(GCF-1, GCF-2, GCF-4, GCF-5+8, GCF-6+9, GCF-10, GCF-11, GCF-12, GCF-13, GCF-15, GCF-16, GCF-17, MCF-1, VCF-1, VCF-2, VCF-3, SCF-1, SCF-3, VDCF-1 & VDCF-2)

DATE: 24.09.2019 **MAXIMUM MARKS: 100** **TIMING: 2 Hours**

MATHS, STATS & REASONING

All Questions is compulsory.

1. Ans. b
Explanation:
$|A| = 0$
$6(-12) - x(24) = 0$
$x = -3$

2. Ans. c
Explanation:
$|A\,A^T| = |A|\,|A^T|$
$= |A|\,|A|$
$= 5 \times 5 = 25$

3. Ans. d
Explanation:
The number of all possible matrices = $2^9 = 512$

4. Ans. b
Exp. SI $= 2{,}600\frac{20}{3}\times\frac{1}{100}\times T$
$= \frac{520}{3}\times T$
T = 3 years

5. Ans. d
Explanation:
Coefficient of variation = $\frac{\text{S.D.}}{\bar{x}}\times 100$
$50 = \frac{\text{S.D.}}{10}\times 100$
$\text{S.D.} = \frac{50\times 10}{100} = 5$
$\therefore$ Variance = $(\text{S.D.})^2 = 5^2 = 25$

6. Ans. b
Explanation:
Coefficient of range = $\frac{L-S}{L+S}$
Where $L \rightarrow$ for largest value
$S \rightarrow$ for smallest value
Coefficient of range = $\frac{40-10}{40+10} = \frac{30}{50} = \frac{3}{5}$

7. Ans. a
Explanation:
Arrange the data in ascending order:
$x/5, x/3, x/2, x$
M = Simple Average of two middle terms

$$M = \frac{\frac{x}{2}+\frac{x}{3}}{2} = 10$$

$$\frac{x}{2}+\frac{x}{3} = 20$$

$$\frac{5x}{6} = 20$$

x = 24

8. Ans. d
Explanation:
$\sum x = 50 \times 80 = 4000$
After replacing correct observations $\sum x = 4000 - 28 - 69 + 82 + 96 = 4081$
Revised $\bar{x} = \frac{4081}{50} = 81.62$

9. Ans. b
Explanation:

$$16\left(\frac{a-x}{a+x}\right)^3 = \frac{a+x}{a-x}$$

$$\left(\frac{a-x}{a+x}\right)^4 = \left(\frac{1}{2}\right)^4$$

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

$$\Rightarrow 2a - 2x = a + x$$

$$a = 3x$$

$$\because x = \frac{a}{3}$$

10. Ans. d
Exp. SI for 2 years = 5,680 – 5,200 = 480
SI for 5 years = $\frac{480}{2} \times 5 = 1,200$
P = 5,200 – 1,200 = Rs. 4,000
Rate = $\frac{100 \times 1,200}{4,000 \times 5} = 6\%$

11. Ans. b
Exp. $x\left(1+\frac{10}{100}\right)^8 = (8,840 - x)\left(1+\frac{10}{100}\right)^{10}$
X = 4,840
B = 8,840 – 4,840 = Rs. 4,000

12. Ans. b
Explanation:
G.M. = $(2 \text{ x } 2^2 \text{x } 2^3 \text{x } 2^4 \text{x} 2^5 \text{x} 2^6)^{1/6}$
$=2^{7/2}$

13. Ans. d
Explanation:
H.M. = $\frac{n}{1+3+5...2n-1} = \frac{1}{n}$

14. Ans. c

15. Ans. b
Explanation:
CAGR = $\left(\frac{280}{100}\right)^{\frac{1}{4}} - 1$
= 29.35%

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

17. Ans. a
Explanation:
$\mathrm{P} = \frac{\mathrm{R}}{\mathrm{r}}\,[1-(1+\mathrm{r})^{-\mathrm{n}}]$
$5{,}00{,}000 = \frac{\mathrm{R}}{.08}\,[1-(1+0.8)^{-3}]$
R = Rs. 1,94,016.75

18. Ans. b
Explanation:
$$\mathrm{r_R} = 1 - \frac{6\sum \mathrm{d}^2}{\mathrm{n}(\mathrm{n}^2-1)}$$
$$0.143 = 1 - \frac{6 \text{ x } 48}{7\,(48)} = 0.143$$

19. Ans. b
Explanation:
F = $\sqrt{\mathrm{L \text{ x } P}}$
150^2 = 144 x P
P = 156.25

20. Ans. b
Explanation:
Revised salary = $\frac{200}{110} \times 325 = 590.90$
It means worker is in loss.

21. Ans. c

22. Ans. d
Explanation :
Regression coefficient are independent of change of origin but not scale (As per Fundamental Principle)

