TEST-02

SAMPURNA JANUARY 2.0 - 2025

QUANTITATIVE APTITUDE

Q1 The value of $\log_2\ 16$ is
(A) 4
(B) 8
(C) 16
(D) None of the above

Q2 The price of scooter and moped are in the ratio 7 : 9. The price of a moped is ₹1600 more than that of a scooter. Then the price of moped is:
(A) ₹7200 (B) ₹5600
(C) ₹800 (D) ₹700

Q3 Two variable x and y are given by $y = 2x - 3$. If the median of x is 20, what is the median of y?
(A) 20 (B) 40
(C) 37 (D) 35

Q4 If the AM and HM for two numbers are 5 and 3.2 respectively, then the GM will be
(A) 16 (B) 4.10
(C) 4.05 (D) 4

Q5 If $\frac{p}{q} = \frac{2}{3}$ then the value of $\frac{2p+q}{2p-q}$ is
(A) $\frac{1}{7}$ (B) $-\frac{1}{7}$
(C) 1 (D) 7

Q6 If $\log_{10} 2 = y$ and $\log_{10} 3 = x$, then the value of $\log_{10} 15$ is:
(A) x - y + 1
(B) x + y + 1
(C) x - y - 1
(D) y - x + 1

Q7 A train covered the first 5 km of its journey at a speed of 30 km/hr and next 15 km at a speed of 45 km/hr. The average speed of the train was
(A) 38 km/hr (B) 40 km/hr
(C) 36 km/hr (D) 42 km/hr

Q8 The students in three classes are in the ratio $2\ :\ 3\ :\ 5$. If 40 students are increased in each class the ratio changes to $4\ :\ 5\ :\ 7$. Originally the total number of students was
(A) 180 (B) 400
(C) 100 (D) 200

Q9 The geometric mean of three numbers 40, 50 and x is 10, the value of x is
(A) 5 (B) 4
(C) 2 (D) $\frac{1}{2}$

Q10 If $\log_a \sqrt{3} = \frac{1}{6}$, find the value of a .
(A) 9 (B) 81
(C) 27 (D) 3

Q11 In a given set if all data are of same value then variance would be:
(A) 0 (B) 1
(C) -1 (D) 0.5

Q12 A bag contained 25 paise, 10 paise and 5 paise are in the ratio 3 : 2 : 1. The total value of ₹40, the number of 5 paise coins is
(A) 45 (B) 48
(C) 40 (D) 20

Q13 $\log_9 x + \log_{27} x + \log_{81} x = \frac{13}{6}$
(A) 4 (B) 6
(C) 8 (D) 9

Q14 If $x = y^a,\ y = z^b\ and\ z = x^c$, then abc is

(A) 2 (B) 1
(C) 3 (D) 4

Q15 If GM of x is 10 and GM of y is 15, then GM of xy is
(A) 150
(B) $\log\ 10 \times \log\ 15$
(C) $\log\ 150$
(D) None of these

Q16 What must be added to each term of the ratio 49 : 68 so that it becomes 3 : 4?
(A) 3 (B) 5
(C) 8 (D) 9

Q17 The range of 15, 12, 10, 9, 17, 20 is
(A) 5 (B) 12
(C) 13 (D) 11

Q18 The average salary of a group of unskilled workers is Rs 10,000 and that of a group of skilled workers is Rs 15,000. If the combined salary is Rs 12,000, then what is the percentage of skilled workers?
(A) 40% (B) 50%
(C) 60% (D) none of these

Q19 If $\log_3 4.\log_4 5.\log_5 6.\log_6 7.\log_7 8.\log_8\ 9, = x$ then the value of x is
(A) 4 (B) 2
(C) 3 (D) 1

Q20 The relationship between two variable x and y is given by 4x – 10y = 20. If the median value of the variable x is 20 then what is median value of variable y?
(A) 1.0 (B) 2.0
(C) 3.0 (D) 6.0

Q21 If the mean and SD of x are a and b respectively, then the SD of $\frac{x-a}{b}$ is
(A) -1 (B) 1
(C) ab (D) $\frac{1}{ab}$

Q22 If the ratio of two numbers is 7 : 11. If 7 is added to each number then the new ratio will be 2 : 3. Then the numbers are
(A) 49, 77 (B) 42, 45
(C) 43, 42 (D) 39, 40

Q23 The arithmetic mean and coefficient of variation of data set x are respectively 10 and 30. The variance of 30 - 2x is
(A) 28 (B) 32
(C) 34 (D) 36

Q24 If mean ($\overline{X}$) is 10 and mode (Z) is 7, then find out the value of median (M).
(A) 9 (B) 17
(C) 3 (D) 4.33

