2. Scientific notations of real numbers and logarithms

Exercise 2.1

1 A. Question

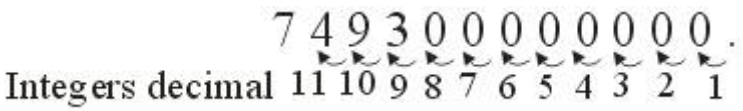
Represent the following numbers in the scientific notation.

749300000000

Answer

The given number is 7 4 9 3 0 0 0 0 0 0 0 . (In integers decimal point at the end is usually omitted.)

Move the decimal point so that there is only one non - zero digit to its left.



The decimal point is to be moved 11 places to the left of its original position. So, the power of 10 is 11.

(The count of the number of digits between the old and new decimal point gives n the power of 10.)

Therefore, scientific notation is $7.49300000000 \times 10^{11} = 7.493 \times 10^{11}$.

1 B. Question

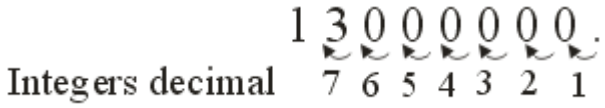
Represent the following numbers in the scientific notation.

13000000

Answer

The given number is 1 3 0 0 0 0 0 0 .

The decimal point is to be moved 7 places to the left of its original position. So the power of 10 is 7.



Therefore, scientific notation is $1.3000000 \times 10^{7} = 1.3 \times 10^{7}$

1 C. Question

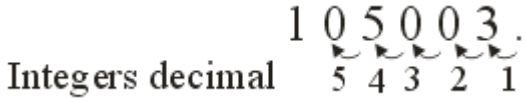
Represent the following numbers in the scientific notation.

105003

Answer

The given number is 1 0 5 0 0 3 .

The decimal point is to be moved 5 places to the left of its original position. So the power of 10 is 5.



Therefore,scientific notation is 1.05003×10^{5}

1 D. Question

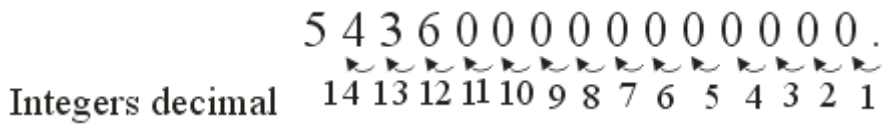
Represent the following numbers in the scientific notation.

543600000000000

Answer

The given number is 5 4 3 6 0 0 0 0 0 0 0 0 0 0 0 .

The decimal point is to be moved 14 places to the left of its original position. So the power of 10 is 14.



Therefore,scientific notation is 5.436×10^{14}.

1 E. Question

Represent the following numbers in the scientific notation.

0.0096

Answer

The given number is 0 . 0 0 9 6

The decimal point is to be moved 3 places to the right of its original position. So the power of 10 is - 3.(If the decimal is shifted to the right ,the exponent n is negative.)

Therefore,scientific notation is 9.6×10^{-3}

1 F. Question

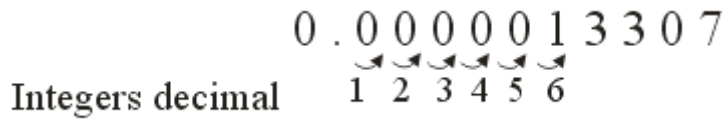
Represent the following numbers in the scientific notation.

0.0000013307

Answer

The given number is 0 . 0 0 0 0 0 1 3 3 0 7

The decimal point is to be moved 6 places to the right of its original position. So the power of 10 is - 6.(If the decimal is shifted to the right ,the exponent n is negative.)



Therefore, scientific notation is 1.3307×10^{-6}

1 G. Question

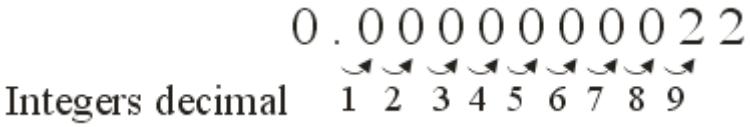
Represent the following numbers in the scientific notation.

0.0000000022

Answer

The given number is 0 . 0 0 0 0 0 0 0 0 2 2

The decimal point is to be moved 9 places to the right of its original position. So the power of 10 is - 9.(If the decimal is shifted to the right ,the exponent n is negative.)



Therefore, scientific notation is 2.2×10^{-9}

1 H. Question

Represent the following numbers in the scientific notation.

0.0000000000009

Answer

The given number is 0 . 0 0 0 0 0 0 0 0 0 0 0 0 9

The decimal point is to be moved 13 places to the right of its original position. So the power of 10 is - 13.(If the decimal is shifted to the right ,the exponent n is negative.)

Therefore, scientific notation is 9.0×10^{-13}

2 A. Question

Write the following numbers in decimal form.

3.25×10^{-6}

Answer

The given number is 3.25×10^{-6}.

In this number the decimal number is 3.25

Now we have to move the decimal point the number of places specified by the power of 10:to the right if positive to the left if negative. Add zeros if necessary. Rewrite the number in decimal form.

Here power of 10 i.e. n is - 6.

So, the number in decimal form is 0.00000325

2 B. Question

Write the following numbers in decimal form.

4.134×10^{-4}

Answer

The given number is 4.134×10^{-4}

In this number the decimal number is 4.134

Now we have to move the decimal point the number of places specified by the power of 10:to the right if positive to the left if negative. Add zeros if necessary. Rewrite the number in decimal form.

Here power of 10 i.e. n is - 4.

So, the number in decimal form is 0.0004134

2 C. Question

Write the following numbers in decimal form.

4.134×10^{4}

Answer

In decimal form, the given expression is written as:

4.134×10^4

$= 41.34 \times 10^3$

$= 413.4 \times 10^2$

$= 4134 \times 10^1$

$= 41340$

Hence, the decimal form of the given expression is: 41340

2 D. Question

Write the following numbers in decimal form.

1.86×10^7

Answer

The given number is 1.86×10^7.

In this number the decimal number is 1.86

Now we have to move the decimal point the number of places specified by the power of 10:to the right if positive to the left if negative. Add zeros if necessary. Rewrite the number in decimal form.

Here power of 10 i.e. n is 7.

So, the number in becomes 18600000.00.

Therefore, the number in decimal form is 18600000.

2 E. Question

Write the following numbers in decimal form.

9.87×10^9

Answer

The given number is 9.87×10^9

In this number the decimal number is 9.87

Now we have to move the decimal point the number of places specified by the power of 10:to the right if positive to the left if negative. Add zeros if necessary. Rewrite the number in decimal form.

Here power of 10 i.e. n is 9.

So, the number in becomes 9870000000.00

Therefore,the number in decimal form is 9870000000.

2 F. Question

Write the following numbers in decimal form.

1.432×10^{-9}

Answer

The given number is 1.432×10^{-9}

In this number the decimal number is 1.432

Now we have to move the decimal point the number of places specified by the power of 10:to the right if positive to the left if negative. Add zeros if necessary. Rewrite the number in decimal form.

Here power of 10 i.e. n is 9.

So, the number indecimal form is 0.000000001432

3 A. Question

Represent the following numbers in scientific notation.

$(1000)^2 \times (20)^6$

Answer

In scientific notation,

$1000 = (1.0 \times 10^3)$ and $20 = (2.0 \times 10^1)^6$

$\therefore (1000)^2 \times (20)^6 = (1.0 \times 10^3)^2 \times (2.0 \times 10^1)^6$

$= (1.0)^2 \times (10^3)^2 \times (2.0)^6 \times (10^1)^6$

$= 1 \times 10^6 \times 64 \times 10^6$

$= 64 \times 10^{12}$

$= 6.4 \times 10^1 \times 10^{12}$

$= 6.4 \times 10^{13}$

$\therefore (1000)^2 \text{ x } (20)^6$ in scientific notation is 6.4×10^{13}

3 B. Question

Represent the following numbers in scientific notation.