23. Ans. c
Explanation:
Let the total Capital be Rs. X
Then $\left(\frac{X}{3} \text{x} \frac{7}{100} \text{x} 1\right)+\left(\frac{X}{4}\times\frac{8}{100}\times 1\right)+\left(\frac{5X}{12}\times\frac{10}{100}\times 1\right)=561$
X = 6600

24. Ans. a
Explanation:
A $= \frac{R}{r}\left[(1+r)^n - 1\right]$
$= \frac{6000}{0.09}\left[(1+0.09)^8 - 1\right]$
= Rs. 66170.84

25. Ans. a
Explanation:
No. of ways that can be formed by using the word 'BANANA' = $\frac{6!}{3!2!}=60$
No. of ways in which two N comes together = $\frac{5!}{3!}=20$
∵ Required No. of ways = 60–20 = 40

26. Ans. d
Explanation:
An injective function means one-one. In option (d), $f(x) = -x$ for every value of x, we get a different value of f. Hence, it is injective.

27. Ans. c
Explanation :
$b_{yx} = 0.5$, $b_{xy} = B$, $r = 0.1$
$r = \sqrt{b_{xy} \times b_{yx}}$
$0.1 = \sqrt{0.5 \times B}$
$0.5B = 0.01$
$B = \frac{0.01}{0.5} = 0.02$

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

29. Ans. a

30. Ans. a
Explanation:

Present value of growing perpetuity = $\frac{R}{i-g}$

$$= \frac{90}{0.07-0.05} = 4500$$

31. Ans. c
Explanation:
No of diagonals in a polygon with n sides
= ${}^{n}C_2$-n = $\frac{n(n-3)}{2}$

32. Ans. b
Exp. = $\log_{60}3 + \log_{60}4 + \log_{60}5$
= $\log_{60}60=1$

33. Ans. d
Explanation: Let the sides of a triangle are in $6x, 4x \text{ and } 3x$
Then $6x+4x+3x=52$
$x=4$
The length of the smallest side = $3\,x\,4=12\,\text{cm}$

34. Ans. c
Explanation:

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

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

35. Ans. c
Explanation : Average age of 10 students = 20 yrs
The sum of age of 10 students = 20 x 10 = 200 yrs
If two boys are increased
The total no of students = 10+2=12
And average increased by 4 yrs
Then new average = 20 + 4 = 24
The sum of age of 12 student = 24 x 12 = 288
The sum of age of two boys = 288 – 200 = 88
Average age of two boys = $\frac{88}{2}$ = 44

36. Ans. c
Explanation:
Given: Mode - Mean = 63

We know the empirical relationship between mean, Median & Mode i.e.
(Mode - Mean) = 3 (Median - Mean)
Median - Mean = $\frac{63}{3} = 21$

37. Ans. a

38. Ans. a
Explanation:

$$b_{vu} = \frac{p}{q} \times b_{yx}$$

$$= \frac{-3}{2} \times -1.2 = 1.8$$

39. Ans. b

40. Ans. a

41. Ans. b

42. Ans. c
Explanation:

$$f(x) = {}^{x}c_2$$

$$= \frac{x\,(\,x-1\,)}{2}$$

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

$$f'(x) = \frac{2x-1}{2}$$

$$f'(3) = \frac{2 \times 3 - 1}{2} = \frac{5}{2}$$

43. 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 x 15 = 90

44. Ans. b
Explanation:

Required sum $= (16)^2 + \frac{1}{2}(16)^2 + \frac{1}{4}(16)^2 + \ldots.$

$$= (16)^2 \left[1 + \frac{1}{2} + \frac{1}{4} + \ldots\right]$$

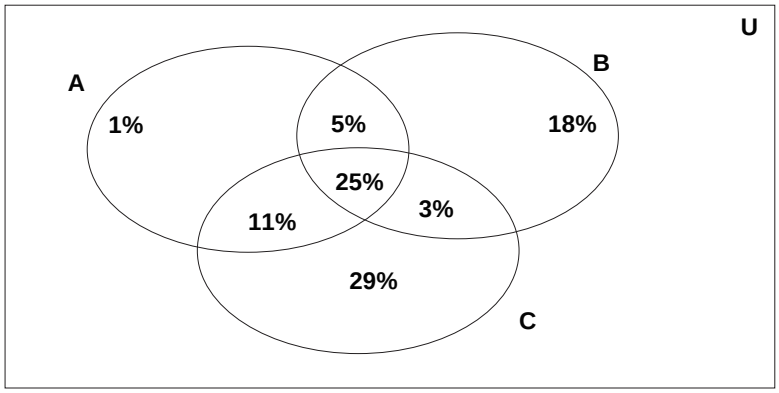
$$= (16)^2 \left[\frac{1}{1-\frac{1}{2}}\right] = 512 \text{ sq. cm}$$

