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SRI LANKA

Association of Accounting Technicians of Sri Lanka

July 2020 Examination - Level I

Suggested Answers
(102)

(102) BUSINESS MATHEMATICS AND STATISTICS

THE ASSOCIATION OF ACCOUNTING TECHNICIANS OF SRI LANKA

Level I Examination - July 2020

(102) BUSINESS MATHEMATICS AND STATISTICS

SUGGESTED ANSWERS

(Total 40 Marks)

<div style="float:right">**SECTION - A**</div>

Suggested Answers to Question One:

1.1

Other ethnic groups	=	100% - (70%+22%) = 8%
Total population X - 8%	=	3,200
Number of Sinhalese in the town	=	$3,200 \times \frac{70}{8}$
Number of Sinhalese in the town	=	**28,000**

Answer (2) - 28,000   *(03 marks)*

1.2

8y + 8	=	3(2y + 8)
8y + 8	=	6y + 24
2y	=	16
Y	=	**8**

Answer (4) – 8   *(03 marks)*

1.3

S	=	x (1+ nr)
S	=	6,000 + (1+(3X 0.08))
S	=	6,000 (1.24)
S	=	**7,440**

Answer (3) – Rs. 7,440   *(03 marks)*

1.4

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

$$Q = \frac{34}{51} \times 100$$

= 67%
Answer (1) - 67%   *(03 marks)*

1.5 $\bar{X} = \dfrac{\sum x}{n}$

$83 = \dfrac{(75 + 68 + 86 + 95 + 90) + x}{6}$

$83 \times 6 = 414 + x$

$498 - 414 = x$

$\underline{x \qquad = \textbf{84}}$

Answer (3) - 84   *(03 marks)*

1.6   r   = $\dfrac{[\ n \sum XY - \sum X . \sum Y\ ]}{\sqrt{\{\ [n \sum X^2 - (\sum X)^2]\ [n \sum Y^2 - (\sum Y)^2]\}}}$

r   = $\dfrac{(7 \times 310.5) - (70 \times 30.6)}{\sqrt{(7 \times 952 - 70^2)\ (7 \times 134.13 - 30.6^2)}}$

r   = $\dfrac{2,173.5 - 2,142}{\sqrt{(6,664 - 4,900)\ (938.91 - 936.36)}}$

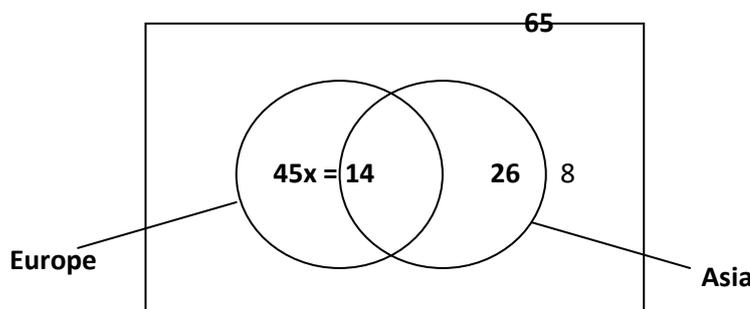= $\dfrac{31.5}{\sqrt{(6,664 - 4,900)\ (938.91 - 936.36)}}$

= $\dfrac{31.5}{67.06}$

=   **0.4697**

Answer (4) - 0.4697   *(03 marks)*

1.7

$45 + 26 + 8 - X = 65$
$X \qquad\qquad = \underline{\textbf{14}}$

The probability that a randomly chosen person visited Europe given that he had visited Asia would be