$(1500)^3(0.0001)^2$

Answer

In scientific notation,

$1500 = (1.5\times10^3)$ and $0.0001 = (1.0\times10^{-4})$

$\therefore(1500)^3\times(0.0001)^2 = (1.5\times10^3)^3\times(1.0\times10^{-4})^2$

$= (1.5)^3\times(10^3)^3\times(1.0)^2\times(10^{-4})^2$

$= 3.375\times(10)^9\times1\times(10)^{-8}$

$= 3.375\times(10)^1$

$\therefore (1500)^3\times(0.0001)^2$ in scientific notation is 3.375×10^1

3 C. Question

Represent the following numbers in scientific notation.

$(16000)^3 \div (200)^4$

Answer

In scientific notation,

$16000 = (1.6\times10^3)$ and $200 = (2.0\times10^2)$

$\therefore (16000)^3 \div (200)^4 = (1.6\times10^4)^3 \div (2.0\times10^2)^4$

$$= \frac{(1.6\times10^4)^3}{(2.0\times10^2)^4} = \frac{(1.6)^3\times(10^4)^3}{(2.0)^4\times(10^2)^4}$$

$$= \frac{(1.6)^3\times10^{12}}{16.0\times(10)^8} = \frac{(1.6)^3\times10^{12}}{(1.6)\times(10)^1\times(10)^8}$$

$$= \frac{(1.6)^3\times10^{12}}{(1.6)\times(10)^9} = (1.6)^2\times10^3 = 2.56\times10^3$$

$\therefore (16000)^3 \div (200)^4$ in scientific notation is 2.56 ×103

3 D. Question

Represent the following numbers in scientific notation.

$(0.003)^7(0.0002)^5 \div (0.001)^3$

Answer

In scientific notation,

$0.003 = (3.0)\times(10)^{-3}$

$0.0002 = (2.0)\times(10)^{-4}$

$0.001 = (1.0)\times(10)^{-3}$

$\therefore (0.003)^7(0.002)^5 \div (0.001)^3 = \frac{(0.003)^7(0.002)^5}{(0.001)^3}$

$\Rightarrow \frac{(3.0\times10^{-3})^7\times(2.0\times10^{-4})^5}{(1.0\times10^{-3})^3}$

$= \frac{2187\times10^{-21}\times32\times10^{-20}}{1\times10^{-9}}$

$= \frac{69984\times10^{-41}}{10^{-9}}$

$= \frac{6.9984\times10^{4}\times10^{-41}}{10^{-9}}$

$= 6.9984\times10^{4}\times10^{-41}\times10^{9}$

$= 6.9984\times10^{-28}$

$\therefore (0.003)^7(0.0002)^5 \div (0.001)^3$ in scientific notation is 6.9984×10 - 28

3 E. Question

Represent the following numbers in scientific notation.

$(11000)^3\ (0.003)^2 \div (30000)$

Answer

$(11000)^3\ (0.003)^2 \div (\ 30000)$

Explanation: In scientific notation,

$11000 = (1.1)\times(10)^4$

$0.003 = (3.0)\times(10)^{-3}$

$30000 = (3.0)\times(10)^5$

$\therefore (11000)^3\ (0.003)^2 \div (\ 30000)$

$\Rightarrow \frac{(11000)^3\times(0.003)^2}{30000}$

$= \frac{(1.1\times10^{4})^3\times(3.0\times10^{-3})^2}{3.0\times10^{5}}$

$$= \frac{1.331 \times 10^{12} \times 9.0 \times 10^{-6}}{3.0 \times 10^{5}}$$

$1.331 \times 10^{6} \times 3 \times 10^{-5}$

$= 3.993 \times 10^{1}$

$\therefore (11000)^3 (0.003)^2 \div (3000)$ in scientific notation is 3.993×10^{1}

Exercise 2.2

1. Question

State whether each of the following statements is true or false.

(i) $\log_5 125 = 3$

(ii) $\log_{\frac{1}{2}} 8 = 3$

(iii) $\log_4(6 + 3) = \log_4 6 + \log_4 3$

(iv) $\log_2\left(\frac{25}{3}\right) = \frac{\log_2 25}{\log_2 3}$

(v) $\log_{\frac{1}{3}} 3 = -1$

(vi) $\log_a M - N = \log_a M \div \log_a N$

Answer

(i) True

$\log_5 125 = 3$

$\Rightarrow 5^3 = 125$

($\because$ $x = \log_a b$ is the logarithmic form of the exponential form $a^x = b$)

This is true.

(ii) False

$\log_{\frac{1}{2}} 8 = 3$

$\Rightarrow \left(\frac{1}{2}\right)^3 = 8$

($\because$ $x = \log_a b$ is the logarithmic form of the exponential form $ax = b$)

Here $\left(\frac{1}{2}\right)^3 = \frac{1}{8}$

Therefore, this False.

(iii) False

Here its given $\log_4(6 + 3) = \log_4 6 + \log_4 3$

Let us consider the RHS i.e.

$\log_4 6 + \log_4 3 = \log_4(6\times3)$ (∵ according to the product rule $\log_a(M\times N) = \log_a M + \log_a N$;

a,M,N are positive numbers,a≠1)

But here LHS is log4 (6 + 3)

Hence it's False.

(iv) False

Here it's given

$$\log_2 \frac{25}{3} = \frac{\log_2 25}{\log_2 3}$$

Let us consider the LHS i.e.

$$\log_2\left(\frac{25}{3}\right) = \log_2 25 - \log_2 3$$

(∵ $\log_a M \div \log_a N = \log_a M - \log_a N$

;a,M,N are positive numbers ,a≠1)

But here the RHS is $\frac{\log_2 25}{\log_2 3}$

Hence both the sides are not equal and therefore it's False.

(v) True

Here it's given:

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

$\Rightarrow \left(\frac{1}{3}\right)^{-1} = 3$(∵ x = $\log_a b$ is the logarithmic form of the exponential form a^x = b)

$\Rightarrow \frac{1}{\frac{1}{3}} = 1 \times \frac{3}{1} = 3$

Hence LHS = RHS

Therefore this is True.

(vi) False

Here it's given that $\log_a (M - N) = \log_a M \div \log_a N$

Let us consider the RHS

$\log_a M \div \log_a N = \log_a M - \log_a N$

(∵ according to quotient rule,$\log_a M \div \log_a N = \log_a M - \log_a N$;a,M,N are positive numbers,$a \neq 1$)

But the LHS is $\log_a (M - N)$

Therefore LHS≠RHS

Hence it's False.

2 A. Question

Obtain the equivalent logarithmic form of the following.

$2^4 = 16$

Answer

Here it's given that $2^4 = 16$,

The given equation is in the form of $a^x = b$.

$\log_a b$ is the logarithmic form of the exponential form $a^x = b$

In the equation $2^4 = 16$ (a = 2,b = 16 ,x = 4)

$\Rightarrow \log_2 16 = 4$

2 B. Question

Obtain the equivalent logarithmic form of the following.

$3^5 = 243$

Answer

Here it's given that $3^5 = 243$

The given equation is in the form of $a^x = b$.

$\log_a b$ is the logarithmic form of the exponential form $a^x = b$

In the equation $3^5 = 243$ (a = 3,b = 343 ,x = 5)

$\Rightarrow \log_3 243 = 5$

2 C. Question

Obtain the equivalent logarithmic form of the following.

$10^{-1} = 0.1$

Answer

Here it's given that $10^{-1} = 0.1$

The given equation is in the form of $a^x = b$.