45. Ans. d
Explanation:

Different words can be formed $= \frac{11!}{4!\,4!\,2!}$

S = 4, P = 2, I = 4

46. 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%



The percentage of persons who read only one paper
= 1% + 18% + 29% = 48%

47. Ans. d
Explanation:

$$\int \frac{dx}{x+\sqrt{x^2-1}} = \int \frac{x-\sqrt{x^2-1}}{(x+\sqrt{x^2-1})(x-\sqrt{x^2-1})}\,dx$$

$$= \int (x-\sqrt{x^2-1})\,dx$$

$$= \frac{x^2}{2} - \frac{x}{2}\sqrt{x^2-1} + \frac{1}{2}\log(x+\sqrt{x^2-1}) + C$$

48. 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

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

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

49. Ans. c

50. Ans. c

51. Ans. c

52. Ans. a
Explanation:

$$\frac{2^{n+3}-10\times 2^{n+1}}{2^{n+1}\times 6}$$

$$=\frac{2^{n}\times 2^{3}-10\times 2^{n}\times 2}{2^{n+1}\times 2\times 6}$$

$$=\frac{8-20}{12}=\frac{-12}{12}=-1$$

53. Ans. d
Explanation:
a, x, c are in A. P. Then,
2 x = a + c
a + c = 50 ……. (i)
a, y, c are in G.P. Then,
y^2 = ac
49 = ac……(ii)
On solving equation (i) and (ii)
a =1, c = 49

54. Ans. a

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

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

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

55. Ans. c
Explanation:

$$np - npq = \frac{5}{9}$$

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

Distribution is $\left(\frac{2}{3}+\frac{1}{3}\right)^5$

56. Ans. b

Explanation : The index 1970 on base 1960 will be = $\frac{150 \text{ x } 200}{100}$ = 300

57. Ans. b
Explanation: Less than ogive& more than Ogive intersect at a point called MEDIAN or we can say second quartile.

58. Ans. a
Explanation:

First Time	Second Time
A = 3x	$A = 27x$
P = x	$P = x$
n = 6	n = ?
$\therefore\ 3x = x\left[1+\frac{r}{100}\right]^6$	$27x = x\left[1+\frac{r}{100}\right]^n$
$3 = \left[1+\frac{r}{100}\right]^6$	$(3)^3 = \left[1+\frac{r}{100}\right]^n$
	$\left\{\left[1+\frac{r}{100}\right]^6\right\}^3 = \left(1+\frac{r}{100}\right)^n$
	$\left(1+\frac{r}{100}\right)^{18} = \left(1+\frac{r}{100}\right)^n \Rightarrow n = 18$

59. Ans. b

60. Ans. a

61. Ans. b

62. Ans. b
Explanation:

$$SI = \frac{prt}{100}$$

$$\frac{3}{8}P = \frac{p \times r \times 25}{400}$$

r = 6%

63. Ans. d
Explanation:

$$A^{\frac{1}{2}} \times A^{\frac{1}{4}} \times A^{\frac{1}{8}} \ldots\ldots\ldots\ldots\infty$$

$$= A^{\frac{1}{2}+\frac{1}{4}+\frac{1}{8}} + \ldots\ldots\ldots\ldots\infty$$

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

$$= A^{\frac{\frac{1}{2}}{1-1/2}} = A$$

64. Ans. a
Explanation:

Largest angle = $\frac{32}{90} \times 360 = 128^0$

Smallest angle = $\frac{17}{90} \times 360 = 68^0$

Difference = 60^0

65. Ans. b
Explanation:

Standard Deviation (σ) = $\sqrt{\text{Variance}}$

= $\sqrt{100} = 10$

$\because$ Mode = 3 Median – 2 Mean

$29 = (3 \times 23) - 2\,\text{Mean}$

Mean = $(69 - 29)/2 = 20$

$\because$ Coefficient of variation (CV) = $\frac{\sigma}{\overline{X}} \times 100$

$\therefore\ \text{CV} = \frac{10}{20} \times 100 = 50\%$

66. Ans. c

67. Ans. b
Explanation:

n= 32, σ=5, Σx=80

$\sigma = \sqrt{\frac{\Sigma x^2}{n} - (\overline{x})^2}$

$(5)^2 = \frac{\Sigma x^2}{32} - 6.25$

$\Sigma x^2 = 1000$

68. Ans. b

69. Ans. b

70. Ans. c

71. Ans. b

72. Ans. c

73. Ans. b

74. Ans. a
Explanation:

The regression line : $y - \overline{y} = b_{yx}\ x - \overline{x}$

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

$\Rightarrow y = 1.24x + 1.98$

75. Ans. b
Explanation:
The two lines of regression are

$2x - 7y + 6 = 0$

….(1)

and $7x-2y+1=0$

….(2)

If we take (1) as the regression equation of Y on X, then (2) is that of X on Y. We can write these as :

$y=\frac{2}{7}x+\frac{6}{7}$ and $x=\frac{2}{7}y-\frac{1}{7}$

respectively.