Q25 The mean proportional between $12x^2\ and\ 27y^2$ is
(A) $18xy$ (B) $81xy$
(C) $8xy$ (D) $9xy$

Q26 Which measure of dispersion is based on the absolute deviations only?
(A) Range
(B) Standard deviation
(C) Mean deviation
(D) Quartile deviation

Q27 The third decile for the numbers 15, 10, 20, 25, 18, 11, 9, 12 is
(A) 13 (B) 10.70
(C) 11 (D) 11.50

Q28 If the difference between Mean and Mode is 69, then the difference between Mean and Median will be
(A) 63 (B) 31.5
(C) 23 (D) None

Q29 The value of $\frac{64\left(b^4a^3\right)^6}{\left[4(a^3b)^2\times\left(ab\right)^2\right]}$ is

(A) $16a^{10}b^{20}$ (B) $4a^{20}b^{10}$

(C) $8a^{10}b^{20}$ (D) $4a^{10}b^{20}$

Q30 Four persons A, B, C, D wish to share a sum in the ratio of 5 : 2 : 4 : 3. If D gets ₹1000 less than C, then the share of B ?

(A) ₹2000

(B) ₹1200

(C) ₹2400

(D) ₹3000

Q31 The average age of 15 students in a class is 9 years. Out of them, the average age of 5 students is 13 years and that 8 students is 5 years. What is the average of remaining 2 students?

(A) 5 years (B) 9 years

(C) 10 years (D) 15 years

Q32 The value of $\left(\frac{8}{27}\right)^{\frac{-1}{3}}\times\left(\frac{32}{243}\right)^{\frac{-1}{5}}$ *is*

(A) $\frac{9}{4}$ (B) $\frac{4}{9}$

(C) $\frac{2}{3}$ (D) none of these

Q33 The monthly income of A and B are in the ratio 4 : 5 and their monthly expenditures are in the ratio 5 : 7. If each saves ₹150 per month, find their monthly incomes.

(A) (₹40, ₹50)

(B) (₹50, ₹40)

(C) (₹400, ₹500)

(D) None of these

Q34 If V(x) = 23, find variance of (2x + 10).

(A) 104 (B) 110

(C) 92 (D) 85

Q35 The $3rd$ decile for the values $15,\ 10,\ 20,\ 25,\ 18,\ 11,\ 9,\ 12$ is

(A) 13 (B) 10.7

(C) 11 (D) 11.5

Q36

Height in cms:	61 – 63	63 – 65	65 – 67	67 – 69	69 – 71
No.of students:	15	118	142	127	18

Modal group is

(A) 65 - 67 (B) 69 - 71

(C) 63 - 65 (D) none

Q37 If 2x + 3y + 4= 0 and v(x) = 6, then v(y) is

(A) $\frac{8}{3}$ (B) 9

(C) -9 (D) 6

Q38 If Arithmetic mean between two numbers is 5 and Geometric mean is 4, then what is the value of Harmonic mean?

(A) 3.2 (B) 3.4

(C) 3.5 (D) 3.6

Q39 $x^{a-b}\times x^{b-c}\times x^{c-a}$ is equal to

(A) x (B) 1

(C) 0 (D) none of these

Q40 The value of $\frac{\log_3 8}{\log_9 16\ .\log_4 10}$ is:

(A) $3\ \log_{10} 2$

(B) $7\ \log_{10} 3$

(C) $3\log_e 3$

(D) None

Q41 The following number of goals were scored by a team in a series of 10 matches:

$2,\ 3,\ 4,\ 5,\ 0,\ 1,\ 3,\ 3,\ 4,\ 3$

Find the median of these scores.

(A) 5

(B) 6

(C) 3

(D) None of the above

Q42 If $x=3^{\frac{1}{3}}+3^{-\frac{1}{3}}$, then find the value of $3x^3-9x$.

(A) 3 (B) 9

(C) 12 (D) 10

Q43 If AM and C.V of a random variable X are 10 and

40 respectively, then the variance of $\left(-15+\frac{3X}{2}\right)$:

(A) 64 (B) 81
(C) 49 (D) 36

Q44 The median of the observations 42, 72, 35, 92, 67, 85, 72, 81, 51, 56 is

(A) 69.5 (B) 72
(C) 64 (D) 61.5

Q45 Find the ratio of third proportional of $12,\ 30$ and mean proportional of $9,\ 25$.