$\log_a b$ is the logarithmic form of the exponential form $a^x = b$

In the equation $10^{-1} = 0.1$ (a = 10,b = 0.1,x = - 1)

$\Rightarrow \log_{10} 0.1 = -1$

2 D. Question

Obtain the equivalent logarithmic form of the following.

$$8^{-\frac{2}{3}} = \frac{1}{4}$$

Answer

Here it's given that $8^{\frac{-2}{3}} = \frac{1}{4}$

The given equation is in the form of $a^x = b$.

$\log_a b$ is the logarithmic form of the exponential form $a^x = b$

In the given equation $8^{\frac{-2}{3}} = \frac{1}{4}$ (a = 8,b $= \frac{1}{4}$,x $= \frac{-2}{3}$)

$\Rightarrow \log_8 (\frac{1}{4}) = -\frac{2}{3}$

2 E. Question

Obtain the equivalent logarithmic form of the following.

$$25^{\frac{1}{2}} = 5$$

Answer

Here it's given that $25^{\frac{1}{2}} = 5$

The given equation is in the form of $a^x = b$.

$\log_a b$ is the logarithmic form of the exponential form $a^x = b$

In the given equation $25^{\frac{1}{2}} = 5$ (a = 25,b = 5,$x = \frac{1}{2}$)

$\Rightarrow \log_{25} 5 = \frac{1}{2}$

2 F. Question

Obtain the equivalent logarithmic form of the following.

$$12^{-2} = \frac{1}{144}$$

Answer

Here it's given that $12^{-2} = \frac{1}{144}$

The given equation is in the form of $a^x = b$.

$\log_a b$ is the logarithmic form of the exponential form $a^x = b$

In the equation $12^{-2} = \frac{1}{144}$ (a = 12,b $= \frac{1}{144}$,x = - 2)

$\Rightarrow \log_{12}\left(\frac{1}{144}\right) = -2$

3 A. Question

Obtain the equivalent exponential form of the following.

$\log_6 216 = 3$

Answer

Here it's given that $\log_6 216 = 3$

The given equation is in the form of $\log_a b = x$

The exponential form of the logarithmic form $\log_a b$ is $a^x = b$.

In the given equation $\log_6 216 = 3$ (a = 6,b = 216 ,x = 3)

$\Rightarrow 6^3 = 216$

3 B. Question

Obtain the equivalent exponential form of the following.

$$\log_9 3 = \frac{1}{2}$$

Answer

Here it's given that $\log_9 3 = \frac{1}{2}$

The given equation is in the form of $\log_a b = x$

The exponential form of the logarithmic form $\log_a b$ is $a^x = b$.

In the given equation $\log_9 3 = \frac{1}{2}$ (a = 9,b = 3 ,$x = \frac{1}{2}$)

$\Rightarrow 9^{\frac{1}{2}} = 3$

3 C. Question

Obtain the equivalent exponential form of the following.

$\log_5 1 = 0$

Answer

Here it's given that $\log_5 1 = 0$

The given equation is in the form of $\log_a b = x$

The exponential form of the logarithmic form $\log_a b$ is $a^x = b$.

In the given equation $\log_5 1 = 0$ (a = 5,b = 1,x = 0)

$\Rightarrow 5^0 = 1$

3 D. Question

Obtain the equivalent exponential form of the following.

$$\log_{\sqrt{3}} 9 = 4$$

Answer

Here it's given that $\log_{\sqrt{3}} 9 = 4$

The given equation is in the form of $\log_a b = x$

The exponential form of the logarithmic form $\log_a b$ is $a^x = b$.

In the given equation $\log_{\sqrt{3}} 9 = 4$ ($a = \sqrt{3}$,b = 9,x = 4)

$\Rightarrow (\sqrt{3})^4 = 9$

3 E. Question

Obtain the equivalent exponential form of the following.

$$\log_{64}\left(\frac{1}{8}\right) = -\frac{1}{2}$$

Answer

Here it's given that $\log_{64}\frac{1}{8} = -\frac{1}{2}$

The given equation is in the form of $\log_a b = x$

The exponential form of the logarithmic form $\log_a b$ is $a^x = b$.

In the given equation $\log_{64}\frac{1}{8} = -\frac{1}{2}$ ($a = 64, b = \frac{1}{8}, x = \frac{-1}{2}$)

$\Rightarrow (64)^{\frac{-1}{2}} = \frac{1}{8}$

3 F. Question

Obtain the equivalent exponential form of the following.

$\log_{0.5} 8 = -3$

Answer

Here it's given that $\log_{0.5} 8 = -3$

The given equation is in the form of $\log_a b = x$

The exponential form of the logarithmic form $\log_a b$ is $a^x = b$.

In the given equation $\log_{0.5} 8 = -3$ ($a = 0.5, b = 8, x = -3$)

$\Rightarrow (0.5)^{-3} = 8$

4 A. Question

Find the value of the following

$$\log_3\left(\frac{1}{81}\right)$$

Answer

$\log_3(\frac{1}{81}) = \log_3(\frac{1}{3^4})$

i.e. $\log_3(3^{-4}) = -4(\log_3 3)$

($\because n\log_a M = \log_a M^n$)

$\Rightarrow -4(1) = -4$

($\log_a a = 1$)

4 B. Question

Find the value of the following

$\log_7 343$

Answer

$\log_7 343 = \log_7 7^3$

$\Rightarrow 3\log_7 7$ ($\because n\log_a M = \log_a M^n$)

$\Rightarrow 1$($\because \log_a a = 1$)

4 C. Question

Find the value of the following

$\log_6 6^5$

Answer

$\log_6 6^5$

$\Rightarrow 5\log_6 6$

($\because n\log_a M = \log_a M^n$)

$= 5(1)$

($\because \log_a a = 1$)

$= 5$

4 D. Question

Find the value of the following

$\log_{\frac{1}{2}} 8$

Answer

Here we have $\log_{\frac{1}{2}} 8$ i.e. $\log_{\frac{1}{2}} 2^3$

$\Rightarrow 3\log_{\frac{1}{2}} 2$, here $\log_{\frac{1}{2}} 2$ is $\log_2^{-1} 2 = -1$

(∵ $a^x = b$ is the exponential form of logarithmic form of $\log_a b$)

⇒ 3(- 1) = - 3

4 E. Question

Find the value of the following

$\log_{10} 0.0001$

Answer

Here we have log100.0001, i.e.

$\log_{10} \frac{1}{10000}$

$\Rightarrow \log_{10} 10^{-4}$

⇒ - $4\log_{10} 10$ (∵ $n\log_a M = \log_a M^n$)

⇒ - 4(1) = - 4 (∵ $\log_a a = 1$)

4 F. Question

Find the value of the following

$\log_{\sqrt{3}} 9\sqrt{3}$

Answer

Here we have ,$\log_{\sqrt{3}} 9\sqrt{3}$

$\Rightarrow (\sqrt{3})^x = 9\sqrt{3}$

(∵ $a^x = b$ is the exponential form of logarithmic form of $\log_a b$)

$\Rightarrow (\sqrt{3})^x = (\sqrt{3})^4\sqrt{3}$

$\Rightarrow (\sqrt{3})^x = (\sqrt{3})^5$

⇒ x = 5

Hence the value of $\log_{\sqrt{3}} 9\sqrt{3}$ is 5.

5 A. Question

Solve the following equations.

$$\log_2 x = \frac{1}{2}$$

Answer

$$\log_2 x = \frac{1}{2}$$

$$\Rightarrow 2^{\frac{1}{2}} = x \text{ i.e } x = \sqrt{2}$$

5 B. Question

Solve the following equations.

$$\log_{\frac{1}{2}} x = 3$$

Answer

$$\log_{\frac{1}{2}} x = 3$$

$$\Rightarrow \left(\frac{1}{2}\right)^3 = x$$

($\because a^x = b$ is the exponential form of logarithmic form of $\log_a b$)

$$\text{Or } x = \left(\frac{1}{2}\right)^3$$

$$\text{Or } x = \frac{1}{125}$$

5 C. Question

Solve the following equations.

