

MATHS, STATS & REASONING**All Questions is compulsory.**

1. Ans. b

Explanation:

$$f(x) = x^2 - 4x$$

$$F(x) = A^2 - 4A$$

$$= \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix} \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix} - 4 \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$$

$$= \begin{bmatrix} 7 & 18 \\ 6 & 19 \end{bmatrix} - \begin{bmatrix} 8 & 12 \\ 4 & 16 \end{bmatrix}$$

$$= \begin{bmatrix} -1 & 6 \\ 2 & 3 \end{bmatrix}$$

2. Ans. c

Explanation:

$$A^T = A$$

$$\begin{bmatrix} 5 & b & 4 \\ 2 & c & d \\ a & -3 & -7 \end{bmatrix} = \begin{bmatrix} 5 & 2 & a \\ b & c & -3 \\ 4 & b & -7 \end{bmatrix}$$

$$a = 4, \quad b = 2$$

3. Ans. a

Explanation:

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

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

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

4. Ans. c

Explanation:

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

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

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

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

$$= 2760$$

5. Ans. a

6. Ans. b

7. Ans. c

8. Ans. b

9. Ans. d
Explanation:

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

$$x-1 = 3x$$

$$2x = -1$$

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

$$1 + \frac{1}{x^2} = 1 + 4 = 5$$

10. Ans. c
Explanation:

$$D = P \left(\frac{R}{100} \right)^2$$

$$768 = P \left(\frac{8}{100} \right)^2$$

$$P = 1,20,000$$

11. Ans. d
Explanation:

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

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

12. Ans. a

13. Ans. b

14. Ans. d

15. Ans. c
Explanation:

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

$$672 = P \left(1 + \frac{r}{100} \right)^2 \dots\dots (i)$$

$$714 = P \left(1 + \frac{r}{100} \right)^3 \dots\dots (ii)$$

$$\frac{\text{equation (ii)}}{\text{equation (i)}} \quad 1.0625 = 1 + \frac{r}{100}$$

$$r = 6.25\%$$

16. Ans. a

Explanation:

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

$$= 5,000 \left(1 + \frac{4}{100} \right) - 5,000$$

$$= 200$$

$$CI = 5,000 \left(1 + \frac{2}{100} \right)^2 - 5,000$$

$$= 202$$

$$D = 202 - 200 = \text{Rs. } 2$$

17. Ans. b

Let the sum borrowed be x. Then,

$$\left(\frac{X \times 6 \times 2}{100} \right) + \left(\frac{x \times 9 \times 3}{100} \right) + \left(\frac{X \times 14 \times 4}{100} \right) = 11,400$$

$$\Leftrightarrow \left(\frac{3x}{25} + \frac{27x}{100} + \frac{14x}{25} \right) = 11,400 \Leftrightarrow \frac{95x}{100} = 11,400 \Leftrightarrow x = \left(\frac{11,400 \times 100}{95} \right) = 12,000$$

Hence, Sum borrowed Rs. 12,000

18. Ans. c

19. Ans. b

20. Ans. a

21. Ans. a

22. Ans. b

23. 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.

24. 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.

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

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. d

Explanation:

(a, a), (b, b), (c, c) $\in R$

So R is a reflexive relation

But (a, b) $\in R$ and (b, a) $\notin R$

Thus, R is not a symmetric relation.

Also, (a, b), (b, c) $\in R \Rightarrow (a, c) \notin R$

Hence R is not a transitive relation

27. Ans. b

28. Ans. b

29. Ans. c

30. Ans. c

Explanation:

$$\begin{aligned} \text{Present value of growing property} &= \frac{R}{i - g} \\ &= \frac{80}{0.07 - 0.05} = 4000 \end{aligned}$$

31. Ans. b

Explanation:

$${}^{n+2}C_r = {}^{n+2}C_{10-r}$$

$$\text{or } n+2 = r+10-r$$

$$\text{or } n = 8$$

$$\text{then } {}^8C_6 = \boxed{28}$$

32. Ans. a

$$\begin{aligned}
 & \log_5^{1024} \\
 &= \frac{\log^{1024}}{\log_5} \\
 &= \frac{10 \log^2}{\log_5} \\
 &= \frac{10 \log^2}{\log_{10} - \log_2} = \frac{10 \times 0.3010}{1 - 0.3010}
 \end{aligned}$$

33. Ans. b
Mean Proportion

$$\begin{aligned}
 &= \sqrt{\frac{a-b}{a+b} \times \frac{a^2 b^2}{a^2 - b^2}} \\
 &= \frac{ab}{a+b}
 \end{aligned}$$

34. Ans. d

35. Ans. a

36. Ans. d

37. Ans. c

38. Ans. c

39. Ans. b

40. Ans. c

41. Ans. c

42. Ans. c
Explanation:

$$\begin{aligned}
 & \int \frac{8^{1+x} + 4^{1-x}}{2^x} dx \\
 &= \int \frac{2^{3x+3} + 2^{2-2x}}{2^x} dx \\
 &= \int (2^{2x+3} + 2^{2-3x}) dx \\
 &= \frac{2^{2x+3}}{2 \log 2} + \frac{2^{2-3x}}{(-3) \log 2} + C \\
 &= \frac{2^{2x+3}}{2 \log 2} - \frac{2^{2-3x}}{3 \log 2} + C
 \end{aligned}$$

