



**Association of Accounting Technicians of Sri Lanka**

**July 2016 Examination - AA1 Level**

**Questions and Suggested Answers  
Subject No : 12**

**QUANTITATIVE METHODS FOR BUSINESS  
(QMB)**

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THE ASSOCIATION OF ACCOUNTING TECHNICIANS OF SRI LANKA

EDUCATION AND TRAINING DIVISION

AA1 Examination - July 2016

(12) Quantitative Methods for Business

SUGGESTED ANSWERS

SECTION - A

Fifteen (15) compulsory questions

(Total 40 marks)

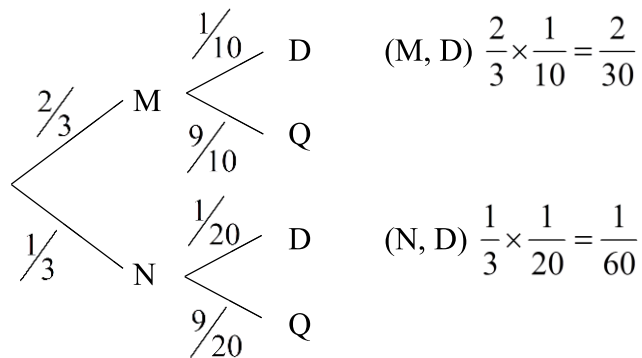
*Suggested Answers to Question One:*

$$\begin{aligned} 1.1 \quad x^2 - x - 2 &= 0 \\ (x - 2)(x + 1) &= 0 \\ x - 2 = 0 \text{ or } x + 1 &= 0 \\ x = 2 \text{ or } x = -1 & \end{aligned}$$

Answer (2)

1.2 Answer (3)

1.3



$$\begin{aligned} P(D) &= \frac{2}{30} + \frac{1}{60} = \frac{5}{60} = \frac{1}{12} \\ &= \underline{\underline{0.0833}} \end{aligned}$$

Answer (4)

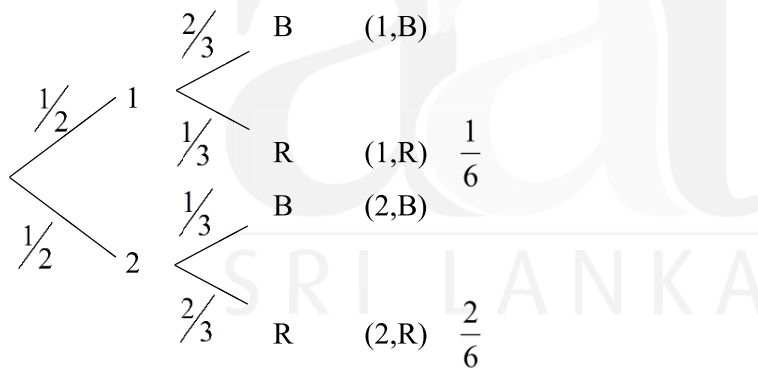
$$\begin{aligned}
 1.4 \quad P &= 1400q - q^2 \\
 \frac{dP}{dq} &= 1400 - 2q \\
 \frac{d^2P}{dq^2} &= -2 \text{ (Maximum)}
 \end{aligned}$$

$$\begin{aligned}
 \frac{dP}{dq} &= 0 \\
 1400 - 2q &= 0 \\
 q &= \frac{1400}{2} = 700 //
 \end{aligned}$$

Answer (2)

1.5 Answer (1)

1.6



$$\begin{aligned}
 P(R) &= \frac{1}{6} + \frac{2}{6} \\
 &= \frac{3}{6} = \frac{1}{2} //
 \end{aligned}$$

Answer (2)

1.7 Answer (3) or (4)

$$\begin{aligned}
 1.8 \quad P_{\frac{n}{p}} &= \frac{105}{50} \times 100 \\
 &= 210 //
 \end{aligned}$$

Answer (4)

$$\begin{aligned}
 1.9 \quad TR &= TC \\
 TR &= 8x \\
 TC &= 6x + 1400 \\
 \text{At the Break Even Point} \\
 TR &= TC \\
 8x &= 6x + 1400 \\
 x &= \underline{700}
 \end{aligned}$$

**Break even number of units = 700.**

1.10 Cost Rs. 150  
Profit Margin 25%

$$\begin{aligned}
 \text{Selling Price} &= 150 \times \frac{125}{100} \\
 &= \text{Rs. } \mathbf{187.50}
 \end{aligned}$$

- 1.11
1. Some populations are infinite.
  2. Some items, objects etc... are difficult to study as some sample tests destroy the product. Eg :- Box of matches, Crackers
  3. The size of the population is extremely large.
  4. Minimize the cost and time.