$\dfrac{14}{26}$

Answer (3) $\dfrac{14}{26}$ *(03 marks)*

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

A = $\dfrac{500{,}000 \times 1.1^4(1.1-1)}{1.1^4-1}$

A = $\dfrac{500{,}000 \times 1.4641 \times 0.1}{1.4641-1}$

A = $\dfrac{73{,}205}{0.4641}$

A = **157,735**

Alternative Method

A = $\dfrac{500{,}000}{\text{Cum DCF 10\%}}$

A = $\dfrac{500{,}000}{3.1698}$

A = **157,735**

Answer (2) Rs.157,735/-   *(03 marks)*

1.9 $S = X(1 + r/N)^{n \times N}$

$63{,}339 = X \times (1 + 0.12/4)^{2 \times 4}$

$X = \dfrac{63\,339}{1.03^8}$

$= \underline{\mathbf{50{,}000}}$

r = *Interest Rate*   N = *No of periods in an year*
X = *Present Value*   N = *No of Years*

Or

S = X{ 1+r}^{n}

r = interest rate per quarter
n = no of quarters

S = X{ 1+r}^{n}

$63{,}339 = X(1+0.03)^8$

X = $\dfrac{63{,}339}{1.03^8}$

= $\underline{50{,}000}$

Answer (2) = Rs.50,000/-   *(03 marks)*

1.10 $T = 198x + 841$

Value of x in 2020 is 7

$T = (198 \times 7) + 84$

$\underline{T = 2,227}$

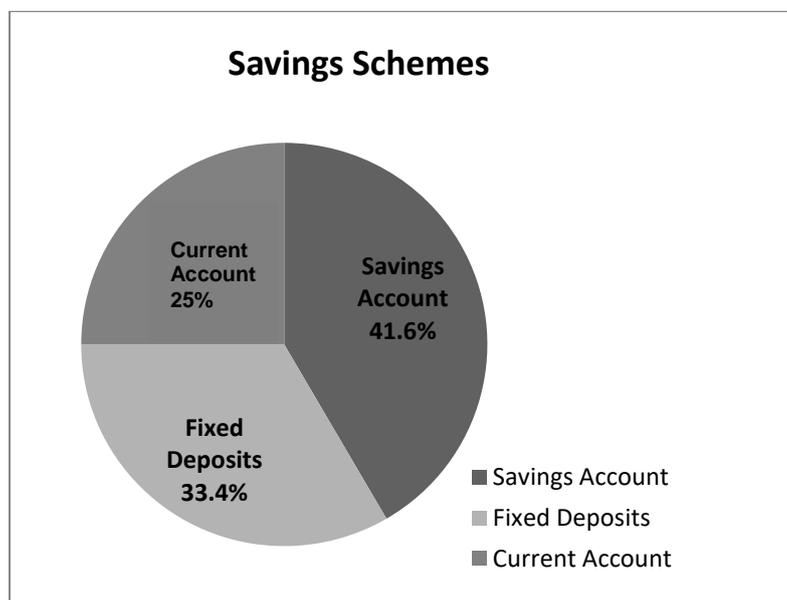**Answer (3) = Rs.2,227/-**

(03 marks)

1.11

A $\longrightarrow$ 3

B $\longrightarrow$ 4

C $\longrightarrow$ 1

D $\longrightarrow$ 2

(02 marks)

1.12

Savings schemes	No. of customers	Percentage (%)	No. of degrees
SavingsAccounts :	30	$\frac{30}{72} \times 100$ $= \mathbf{41.6\%}$	$\frac{30}{72} \times 360 = 150^0$
CurrentAccounts :	18	$\frac{18}{72} \times 100$ $= \mathbf{25\%}$	$\frac{18}{72} \times 360 = 90^0$
FixedDeposits :	24	$\frac{24}{72} \times 100$ $= \mathbf{33.4\%}$	$\frac{24}{72} \times 360 = 120^0$
Total	**72**	**100%**	**360**

Savings Schemes

Current Account 25%

Savings Account 41.6%

Fixed Deposits 33.4%

■ Savings Account
■ Fixed Deposits
■ Current Account

(02 marks)

1.13 $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

0.72 $= 0.60 + 0.30 - P(A \cap B)$

$P(A \cap B) = 0.9 - 0.72$

$\underline{P(A \cap B) = 0.18}$

(02 marks)