(A) $7\ :\ 2$
(B) $5\ :\ 1$
(C) $9\ :\ 4$
(D) None of these

Q46 If the coefficient of variation and standard deviation are 30 and 12 respectively, then the arithmetic mean of the distribution is

(A) 40 (B) 36
(C) 25 (D) 19

Q47 The heights (in centimeters) of a group of students in a class were recorded. The data set is as follows:

$141,\ 150,\ 154,\ 152,\ 162,\ 142,\ 155,\ 160,\ 167,\ 147,\ 152,\ 160$

What is the mode(s) of the heights in the data set?

(A) 142 (B) 165
(C) 152 and 160 (D) No mode

Q48 Solve for 'b' if $12^{2b+4} = 3^{3b} \times 4^{b+8}$.

(A) -4 (B) 2
(C) 4 (D) -2

Q49 If the first quartile is 56 and the third quartile is 77, then the coefficient of quartile deviation is

(A) 18.09 (B) 15.79
(C) 63.80 (D) 56.71

Q50 The quartile deviation for the data is:

x	2	3	4	5	6
f	3	4	8	4	1

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$
(C) 1 (D) 0

Answer Key

Q1	(A)	Q26	(C)
Q2	(A)	Q27	(B)
Q3	(C)	Q28	(C)
Q4	(D)	Q29	(A)
Q5	(D)	Q30	(A)
Q6	(A)	Q31	(D)
Q7	(B)	Q32	(A)
Q8	(D)	Q33	(C)
Q9	(D)	Q34	(C)
Q10	(C)	Q35	(B)
Q11	(A)	Q36	(A)
Q12	(C)	Q37	(A)
Q13	(D)	Q38	(A)
Q14	(B)	Q39	(B)
Q15	(A)	Q40	(A)
Q16	(C)	Q41	(C)
Q17	(D)	Q42	(D)
Q18	(A)	Q43	(D)
Q19	(B)	Q44	(A)
Q20	(D)	Q45	(B)
Q21	(B)	Q46	(A)
Q22	(A)	Q47	(C)
Q23	(D)	Q48	(C)
Q24	(A)	Q49	(B)
Q25	(A)	Q50	(C)

Hints & Solutions

Q1 Text Solution:

$\log_2 16$

$= \log_2 2^4$

$= 4\log_2 2$

$= 4(1)$

$= 4$

Hence, the correct option is (A).

Q2 Text Solution:

Given; Ratio of prices of scooter and moped = 7 : 9

Let the price of scooter be 7x and moped be 9x.

Since, the price of a moped is ₹1600 more than that of a scooter

$\Rightarrow 9x - 7x = 1600$

$\Rightarrow 2x = 1600$

$\Rightarrow x = 800$

Therefore, the price of moped is $9x = 9(800) = ₹7200.$

Q3 Text Solution:

Given: $y = 2x - 3$ and the median of x is 20.

To find median of y, put $x = 20$ in the given equation

$\Rightarrow y = 2 \times 20 - 3$

$\Rightarrow y = 40 - 3$

$\Rightarrow y = 37$

Thus, the median of y is 37 .

Hence, the correct option is (C) i.e. 37 .

Q4 Text Solution:

Given: AM = 5 and GM = 3.2

We know that,

$AM \times HM = GM^2$

$\Rightarrow GM^2 = 5 \times 3.2$

$\Rightarrow GM^2 = 16$

$\Rightarrow GM = 4$

Therefore, GM will be 4.

Q5 Text Solution:

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

Let $p = 2x$ and $q = 3x$

Then, $\frac{2p+q}{2p-q}$

$\Rightarrow \frac{2(2x)+3x}{2(2x)-3x}$

$\Rightarrow \frac{4x+3x}{4x-3x}$

$\Rightarrow \frac{7x}{x}$

$\Rightarrow \frac{7}{1}$

$\Rightarrow 7$

Q6 Text Solution:

Given: $\log_{10} 2 = y \; and \; \log_{10} 3 = x$

$\log_{10} 15 = \log_{10}\left(\frac{30}{2}\right) = \log_{10} 30 - \log_{10} 2$

$= \log_{10} (3 \times 10) - \log_{10} 2$

$= \log_{10} 3 + \log_{10} 10 - \log_{10} 2$

= x + 1 - y

Therefore, $\log_{10} 15 = x - y + 1$

Q7 Text Solution:

We know that,

$Speed = \frac{Dis\tan ce}{Time}$

Thus, average speed = $\frac{Total\ dis\tan ce}{Total\ time}$

$\Rightarrow \frac{5+15}{\frac{5}{30}+\frac{15}{45}}$

$\Rightarrow \frac{20}{\frac{1}{6}+\frac{1}{3}}$

$\Rightarrow \frac{20\times 6}{3}$

$\Rightarrow 40\ km/hr$

Q8 Text Solution:

Given; Ratio of students in three classes = 2 : 3 : 5

Let the students in three classes be 2x, 3x and 5x respectively.