1.12 For the 3rd Option

$$\begin{aligned}
 PV &= 15,000 / 0.11 = 136,363.64 \\
 NPV &= 136,363.64 - 112,000 \\
 &= 24,363.64
 \end{aligned}$$

$\therefore$  NPV = Rs; 24,363.64

$\therefore$  statement is **False**.

- 1.13 1st Option ( Wind Power, NPV = 2199.00)  
2nd Option ( Hydro Power, NPV = (9343.00)

Option 1, has positive NPV, considering above two options.

$\therefore$  Wind Power is more suitable;

$\therefore$  statement is **False**.

- 1.14 Sola Power (Option 1) , has most positive NPV considering all three options.

$\therefore$  Sola Power is more suitable;

$\therefore$  statement is **True**.

- 1.15 NPV values of all Options be increase when the cost of capital is decreased to 10%.

$\therefore$  Sola Power is more suitable at this situation;

$\therefore$  statement is **False**.

*End of Section A*

Four (04) compulsory questions.

(Total 40 marks)

**Suggested Answers to Question Two:**

(a)  $R(x) = 24x - 2x^2$ ,  $C(x) = 40 + 4x$

(i)  $P(x) = R(x) - C(x)$   
 $P(x) = (24x - 2x^2) - (40 + 4x)$   
 $\underline{P(x) = -2x^2 + 20x - 40}$

(ii)  $R(x) = 24x - 2x^2$   
 $MR = \frac{dR}{dx}$   
 $MR = 24 - 4x$   
 $C(x) = 40 + 4x$   
 $MC = 4$

At maximum profit

$MR = MC$

$24 - 4x = 4$

$\underline{x = 5}$

No. of units 5000

(for the maximum profit)

Or

$d_p = 20 - 4x = 0$

$\underline{x = 5}$

(iii) When  $x = 5$ ,  
 $P(x) = -2x^2 + 20x - 40$   
 $P(x) = -2 \times 5^2 + 20 \times 5 - 40$   
 $= 10$

$\therefore$  Maximum Profit = Rs. 10,000/=

(b) Laspeyre's Price Index ( $LP_{1/0}$ ) =  $\frac{\sum(P_1 \times q_0)}{\sum(P_0 \times q_0)} \times 100$   
 $= \frac{9640}{9910} \times 100$   
 $= \underline{97.27}$

$P_1 \times q_0$	$P_0 \times q_0$
$5 \times 200 = 1000$	$5 \times 200 = 1000$
$12 \times 450 = 5400$	$15 \times 450 = 6750$
$6 \times 540 = 3240$	$4 \times 540 = 2160$
9640	9910

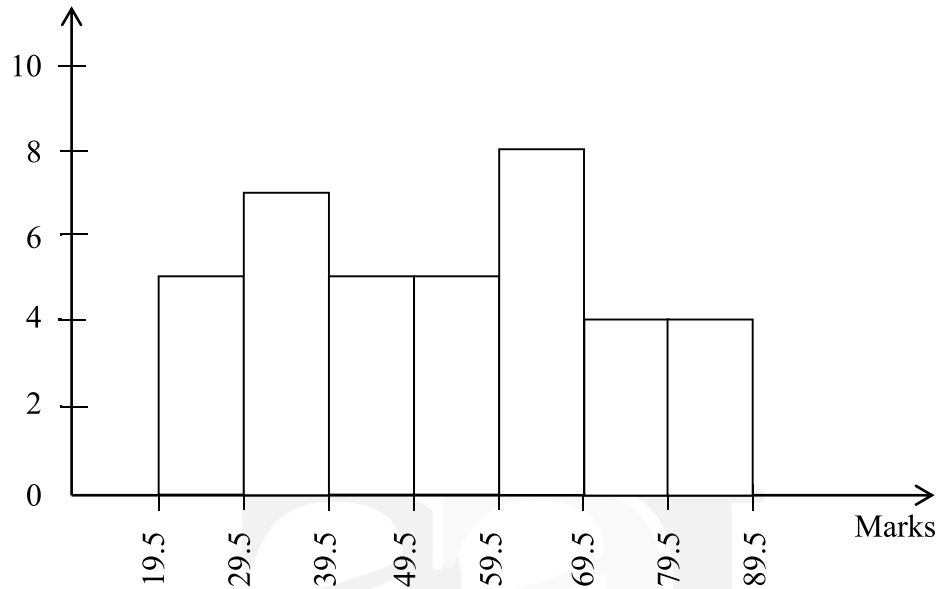
(10 marks)

