

BUSINESS MATHEMATICS, REASONING & STATISTICS

1. Ans. c
Explanation:
 $1Rs. : 50P : 25P$
 $4x, 5x, 6x$
 $4x + \frac{250x}{100} + \frac{150x}{100} = 120$
 $x = 15$
 The number of coins of 25 paisa = $6 \times 15 = 90$
2. Ans. c
Explanation:
 $A : B = 4 : 5] \times 7$
 $B : C = 7 : 8] \times 5$
 $A : B : C = 28 : 35 : 40$
3. Ans. b
Explanation:
 The number of straight lines
 $= {}^nC_2 - {}^xC_2 + 1$
 $= {}^{15}C_2 - {}^6C_2 + 1 = 91$
4. Ans. c
Explanation:
 The no. of arrangements = Total no. of arrangements - Two 'o's come together-
 $= \frac{6!}{2!} - 5! = 240$
5. Ans. b
Explanation:
 $9, G, G_2, G_3, G_4, 288$
 $l = ar^{n-1}$
 $288 = 9r^5$
 $r^5 = 2^5$
 $r = 2$
 $G_1 = ar = 9 \times 2 = 18$
 $G_2 = ar^2 = 9 \times 4 = 36$
 $G_3 = ar^3 = 9 \times 8 = 72$
 $G_4 = ar^4 = 9 \times 16 = 144$

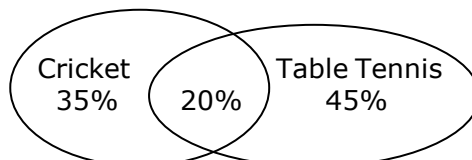
6. Ans. a

Explanation:

$$\begin{aligned}
 \text{Compound annual growth rate} &= \left[\frac{V(t_n)}{V(t_o)} \right]^{\frac{1}{t_n - t_o}} - 1 \\
 &= \left(\frac{210}{100} \right)^{\frac{1}{4}} - 1 = 26.98\%
 \end{aligned}$$

7. Ans. b

Explanation:



$$\begin{aligned}
 \text{No. of students can play cricket} &= 35\% + 20\% \\
 &= 55\% \text{ of } 120 \\
 &= 66
 \end{aligned}$$

8. Ans. d

Explanation:

$$\begin{aligned}
 \int \frac{dx}{x + \sqrt{x^2 - 1}} &= \int \frac{x - \sqrt{x^2 - 1}}{(x + \sqrt{x^2 - 1})(x - \sqrt{x^2 - 1})} dx \\
 &= \int (x - \sqrt{x^2 - 1}) dx \\
 &= \frac{x^2}{2} - \frac{x}{2} \sqrt{x^2 - 1} + \frac{1}{2} \log(x + \sqrt{x^2 - 1}) + C
 \end{aligned}$$

9. Ans. c

Explanation:

$$\begin{aligned}
 \frac{d}{dx}(x^2 \log x) &= x^2 \cdot \frac{1}{x} + 2x \log x \\
 &= x(1 + 2 \log x)
 \end{aligned}$$

10. Ans. b

Explanation:

$$\begin{aligned}
 f \circ g(x) &= f[g(x)] \\
 &= f\left[\frac{1}{1-x}\right] \\
 &= \frac{\frac{1}{1-x} - 1}{\frac{1}{1-x}} \\
 &= x
 \end{aligned}$$

11. Ans. b

Explanation:

$$\alpha - \beta = \sqrt{(\alpha + \beta)^2 - 4\alpha\beta}$$

$$= \sqrt{(7)^2 - 4(-9)} = \sqrt{85}$$

12. Ans. a

Explanation:

	Machine I	Machine II	
Grade A	2	3	≥ 14
Grade B	1	4	≥ 12

$$2x + 3y \geq 14$$

$$x + 4y \geq 12$$

13. Ans. b

Explanation:

$$2i \times -i - 2i \times 3i$$

$$= 2 + 6$$

$$= 8$$

14. Ans. b

Explanation:

3×2 Matrix multiply by 2×3 matrix then order of matrix will be 3×3 matrix.

15. Ans. a

16. Ans. a

17. Ans. b

Explanation:

$$\text{Income Tax Central angle} = \frac{240}{720} \times 360 = 120$$

$$\text{Wealth Tax angle} = \frac{180}{720} \times 360 = 90$$

18. Ans. d

Explanation:

$$\sum n^2 = \frac{n(n+1)(2n+1)}{6}$$

A.M. of first $2n$ natural number

$$\frac{2n(2n+1)(4n+1)}{6 \times 2n}$$

$$= \frac{(2n+1)(4n+1)}{6}$$

19. Ans. c

Explanation:

If the plotted points in a scatter diagram lie from upper left to lower right, then correlation is negative

20.

