

(ALL CA FOUNDATION BATCHES)

DATE: 02.01.2021

MAXIMUM MARKS: 100

TIMING: 3 Hours

BUSINESS MATHEMATICS, REASONING & STATISTICS

1. Ans. C

Let the sum be Rs. x. Then,

$$C.L. = \left[X \times \left(1 + \frac{50}{3 \times 100} \right)^3 - X \right] = \left(\frac{343x}{216} - X \right) = \frac{127x}{216}$$

$$\therefore \frac{127x}{216} = 1,270 \text{ or } x = \frac{1,270 \times 216}{127} = 2,160.$$

Thus, the sum is Rs. 2,160.

$$\therefore S.L. = Rs \left(2,160 \times \frac{50}{3} \times 3 \times \frac{1}{100} \right) = Rs 1,080.$$

2. Ans. C

Explanation:

Total line can be made by 10_{C_2} and 7_{C_2} lines could not be drawn because points are collinear

$$\text{So Remaining} \Rightarrow 10_{C_2} - 7_{C_2} + 1$$

$$\Rightarrow 25$$

3. Ans. A

Explanation :

$$f(x) = (x-1)^3 + 2 \text{ (bijection function)}$$

$$\text{Let } (x-1)^3 + 2 = y$$

$$(x-1)^3 = y - 2$$

$$x = (y-2)^{1/3} + 1$$

$$\text{So } f^{-1} = (x-2)^{1/3} + 1$$

4. Ans. A

Explanation:

$$2x^2 + 5xy + 3y^2 = 1$$

$$4x + 5x \frac{dy}{dx} + 5y + 6y \frac{dy}{dx} = 0$$

$$\frac{dy}{dx} = \frac{-4x-5y}{5x+6y}$$

5. Ans. C

Explanation:

$$\begin{aligned} \text{The no. of ways} &= {}^4P_3 \times 4! \\ &= 24 \times 24 = 576 \end{aligned}$$

6. Ans. B

7. Ans. B

Explanation:

$$CI = 60000 \left(1 + \frac{6}{100}\right) \left(1 + \frac{8}{100}\right) \left(1 + \frac{10}{100}\right) - 60,000 = \text{Rs. } 15,556.80$$

8. Ans. C

9. Ans. C

Explanation:

Let the total Capital be Rs. X

$$\text{Then } \left(\frac{X}{3} \times \frac{7}{100} \times 1\right) + \left(\frac{X}{4} \times \frac{8}{100} \times 1\right) + \left(\frac{5X}{12} \times \frac{10}{100} \times 1\right) = 561$$

$$X = 6600$$

10. Ans. D

Explanation: Let the sides of a triangle are in 6x, 4x and 3x

$$\text{Then } 6x + 4x + 3x = 52$$

$$x = 4$$

$$\text{The length of the smallest side} = 3 \times 4 = 12 \text{ cm}$$

11. 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

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

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

12. Ans. A

Explanation :

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

$$= \log n^2 + \log (n+1)^2 - \log 4$$

$$= 2 \log n + 2 \log (n+1) - 2 \log 2$$

13. Ans. A

14. Ans. B

15. Ans. A

16. Ans. B

17. Ans. B

18. Ans. B

19. Ans. D

20. Ans. C

Explanation:

$$x\left(1 + \frac{5 \times 2}{100}\right) = 4\left(1 + \frac{3 \times 5}{100}\right) = 2\left(1 + \frac{4 \times 5}{100}\right)$$

$$22x = 23y = 24z$$

$$x : y : z = 552 : 528 : 506$$

$$A = \frac{552}{1586} \times 7930 \\ = 2760$$

21. Ans. A

22. Ans. C

23. Ans. B

24. Ans. D

25. Ans. D

Explanation:

$$\begin{aligned} \text{No. of ways} &= {}^7C_4 \times {}^3C_2 + {}^7C_3 \times {}^3C_3 \\ &= 105 + 35 = 140 \end{aligned}$$

26. Ans. B

Mean Proportion

$$= \sqrt{\frac{a-b}{a+b} \times \frac{a^2 b^2}{a^2 - b^2}}$$

$$= \frac{ab}{a+b}$$

27. Ans. C

28. Ans. B

Explanation:

$$T_5 = a + 4d = 14 \dots\dots\dots (i)$$

$$T_{12} = a + 11d = 35 \dots\dots\dots (ii)$$

On solving equation (i) and (ii)

$$a = 2$$

29. Ans. A

30. Ans. B

31. Ans. B

32. Ans. B

33. Ans. C

34. Ans. A

Explanation:

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

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

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

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

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

35. Ans. B

36. Ans. A

Explanation:

$$A^{-1} = \frac{1}{|A|} \text{adj } A$$

$$= \frac{1}{(6-5)} \begin{bmatrix} 3 & -5 \\ -1 & 2 \end{bmatrix}$$

$$= \begin{bmatrix} 3 & -5 \\ -1 & 2 \end{bmatrix}$$

37. Ans. D

Explanation:

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

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

38. Ans. B

$$\text{Let the sum be Rs. } x. \text{ Then, } \left(\frac{x \times 10 \times 7}{100 \times 2} \right) - \left(\frac{x \times 12 \times 5}{100 \times 2} \right) = 40$$

$$\Leftrightarrow \frac{7x}{20} - \frac{3x}{10} = 40 \Leftrightarrow x = (40 \times 20) = 800.$$

Hence, the sum is Rs. 800.