According to question,

$(2x + 40) : (3x + 40) : (5x + 40)$
$= 4 : 5 : 7$
$\Rightarrow \frac{2x+40}{3x+40} = \frac{4}{5}$
$\Rightarrow 5(2x + 40) = 4(3x + 40)$
$\Rightarrow 10x + 200 = 12x + 160$
$\Rightarrow 2x = 40$
$\Rightarrow x = 20$
Therefore, the total students originally were
$2x + 3x + 5x = 10x = 10(20) = 200.$

Q9 Text Solution:
Given, Geometric mean of three numbers 40, 50 and x = 10
i.e., $(40 \times 50 \times x)^{\frac{1}{3}} = 10$
Taking cube on both sides, we get
$2000x = 10^3$
$\Rightarrow 2000x = 1000$
$\Rightarrow x = \frac{1}{2}$

Q10 Text Solution:
$\log_a \sqrt{3} = \frac{1}{6}$
$\Rightarrow \frac{\log \sqrt{3}}{\log a} = \frac{1}{6}$
$\Rightarrow \log a = 6 \log \sqrt{3}$
$\Rightarrow \log a = \log (\sqrt{3})^6$
$\Rightarrow a = 3^3 = 27$

Q11 Text Solution:
We know,
In a given set if all data are of same value, then both standard deviation and variance would be zero.

Q12 Text Solution:
Given, Ratio of 25 paise, 10 paise and 5 paise coins = 3 : 2 : 1
Total value = ₹40
Let the number of 25 paise coins, 10 paise coins and 5 paise coins be 3x, 2x and x respectively.
Then, the value
$= 0.25 \times 3x + 0.10 \times 2x + 0.05 \times x$
$\Rightarrow 0.75x + 0.20x + 0.05x = 40$
$\Rightarrow x = 40$
Therefore, the number of 5 paise coins = x = 40.

Q13 Text Solution:
Given, $\log_9 x + \log_{27} x + \log_{81} x = \frac{13}{6}$
$\Rightarrow \log_{3^2} x + \log_{3^3} x + \log_{3^4} x = \frac{13}{6}$
$\Rightarrow \frac{1}{2}\log_3 x + \frac{1}{3}\log_3 x + \frac{1}{4}\log_3 x = \frac{13}{6}$
$\Rightarrow \left(\frac{1}{2} + \frac{1}{3} + \frac{1}{4}\right) \log_3 x = \frac{13}{6}$
$\Rightarrow \left(\frac{6+4+3}{12}\right) \log_3 x = \frac{13}{6}$
$\Rightarrow \left(\frac{13}{12}\right) \log_3 x = \frac{13}{6}$
$\Rightarrow \log_3 x = 2$
$\Rightarrow x = 3^2$
$\Rightarrow x = 9$

Q14 Text Solution:
Given: $x = y^a$, $y = z^b$ and $z = x^c$
Put the value of $y = z^b$ in $x = y^a$
$\Rightarrow x = (z^b)^a = z^{ab}$
Put the value of z,
$\Rightarrow x = (x^c)^{ab}$
$\Rightarrow x = x^{abc}$
On comparing the powers,
$\Rightarrow abc = 1$
Hence, the correct option is (B) i.e., 1.

Q15 Text Solution:
Given: GM of x = 10 and GM of y = 15
We know that,
GM of the product of two variables is the product of their GM's.
Thus, GM of xy = GM of x $\times$ GM of y
$= 10 \times 15 = 150$
Therefore, GM of xy is 150.
Hence, the correct option is (A) i.e. 150.

Q16 Text Solution:
Let x be added to each term of the ratio 49 : 68 so that it becomes 3 : 4, then

$\frac{49+x}{68+x} = \frac{3}{4}$

$\Rightarrow 4\left(49+x\right) = 3\left(68+x\right)$

$\Rightarrow 196 + 4x = 204 + 3x$

$\Rightarrow x = 8$

Q17 Text Solution:

Given data: 15, 12, 10, 9, 17, 20

Maximum value of the observation = 20

Minimum value of the observation = 9

∴ Range = Maximum value - Minimum value

= 20 - 9 = 11

Hence, the correct answer is option (D) i.e., 11.

Q18 Text Solution:

Let the percentage of skilled worker be x, so unskilled worker will be $(100 - x)$.