$\log_3 y = -2$

Answer

$\log_3 y = -2$

$\log_3 y = -2$

$\Rightarrow 3^{-2} = y$

$\Rightarrow y = 3^{-2}$

$\Rightarrow y = \frac{1}{3^2}$

i.e. $y = \frac{1}{9}$

5 D. Question

Solve the following equations.

$\log_x 125\sqrt{5} = 7$

Answer

$\log_x 125\sqrt{5} = 7$

$\Rightarrow (x)^7 = 125\sqrt{5}$

$\Rightarrow (x)^7 = (\sqrt{5})^6\sqrt{5}$

$\Rightarrow (x)^7 = (\sqrt{5})^7$

$\therefore x = \sqrt{5}$

5 E. Question

Solve the following equations.

$\log_x 0.001 = -3$

Answer

$\log_x 0.001 = -3$

$\Rightarrow x^{-3} = 0.001$

($\because a^x = b$ is the exponential form of logarithmic form of $\log_a b$)

$\Rightarrow x^{-3} = \frac{1}{1000}$

$\Rightarrow x^{-3} = 10^{-3}$

$\Rightarrow x = 10$

5 F. Question

Solve the following equations.

$x + 2\log_{27} 9 = 0$

Answer

$x + 2\log_{27}9 = 0$

$\Rightarrow x = -2\log_{27}9$

$\Rightarrow x = \log_{27}9^{-2}$

$\Rightarrow x = \log_{3^3}(3^2)^{-2}$

$\Rightarrow x = \log_{3^3}(3)^{-4}$

$\Rightarrow (3^3)^x = 3^{-4}$

($\because a^x = b$ is the exponential form of logarithmic form of $\log_a b$)

$\Rightarrow 3x = -4$ (compare the exponents)

$\Rightarrow x = -4/3$

6 A. Question

Simplify the following.

$\log_{10}3 + \log_{10}3$

Answer

$\log_{10}3 + \log_{10}3 = \log_{10}(3\times3) = \log_{10}9$

($\because$ using the product rule,$\log_a(M\times N) = (\log_a M) + (\log_a N)$;a,M,N are positive numbers ,$a\neq1$)

6 B. Question

Simplify the following.

$\log_{25}35 - \log_{25}10$

Answer

$$\log_{25}35 - \log_{25}10 = \log_{25}\frac{35}{10}$$

(using the quotient rule $\log_a(M \div N) = (\log_a M) - (\log_a N)$);a,M,N are positive numbers ,$a\neq1$)

$$= \log_{25}\frac{5\times7}{5\times2}$$

$$= \log_{25}\frac{7}{2}$$

6 C. Question

Simplify the following.

$\log_7 21 + \log_7 77 + \log_7 88 - \log_7 121 - \log_7 24$

Answer

$\log_7 21 + \log_7 77 + \log_7 88 - \log_7 121 - \log_7 24$

$\Rightarrow \frac{\log_7 (21)(77)(88)}{\log_7 (121)(24)}$

(using the product rule and the quotient rule i.e.

$\log_a(M \times N) = (\log_a M) + (\log_a N)$ and

$\log_a(M \div N) = (\log_a M) - (\log_a N))$

$\Rightarrow \frac{\log_7 (7\times3)(7\times11)(8\times11)}{\log_7 (11\times11)(8\times3)}$

$\Rightarrow \log_7 (7 \times 7)$

$\Rightarrow \log_7 7^2$

$\Rightarrow 2\log_7 7 = 2$

$(\because \log_7 7 = 1)$

6 D. Question

Simplify the following.

$$\log_8 16 + \log_8 52 - \frac{1}{\log_{13} 8}$$

Answer

$$\log_8 16 + \log_8 52 - \frac{1}{\log_{13} 8}$$

$\Rightarrow \log_8(16\times52) - \log_8 13$

$(\because \log_a(M\times N) = (\log_a M) + (\log_a N)$ and $\log_a b = \frac{1}{\log_b a})$

$\Rightarrow \log_8 \frac{16\times52}{13}$

$(\because \log a(M \div N) = (\log_a M) - (\log_a N))$

$\Rightarrow \log_8(16\times4) = \log_8 64$

$\Rightarrow 8x = 64$ or $x = 2$

($\because a^x = b$ is the exponential form of logarithmic form of $\log_a b$)

6 E. Question

Simplify the following.

$5\log_{10}2 + 2\log_{10}3 - 6\log_{64}4$

Answer

$5\log_{10}2 + 2\log_{10}3 - 6\log_{64}4$

Here $\log_{64}4 = x$

$\Rightarrow 64^x = 4$

$\Rightarrow (4^3)^x = 4$

$\Rightarrow 3x = 1$

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

$\therefore 6\log_{64}4 = 6 \times \frac{1}{3} = 2$

$\therefore 5\log_{10}2 + 2\log_{10}3 - 6\log_{64}4 = \log_{10}2^5 + \log_{10}3^2 - 2$

$= \log_{10}32 + \log_{10}9 - 2\log_{10}10$

$= \log_{10}32 + \log_{10}9 - \log_{10}10^2$

$= \log_{10}\frac{32\times9}{10\times10} = \log\frac{72}{25}$

6 F. Question

Simplify the following.

$\log_{10}8 + \log_{10}5 - \log_{10}4$

Answer

$\log_{10}8 + \log_{10}5 - \log_{10}4$

$\Rightarrow \log_{10}(8\times5) - \log_{10}4$

($\because \log_a(M\times N) = (\log_a M) + (\log_a N)$)

$\Rightarrow \log_{10}(\frac{8\times5}{4})$

$(\because \log_a(M \div N) = (\log_a M) - (\log_a N))$

$\Rightarrow \log 10(2 \times 5) = \log 1010 = 1$

$(\because \log_a a = 1)$

7 A. Question

Solve the equation in each of the following.

$\log_4(x + 4) + \log_4 8 = 2$

Answer

$\log_4(x + 4) + \log_4 8 = 2$

$\Rightarrow \log_4((x + 4) \times 8) = 2$

$\Rightarrow \log_4(8x + 32) = 2$

$\Rightarrow 8x + 32 = 4^2$

$\Rightarrow 8x + 32 = 16$

$\Rightarrow 8x = 16 - 32 = -16$

$\Rightarrow 8x = -16$

$\Rightarrow x = -2$

7 B. Question

Solve the equation in each of the following.

$\log_6(x + 4) - \log_6(x - 1) = 2$

Answer

$\log_6(x + 4) - \log_6(x - 1) = 2$

$\Rightarrow \log_6 \frac{x+4}{x-1} = 2$

$\Rightarrow (x + 4)(x - 1) = 6^2 = 6 \times 6$

$\Rightarrow x + 4 = 6$

$\Rightarrow x = 6 - 4 = 2$

7 C. Question

Solve the equation in each of the following.

$$\log_2 x + \log_4 x + \log_8 x = \frac{11}{6}$$

Answer

$\log_2 x + \log_4 x + \log_8 x =$

$$\log_2 x + \log_4 x + \log_8 x = \frac{11}{6}$$

Here LHS is $\log_2 x + \log_4 x + \log_8 x$

$\Rightarrow \log_2 x + \log_2{}^2 x + \log_2{}^3 x$

$$\Rightarrow \frac{1}{\log_x 2} + \frac{1}{\log_x 2^2} + \frac{1}{\log_x 2^3}$$

$$(\because \log_a b = \frac{1}{\log_b a})$$

$$\Rightarrow \frac{1}{\log_x 2} + \frac{1}{2\log_x 2} + \frac{1}{3\log_x 3}$$

$(\because \log_a M^n = n\log_a M)$

$$\Rightarrow \frac{1}{\log_x 2}(1 + \frac{1}{2} + \frac{1}{3})$$

$$\Rightarrow \frac{1}{\log_x 2}(\frac{6+3+2}{6})$$

$$\Rightarrow \frac{1}{\log_x 2}(\frac{11}{6})$$

Now we equate LHS to the RHS i.e.

$$\frac{1}{\log_x 2}\left(\frac{11}{6}\right) = \frac{11}{6}$$

$$\Rightarrow \frac{1}{\log_x 2} = 1$$

$\Rightarrow \log x2 = 1$ or $x1 = 2$ or $x = 2$

7 D. Question

Solve the equation in each of the following.