39. Ans. D

40. Ans. D

Explanation:

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

$$1 = P \left(1 + \frac{10}{100} \right)^2$$

$$P = 0.83$$

41. Ans. B

Explanation:

$$P = \frac{R}{r} = \frac{30,000}{0.58} = 5,17,241.38$$

42. Ans. B

Explanation :

$$ar^3 = 3$$

$$\begin{aligned} a \times ar \times ar^2 \dots \dots \dots ar^6 &= a^7 r^{21} \\ &= (ar^3)^7 \\ &= 3^7 \end{aligned}$$

43. Ans. D

44. Ans. C

45. Ans. A

46. Ans. B

47. Ans. D

48. Ans. A

49. Ans. D

50. Ans. B

51. Ans. C

52. Ans. C

53. Ans. A

54. Ans. B

Explanation:

The algebraic sum of deviations taken from mean is zero.

Example:

X_i	$X_i - \bar{X}$	$\bar{X} = \frac{\sum X_i}{n}$
10	-10	
20	0	
30	10	
	<u>0</u>	$= \frac{10+20+30}{3}$
		$= 20$

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

55. Ans. B

56. Ans. A

57. Ans. D

58. Ans. C

59. Ans. B

60. Ans. C

61. Ans. A

62. Ans. C

63. Ans. D

64. Ans. B

65. Ans. B

66. Ans. B

67. Ans. B

68. Ans. B

69. Ans. A

70. Ans. B

71. Ans. C

72. Ans. A

73. Ans. C

74. Ans. B

75. Ans. C

76. Ans. A

77. Ans. A

78. Ans. B

79. Ans. A

80. Ans. A

81. Ans. A

82. Ans. B

83. Ans. A

84. Ans. C

85. Ans. A

Explanation:

$$P_1 = x, P_2 = 20,000 - x$$

$$\frac{x \times 8 \times 1}{100} + \frac{(20,000 - x) \times 4 \times 1}{300} = 800$$

$$x = 8,000$$

86. Ans. C

Explanation:

Region represented by the line $3x + 2y = 24$ meets the coordinate axes at (8,0) and (0,12). Since the shaded region lies below the line $3x+2y=24$ therefore it is represented by less than or equal to sign i.e. $3x+2y \leq 24$.

Similarly for the line $x+2y = 16$ the shaded region lies below the line therefore it is represented by less than or equal to sign i.e. $x+2y \leq 16$

Clearly $X \geq 0$ and $y \geq 0$ represents the region lying on the right side of y axis and above x axes.

87. Ans. C

Explanation:

$$A^{-1} = \frac{\text{adj}(A)}{|A|}$$

$$\text{adj } A = \begin{bmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{bmatrix}^T$$

$$= \begin{bmatrix} 2 & -3 \\ 2 & 1 \end{bmatrix}^T$$

$$= \begin{bmatrix} 2 & 2 \\ -3 & 1 \end{bmatrix}$$

$$|A| = 2 - (-6) = 2 + 6 = 8$$

$$A^{-1} = \frac{1}{8} \begin{bmatrix} 2 & 2 \\ -3 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} \frac{1}{4} & \frac{1}{4} \\ -\frac{3}{8} & \frac{1}{8} \end{bmatrix}$$

88. Ans. C

Explanation:

100-----→ 200-----→ 400-----→
 5 yrs. 5 yrs. 5 yrs.
 Total = 15 years.

89. Ans. D

Explanation:

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

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

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

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

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

$$P = \frac{50,000 \times 0.015}{0.346}$$

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

90. Ans. C

Explanation:

Let us denote by x , the number of bags of fertilizers of grade I and by y , the number of bags of fertilizers of grade II produced in a week. We are given that grade I fertilizer requires 6 hours in plant A and grade II fertilizer requires 3 hours in plant A and plant A has maximum of 120 hours available in a week. Thus $6x + 3y \leq 120$.

Similarly grade I fertilizer requires 4 hours in plant B and grade II fertilizer requires 10 hours in Plant B and Plant B has maximum of 180 hours available in a week. Hence, we get the inequality $4x + 10y \leq 180$.

91. Ans. C

Explanation:

$$x^2 + x + 2 = 0$$

$$\alpha + \beta = -1, \alpha \beta = 2$$

$$(\alpha + \beta)^2 = \alpha^2 + \beta^2 + 2\alpha\beta$$

$$1 = \alpha^2 + \beta^2 + 4$$

$$\alpha^2 + \beta^2 = -3$$

$$\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{\alpha^2 + \beta^2}{\alpha\beta} = \frac{-3}{2}$$

92. Ans. D

Explanation:

$$E = \left[\left(1 + \frac{9.9}{1200} \right)^{12} - 1 \right] \times 100$$

$$= 10.36\%$$

93. Ans. B

Explanation:

$$2^a = 3^b = 12^c = k$$

$$2 \times 2 \times 3 = 12$$

$$k^{1/a} \times k^{1/a} \times k^{1/b} = k^{1/c}$$

$$\frac{2}{a} + \frac{1}{b} = \frac{1}{c}$$

$$\frac{2b + a}{ab} = \frac{1}{c}$$

$$ab = c(a + 2b)$$

94. Ans. A

95. Ans. B

96. Ans. D

Explanation:

In tabulation 'Caption' is the upper part of the table that describes the column and sub-column.

97. Ans. B

Explanation:

$$\text{G.M.} = (2 \times 2^2 \times 2^3 \times 2^4 \times 2^5 \times 2^6)^{1/6}$$

$$= 2^{7/2}$$

98. Ans. D

Explanation:

$$P(A/B) = \frac{P(A \cap B)}{P(B)} = \frac{1}{2}$$

99. Ans. D

100. Ans. A

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