1.14 Statement is "True"   *(01 marks)*

1.15 Statement is "False"

(01 marks)

(Total 40 marks)

End of Section A

Suggested Answers to Question Two:

(a)

Chapter 1-Fundamental Concepts of Mathematics

$3X + 2Y = 17 \Rightarrow (1)$
$2X + 5Y = 26 \Rightarrow (2)$

$(1) \quad X \quad 2 \Rightarrow 6X + 4Y = 34 \Rightarrow (3)$
$(2) \quad X \quad 3 \Rightarrow 6X + 15Y = 78 \Rightarrow (4)$

$(4)-(3) \Rightarrow \quad 11Y = 44$
$\Rightarrow \quad Y = 4$

$\underline{Y = 4}$

$(1) \quad \Rightarrow \quad 3X+(2*4) = 17$
$\qquad 3X = 17-8$
$\qquad 3X = 9$
$\qquad \underline{X = 3}$

(04 marks)

(b)

Chapter 1-Fundamental Concepts of Mathematics

If cost is Rs.100/-

Cost	+	Profit	=	Sales Price
100		20		120
?				**48,000**

Production cost of the table $\qquad = \dfrac{100}{120} \times 48,000$

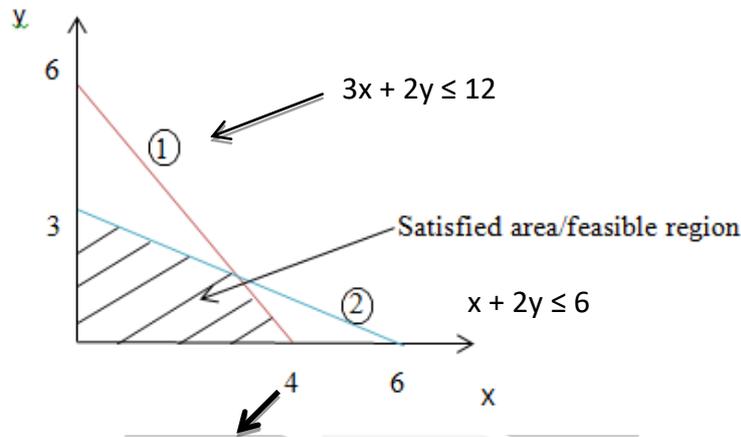$\qquad\qquad\qquad\qquad\qquad = \quad \underline{\textbf{Rs. 40,000}}$

(02 marks)

(c)

Chapter 1-Fundamental Concepts of Mathematics

$$3x + 2y \leq 12 \rightarrow \text{①} \qquad x + 2y \leq 6 \rightarrow \text{②}$$

If X=0 , y=6(0,6)　　If x=0 , y=3(0,3)
If y=0 , X=4(4,0)　　If y=0 , x=6(6,0)

<div align="right">

(03 marks)
(01 mark)
(Total 10 marks)

</div>

Suggested Answers to Question Three:

Chapter 3-Financial Operative Measures for Business

(a)

$TR = p \times q$ 　(Demand *Quantity)　$p = 1000 - 2q$

$TR = (1000 - 2q) \times q$

$TR = 1000q - 2q^2$

TC　=VC+FC　(Variable Cost + Fixed Cost)

TC　= $3q^2 + 100q + 800$

<div align="right">

(03 marks)

</div>

(b)

Profit Function (TP) = TR - TC
TP　= TR – TC

$TP = (1000q - 2q^2) - (3q^2 + 100q + 800)$

$TP = 1000q - 2q^2 - 3q^2 - 100q - 800$

$TP = 900q - 5q^2 - 800$

or

$= 180q - q^2 - 160$ 　　　　　　　　　　*(03 marks)*

(c)

$$\frac{D(Tp)}{Dq} = 180 - 2q \quad \text{or} \quad 900 - 10q$$

$$\frac{D^2(Tp)}{Dq} = -2 < 0$$

Therefore number of units at profit maximized   =>180-2q=0

$$2q = 180$$
$$\underline{Q = \mathbf{90}}$$

Alternative Calculation Method

$TR = 1000q - 2q^2$

MR = 1000 – 4q

TC   = $800 + 100q + 3q^2$
MC   =   100 + 6q

Profit is maximized, When, **MR = MC**

1000 – 4q = 100 + 6q

X = 90

(04marks)
(Total 10 marks)

