(GCF-14, GCF-15, GCF-16, GCF-17 & GCF-17-A, VCF-3, VDCF-3)

DATE: 12.06.2023 **MAXIMUM MARKS: 100** **TIMING: 3 Hours**

BUSINESS MATHEMATICS, REASONING & STATISTICS

1. Ans. C
Explanation:
Taking logarithms, we may write
log y = $\frac{1}{2}[\log(1-x)-\log(1+x)]$
[differentiation] $\frac{1}{y}\frac{dy}{dx}=\frac{1}{2}\left[\frac{-1}{1-x}-\frac{1}{1+x}\right]$
By cross multiplication
$(1-x^2)\frac{dy}{dx}=-y$

2. Ans. A
Explanation:
$\frac{dy}{dx}=6x^2-6x-12$
$\frac{dy}{dx}$ at x=0 = -12

3. Ans. B
Explanation:
R is reflexive and symmetric but not transitive, since (1,2) $\in$ R and (2,3) $\in$ R but (1,3) does not belong to R.

4. Ans. C
Explanation:
$\frac{3x-4}{2}\geq\frac{x+1-4}{4}$
12x-16 $\geq$ 2x-6
10x $\geq$ 10
X $\geq$ 1

5. Ans. A
Explanation:
Sum of roots ($\alpha+\beta$) = $\frac{-b}{a}=2$
Product of roots ($\alpha\beta$) = $\frac{c}{a}=-\frac{1}{2}$
$(\alpha+\beta)^3=a^3+\beta^3+3\alpha\beta(\alpha+\beta)$
$(2)^3=\alpha^3+\beta^3+3\left(-\frac{1}{2}\right)(2)$

$\alpha^3 + \beta^3 = 11$

6. Ans. B
Explanation:
By option -1, 3, 4

7. Ans. B
Explanation:
n(m U E) = n (m)+ n(E) – n(m Ω E)
= 40% + 30%-10%
= 60%
The percentage of students who passed in both subject = 100% – 60% = 40%.

8. Ans. C
Explanation:
Let the ages of A and B are 5x and 7x
5x +9 = 2(7x - 9)
5x +9 = 14x – 18
X =3
The present age of B = 7x = 7 X 3 = 21 years.

9. Ans. A
Explanation:
A = 5B , A = 3C
A + B + C =1380

$$A+\frac{A}{5}+\frac{A}{3}=1380$$

A = 900
A = 3C
900 = 3C
C=300

10. Ans. A
Explanation:

$$\frac{4a^{\frac{1}{2}+\frac{2}{3}-\frac{7}{3}}}{3a^{-\frac{5}{3}+\frac{3}{2}}} = \frac{4}{3}a^{-1} = \frac{4}{3}X\frac{1}{4} = \frac{1}{3}$$

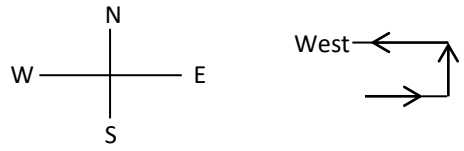
11. Ans. A
Explanation:
M = 80 Ltr.
W = 18 Ltr.
After 49 Ltr. taken out, M = 40 Ltr. & W = 9 Ltr.
Now, $\frac{40+2x}{9+x}=\frac{4}{1}$
$\Rightarrow$ 40 + 2x = 36 + 4x
$\Rightarrow$ 4 = 2x
$\Rightarrow$ 2 = x
Then, Milk added = 2x = 4 Ltr.

12. Ans. A
Explanation:

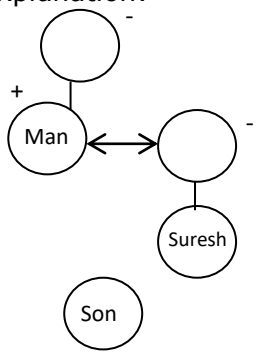
	Previous	Mixed
Alcohol	26	100
	60	
	40 : 34	
	20 : 17	

Now, Previously 20 = 240 ⇒ 1= 12
Then 17 = 17 x 12
= 204 Ltr.