$\log_4(8\log_2 x) = 2$

Answer

$\log_4(8\log_2 x) = 2$

$\Rightarrow 8\log_2 x = 4^2$

($\because a^x = b$ is the exponential form of logarithmic form of $\log_a b$)

$\Rightarrow \log_2 x^8 = 16$

($\because \log_a M^n = n\log_a M$)

$\Rightarrow 2^{16} = x^8$

$\Rightarrow (2^2)^8 = x^8$

$\Rightarrow x = 2^2 = 4$

7 E. Question

Solve the equation in each of the following.

$\log_{10}5 + \log_{10}(5x + 1) = \log_{10}(x + 5) + 1$

Answer

$\log_{10}5 + \log_{10}(5x + 1) = \log_{10}(x + 5) + 1$

$\Rightarrow \log_{10}(5(5x + 1)) - \log_{10}(x + 5) = 1$

$\Rightarrow \log_{10}\frac{5(5x+1)}{x+5} = 1$

($\because \log_a(M \div N) = (\log_a M) - (\log_a N)$)

$\Rightarrow \frac{25x+5}{x+5} = 10^1$

$\Rightarrow 25x + 5 = 10(x + 5)$

$\Rightarrow 25x + 5 = 10x + 50$

$\Rightarrow 25x - 10x = 50 - 5 = 45$

$\Rightarrow 15x = 45$

$\Rightarrow x = 3$

7 F. Question

Solve the equation in each of the following.

$4\log_2 x - \log_2 5 = \log_2 125$

Answer

$4\log_2 x - \log_2 5 = \log_2 125$

$\Rightarrow \log_2 x^4 - \log_2 5 = \log_2 125$

$\Rightarrow \log_2 \frac{x^4}{5} = \log_2 125$

$\Rightarrow \frac{x^4}{5} = 125$

$\Rightarrow x^4 = 5 \times 125 = 5 \times 5^3 = 5^4$

$\Rightarrow x = 5$

7 G. Question

Solve the equation in each of the following.

$\log_3 25 + \log_3 x = 3\log_3 5$

Answer

$\log_3 25 + \log_3 x = 3\log_3 5$

$\Rightarrow \log_3 (25 \times x) = 3\log_3 5$

$\Rightarrow \log_3 (25x) = \log_3 5^3$

$\Rightarrow 25x = 5^3$ or $(5^2)x = 5^3$

$\Rightarrow x = 5$

7 H. Question

Solve the equation in each of the following.

$$\log_3\left(\sqrt{5x-2}\right) - \frac{1}{2} = \log_3\left(\sqrt{x+4}\right)$$

Answer

$$\log_3 \sqrt{5x-2} - \frac{1}{2} = \log_3 \sqrt{x+4}$$

$$\Rightarrow \log_3 \sqrt{5x-2} - \log_3 \sqrt{x+4} = \frac{1}{2}$$

$$\Rightarrow \log_3 \frac{\sqrt{5x-2}}{\sqrt{x+4}} = \frac{1}{2}$$

($\because \log_a(M \div N) = \log_a M - \log_a N$)

$$\Rightarrow 3^{\frac{1}{2}} = \sqrt{\frac{5x-2}{x+4}}$$

(∵ $a^x = b$ is the exponential form of logarithmic form $\log_a b$)

$\Rightarrow \sqrt{3} = \sqrt{\frac{5x-2}{x+4}}$

$\Rightarrow \frac{5x-2}{x+4} = 3$

$\Rightarrow 5x - 2 = 3(x + 4)$

$\Rightarrow 5x - 2 = 3x + 12$

$\Rightarrow 5x - 3x = 12 + 2$

$\Rightarrow 2x = 14$

$\Rightarrow x = 7$

8. Question

Given $\log_a 2 = x$, $\log_a 3 = y$ and $\log_a 5 = z$. Find the value in each of the following in terms of x, y and z.

(i) $\log_a 15$ (ii) $\log_a 8$ (iii) $\log_a 30$

(iv) $\log_a\left(\frac{27}{125}\right)$ (v) $\log_a\left(3\frac{1}{3}\right)$ (vi) $\log_a 1.5$

Answer

(i) $\log_a 15 = \log_a(5\times3)$

i.e. $\log_a(5\times3) = \log_a 5 + \log_a 3$

(∵ $\log_a(M\times N) = (\log_a M) + (\log_a N)$)

$= z + y$(∵ $\log_a 5 = z, \log_a 3 = y$)

(ii) $\log_a 8 = \log_a 2^3 = 3\log_a 2 = 3x$

(∵ $\log_a 2 = x$)

(iii) $\log_a 30 = \log_a(5\times3\times2) = \log_a(5) + \log_a(3) + \log_a(2)$

(∵ $\log_a(M\times N) = (\log_a M) + (\log_a N)$)

$= z + y + x$

(∵ $\log_a 5 = z, \log_a 3 = y, \log_a 2 = x$)

$= x + y + z$

(iv) $\log_a \frac{27}{125} = \log_a 27 - \log_a 125$

⇒ $\log_a(3\times3\times3) - \log_a(5\times5\times5)$

⇒ $(\log_a 3 + \log_a 3 + \log_a 3) - (\log_a 5 + \log_a 5 + \log_a 5)$

⇒ (y + y + y) - (z + z + z) = 3y - 3z = 3(y - z)

(v) $\log_a 3\frac{1}{3} = \log_a \frac{10}{3}$

⇒ $\log_a 10 - \log_a 3$

(∵ $\log_a(M \div N) = \log_a M - \log_a N$)

Here $\log_a 10 = \log_a(5\times2)$

(∵ $\log_a(M\times N) = (\log_a M) + (\log_a N)$)

= $\log_a 5 + \log_a 2 = z + x$ (∵ $\log_a 5 = z, \log_a 2 = x$)

(vi) $\log 0.5 = \log\frac{15}{10} = \log\frac{3\times5}{5\times2}$

⇒ $\log\frac{3}{2} = \log 3 - \log 2$

(∵ $\log_a(M \div N) = (\log_a M) - (\log_a N)$)

= y - x(∵ $\log_a 3 = y, \log_a 2 = x$)

9 A. Question

Prove the following equations.

$\log_{10}1600 = 2 + 4\log_{10}2$

Answer

$\log_{10}1600 = 2 + 4\log_{10}2 = 2\log_{10}10 + 4\log_{10}2$

Let us consider the RHS:

i.e. $2 + 4\log_{10}2 = 2\log_{10}10 + 4\log_{10}2$

(∵ $\log_a a = 1$)

= $\log_{10}10^2 + \log_{10}2^4$

(∵ $\log_a M^n = n\log_a M$)

= $\log_{10}100 + \log_{10}16$

$= \log_{10}(100 \times 16)$

$(\because \log_a(M \times N) = (\log_a M) + (\log_a N))$

$= \log_{10}1600$

Hence LHS = RHS

9 B. Question

Prove the following equations.

