.9 \\
 &= 0.25 + 0.054 \\
 &= \mathbf{0.304}
 \end{aligned}$$

**Expected proportion of subscribers = 0.3**

(03 marks)  
(Total 10 marks)

### Suggested Answers to Question Five:

**Chapter 04 – Data Presentation and Descriptive Measures**

(a)

| Interval                          | Mid Point<br>( $x$ ) | $f$        | Cumulative<br>Frequency ( $C_f$ ) | $fx$          | $fx^2$            |
|-----------------------------------|----------------------|------------|-----------------------------------|---------------|-------------------|
| 30 - 39                           | 34.5                 | 13         | 13                                | 448.5         | 15,473.25         |
| 40 - 49                           | 44.5                 | 15         | 28                                | 667.5         | 29,703.75         |
| 50 - 59                           | 54.5                 | 22         | 50                                | 1,199         | 65,345.50         |
| 60 - 69                           | 64.5                 | 25         | 75                                | 1,612.5       | 104,006.25        |
| <b>70 - 79<br/>(Median Class)</b> | 74.5                 | 35         | 110                               | 2,607.5       | 194,258.75        |
| 80 - 89                           | 84.5                 | 28         | 138                               | 2,366         | 199,927.00        |
| 90 - 99                           | 94.5                 | 22         | 160                               | 2,079         | 196,465.50        |
|                                   |                      | <b>160</b> |                                   | <b>10,980</b> | <b>805,180.00</b> |

(a) Median (Md)

$$\frac{n}{2} = 80, \text{ Median Class } 69.5 - 79.5(70 - 79)$$

$$L_1 = 69.5 \quad n = 160 \quad F_c = 75 \quad F_m = 35 \quad C = 79.5 - 69.5 = 10$$

$$Md = L + \frac{\left(\frac{n}{2} - F_c\right)}{f_m} \times c$$



$$Md = 69.5 + \frac{(80-75)}{35} \times 10$$

$$Md = 69.5 + 1.43$$

$$\underline{\underline{Md = 70.93}}$$

(03 marks)

(b)

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$= \frac{10,980}{160}$$

$$= \underline{\underline{68.625}}$$

(03 marks)

(c)

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

$$= \sqrt{\frac{805,180}{160} - 68.625^2}$$

$$= \sqrt{5,032.375 - 4,709.391}$$

$$= \sqrt{322.984}$$

$$= \underline{\underline{17.97}}$$

(04 marks)  
(Total 10 marks)

**End of Section B**

**Suggested Answers to Question Six:**

(A)

**Chapter 02 – Financial Mathematics for Business**

(a)

$$\begin{aligned}
 A &= \frac{SR^n (R-1)}{R^n - 1} \\
 &= \frac{700,000 \times (1+0.08)^5 (1+0.08-1)}{(1+0.08)^5 - 1} \\
 &= \frac{82,282.3723}{0.4693} \\
 &= \underline{\underline{175,319.52}}
 \end{aligned}$$

**Alternative method**

$$\begin{aligned}
 A &= \frac{x[1 - (1+r)^{-n}]}{r} && A = 700,000, n = 5, r = 0.08 \\
 700,000 &= \frac{x[1 - 1.08^{-5}]}{0.08} \\
 x &= \frac{700,000 \times 0.08}{[1 - 1.08^{-5}]} \\
 X &= \underline{\underline{175,319.52}}
 \end{aligned}$$

Annual Installment is **Rs.175,319.52**

(03 marks)

(b)

| Year | Loan at Beginning | Interest @ 8% | Capital Repayment | Interest   | Capital at year end |
|------|-------------------|---------------|-------------------|------------|---------------------|
| 1    | 700,000.00        | 56,000.00     | 19,319.52         | 175,319.52 | 580,680.48          |
| 2    | 580,680.48        | 46,454.00     | 128,865.00        | 175,319.52 | 451,815.48          |
| 3    | 451,815.48        | 36,145.00     | 139,174.52        | 175,319.52 | 312,640.96          |
| 4    | 312,640.96        | 25,011.00     | 150,308.52        | 175,319.52 | 162,332.44          |
| 5    | 162,332.44        | 12,986.59     | 162,332.00        | 175,319.52 | -                   |

(03 marks)

(B)