Ans. a

Explanation:

$$5x + 7y - 22 = 0$$

$$6x + 2y - 22 = 0$$

$$r = \sqrt{\frac{10}{42}}$$

$$b_{yx} = \frac{-5}{7}$$

$$b_{xy} = -\frac{2}{6} \qquad -\frac{5}{7} = -\frac{\sqrt{\frac{10}{42}} \times \sqrt{15}}{\sigma_x} \qquad \sigma_x = 2.646$$

21.

Ans. b

Explanation:

$$p.E = \frac{0.6745 \times 1 - r^2}{\sqrt{n}}$$

$$0.2 = \frac{0.6745 \times (1 - r^2)}{3}$$

$$r = 0.332$$

22.

Ans. c

Explanation:

$$P(A \cap B) = 1 - \frac{5}{6} = \frac{1}{6}$$

$$P(B) = 1 - \frac{2}{3} = \frac{1}{3}$$

$$P(A \cup B) = \frac{1}{2} + \frac{1}{3} - \frac{1}{6} = \frac{2}{3}$$

23.

Ans. b

Explanation:

$$n p = \frac{10}{3}$$

$$2 n_{c_2} p^2 q^{n-2} = n_{c_3} p^3 q^{n-3}$$

$$\frac{2 \times n!}{2! n-2!} q = \frac{n!}{3! n-3!} p$$

$$\frac{q}{n-2} = \frac{p}{6}$$

$$6q = n p - 2 p$$

$$6q = \frac{10}{3} - 2 p$$

$$6q = \frac{10-6p}{3}$$

$$18q = 10-6p$$

$$18-18p = 10-6p$$

$$12p = 8$$

$$p = \frac{2}{3} \quad q = \frac{1}{3}$$

$$n \times \frac{2}{3} = \frac{10}{3}$$

$$n = 5$$

$$5_{c_0} \left(\frac{2}{3}\right)^0 \left(\frac{1}{3}\right)^5 + 5_{c_1} \left(\frac{2}{3}\right)^1 \left(\frac{1}{3}\right)^4 + 5_{c_2} \left(\frac{2}{3}\right)^2 \left(\frac{1}{3}\right)^3$$

$$\frac{1}{3^5} + 5 \times \frac{2}{3^5} + \frac{10 \times 4}{3^5}$$

$$\frac{1+10+40}{3^5} = \frac{51}{3^5} = \frac{51}{243} = \frac{17}{81}$$

24. Ans. b

Explanation:

Given equation is $3x^2 + (5m-2)x + m = 0$

$$\text{Sum of the roots} = \frac{-(5m-2)}{3}$$

We know that if roots are reciprocal to each other then $\frac{c}{a} = 1$ of $ax^2 + bx + c = 0$

$$\text{So } \frac{m}{3} = 1 \Rightarrow m = 3$$

$$\text{So sum of the roots } \frac{-(5 \times 3 - 2)}{3} = \boxed{\frac{-13}{3}}$$

25. Ans. b

Explanation:

$$\text{LHL} = 3$$

$$\text{RHL} = 5-P$$

$$\text{LHL} = \text{RHL}$$

$$3 = 5-P$$

$$P = 2$$

26. Ans. b

Explanation:

$$f(x) = 2x^2 + 3x - 5$$

$$f'(x) = 4x + 3$$

$$f'(0) = 3$$

$$f'(-1) = -1$$

$$f'(0) + 3f'(-1) = 3 + 3(-1) = 3 - 3 = 0$$

27. Ans. b
Explanation: if rank is in reverse order then spearman rank correlation coefficient is -1.

28. Ans. c
Explanation:

Commodity	R	W	RW
I	110	3	330
II	120	3	360
III	70	1	70
Total		7	760

$$\text{Weighted Price Index} = \frac{\sum RW}{\sum W} = \frac{760}{7} = 108.5$$

29. Ans. b
Explanation :

$$\begin{aligned}
 \frac{L}{P} &= \frac{\frac{\sum p_1 q_0}{\sum p_0 q_0}}{\frac{\sum p_1 q_1}{\sum p_0 q_1}} = \frac{\frac{20 + 5x}{15}}{\frac{10 + 2x}{7}} = \frac{28}{27} \\
 &= \frac{140 + 35x}{150 + 30x} = \frac{28}{27} \\
 x &= 4
 \end{aligned}$$

30. Ans. b
Explanation : $\bar{x} = 1500$, $SD = 400$
 After 1st year
 Mean = $1500 + 20\% \text{ of } 1500 = 1800$
 $SD = 400 + 20\% \text{ of } 400 = 480$
 After 2nd year
 Mean = $1800 + 100 = 1900$
 $SD = 480$ (no change)

31. Ans. a

32. Ans. a
Explanation:

$$\begin{aligned}
 b_{vu} &= \frac{p}{q} \times b_{yx} \\
 &= \frac{-3}{2} \times -1.2 = 1.8
 \end{aligned}$$