$\log_{10}12500 = 2 + 3\log_{10}5$

Answer

$\log_{10}12500 = 2 + 3\log_{10}5 = 2\log_{10}10 + 3\log_{10}5$

Let us consider the RHS:

i.e. $2 + 3\log_{10}5 = 2\log_{10}10 + 3\log_{10}5$

$= \log_{10}10^2 + \log_{10}5^3$

$(\because \log_a M^n = n\log_a M)$

$= \log_{10}(10^2 \times 5^3)$

$(\because \log_a(M \times N) = (\log_a M) + (\log_a N))$

$= \log_{10}(100 \times 125)$

$= \log_{10}(12500)$

Hence LHS = RHS

9 C. Question

Prove the following equations.

$\log_{10}2500 = 4 - 2\log_{10}2$

Answer

$\log_{10}2500 = 4 - 2\log_{10}2$

Let us consider the RHS:

i.e. $4 - 2\log_{10}2 = 4\log_{10}10 - 2\log_{10}2$

$= \log_{10}10^4 - \log_{10}2^2$

($\because \log_a M^n = n\log_a M$)

$= \log_{10}\frac{10000}{4} = \log_{10} 2500$

($\because \log_a(M \div N) = (\log_a M) - (\log_a N)$)

Hence LHS = RHS

9 D. Question

Prove the following equations.

$\log_{10}0.16 = 2\log_{10}4 - 2$

Answer

$\log_{10}0.16 = 2\log_{10}4 - 2$

Let us consider the RHS:

i.e. $2\log_{10}4 - 2 = 2\log_{10}4 - 2\log_{10}10$

$= \log_{10}4^2 - \log_{10}10^2$

($\because \log_a M^n = n\log_a M$)

$= \log_{10}\frac{4^2}{10^2} = \log_{10}\frac{16}{100}$

($\because \log_a(M \div N) = (\log_a M) - (\log_a N)$)

$= \log_{10}(0.16) = \log_{10}0.16$

Hence LHS = RHS

9 E. Question

Prove the following equations.

$\log_5 0.00125 = 3 - 5\log_5 10$

Answer

$\log_5 0.00125 = 3 - 5\log_5 10$

Let us consider the RHS:

i.e. $3 - 5\log_5 10 = 3\log_5 5 - 5\log_5 10$($\because \log_a a = 1$)

$= \log_5 5^3 - \log_5 10^5$

($\because \log_a M^n = n\log_a M$)

$= \log_5 \frac{5^3}{10^5} = \log_5 \frac{125}{100000}$

($\because \log_a(M \div N) = (\log_a M) - (\log_a N)$)

$= \log_5 0.00125$

9 F. Question

Prove the following equations.

$$\log_5 1875 = \frac{1}{2}\log_5 36 - \frac{1}{3}\log_5 8 + 20\log_{32} 2$$

Answer

$$\log_5 1875 = \frac{1}{2}\log_5 36 - \frac{1}{3}\log_5 8 + 20\log_{32} 2$$

Let us consider the RHS

$$\frac{1}{2}\log_5 36 - \frac{1}{3}\log_5 8 + 20\log_{32} 2$$

$$= \log_5 36^{\frac{1}{2}} - \log_5 8^{\frac{1}{3}} + 20\log_{2^5} 2$$

$$= \log_5 6 - \log_5 2 + 20(\frac{1}{5})$$

($\because \log_a^x a^y = \frac{y}{x}$)

$= \log_5 6 - \log_5 2 + 4$

$= \log_5 6 - \log_5 2 + 4\log_5 5$

$$= \log_5 6 + \log_5 5^4 - \log_5 2$$

$= \log_5 \frac{6\times 5^4}{2}$($\because \log_a(M \div N) = (\log_a M) - (\log_a N)$ and $\log_a(M\times N) = (\log_a M) + (\log_a N)$)

$= \log_5 1875$

Hence LHS = RHS

Exercise 2.3

1 A. Question

Write each of the following in scientific notation:

92.43

Answer

Scientific Notation: A number is written in **scientific notation** when a number between 1 and 10 is multiplied by a power of 10.

Let N = 92.43

Divide N by 100 to remove decimal, we get

$$N = 92.43 = \frac{9243}{100}$$

Multiply and Divide N by 1000, we get

$$N = \frac{9243}{100} \times \frac{1000}{1000}$$

$$= \frac{9243}{1000} \times 10$$

$$= 9.243 \times 10$$

Thus, scientific notation of 92.43 = 9.243×10^1

1 B. Question

Write each of the following in scientific notation:

0.9243

Answer

Scientific Notation: A number is written in **scientific notation** when a number between 1 and 10 is multiplied by a power of 10.

Let N = 0.9243

Divide N by 10000 to remove decimal, we get

$$N = 0.9243 = \frac{9243}{10000}$$

Multiply and Divide N by 1000, we get

$$N = \frac{9243}{10000} \times \frac{1000}{1000}$$

$$= \frac{9243}{1000} \times \frac{1}{10}$$

$$= 9.243 \times 10^{-1}$$

Thus, scientific notation of 0.9243 = 9.243×10^{-1}

1 C. Question

Write each of the following in scientific notation:

9243

Answer

Scientific Notation: A number is written in **scientific notation** when a number between 1 and 10 is multiplied by a power of 10.

Let N = 9243

Multiply and Divide N by 1000, we get

$$N = 9243 \times \frac{1000}{1000}$$

$$= \frac{9243}{1000} \times 10^3$$

$$= 9.243 \times 10^3$$

Thus, scientific notation of 9243 = 9.243×10^3

1 D. Question

Write each of the following in scientific notation:

924300

Answer

Scientific Notation: A number is written in **scientific notation** when a number between 1 and 10 is multiplied by a power of 10.

Let N = 924300

Multiply and Divide N by 10^5, we get

$$N = 924300 \times \frac{10^5}{10^5}$$

$$= \frac{924300}{100000} \times 10^5$$

$$= 9.243 \times 10^5$$

Thus, scientific notation of 924300 = 9.243×10^5

1 E. Question

Write each of the following in scientific notation:

0.009243

Answer

Let N = 0.009243

Divide N by 10^6 to remove decimal, we get

$$N = 0.009243 = \frac{9243}{10^6}$$

Multiply and Divide N by 1000, we get

$$N = \frac{9243}{10^6} \times \frac{1000}{1000}$$

$$= \frac{9243}{1000} \times \frac{1}{10^3}$$

$$= 9.243 \times 10^{-3}$$

Thus, scientific notation of 0.009243 = 9.243×10^{-3}

1 F. Question

Write each of the following in scientific notation:

0.09243

Answer

Scientific Notation: A number is written in **scientific notation** when a number between 1 and 10 is multiplied by a power of 10.

Let N = 0.09243

Divide N by 10^5 to remove decimal, we get

$$N = 0.09243 = \frac{9243}{10^5}$$

Multiply and Divide N by 1000, we get

$$N = \frac{9243}{10^5} \times \frac{1000}{1000}$$

$$= \frac{9243}{1000} \times \frac{1}{10^2}$$

$$= 9.243 \times 10^{-2}$$

Thus, scientific notation of 0.09243 = 9.243×10^{-2}

2 A. Question

Write the characteristic of each of the following

log 4576

Answer

Characteristic: In a scientific number, the power of 10 determines the characteristic.

Let N = 4576

Multiply and Divide N by 1000, we get

$$N = 4576 \times \frac{1000}{1000}$$

$$= \frac{4576}{1000} \times 10^3$$

$$= 4.576 \times 10^3$$

Thus, scientific notation of 4576 = 4.576×10^3

Consider,

log 4576 = log (4.576×10^3)

= log 4.576 + log 10^3

(since, log (a×b) = log a + log b)

= log 4.576 + 3 (since, log 10^n = n)

Thus characteristic of log 4576 is 3

2 B. Question

Write the characteristic of each of the following

log 24.56

Answer

Characteristic: In a scientific number, the power of 10 determines the characteristic.