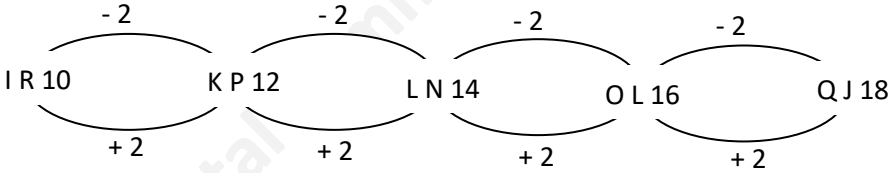
13. Ans. B
Explanation:



14. Ans. B
Explanation:

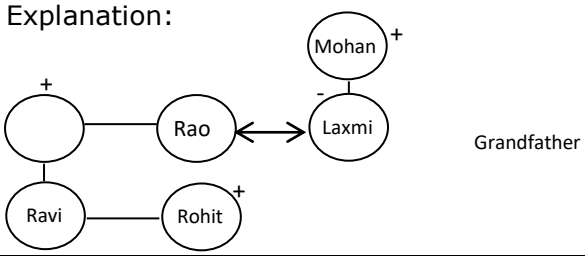


15. Ans. D
Explanation:



16. Ans. C
Explanation:
Both.

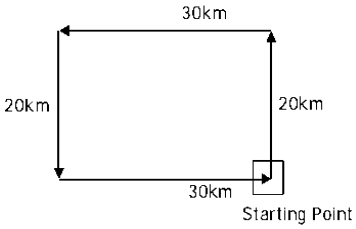
17. Ans. B
Explanation:



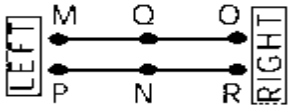
18. Ans. C
Explanation:
2nd = (1st + 1) : 3rd = (2nd + 2); 4th = (3rd + 3); 5th = (4th +4).
But 18 = 6th term not equal ? 5th + 5 = 14 + 5 = 19.

19. Ans. C
Explanation:
156 + 312 =468
468 + 312 = 780
780 + 312 = 1092
Hence 1092 is wrong

20. Ans. B
Explanation:
Draw a figure as per given instruction in the question. We can see that according to graph he is driving towards east.



21. Ans. B
Explanation:
According to question,
The sitting arrangement of M, N, O, P, Q and R would be as follows:
It is clear from the diagram that Q is facing N.



22. Ans. C
Explanation:
Common Solution for the set:
In this type of linear arrangement, we find the fixed position all are facing north
Here Y is Exactly in the Middle and it is third to the left of U

1	2	3	4	5	6	7
			Y			U

W, cannot sit at any extreme end so, T is in 1st place. W sits fifth to the right of T. W is in 6th place

1	2	3	4	5	6	7
T			Y		W	U

Z is not an immediate neighbor of Y. so, only one place left for Z that is 2.

1	2	3	4	5	6	7
T	Z		Y		W	U

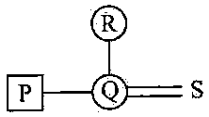
Two people sit between Z and X, X is at 5th place

1	2	3	4	5	6	7
T	Z		Y	X	W	U

The last place left for V.
From the given information we can make the following arrangement.

1	2	3	4	5	6	7
T	Z	V	Y	X	W	U

23. Ans. D
Explanation:
Mother in Law



24. Ans. D
Explanation:
Since X and Y both are the young-ones of Z. Hence either X and Y will be either sons or daughters of Z. Since Y is not the son of Z. Hence Y will be the daughter of Z.

25. Ans. A
Explanation:
The pattern is + 3, + 6, + 12, + 24,.....
So, missing term = 46 + 48 = 94.

26. Ans. B
Explanation:
The given series consists of squares of consecutive prime numbers
i.e. $2^2,3^2,5^2,.....,$
$11^2,13^2,17^2,19^2$
So, missing term = $7^2=49$.

27. Ans. C
Explanation:
8251896
Since, in CALICUT, C is coded as 8, A is coded as 2, L as 5, I as 1, U as 9, T as 6. So, code for CALICUT IS 8251896.
Option C is correct.

28. Ans. A

29. 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 = $\frac{40-10}{40+10}=\frac{30}{50}=\frac{3}{5}$

30. Ans. D

Explanation:

H.M. = $\frac{n}{1+3+5...2n-1} = \frac{1}{n}$

31. Ans. A

32. 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

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

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

33. Ans. B

Explanation:

Less than ogive & more than Ogive intersect at a point called MEDIAN or we can say second quartile.

34. 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) = $\frac{\sigma}{\bar{X}} \times 100$

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

35. Ans. C

Explanation:

Change in scale.