Therefore $n_1 = x, n_2 = x, \bar{x}_i = 12000$

$\overline{x_1} = 15000,\ \overline{x_2} = 10000$

$\overline{x_i} = \frac{n_1\bar{x}_1 + n_2\overline{x_2}}{n_1+n_2}$

$\Rightarrow 12000 = \frac{x(15000)+(100-x)(10000)\}}{\{x+100-x\}}$

$\Rightarrow 1200000 = 15000x + 1000000 - 10000x$

$\Rightarrow 200000 = 5000x$

$\Rightarrow x = 40\%$

Q19 Text Solution:

Given,

$\log_3 4.\ \log_4 5.\ \log_5 6.\ \log_6 7.\ \log_7 8 . \log_8 9 = x$

$\Rightarrow \frac{\log 4}{\log 3}.\ \frac{\log 5}{\log 4}.\ \frac{\log 6}{\log 5}.\ \frac{\log 7}{\log 6}.\ \frac{\log 8}{\log 7}.\ \frac{\log 9}{\log 8} = x$

$\Rightarrow x = \frac{\log 9}{\log 3}$

$\Rightarrow x = \frac{\log 3^2}{\log 3}$

$\Rightarrow x = \frac{2\log 3}{\log 3}$

$\Rightarrow x = 2$

Q20 Text Solution:

Given relation, 4x – 10y = 20

$\Rightarrow 4x_{med} - 10y_{med} = 20$

$\Rightarrow 4(20) - 10y_{med} = 20$

$\Rightarrow 80 - 10y_{med} = 20$

$\Rightarrow 10y_{med} = 60$

$\Rightarrow y_{med} = 6$

Q21 Text Solution:

The relation is $y = \frac{(x-a)}{b}$

$\Rightarrow y = \frac{x}{b} - \frac{x}{a}$

So, S.D of y $= \frac{1}{b}(S.D \text{ of } x)$

$\Rightarrow y = \frac{1}{b}(b)$

$\Rightarrow y = 1$

Q22 Text Solution:

Given: Ratio of two numbers = 7 : 11

Let us assume the two numbers to be 7x and 11x.

According to the question,

$\frac{7x+7}{11x+7} = \frac{2}{3}$

On cross-multiplying, we get

3(7x + 7) = 2(11x + 7)

⇒ 21x + 21 = 22x + 14

⇒ 22x - 21x = 21 - 14

⇒ x = 7

Therefore, the numbers are 7×7 and 11×7 i.e., 49 and 77 respectively.

Hence, the correct option is (A) i.e., 49, 77.

Q23 Text Solution:

Given, Mean = 10 and Coefficient of variation (C.V.) = 30

We know that,

$C.V = \frac{S.D}{Mean} \times 100$

$\Rightarrow 30 = \frac{S.D}{10} \times 100$

$\Rightarrow S.D = 3$

Let y = 30 - 2x, then

$S.D_y = |-2| \times S.D_x$

$\Rightarrow S.D_y = 2 \times 3 = 6$

Therefore, variance of (30 - 2x) $= 6^2 = 36$.

Q24 Text Solution:

Given: Mean ($\overline{X}$) = 10, Mode (Z) = 7

To find: Median (M)

We know that,

3 Median = 2 Mean + Mode

$\Rightarrow$ 3M = 2(10) + 7

$\Rightarrow$3M = 27

$\Rightarrow$M = 9

Therefore, the value of median (M) is 9.

Q25 Text Solution:

We know that,

Mean proportion between a and b $= \sqrt{ab}$

Therefore, the required mean proportion:

$\sqrt{12x^2 \times 27y^2}$

$= \sqrt{2 \times 2 \times 3 \times x^2 \times 3 \times 3 \times 3 \times y^2}$

$= 2 \times 3 \times 3 \times x \times y$

$= 18xy$

Q26 Text Solution:

We know that,

$M.D = \sum |x_i - \bar{x}|$, which gives the absolute deviations only.

Therefore, Mean deviation is based on the absolute deviations only.

Q27 Text Solution:

Given observations: 15, 10, 20, 25, 18, 11, 9, 12

Arranging the observation in ascending order, we get 9, 10, 11, 12, 15, 18, 20, 25

We know that,

Third decile, $D_3 = \frac{3}{10} \times (n+1)^{th}$ value

$= \frac{3}{10} \times (8+1)^{\text{th}}$ value

$= \frac{3}{10} \times 9^{\text{th}}$ value

$= 2.7^{\text{th}}$ value

$= 2^{\text{nd}}$ value $+ 0.7 \times$ Difference between 3^{rd} and 2^{nd} value

$= 10 + 0.70(11 - 10)$

$= 10 + 0.70$

$= 10.70$

Hence, the correct option is (B).