Let N = 24.56

Divide N by 100 to remove decimal, we get

$$N = 24.56 = \frac{2456}{100}$$

Multiply and Divide N by 1000, we get

$$N = \frac{2456}{100} \times \frac{1000}{1000}$$

$$= \frac{2456}{1000} \times 10$$

$$= 2.456 \times 10^1$$

Thus, scientific notation $24.56 = 2.456 \times 10^1$

Consider,

$\log 24.56 = \log (2.456 \times 10^1)$

$= \log 2.456 + \log 10^1$

(since, $\log (a \times b) = \log a + \log b$)

$= \log 2.456 + 1$ (since, $\log 10^n = n$)

Thus characteristic of log 24.56 is 1

2 C. Question

Write the characteristic of each of the following

log 0.00257

Answer

Characteristic: In a scientific number, the power of 10 determines the characteristic.

Let N = 0.00257

Divide N by 10^5 to remove decimal, we get

$$N = 0.00257 = \frac{257}{100000}$$

Multiply and Divide N by 100, we get

$$N = \frac{257}{100000} \times \frac{100}{100}$$

$$= \frac{257}{100} \times \frac{1}{10^3}$$

$$= 2.57 \times 10^{-3}$$

Thus, scientific notation $0.00257 = 2.57 \times 10^{-3}$

Consider,

log 0.00257 = log (2.57×10^{-3})

= log 2.57 + log 10^{-3}

(since, log (a×b) = log a + log b)

= log 2.57 + (–3)

(since, log 10^{n} = n)

Thus characteristic of log 0.00257 is –3

2 D. Question

Write the characteristic of each of the following

log 0.0756

Answer

Characteristic: In a scientific number, the power of 10 determines the characteristic.

Let N = 0.0756

Divide N by 10^{4} to remove decimal, we get

$$N = 0.0756 = \frac{756}{10000}$$

Multiply and Divide N by 100, we get

$$N = \frac{756}{10000} \times \frac{100}{100}$$

$$= \frac{756}{100} \times \frac{1}{10^{2}}$$

$$= 7.56 \times 10^{-2}$$

Thus, scientific notation 0.0756 = 7.56×10^{-2}

Consider,

log 0.0756 = log (7.56×10^{-2})

= log 7.56 + log 10^{-2}

(since, log (a×b) = log a + log b)

= log 7.56 + (–2)

(since, log 10^n = n)

Thus characteristic of log 0.0756 is –2

2 E. Question

Write the characteristic of each of the following

log 0.2798

Answer

Characteristic: In a scientific number, the power of 10 determines the characteristic.

Let N = 0.2798

Divide N by 10^4 to remove decimal, we get

$$N = 0.2798 = \frac{2798}{10000}$$

Multiply and Divide N by 1000, we get

$$N = \frac{2798}{10000} \times \frac{1000}{1000}$$

$$= \frac{2798}{1000} \times \frac{1}{10}$$

$$= 2.798 \times 10^{-1}$$

Thus, scientific notation 0.2798 = 2.798×10^{-1}

Consider,

log 0.2798 = log (2.798×10^{-1})

= log 2.798 + log 10^{-1}

(since, log (a×b) = log a + log b)

= log 2.798 + (–1)

(since, log 10^n = n)

Thus characteristic of log 0.2798 is –1

2 F. Question

Write the characteristic of each of the following

log 6.453

Answer

Characteristic: In a scientific number, the power of 10 determines the characteristic.

Consider,

log 6.453 = lo

g (6.453×10^0)

= log 6.453 + log 10^0

(since, log (a×b) = log a + log b)

= log 6.453 + 0

(since, log 10^n = n)

Thus characteristic of log 6.453 is 0

3 A. Question

The mantissa of log 23750 is 0.3756. Find the value of the following.

log 23750

Answer

Mantissa: Every logarithm consist of a fractional part called the mantissa.

Here, The mantissa of log 23750 is 0.3756

Let N = 23750

Multiply and Divide N by 10000, we get

$$N = 23750 \times \frac{10000}{10000}$$

$$= \frac{23750}{10000} \times 10^4$$

$$= 2.3750 \times 10^4$$

Thus, scientific notation of 23750 = 2.3750×10^4

Consider,

log 23750 = log (2.3750×10^4)

= log 2.375 + log 10^4

(since, log (a×b) = log a + log b)

= log 2.375 + 4

(since, log 10^n = n)

Thus characteristic of log 23750 is 4

Thus, Value of log 23750 = 4 + 0.3756 = 4.3756

3 B. Question

The mantissa of log 23750 is 0.3756. Find the value of the following.

log 23.75

Answer

Mantissa: Every logarithm consist of a fractional part called the mantissa.

Here, The mantissa of log 23750 is 0.3756

Let N = 23.75

Divide N by 100 to remove decimal, we get

$$N = 23.75 = \frac{2375}{100}$$

Multiply and Divide N by 1000, we get

$$N = \frac{2375}{100} \times \frac{1000}{1000}$$

$$= \frac{2375}{1000} \times 10$$

$$= 2.375 \times 10^1$$

Thus, scientific notation 23.75 = 2.375×10^1

Consider,

log 23.75 = log (2.375×10^1)

= log 2.375 + log 10^1

(since, log (a×b) = log a + log b)

= log 2.375 + 1

(since, log 10^n = n)

Thus characteristic of log 23.75 is 1

Thus, Value of log 23.75 = 1 + 0.3756 = 1.3756

3 C. Question

The mantissa of log 23750 is 0.3756. Find the value of the following.

log 2.375

Answer

Mantissa: Every logarithm consist of a fractional part called the mantissa.

Here, The mantissa of log 23750 is 0.3756

Consider,

$\log 2.375 = \log (2.375 \times 10^0)$

$= \log 2.375 + \log 10^0$

(since, $\log (a \times b) = \log a + \log b$)

$= \log 2.375 + 0$

(since, $\log 10^n = n$)

Thus characteristic of log 2.375 is 0

Thus, Value of log 2.375 = 0 + 0.3756 = 0.3756

3 D. Question

The mantissa of log 23750 is 0.3756. Find the value of the following.

log 0.2375

Answer

Mantissa: Every logarithm consist of a fractional part called the mantissa.

Here, The mantissa of log 23750 is 0.3756

Let N = 0.2375

Divide N by 10000 to remove decimal, we get

$$N = 0.2375 = \frac{2375}{10000}$$

Multiply and Divide N by 1000, we get

$$N = \frac{2375}{10000} \times \frac{1000}{1000}$$

$$= \frac{2375}{1000} \times \frac{1}{10}$$

$= 2.375 \times 10^{-1}$

Thus, scientific notation 0.2375 = 2.375×10^{-1}

Consider,

log 0.2375 = log (2.375×10^{-1})

= log 2.375 + log 10^{-1}

(since, log (a×b) = log a + log b)

= log 2.375 + (–1)

(since, log 10^{n} = n)

Thus characteristic of log 0.2375 is –1

Thus, Value of log 0.2375 = –1 + 0.3756 = $\bar{1}.3756$

3 E. Question

The mantissa of log 23750 is 0.3756. Find the value of the following.

log 23750000

Answer

Mantissa: Every logarithm consist of a fractional part called the mantissa.