36. Ans. B

Explanation:

n= 32, σ=5, Σx=80

σ = $\sqrt{\frac{\Sigma x^2}{n} - (\bar{x})^2}$

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

Σx^2 = 1000

37. Ans. C
Explanation:
Algebraic sum of deviations taken from mean is Zero.
Example:

X_i	$(X_i - \overline{X})$
10	−10
20	0
30	10
	0

$\overline{X} = \frac{\Sigma X_i}{n}$

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

$= 20$

So, $\Sigma(X_i - \overline{X}) = 0$

38. Ans. A
Explanation:
Laspeyre's Price Index is based on base year Quantity.
Since Formula is $L = \frac{\Sigma P_1 Q_0}{\Sigma P_0 Q_0} \times 100$
Hence Q_0 is constant.

39. Ans. B
Explanation : Chain index for any year
$= \frac{\text{Link relative (index) of current year} \times \text{Chain index of the previous year}}{100}$

40. Ans. B

41. ANS. C
Explanation:
$A = P\left(1+\frac{r}{100}\right)^n$

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

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

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

$r = 6.25\%$

42. ANS. C
Let the sum be Rs. x. Then,

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

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

Thus, the sum is Rs. 2,160.

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

43. ANS. C
Explanation:

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

$$= \frac{80}{0.07 - 0.05} = 4000$$

44. ANS. B
Explanation:

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

or $n+2 = r+10-r$

or n = 8

then $8_{C_6} = \boxed{28}$

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. C
Explanation:

The no. of ways = $^4P_3 \times 4!$
= 24 × 24 = 576

48. ANS. A
Explanation:
Scrap Value = $P(1-\frac{r}{100})^n$
$21,870 = P\ (.9)^3$
P = Rs. 30,000

49. ANS. B
Explanation:
$A = \frac{R}{r}[(1+r)^n - 1]$
$400000 = \frac{R}{0.10}[(1+0.10)^{10} - 1]$
R = Rs. 25098.16

50. ANS. C
Explanation:
fog (x) = f[g(x)]
$= f(x^2+7)$
$fog(x) = 2(x^2+7) + 7$
$fog(x) = 2x^2+21$
$\Rightarrow 2x^2 + 21 = 25$
$x^2 = 2$
$x = \pm\sqrt{2}$

51. ANS. B
Explanation:
$CAGR = \left(\frac{280}{100}\right)^{\frac{1}{4}} - 1$
= 29.35%

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

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

54. 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

55. 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

56. 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 = $3\,x\,4=12\,\text{cm}$

57. 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

58. ANS. B
Explanation:

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

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

r = 6%

59. 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

60. 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%

61. ANS. D
Explanation:

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

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

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

62. ANS. B
Explanation :

SI = $\frac{2000 \text{ x } 5 \text{ x } 6}{100} = 600$

63. Ans. A
Explanation:

$3P = P\left(1+\frac{r\times 8}{100}\right)$

$r = 25\%$

$5P = P\left(1+\frac{25\times t}{100}\right)$

$t = 16\,years$

64. Ans. C
Explanation:
The sum of digit in unit place

$= (3+4+5+6) \times 3!$

= 108

65. Ans. B
Explanation:

$9, G, G_2, G_3, G_4, 288$

$l = a\,r^{n-1}$

$288 = 9\ r^5$

$r^5 = 2^5$

$r = 2$

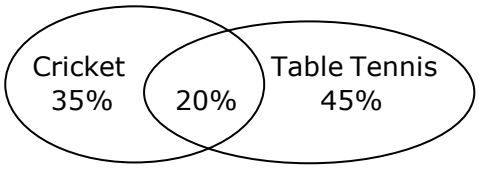
$G_1 = ar = 9\times 2 = 18$

$G_2 = ar^2 = 9 \times 4 = 36$

$G_3 = ar^3 = 9 \times 8 = 72$

$G_4 = ar^4 = 9 \times 16 = 144$

66. Ans. B
Explanation:



No. of students can play cricket $= 35\% + 20\%$
$= 55\% \; of \; 120$
$= 66$

67. 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

68. Ans. D
Explanation:

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

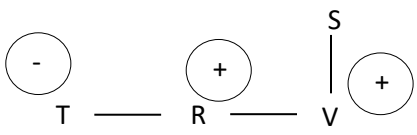
$= A^{\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\ldots\ldots\ldots\ldots\ldots\infty}$

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

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

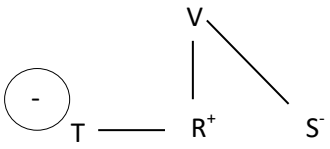
69. Ans. C
Explanation:
12 ex. U, V, M etc.