33. Ans. c
Explanation :
 Event A: Person aged 50 years will remain alive after 20 years
 Event B: Person aged 60 years will remain alive after 20 years

$$\therefore P(A) = \frac{5}{9+5} = \frac{5}{14} \text{ and } P(B) = \frac{6}{8+6} = \frac{6}{14}$$

$$\therefore P(A \cup B) = \frac{5}{14} + \frac{6}{14} - \frac{5}{14} \times \frac{6}{14} = \frac{31}{49}$$

34. Ans. a

35. Ans. a

36. Ans. b

37. Ans. a

38. Ans. d

39. Ans. a

40. Ans. b

41. Ans. b

Explanation:

By formula

$$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(A \cap C) + n(A \cap B \cap C)$$

$$92\% = 42\% + 51\% + 68\% - 30\% - 28\% - 36\% + n(A \cap B \cap C)$$

$$n(A \cap B \cap C) = 25\%$$

42. Ans. d

43. Ans. a

Explanation:

$$\int (x^3 + 3^x) dx \quad e^{\log x} = x$$

$$\frac{1}{4} x^4 + \frac{3^x}{\log 3} + c$$

44. Ans. d

45. Ans. c

46. Ans. c

Explanation:

$$\text{New Mean} = \frac{\bar{x}}{\alpha} \quad \text{New Mean} = \frac{\bar{x}}{\alpha} + 10$$

47. Ans. c

Explanation:

$$P=2$$

$$P=2(1-P)$$

$$P=2-2P$$

$$3P=2$$

$$P=2/3$$

$$q=\frac{1}{3}$$

$$\begin{aligned}
 & {}^5C_3 \left(\frac{2}{3}\right)^3 \left(\frac{1}{3}\right)^2 \\
 &= \frac{80}{243}
 \end{aligned}$$

48. Ans. d

Explanation:

$$A = \frac{P}{r} [(1+r)^n - 1]$$

$$\text{Here } r = \frac{6}{100 \times 4} = 0.015$$

$$n = 5 \times 4 = 20$$

$$\text{Now } 50,000 = \frac{P}{0.015} [1.015^{20} - 1]$$

$$= \frac{P}{0.015} 1.346 - 1$$

$$P = \frac{50,000 \times 0.15}{0.346}$$

$$P = \text{Rs. } 2162.2866$$

49. Ans. b

Explanation:

$$5x + 2y = 6$$

$$2y = 6 - 5x$$

$$y = \frac{6}{2} - \frac{5x}{2}$$

$$|b| = \left| \frac{-5}{2} \right| = \frac{5}{2} \quad [\text{coefficient of } x]$$

mean deviation of $y = |b| \times \text{mean deviation of } x \text{ about mean.}$

$$= \frac{5}{2} \times 6 = 15$$

50. Ans. d

51. Ans. c

Explanation :

$$A = P \left(1 + \frac{r_1}{100}\right) \left(1 + \frac{r_2}{100}\right) \left(1 + \frac{r_3}{100}\right)$$

$$550 = P \left(\frac{109}{100} \right) \left(\frac{106}{100} \right) \left(\frac{103}{100} \right)$$

$$P = 462.16$$

52. Ans. d

Explanation:

$$E = \left[\left(1 + \frac{r}{100} \right)^n - 1 \right] \times 100$$

$$= \left[\left(1 + \frac{6}{200} \right)^2 - 1 \right] \times 100 = 6.09\%$$

53. Ans. b

54. Ans. a

55. Ans. a

56. Ans. b

Explanation :

$$A = P \left(1 + \frac{r}{100} \right)^n$$

$$121 = 100 \left(1 + \frac{r}{100} \right)^2$$

$$r = 10\%$$

57. Ans. c

58. Ans. c

59. Ans. c

60. Ans. a

Explanation:

$$\frac{\left(\frac{x}{y} - 1 \right)}{\left(\frac{x^2}{y^2} - 1 \right)}$$

$$\Rightarrow \left(\frac{x-y}{y} \right) \times \frac{y^2}{x^2 - y^2}$$

$$\Rightarrow \frac{y}{x+y}$$

61. Ans. a

Explanation:

$$\begin{aligned}
 & \frac{\log_b x}{\log_{2b} x} \\
 & \Rightarrow \frac{\log_x 2b}{\log_x b} \\
 & \Rightarrow \frac{\log_x 2 + \log_x b}{\log_x b} \\
 & \Rightarrow 1 + \frac{\log_x 2}{\log_x b} \\
 & \Rightarrow 1 + \log_b 2
 \end{aligned}$$