$\therefore b_{yx}=\frac{2}{7}$ and $b_{xy}=\frac{2}{7}$

$\Rightarrow b_{yx}b_{xy}=\frac{2}{7}\times\frac{2}{7}=\frac{4}{49}<1$

So, our choice is valid.

Now, $r^2=b_{yx}b_{xy}=\frac{4}{49}\Rightarrow r=\frac{2}{7}$

(Note that $b_{yx}>0$), so r > 0

76. Ans. b

Explanation :

$$r_R=1-\frac{6\sum d^2}{n(n^2-1)}$$

$$0.8=1-\frac{6\sum d^2}{990}$$

$$\sum d^2=33$$

$$\text{Cor.}\sum d^2=33-(7)^2+(9)^2=65$$

$$\text{Cor. } r_R=1-\frac{6\text{ x }65}{990}$$

=0.61

77. Ans. a

Explanation:

Laspeyre's Price Index is based on base year Quantity.

Since Formula is $L=\frac{\Sigma P_1Q_0}{\Sigma P_0Q_0}\times100$

Hence Q_0 is constant.

78. Ans. c

Explanation:

A={1, 2, 3}

Subsets of A = Power set of A

{ϕ, {1},{2},{3},{1,2},{2,3},{1,3},{1,2,3}}

79. Ans. b

Explanation:

f(x) = $\sqrt{x+\sqrt{x+...\infty}}$

f(x) = $\sqrt{x+f(x)}$

On squaring both sides, we get

$[f(x)]^2 = x + f(x)$

differentiation both sides

2f(x) f'(x) = 1+f'(x)

f'(x) [2f(x)–1]=1

f'(x)= $\frac{1}{2f(x)-1}$

80. Ans. b

Explanation:

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

81. Ans. b

Explanation:

By Option

82. Ans. a

Explanation:

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

$2x+3y \geq 14$

$x+4y \geq 12$

83. Ans. b

Explanation:

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

84. Ans. d

Explanation:

fog(x) = f[g(x)]

= f[2x-3]

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

= $4x^2-6x+1$

fog(-1) = 4+6+1 = 11

85. Ans. d

86. Ans. b

87. Ans. d

88. Ans. a

89. Ans. c

90. Ans. a

Explanation:

a = 5,00,000 , d = 15,000

$$S_n = \frac{n}{2}[2a + (n-1)\ d]$$

$$= \frac{10}{2}[2 \times 5{,}00{,}000 + (10-1)\ 15{,}000]$$

= Rs. 56,75,000

91. Ans. c

Explanation:

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

$$\frac{25}{16}P = P(1 + \frac{r}{100})^2$$

$$\left(\frac{5}{4}\right)^2 = (1 + \frac{r}{100})^2$$

$$\frac{5}{4} = 1 + \frac{r}{100}$$

r = 25%

92. Ans. d

Explanation:

$$x^2 - (sum\ of\ \ roots)\,x + product\ of\ \ roots = 0$$

$$x^2 - (2-\sqrt{3}+2+\sqrt{3})\ x + (2-\sqrt{3})\ (2+\sqrt{3}) = 0$$

$$x^2 - 4x + 1 = 0$$

93. Ans. b

94. Ans. a

95. Ans. c

96. Ans. d

Explanation:

$$P_{01} = \sqrt{\frac{\sum P_1 q_0}{\sum P_0 q_0} x \frac{\sum P_1 q_1}{\sum P_0 q_1}} x100 = 94.88$$

97. Ans. d

Explanation : Regression coefficient are independent of change of origin but not scale (As per Fundamental Principle).

98. Ans. c

Explanation : Chain index for any year

$$= \frac{Link\ relative (index) of\ current\ year \times Chain\ index\ of\ the\ previous\ year}{100}$$

99. Ans. d
Explanation:

Using Formula : Real wage = $\frac{\text{Money wage}}{\text{Price Index}} \times 100$

$$\Rightarrow 1680 = \frac{\text{Money Wage}}{\left(\frac{215}{120} \times 100\right)} \times 100$$

$\therefore$ Money Wage = $\frac{215}{120} \times 1680 = 3010$ Rs.

$\therefore$ Loss of worker = 3010 – 3000 = 10 Rs.

100. Ans. b

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