Suggested Answers to Question Four:

Chapter 5- Comparing two Quantitative Variables

(a)

x	y	x^2	xy
44	550	1,936	24,200
29	480	841	13,920
74	630	5,476	46,620
12	230	144	2,760
9	240	81	2,160
50	610	2,500	30,500
218	**2,740**	**10,978**	**120,160**

$$b = \frac{n\sum xy - \sum x . \sum y}{\left(n\sum x^2 - (\sum x)^2\right)}$$

$$b = \frac{(6 \times 120,160) - (218 \times 2,740)}{(6 \times 10,978) - (218)^2}$$

b	=	$\dfrac{720{,}960 - 597{,}320}{65{,}868 - 47{,}524}$
b	=	$\dfrac{123{,}640}{18{,}344}$
b	=	**6.74**

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

a $= \dfrac{2{,}740}{6} - [6.7401 \times \dfrac{218}{6}]$

a $=$ 456.67-244.89

a $=$ **211.78**

Therefore least square regression line is;

Y $=$ a+ bx

Y $=$ **211.78 + 6.74x**

(07 marks)

(a) Advertising expense is Rs.40,000/-.

Y $=$ 211.78 + 6.74x

Then, Substituting x = 40

Y $=$ 211.78+ 6.74 (40)

$=$ 481.38

Y $=$ **481,380**

Expected Sales Value = **Rs.481,380/-**

(03 marks)
(Total 10 marks)

Suggested Answers to Question Five:

Chapter 4- Data Presentation and Descriptive Measures

Waiting time (minutes)	Mid-Point(x)	Frequency(f)	$f(x)$	$f(x)^2$
10 - 19	14.5	15	217.5	3,153.75
20 - 29	24.5	9	220.5	5,402.25
30 - 39	34.5	30	1,035	35,707.5
40 - 49	44.5	14	623	27,723.5
50 - 59	54.5	12	654	35,643
		$\sum f$=80	$\sum fx$=2,750	$\sum fx^2$=107,630

Note: These values can be obtained by using calculator.

(a)   **Mean** $=$ $\dfrac{\sum f(x)}{\sum f}$

                   $=$ $\dfrac{2{,}750}{80}$

                   $=$ **34.375**

(04 marks)

(b)   **Standard Deviation** $= \sqrt{\dfrac{\sum fx^2}{\sum f} - [x\,[\overline{x}]^2}$

                   $= \sqrt{\dfrac{107{,}630}{80} - \left(34.375^2 \right)}$

                   $= \sqrt{1{,}345.375 - 1{,}181.64}$

                   $= \sqrt{163.73}$

                   $=$ **12.79**

(04 marks)

(b)   **Coefficient of Variation (V)**

                   $= \dfrac{Standard\ Deviation}{Mean} \times 100\%$

                   $= \dfrac{12.79}{34.375} \times 100$

                   $=$ **37.2%**

(02 marks)
(Total 10 marks)

End of Section A

Suggested Answers to Question Six:

(A)

Chapter 2- Financial Mathematics for Business

(a)   **(i)**

	I	CF	DF @15%	PV
0	(150,000)	-	1	(150,000)
1	-	70,000	0.870	60,900
2	-	85,000	0.756	64,260
3	-	50,000	0.658	32,900
4				**NPV=8,060**

NPV =   8,060

(04 marks)

(b)   NPV of the project is positive.