**Chapter 02 – Financial Mathematics for Business**

(a)

| Year | Cash Flow |           | D.F. (12%) | Present Value (A) | Present Value (A) |
|------|-----------|-----------|------------|-------------------|-------------------|
|      | A         | B         |            |                   |                   |
| 0    | (100,000) | (200,000) | 1.000      | (100,000)         | (200,000)         |
| 1    | 60,000    | 103,000   | 0.893      | 53,580            | 91,979            |
| 2    | 45,000    | 70,000    | 0.797      | 35,865            | 55,790            |
| 3    | 40,000    | 50,000    | 0.712      | 28,480            | 35,600            |
| NPV  |           |           |            | <b>17,925</b>     | <b>(16,631)</b>   |

Net Present Value of **Project A = + 17,925**

Net Present Value of **Project B = (16,631)**

**Alternate Answer**

|           |           |        |        |        |
|-----------|-----------|--------|--------|--------|
| Year      | 0         | 1      | 2      | 3      |
| Cash flow | (100 000) | 60 000 | 45 000 | 40 000 |

NPV = Present value of cash inflow - Present value of cash outflow

$$PV = \frac{X}{(1+r)^n} \quad r=0.12 \quad PV = \frac{X}{1.12^n}$$

$$NPV = \frac{60,000}{1.12^1} + \frac{45,000}{1.12^2} + \frac{40,000}{1.12^3} - 100,000$$

$$NPV = 117,916.36 - 100,000 \\ = \mathbf{17,916.36}$$

| Year      | 0         | 1       | 2      | 3      |
|-----------|-----------|---------|--------|--------|
| Cash flow | (200,000) | 103,000 | 70,000 | 50,000 |

NPV = Present value of cash inflow - Present value of cash outflow

$$PV = \frac{X}{(1+r)^n} \quad r=0.12 \quad PV = \frac{X}{1.12^n}$$

$$NPV = \frac{103,000}{1.12^1} + \frac{70,000}{1.12^2} + \frac{50,000}{1.12^3} - 200,000$$

$$NPV = 183,356.87 - 200,000 \\ = \mathbf{(16,643.13)}$$

(05 marks)

(b)

|            | Project A | Project B |
|------------|-----------|-----------|
| Investment | 100,000   | 200,000   |
| NPV        | 17,925    | (16,631)  |

Net Present Value of project A is positive. Project B have negative NPV.

Therefore Project A is the best investment.

(02 marks)

(c)

**Chapter 06 - Probability and its Applications**

A - Student passes a written exam

B - Student passes a practical exam

$$P(W) = 1/2 \quad P(P) = 1/3 \quad P(W \cap P) = 1/4$$

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

$$P(W/P) = \frac{P(W \cap P)}{P(P)} \\ = \frac{1/4}{1/3} \\ = \mathbf{\frac{3}{4} \text{ Or } 0.75}$$

(03 marks)

(D)

**Chapter 06 - Probability and its Applications**

X : Height of the soldier (cm)

$$\mu = 170 \quad \sigma = 5$$

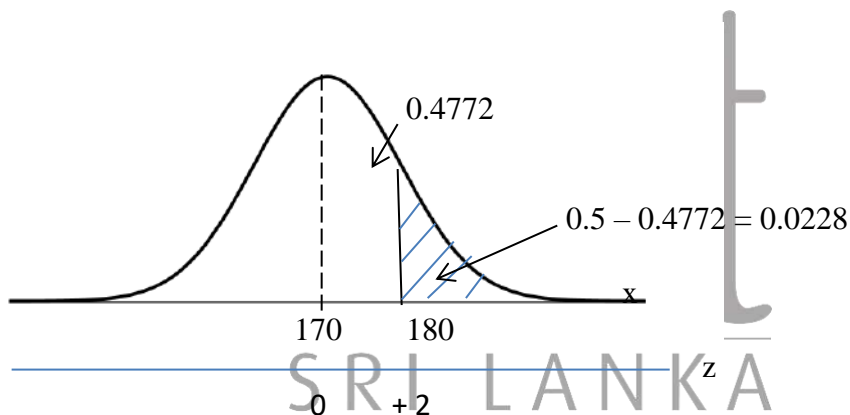
$$Z = \frac{X - \mu}{\sigma}$$

$$Z = \frac{X - 170}{5}$$

$$X = 180$$

$$Z = \frac{180 - 170}{5}$$

$$Z = +2$$



$$\Pr(x > 180) = P(z > 2)$$

$$= 0.5 - 0.4772$$

$$= \underline{\underline{0.0228 \text{ or } 2.28\%}}$$

(04 marks)  
(Total 20 marks)

**End of Section C**

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