Q28 Text Solution:

We know that,

Mean - Mode = 3(Mean - Median)

$\Rightarrow 69 = 3(mean - median)$

$\Rightarrow \frac{69}{3} = Mean - Median$

$\Rightarrow Mean - Median = 23$

Q29 Text Solution:

$$\frac{64(b^4a^3)^6}{\left[4(a^3b)^2 \times (ab)^2\right]}$$

$$= \frac{64 \times b^{24}a^{18}}{\left[4 \times a^6b^2 \times a^2b^2\right]}$$

$= 16 \times b^{24-2-2}a^{18-6-2}$

$= 16b^{20}a^{10}$

Q30 Text Solution:

Given, Ratio of A, B, C and D = 5 : 2 : 4 : 3

Let the share of A, B, C and D be 5x, 2x, 4x and 3x respectively.

Since, D gets ₹1000 less than C, thus

$D = C - 1000$

$\Rightarrow 3x = 4x - 1000$

$\Rightarrow x = 1000$

Therefore, the share of

B $= 2x = 2(1000) = 2000$

Hence, the correct option is (A).

Q31 Text Solution:

According to the question, we have

$\bar{x} = 9,\ \overline{x_1} = 13,\ \overline{x_2} = 5,\ n_1 = 5,\ n_2 = 8$ $and\ n_3 = 2$

Thus, the average of remaining 2 students is given by:

$\bar{x} = \frac{n_1\overline{x_1} + n_2\overline{x_2} + n_3\overline{x_3}}{n_1 + n_2 + n_3}$

$\Rightarrow 9 = \frac{5 \times 13 + 8 \times 5 + 2\overline{x_3}}{15}$

$\Rightarrow 135 = 65 + 40 + 2\overline{x_3}$

$\Rightarrow 2\overline{x_3} = 30$

$\Rightarrow \overline{x_3} = 15$

Q32 Text Solution:

$\left(\frac{8}{27}\right)^{\frac{-1}{3}} \times \left(\frac{32}{243}\right)^{\frac{-1}{5}}$

$= \left(\frac{2^3}{3^3}\right)^{\frac{-1}{3}} \times \left(\frac{2^5}{3^3}\right)^{\frac{-1}{5}}$

$= \left(\frac{2}{3}\right)^{3\times\frac{-1}{3}} \times \left(\frac{2}{3}\right)^{5\times\frac{-1}{5}}$

$= \left(\frac{2}{3}\right)^{-1} \times \left(\frac{2}{3}\right)^{-1}$

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

$= \frac{9}{4}$

Therefore, the value of $\left(\frac{8}{27}\right)^{\frac{-1}{3}} \times \left(\frac{32}{243}\right)^{\frac{-1}{5}}$ is $\frac{9}{4}$.

Hence, the correct answer is option (A)

Q33 Text Solution:

Given: Ratio of monthly incomes of A and B = 4 : 5

Ratio of their expenditures = 5 : 7

Let the monthly income of A be 4x and that of B be 5x

Let the monthly expenses of A be 5y and that of B be 7y

According to the question,

4x – 5y = 150 .....(1)

5x – 7y = 150 .....(2)

Multiply eq (1) with 5 and (2) by 4, thus we get

20x - 25y = 750

20x - 28y = 600

On solving both equations, we get

3y = 150

y = 50

Thus, 4x - 250 = 150

4x = 400

x = 100

Therefore, the monthly income of A = 4x = 4(100) = ₹400

Monthly income of B = 5x = 5(100) = ₹500

Q34 Text Solution:

We know that, standard deviation (σ) remains unaffected due to a change of origin but is affected in the same ratio due to a change of scale.

Given, $V(x) = 23 \Rightarrow \sigma = \sqrt{23}$

Now, S.D. of $(2x + 10) = 2\sigma = 2\sqrt{23}$

Thus, $V(2x + 10) = \left(2\sqrt{23}\right)^2 = 92$

Q35 Text Solution:

Deciles (Measures of Positions):

The deciles are the values (nine in numbers) of the variable that divide an ordered data set into 10 equal parts so that each equal part represents $\frac{1}{10}$ of the sample.

Arranging the given data in ascending order, we get

$9, 10, 11, 12, 15, 18, 20, 25$

Here, $n = 8$

Therefore, $D_3 = 3\left(\frac{n+1}{10}\right)^{th}$ observation

$= 3\left(\frac{8+1}{10}\right)^{th} = (2.7)^{th}$ observation

$= 2^{nd}$ observation $+0.7\left(3^{rd} - 2^{nd}\right)$ observation

$= 10 + 0.7(11 - 10)$

$= 10.7$

Hence, option (B) i.e. 10.7 is the correct answer.

Q36 Text Solution:

We know that,

For a given set of observations, mode may be defined as the value that occurs the maximum number of times.

Clearly, the highest frequency is 142 which lies in the class 65 - 67.