Therefore company should invest in the said project.   *(02 marks)*

(B)

Chapter 7- Index numbers and forecasting

	P_0	q_0	P_1	P_0q_0	P_1q_0
X	20	250	30	5,000	7,500
Y	18	130	25	2,340	3,250
Z	40	180	50	7,200	9,000
				14,540	**19,750**

Laspeyre's Price Index ($LP_{1/0}$)   = $\dfrac{\sum (p_1 \times q_0)}{\sum (p_0 \times q_0)} \times 100$

= $\dfrac{19,750}{14,540}$ X 100%

=   **135.83%**

(04 marks)

(C)

Chapter 6- Probability and its Applications

(a)

(i)
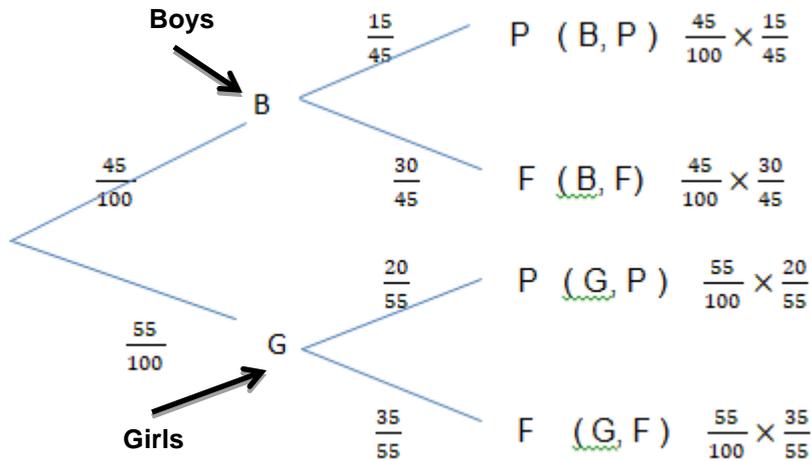
B - Being a boy P – Pass the exam
G - Being a girl F – Fail the exam

(03 marks)

(ii)

Probability $=$ $P(B,P) + P(G,P)$

$= \dfrac{45}{100} \times \dfrac{15}{45} + \dfrac{55}{100} \times \dfrac{20}{55}$

$= \dfrac{15}{100} + \dfrac{20}{100}$

$= \underline{\dfrac{35}{100}}$

Probability of a student passing that examination is 35%

(02 marks)

(iii) Probability of a selected student,
who is a boy, fails the examination. $= \dfrac{30}{45}$

or

$= \underline{\underline{\dfrac{2}{3}}}$

(02 marks)

(b)

X =time taken by a runner to finish a marathon (min)

μ=240 σ =40

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

$$Z \quad = \quad \frac{X - 240}{40}$$

$$Z \quad = \quad \frac{300 - 240}{40}$$

$$= \quad \frac{60}{40}$$

$$Z \quad = \quad \underline{\textbf{+1.5}}$$
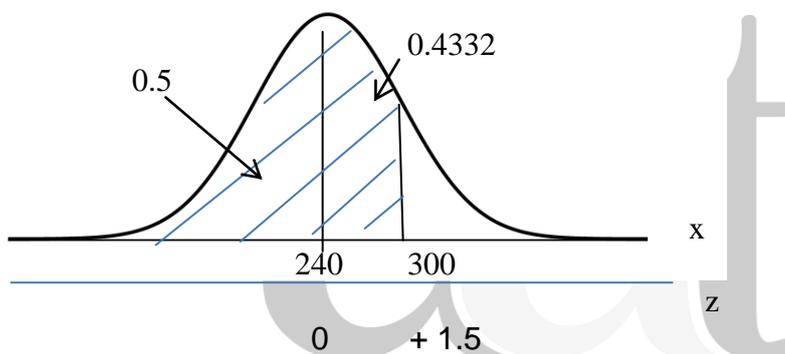
$$\text{Pr}(X < 300) \quad = \quad 0.5 - 0.4332$$

$$= \quad \underline{\textbf{0.6668 or 93.32\%}}$$

The probability that the runner takes below 300 minutes to finish the marathon is 93.32%

(03 marks)
(Total 20 marks)