62. Ans. c

Explanation:

$$\begin{aligned}
 & \left(\frac{a^{-1}b^2}{a^2b^{-4}} \right)^7 \cdot \left(\frac{a^3b^{-5}}{a^{-2}b^3} \right)^{+5} \times a^{-4}b^{-2} \\
 & \Rightarrow \left(\frac{b^6}{a^3} \right)^7 \cdot \left(\frac{a^5}{b^8} \right)^5 \cdot a^{-4}b^{-2} \\
 & \Rightarrow \frac{(b)^{42}}{(a)^{21}} \cdot \frac{(a)^{25}}{(b)^{40}} \cdot a^{-4}b^{-2} \\
 & \Rightarrow (b)^{42-40-2} \cdot (a)^{25-21-4} \\
 & \Rightarrow (b)^0 \cdot (a)^0 \\
 & \Rightarrow 1
 \end{aligned}$$

63. Ans. c

Explanation:

$$\log_{.01} .00000001 = \log_{.01} (.01)^4 = 4$$

$$\log_{\sqrt{3}} 81 = \log_{\sqrt{3}} \sqrt{3}^8 = 8$$

so ratio is 4 : 8

$$\boxed{1:2}$$

64. Ans. c

$$\text{Here } 5^{x+1} + 5^{2-x} = 125 + 1 = 126.$$

$$\text{or } 5^x \cdot 5 + 5^2 \cdot 5^{-x} = 126.$$

$$\text{Put } 5^x = y \text{ so that (1) becomes : } 5y + \frac{25}{y} = 126 \Rightarrow 5y^2 - 126y + 25 = 0$$

$$\text{or } 5y^2 - 125y - y + 25 = 0 \text{ or } 5y(y - 25) - 1(y - 25) = 0$$

$$(y - 25)(5y - 1) = 0 \Rightarrow y = 25, y = 1/5$$

$$\text{When } y = 25. \text{ Then } 5^x = 25 \Rightarrow 5^x = 5^2 \Rightarrow x = 2.$$

$$\text{When } y = 1/5, \text{ then } 5^x = 1/5 = 5^{-1} \Rightarrow x = -1.$$

Hence the solution set is (-1, 2).

65. Ans. c
 Explanation:
 The no. of ways $= {}^4P_3 \times 4!$
 $= 24 \times 24 = 576$

66. Ans. c
 Explanation:

$$S_{\infty} = \frac{a}{1-r}$$

$$a = 2, b = \frac{6}{5}$$

$$ab = \frac{12}{5}$$

67. Ans. b

Explanation:

$$\frac{1}{2} \times \frac{1}{x} = \frac{1}{3} \times \frac{1}{5}$$

$$x = \frac{15}{2}$$

68. Ans. c

69. Ans. d

70. Ans. b

71. Ans. c

72. Ans. b

73. Ans. c

74. Ans. c

75. Ans. c

76. Ans. a

77. Ans. a

78. Ans. a

79. Ans. a

80. Ans. b

81. Ans. c

82. Ans. b

83. Ans. c

84. Ans. b

85. Ans. c

86. Ans. a

87. Ans. b

88. Ans. c

89. Ans. a

90. Ans. c

Explanation:

Sum of deviation from mean for any set of observation is Zero.

Example:

X_i	$X_i - \bar{X}$
10	-10
20	0
30	10
	0

$$\bar{X} = \frac{\sum X_i}{n}$$

$$= \frac{10+20+30}{3}$$

$$= 20$$

Therefore $\sum X_i - \bar{X} = 0$

91. Ans. a

Explanation:

The regression line : $y - \bar{y} = b_{yx} (x - \bar{x})$

or $y - 8.8 = 1.24(x - 5.5)$

$\Rightarrow y = 1.24x + 1.98$

92. Ans. c

Explanation:

Suitable form of average in this case is HM because it used for average rate.

93. Ans. b

Explanation:

X	P	PX
5	1/3	5/3
6	1/4	6/4
7	5/12	35/12

$$\frac{5}{3} + \frac{6}{4} + \frac{35}{12}$$

$$\frac{20+18+35}{12} = 6.08$$

94. Ans. b

Explanation:

$$4_{C_0} p^0 q^4 = \frac{16}{81}$$

$$q = \frac{2}{3} \quad p = \frac{1}{3}$$

$$4_{C_4} \left(\frac{1}{3}\right)^4 \left(\frac{2}{3}\right)^0 = \frac{1}{81}$$

95. Ans. d

Explanation:

$$m = 150 \times \frac{2}{100} = 3 \quad p(\text{more than } 2) = 1 - \frac{e^{-3} 3^0}{0!} - \frac{e^{-3} 3^1}{1!} - \frac{e^{-3} 3^2}{2!}$$

$$= 1 - \frac{e^{-3} 3^0}{0!} - \frac{e^{-3} 3^1}{1!} - \frac{e^{-3} 3^2}{2!} = 0.58$$

96. Ans. A

97. Ans. C

98. Ans. b

99. Ans. d

100. Ans. c

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