Therefore, the modal class is 65 - 67.

Q37 Text Solution:

Given: 2x + 3y + 4 = 0

$\Rightarrow 3y = -2x - 4$

$\Rightarrow y = -\frac{2x}{3} - \frac{4}{3}$

Thus,

$S.D._y = |b| S.D._x$

$\Rightarrow V\left(y\right) = b^2 \times V\left(x\right)$

$\Rightarrow V\left(y\right) = \left(\frac{2}{3}\right)^2 \times 6$

$\Rightarrow V\left(y\right) = \frac{4}{9} \times 6$

$\Rightarrow V\left(y\right) = \frac{8}{3}$

Q38 Text Solution:

Given, A.M = 5 and G.M = 4

We know that,

$G.M^2 = A.M \times H.M$

$\Rightarrow 4^2 = 5 \times H.M$

$\Rightarrow 16 = 5 \times H.M$

$\Rightarrow H.M = 3.2$

Q39 Text Solution:

To find: $x^{a-b} \times x^{b-c} \times x^{c-a}$

We know that,

$a^m \times a^n = a^{m+n}$

$\Rightarrow x^{a-b} \times x^{b-c} \times x^{c-a}$

$= x^{a-b+b-c+c-a}$

$= x^0 = 1 \quad \left(\because a^0 = 1\right)$

Q40 Text Solution:

To simplify: $\frac{\log_3\ 8}{\log_9\ 16\ .\log_4\ 10}$

This expression can be rewritten as:

$\Rightarrow \frac{\log_3\ 8}{\log_9\ 16\ .\log_4\ 10} = \frac{\log_3\ 2^3}{\log_{3^2}\ 2^4\ \times \log_{2^2}\ 10}$

We know that,

$\log\ a^b = b\ log\ a$

$\Rightarrow \frac{3\ \log_3\ 2}{\frac{4}{2}\log_3\ 2 \times \frac{1}{2}\ \log_2\ 10}$

On further simplification, we get

$= \frac{3}{\frac{4}{2} \times \frac{1}{2}\ \log_2\ 10}$

$= \frac{3}{\log_2\ 10}$

It is known that,

$\frac{1}{\log_a\ b} = \log_b\ a$

So, $\frac{\log_3\ 8}{\log_9\ 16.\ \log_4\ 10} = 3\ \log_{10} 2$

Thus, the value $\frac{\log_3\ 8}{\log_9\ 16.\ \log_4\ 10}$ is $3\log_{10}\ 2$.

Q41 Text Solution:

Arranging the given data in ascending order:

0, 1, 2, 3, 3, 3, 3, 4, 4, 5

Here, number of observations (n) = 10, which is even

Thus, median $= \frac{\frac{n}{2}^{th} + \left(\frac{n}{2}+1\right)^{\text{th}}\ \text{term}}{2}$

$= \frac{\frac{10}{2}^{th} + \left(\frac{10}{2}+1\right)^{\text{th}}\ \text{term}}{2}$

$= \frac{5th\ term + 6th\ term}{2}$

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

$= \frac{6}{2}$

$= 3$

Therefore, the median of given observations is 3.

Q42 Text Solution:

As we know,

$\left(a + b\right)^3 = a^3 + b^3 + 3a^2b + 3ab^2$

So, x^3 will be

$x^3 = \left(3^{\frac{1}{3}} + 3^{-\frac{1}{3}}\right)^3$

$x^3 = \left(3^{\frac{1}{3}}\right)^3 + \left(3^{-\frac{1}{3}}\right)^3 +$

$3\left(3^{\frac{1}{3}}\right)^2\left(3^{-\frac{1}{3}}\right) + 3\left(3^{\frac{1}{3}}\right)\left(3^{-\frac{1}{3}}\right)^2$

$x^3 = 3 + \frac{1}{3} + 3^{\frac{4}{3}} + 3^{\frac{2}{3}}$

Now, $3x^3 - 9x$ will be,

$= 3\left(3 + \frac{1}{3} + 3^{\frac{4}{3}} + 3^{\frac{2}{3}}\right) -$

$9\left(3^{\frac{1}{3}} + 3^{-\frac{1}{3}}\right)$

$= 10 + 3^{\frac{7}{3}} + 3^{\frac{5}{3}} - 3^{\frac{7}{3}} - 3^{\frac{5}{3}}$

$= 10$

Hence, the correct option is (D) i.e., 10.