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**Suggested Answers to Question Three:**

(a)

(No. of Students)



(b)

$$5x + 4y = 24 \quad \text{---} \quad \textcircled{1}$$

$$4x + 2y = 18 \quad \text{---} \quad \textcircled{2}$$

$$\textcircled{2} \times 2 \quad 8x + 4y = 36 \quad \text{---} \quad \textcircled{3}$$

$$\textcircled{3} - \textcircled{1} \quad 3x = 12$$

$$x = 4$$

Substituting  $x = 4$ , in  $\textcircled{2}$ ,

$$16 + 2y = 18$$

$$2y = 2$$

$$y = 1$$

$$\therefore x = 4$$

$$y = 1$$

(10 marks)

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***Suggested Answers to Question Four:***

(a)

x	p	xp	x <sup>2</sup>	x <sup>2</sup> p
2	0.01	0.02	4	0.04
3	0.25	0.75	9	2.25
4	0.40	1.60	16	6.40
5	0.30	1.50	25	7.50
6	0.04	0.24	36	1.44
		4.11	90	17.63

i Expected number of Errors =  $\sum xp$   
 = **4.11**

ii Variance =  $\frac{\sum x^2 p - (\sum xp)^2}{n}$   
 =  $17.63 - 4.11^2$   
 = **0.7379**

(b)

$$TR = -2x^2 + 9000x$$

$$MR = \frac{dTR}{dq}$$

$$MR = -4x + 9000$$

$$TC = 4x^2 + 23\,000$$

$$MC = \frac{dTC}{dq}$$

$$MC = 8x$$

(10 marks)

### Suggested Answers to Question Five:

(a) Value of “a”

$$\begin{aligned} \text{Value at maturity} &= \text{Capital} + (\text{Capital} \times \text{Return} \times \text{No. Of. Years}) \\ &= 250 + 250 \times 0.12 \times 2 \\ &= 310 \end{aligned}$$

$$\underline{\underline{\mathbf{a} = 310}}$$

Value of “b”

$$\begin{aligned} \text{Value at maturity} &= \text{Capital} + (\text{Capital} \times \text{Return} \times \text{No. Of. Years}) \\ &= 250 + 250 \times 0.12 \times 6 \\ &= 430 \end{aligned}$$

$$\underline{\underline{\mathbf{b} = 430}}$$

(b) **Option 1**

Years	Cash Flow (Rs.' 000)	Discount Factors	Present value (Rs.'000)	Present value (Rs.'000)
0	(1000)	1	(1,000.00)	(1,000.00)
1		1/1.08 <sup>1</sup> or 0.962	-	-
2	310	1/1.08 <sup>2</sup> or 0.857	265.78	265.67
3		1/1.08 <sup>3</sup> or 0.794	-	-
4	370	1/1.08 <sup>4</sup> or 0.735	271.96	271.95
5		1/1.08 <sup>5</sup> or 0.681	-	-
6	430	1/1.08 <sup>6</sup> or 0.630	270.97	270.90
7		1/1.08 <sup>7</sup> or 0.583	-	-
8	490	1/1.08 <sup>8</sup> or 0.540	264.73	264.60
<b>NPV</b>			<b>73.44</b>	<b>73.12</b>



**Option 2**

Years	Cash Flow (Rs.' 000)	Discount Factors	Present value (Rs.'000)	Present value (Rs.'000)
0	(1000)	1	(1000)	(1,000.00)
1	110	1/1.08 <sup>1</sup> or 0.962	101.85	101.86
2	110	1/1.08 <sup>2</sup> or 0.857	94.31	94.27
3	110	1/1.08 <sup>3</sup> or 0.794	87.32	87.34
4	110	1/1.08 <sup>4</sup> or 0.735	80.85	80.85
5	110	1/1.08 <sup>5</sup> or 0.681	74.86	74.91
6	110	1/1.08 <sup>6</sup> or 0.630	69.32	69.30
7	110	1/1.08 <sup>7</sup> or 0.583	64.18	64.13
8	1110	1/1.08 <sup>8</sup> or 0.540	599.70	599.40
<b>NPV</b>			<b>172.39</b>	<b>172.06</b>