70. Ans. D
Explanation:



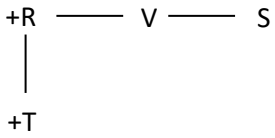
Daughter

71. Ans. B
Explanation:



Sister

72. Ans. A
Explanation:



Aunt

73. Ans. C
Explanation:
"The less than Ogive" is a S–shaped curve

74. Ans. D
Explanation:
Most of the commonly used frequency curves are Bell-shaped

75. Ans. B
Explanation:

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

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

76. Ans. C
Explanation:
The most stable measure of central tendency is mean

77. Ans. C
Explanation:

$$\sum\left(x-\bar{x}\right)^2 = Minimum$$

78. Ans. A
Explanation:

$$A.M.=\frac{6+8+12+36}{4}=15.5$$

$$G.M.=(6\times8\times12\times36)^{1/4}=12$$

79. Ans. C
Explanation:

$$4x-6y=13$$
$$4\times16-6y=13$$
$$64-13=6y$$
$$6y=51$$
$$y_m=\frac{51}{6}=8.5$$

80. Ans. A
Explanation:

$$Q_1=\frac{1\,(n+1)}{4}th \qquad D_6=\frac{6\,(n+1)}{10}th \qquad P_{82}=\frac{82\,(n+1)}{100}th$$

$$=\frac{10+1}{4}th \qquad \frac{6\,X\,11}{10}=6.6th \qquad \frac{82\times11}{100}th$$

2.75 th item = 62.75 6.6 th item = 81.20 9.02 th item = 120.20

81. Ans. B
Explanation:
Mean – Mode = 3 (Mean – Median)
50 – x = 3 (50 – 40)
50 – x = 30
X = 20

82. Ans. D
Explanation:

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

A.M. of first 2n natural number

$$\frac{2n\ (2n+1)\ (4n+1)}{6\times2n}$$

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

83. Ans. B
Explanation:
If the values of y are not affected by changes in the values of x, the variables are said to be Uncorrelated

84. Ans. B
Explanation:
Correlation coefficient is Independent of the units of measurement

85. Ans. C
Explanation:
If y = a + bx, then what is the coefficient of correlation between x and y -1

86. Ans. C
Explanation:
If the plotted points in a scatter diagram lie from upper left to lower right, then correlation is negative

87. Ans. A
Explanation:
Co-variance may be positive, negative or zero True

88. Ans. D
Explanation:
The difference between the observed value and the estimated value in regression analysis is known as error or residue

89. Ans. A
Explanation:

The two lines of regression meet at $(\bar{x}, \bar{y})$

90. Ans. B
Explanation:

$$byx = \frac{r \times \sigma y}{\sigma x}$$

$$-\frac{3}{4} = -\frac{\sqrt{\frac{3}{2}} \times 2}{\sigma x}$$

$$\sigma x = \sqrt{\frac{16}{3}}$$

$$Vx = \frac{16}{3}$$

91. Ans. A
Explanation:

$$byx = \frac{0.92 \times 6}{5} \qquad bxy = \frac{0.92 \times 5}{6}$$

$$byx + bxy = 1.871$$

92. Ans. C

Explanation:

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

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

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

93. Ans. A
Explanation:
$(3,4)(4,3)\ (2,6)\ (6,2)$

$$= \frac{4}{36}$$

94. Ans. D
Explanation:

$$\frac{5c_3}{12c_3} \times \frac{7c_3}{12c_3} = \frac{7}{968}$$

$$\frac{5c_3}{12c_3} \times \frac{7c_3}{12c_3} = \frac{5}{264}$$

95. Ans. C
Explanation:

$$A = \frac{4}{5} \qquad A' = \frac{1}{5}$$

$$B = \frac{3}{4} \qquad B' = \frac{1}{4}$$

$$AB' + BA' = \frac{7}{20}$$

96. Ans. B
Explanation:
SM
MT
TW
WT 53 Saturday= $\frac{2}{7}$
TF
FS
SS

97. Ans. D
Explanation:
$E(x-\mu)^2$ *and* $E[x-E(x)]^2$ *both are known as* variance

98. Ans. B
Explanation:
$\beta(n, p)$ it is Biparametric and Parameters are n and p

99. Ans. A
Explanation:
$n\ p = 4$
$npq = 3$
$4q = 3$
$q = \frac{3}{4}$ $p = \frac{1}{4}$ so n = 16
$\text{mod}\, e = (16+1)\frac{1}{4} = \frac{17}{4} = (4)$

100. Ans. A
Explanation:
${}^{10}c_5\left(\frac{1}{2}\right)^{10}$

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