Q43 Text Solution:

We know that,

Coefficient of variance, $C.V = \frac{\sigma}{\overline{X}} \times 100$

Given, $C.V = 40$, $\overline{X} = 10$

then, $40 = \frac{\sigma}{10} \times 100$

$\Rightarrow \sigma = \frac{400}{100} = 4$

Thus, $S \cdot D\left(-15 + \frac{3X}{2}\right) = \frac{3}{2} \times SD(X)$

$\Rightarrow S \cdot D\left(-15 + \frac{3X}{2}\right) = \frac{3}{2} \times 4 = 6$

Therefore, variance of $\left(-15 + \frac{3X}{2}\right) = 6^2 = 36$

Q44 Text Solution:

Given observations: 42, 72, 35, 92, 67, 85, 72, 81, 51, 56

Arranging the observations in ascending order, we get

35, 42, 51, 56, 67, 72, 72, 81, 92

Here, number of observations (n) is even i.e., 10.

Therefore, Median is given by

$\frac{\left(\frac{n}{2}\right)^{th} term + \left(\frac{n}{2}+1\right)^{th} term}{2}$

$= \frac{5^{th}\ term + 6^{th}\ term}{2}$

$= \frac{67+72}{2}$

$= 69.5$

Q45 Text Solution:

Let the third proportional to 12 and 30 be x.

Then, $12 : 30 :: 30 : x$

$\Rightarrow \frac{12}{30} = \frac{30}{x}$

$\Rightarrow x = \frac{30 \times 30}{12}$

$\Rightarrow x = 75$

Thus, third proportional to 12 and 35 is 75.

Also, Mean proportional between 9 and 25

$= \sqrt{9 \times 25}$

$= 3 \times 5$

$= 15$

Required ratio $= \frac{75}{15} = 5 : 1$

Hence, the correct answer is option (B) i.e., 5 : 1.

Q46 Text Solution:

Given: Coefficient of variation = 30, Standard deviation $(\sigma) = 12$

We know that,

Coefficient of variation$= \frac{\sigma}{\overline{X}} \times 100$

$30 = \frac{12}{\overline{X}} \times 100$

$\Rightarrow \overline{X} = \frac{12}{30} \times 100$

$\Rightarrow \overline{X} = 40$

Therefore, the arithmetic mean of the distribution is 40.

Q47 Text Solution:

Given data:

$141,\ 150,\ 154,\ 152,\ 162,\ 142,\ 155,\ 160,\ 167,\ 147,\ 152,\ 160$

We know that,

For a given set of observations, mode may be defined as the value that occurs the maximum number of times.

Here, we can see that the heights 152 and 160 both appear two times, which is more frequent than any other height in the data set.

Therefore, the modes of the heights in the data set are 152 and 160.

Q48 Text Solution:

We have,

$12^{2b+4} = 3^{3b} \times 4^{b+8}$

$\Rightarrow 3^{2b+4} \times 4^{2b+4} = 3^{3b} \times 4^{b+8}$

$\Rightarrow \frac{3^{2b+4}}{3^{3b}} = \frac{4^{b+8}}{4^{2b+4}}$

$\Rightarrow 3^{2b+4-3b} = 4^{b+8-2b-4}$

$\left(\because \frac{a^m}{a^n} = a^{m-n}\right)$

$\Rightarrow 3^{4-b} = 4^{4-b}$

$\Rightarrow \frac{3^{4-b}}{4^{4-b}} = 1$

$\Rightarrow \left(\frac{3}{4}\right)^{4-b} = \left(\frac{3}{4}\right)^{0}$

On comparing, we get

$\Rightarrow 4 - b = 0$

$\Rightarrow b = 4$

Hence, the correct option is (C).

Q49 **Text Solution:**

Given: $Q_1 = 56$ & $Q_3 = 77$

We know that,

Coefficient of quartile deviation is given by:

$\frac{Q_3 - Q_1}{Q_3 + Q_1} \times 100$

$\Rightarrow \frac{77-56}{77+56} \times 100$

$\Rightarrow 15.79$

Q50 **Text Solution:**

We know that,

Quartile deviation is given by $Q.D. = \frac{1}{2} \times (Q_3 - Q_1)$, where

$Q_1 = \left(\frac{N+1}{4}\right)th \ \ observation,$

$Q_3 = 3 \times \left(\frac{N+1}{4}\right)th \ observation$

Calculating cumulative frequency, we get

x	2	3	4	5	6
f	3	4	8	4	1
cf	3	7	15	19	20

$Here, \ N = \sum x_i = 20$

$So, \ Q_1 = \left(\frac{20+1}{4}\right)th = 5.25th$

$observation = 3$

Similarly, $Q_3 = \left[\frac{3(20+1)}{4}\right]th$

$= 15.75th \ observation = 5$

Therefore, $Q.D. = \frac{1}{2} \times (5 - 3) = 1$