**Option 2 (Another Method)**

Using cumulative present value

(Cumulative present value for 7th year = 5.206)

$$\text{NPV} = 110 \times 5.206 + 1110 \times 0.540 - 1000$$

$$\text{NPV} = 172.06$$

(C) NPV for the 1st option = 73.12

NPV for the 2nd option = 172.06

Therefore we can recommend 2nd option

(Highest NPV is given by 2nd option.)

*(10 marks)*

**End of Section B**

One (01) compulsory question.  
(Total 20 marks)

**Suggested Answers to Question Six:**

(A)

Year	Q1	Q2	Q3	Q4
2012	-	-	(17)	44.25
2013	(29.63)	2.50	(20.25)	36.62
2014	20.38	4.50	(16.38)	34.12
2015	(21.50)	2.50	-	-
<b>Total</b>	<b>(71.51)</b>	<b>9.5</b>	<b>(53.63)</b>	<b>114.99</b>
Mean	23.84	3.17	17.88	38.33
Adjustment	(0.055)	(0.055)	(0.055)	(0.055)
<b>Seasonal Indices</b>	<b>(23.785)</b>	<b>3.225</b>	<b>(17.825)</b>	<b>38.385</b>

$$= \frac{(0.22)}{4}$$

$$= \mathbf{(0.055)}$$

(B) **1st Method**

Salary	f	x	fx	x <sup>2</sup>	fx <sup>2</sup>
110-119	0	114.5	0.00	13,225	0.00
120-129	2	124.5	250	15,625	31,250
130-139	5	134.5	675	18,225	91,125
140-149	25	144.5	3625	21,025	525,625
150-159	10	154.5	1550	24,025	240,250
160-169	8	164.5	1320	27,225	217,800
	<b>50</b>		<b>7420</b>		<b>1,106,050</b>

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

$$= \frac{7420}{50}$$

$$= \mathbf{148.4 \text{ Rs. } 148.4}$$

$$\text{Standard Deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

$$\text{Standard Deviation} = \sqrt{\left(\frac{1,106,050}{50}\right) - \left(\frac{7420}{50}\right)^2} = \sqrt{22,121 - 22,022.56}$$

$$= \mathbf{9.92}$$

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**2nd Method**

Salary	f	X	d	fd	fd <sup>2</sup>
110-119	0	114.5	-30	0	0
120-129	2	124.5	-20	-40	800
130-139	5	134.5	-10	-50	500
140-149	25	144.5	0	0	0
150-159	10	154.5	10	100	1000
160-169	8	164.5	20	160	3200
				170	5500

$$\begin{aligned}\text{Mean} &= A + \frac{\sum fX}{\sum f} \\ &= 144.5 + \frac{170}{50} \\ &= \mathbf{147.9}\end{aligned}$$

(C)

$$\sum X = 12, \quad \sum Y = 52, \quad \sum XY = 129, \quad \sum X^2 = 34, \quad \sum Y^2 = 546, \quad n = 5$$

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

$$r = \frac{5 \times 129 - 12 \times 52}{\sqrt{(5 \times 34 - 12^2)(5 \times 546 - 52^2)}}$$

$$= \frac{21}{\sqrt{26 \times 26}}$$

$$= 21/26$$

$$= \mathbf{\underline{0.808}}$$

(20 marks)

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*End of Section C*

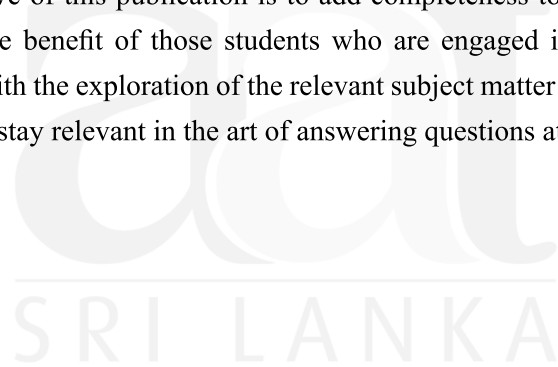
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