43. Ans. b
 Let the three consecutive
 Multiples of 13 is
 $13x, 13x+13, 13x+26$
 $13x + 13x + 13 + 13x + 26 = 390$
 $39x + 39 = 390$
 $39x = 351$
 $x = 9$
 Second Multiple of 13 = $13x + 13$
 $= 13 \times 9 + 13$
 $= 130$
44. Ans. b
 Explanation:
 $T_5 = a + 4d = 14$ (i)
 $T_{12} = a + 11d = 35$ (ii)
 On solving equation (i) and (ii)
 $a = 2$
45. 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
 So Remaining $\Rightarrow 10_{C_2} - 7_{C_2} + 1$
 $\Rightarrow 25$
46. Ans. a
 Explanation :
 $f(x) = (x-1)^3 + 2$ (bijection function)
 Let $(x-1)^3 + 2 = y$
 $(x-1)^3 = y - 2$
 $x = (y-2)^{1/3} + 1$
 So $f^{-1} = (x-2)^{1/3} + 1$
47. Ans. a
 Explanation:
 $2x^2 + 5xy + 3y^2 = 1$
 $4x + 5x \frac{dy}{dx} + 5y + 6y \frac{dy}{dx} = 0$
 $\frac{dy}{dx} = \frac{-4x-5y}{5x+6y}$
48. Ans. a
49. Ans. a
50. Ans. d

51. Ans. b

52. Ans. c

Explanation:

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

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

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

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

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

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

53. Ans. c

Explanation:

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

54. Ans. b

Explanation:

$$\begin{aligned} &\log(a + \sqrt{a^2 + 1}) + \log(a + \sqrt{a^2 + 1})^{-1} \\ &= \log(a + \sqrt{a^2 + 1}) - \log(a + \sqrt{a^2 + 1}) \\ &= 0 \end{aligned}$$

55. Ans. b

56. Ans. c

57. Ans. b

58. Ans. c

Explanation:

$$a = 132, l = 468$$

$$l = a + (n-1)d$$

$$468 = 132 + (n-1)(12)$$

$$n = 29$$

$$S_n = \frac{n}{2}(a + l)$$

$$S_{29} = \frac{29}{2}(132 + 468) = 8700$$

59. Ans. c

60. Ans. a

61. Ans. b

62. Ans. a

Explanation:

$$\text{Scrap Value} = P \left(1 - \frac{r}{100}\right)^n$$

$$21,870 = P (.9)^3$$

$$P = \text{Rs. } 30,000$$

63. Ans. c
Explanation:

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

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

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

64. Ans. a

65. Ans. a

66. Ans. a

67. Ans. a

68. Ans. c

69. Ans. d

70. Ans. a

71. Ans. d

72. Ans. b

73. Ans. b

74. Ans. b

75. Ans. c

76. Ans. c

77. Ans. d

78. Ans. b
Explanation:
 $(A \cup B)'$
 $= A' \cap B'$
 $= B - A$

79. Ans. a
Explanation:

$$\frac{dx}{dt} = \frac{1}{t} \text{ and } \frac{dy}{dt} = -\frac{1}{t^2}$$

$$\Rightarrow \frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{-\frac{1}{t^2}}{\frac{1}{t}} = -\frac{1}{t}$$

$$= -y$$

Differentiating w.r.t. x

$$\frac{d^2y}{dx^2} = -\frac{dy}{dx}$$

$$\Rightarrow \frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$$

80. Ans. c

Explanation:

$$A^T = -A$$

$$|A^T| = |-A|$$

$$|A| = -|A|$$

$$|A| + |A| = 0$$

$$2|A| = 0$$

$$|A| = 0$$

81. Ans. b

Explanation:

$$-2x + 3y \geq 6 \text{ Cuts on X axis } (-3, 0)$$

$$\text{Y axis } (0, 2)$$

and y is more than x so option (B) is Correct.

82. Ans. b

Explanation:

Sum of male and female employees Can not be more than ten so option (b) shows right inequality.

83. Ans. b

Explanation:

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

$$400000 = \frac{R}{0.10} [(1 + 0.10)^{10} - 1]$$

$$R = \text{Rs. } 25098.16$$

84. Ans. c

Explanation:

$$\text{fog}(x) = f[g(x)]$$

$$= f(x^2 + 7)$$

$$\text{fog}(x) = 2(x^2 + 7) + 7$$

$$\text{fog}(x) = 2x^2 + 21$$

$$\Rightarrow 2x^2 + 21 = 25$$

$$x^2 = 2$$

$$x = \pm\sqrt{2}$$

85. Ans. d

86. Ans. c

87. Ans. a

88. Ans. c

89. Ans. a

90. Ans. d
Explanation:
 $r = -3$

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

91. Ans. d
Explanation:

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

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

$$P = 0.83$$

92. Ans. a
Explanation:

$$\text{One root} = \infty$$

$$\text{Other root} = \infty$$

$$\text{Sum} = 4\infty = \frac{-b}{a}$$

$$\infty = \frac{-b}{4a}$$

$$\text{Product} = 3\infty^2 = \frac{c}{a}$$

$$\infty^2 = \frac{c}{3a}$$

$$\frac{b^2}{16a^2} = \frac{c}{3a}$$

$$3b^2 = 16ac$$

93. Ans. c

94. Ans. d

95. Ans. d

96. Ans. b

97. Ans. d

Explanation:

$E(x - \mu)^2$ and $E[x - E(x)]^2$ both are variance.

98. Ans. c

Explanation:

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

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

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

99. Ans. a

Explanation:

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

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

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

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

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

100. Ans. b