Here, The mantissa of log 23750 is 0.3756

Let N = 23750000

Multiply and Divide N by 10^{7}, we get

$$N = 23750000 \times \frac{10^{7}}{10^{7}}$$

$$= \frac{23750000}{10^{7}} \times 10^{7}$$

$$= 2.375 \times 10^{7}$$

Thus, scientific notation 23750000 = 2.375×10^{7}

Consider,

log 23750000 = log (2.375×10^{7})

= log 2.375 + log 10^{7}

(since, log (a×b) = log a + log b)

= log 2.375 + 7

(since, log 10^n = n)

Thus characteristic of log 23750000 is 7

Thus, Value of log 23750000 = 7 + 0.3756 = 7.3756

3 F. Question

The mantissa of log 23750 is 0.3756. Find the value of the following.

log 0.00002375

Answer

Mantissa: Every logarithm consist of a fractional part called the mantissa.

Here, The mantissa of log 23750 is 0.3756

Let N = 0.00002375

Divide N by 10^8 to remove decimal, we get

$$N = 0.00002375 = \frac{2375}{10^8}$$

Multiply and Divide N by 1000, we get

$$N = \frac{2375}{10^8} \times \frac{1000}{1000}$$

$$= \frac{2375}{1000} \times \frac{1}{10^5}$$

$$= 2.375 \times 10^{-5}$$

Thus, scientific notation 0.00002375 = 2.375×10^{-5}

Consider,

log 0.00002375 = log (2.375×10^{-5})

= log 2.375 + log 10^{-5}

(since, log (a×b) = log a + log b)

= log 2.375 + (−5)

(since, log 10^n = n)

Thus characteristic of log 0.00002375 is −5

Thus, Value of log 0.00002375 = −5 + 0.3756 = $\bar{5}$.3756

4 A. Question

Using logarithmic table find the value of the following.

log 23.17

Answer

Let N = 23.17

Divide N by 100 to remove decimal, we get

$$N = 23.17 = \frac{2317}{100}$$

Multiply and Divide N by 1000, we get

$$N = \frac{2317}{100} \times \frac{1000}{1000}$$

$$= \frac{2317}{1000} \times 10$$

$$= 2.317 \times 10$$

Thus, scientific notation $23.17 = 2.317 \times 10^1$

Consider,

$\log 23.17 = \log (2.317 \times 10^1)$

$= \log 2.317 + \log 10^1$

(since, $\log (a \times b) = \log a + \log b$)

$= \log 2.317 + 1$

(since, $\log 10^n = n$)

Thus characteristic of log 23.17 is 1

From the table log 2.31 = 0.3636

Mean difference of 7 is 0.0013

Thus, Mantissa of log 23.17 = 0.3636 + 0.0013 = 0.3649

Thus, Value of log 23.17 = 1 + 0.3649 = 1.3649

4 B. Question

Using logarithmic table find the value of the following.

log 9.321

Answer

Let N = 9.321

Consider,

log 9.321 = log (9.321×10^0)

= log 9.321 + log 10^0

(since, log (a×b) = log a + log b)

= log 9.321 + 0

(since, log 10^n = n)

Thus characteristic of log 9.321 is 0

From the table log 9.32 = 0.9694

Mean difference of 1 is 0

Thus, Mantissa of log 9.321 = 0.9694

Thus, Value of log 9.32 = 0+ 0.9694 = 0.9694

4 C. Question

Using logarithmic table find the value of the following.

log 329.5

Answer

Let N = 329.5

Divide N by 10 to remove decimal, we get

$$N = 329.5 = \frac{3295}{10}$$

Multiply and Divide N by 1000, we get

$$N = \frac{3295}{10} \times \frac{1000}{1000}$$

$$= \frac{3295}{1000} \times 100$$

$$= 3.295 \times 10^2$$

Thus, scientific notation 329.5 = 3.295×10^2

Consider,

log 329.5 = log (3.295×10^2)

= log 3.295 + log 10^2

(since, log (a×b) = log a + log b)

= log 3.295 + 2

(since, log 10^n = n)

Thus characteristic of log 329.5 is 2

From the table log 3.29 = 0.5172

Mean difference of 5 is 0.0007

Thus, Mantissa of log 329.5 = 0.5172+0.0007 = 0.5179

Thus, Value of log 329.5 = 2+0.5178 = 2.5179

4 D. Question

Using logarithmic table find the value of the following.

log 0.001364

Answer

Let N = 0.001364

Divide N by 10^6 to remove decimal, we get

$$N = 0.001364 = \frac{1364}{10^6}$$

Multiply and Divide N by 1000, we get

$$N = \frac{1364}{10^6} \times \frac{1000}{1000}$$

$$= \frac{1364}{1000} \times \frac{1}{10^3}$$

$$= 1.364 \times 10^{-3}$$

Thus, scientific notation 0.001364 = 1.364×10^{-3}

Consider,

log 0.001364 = log (1.364×10^{-3})

= log 1.364 + log 10^{-3}

(since, log (a×b) = log a + log b)

= log 1.364 + (−3)

(since, log 10^n = n)

Thus characteristic of log 1.364 is −3

From the table log 1.36 = 0.1335

Mean difference of 4 is 0.0013

Thus, Mantissa of log 0.001364 = 0.1335+0.0013 = 0.1348

Thus, Value of log 0.001364 = −3 + 0.1348 = $\bar{3}$.1348

4 E. Question

Using logarithmic table find the value of the following.

log 0.9876

Answer

Let N = 0.9876

Divide N by 10^4 to remove decimal, we get

$$N = 0.9876 = \frac{9876}{10^4}$$

Multiply and Divide N by 1000, we get

$$N = \frac{9876}{10^4} \times \frac{1000}{1000}$$

$$= \frac{9876}{1000} \times \frac{1}{10^1}$$

$$= 9.876 \times 10^{-1}$$

Thus, scientific notation 0.9876= 9.876×10^{-1}

Consider,

log 0.9876 = log (9.876×10^{-1})

= log 9.876 + log 10^{-1}

(since, log (a×b) = log a + log b)

= log 9.876 + (−1)

(since, log 10^n = n)

Thus characteristic of log 0.9876 is −1

From the table log 9.87=0.9943

Mean difference of 6 is 0.0003

Thus, Mantissa of log 0.9876 = 0.9943+0.0003=0.9946

Thus, Value of log 0.9876 = –1+0.9946 = $\bar{1}$.9946

4 F. Question

Using logarithmic table find the value of the following.

log 6576

Answer

Let N = 6576

Multiply and Divide N by 1000, we get

$$N = 6576 \times \frac{1000}{1000}$$

$$= \frac{6576}{1000} \times 1000$$

$$= 6.576 \times 10^3$$

Thus, scientific notation 6576= 6.576×10^3

Consider,

log 6576 = log (6.576×10^3)

= log 6.576 + log 10^3

(since, log (a×b) = log a + log b)

= log 6.576 + 3

(since, log 10^n = n)

Thus characteristic of log 6576 is 3

From the table log 6.57=0.8176

Mean difference of 6 is 0.0004

Thus, Mantissa of log 6576 = 0.8176 +0.0004=0.8180

Thus, Value of log 6576 = 3+0.8180 = 3.8180

5. Question

Using antilogarithmic table find the value of the following.

i. antilog 3.072

ii. antilog 1.759

iii. antilog $\bar{1}.3826$

iv. antilog $\bar{3}.6037$

v. antilog 0.2732

vi. antilog $\bar{2}.1798$

Answer

(i) Characteristic is 3

Mantissa is 0.072

From the antilog table antilog 0.072 = 1.180

Now as the characteristic is 3, therefore we will place the decimal after 3+1=4 numbers in 1180

∴ antilog 3.072 = 1180

(ii) Characteristic is 1

Mantissa is 0.759

From the antilog table antilog 0.759 = 5.741

Now as the characteristic is 1, therefore we will place the decimal after 1+1=2 numbers in 5741

∴ antilog 1.759 = 57.41

(iii) Characteristic is $\bar{1}$ = –1

Mantissa is 0.3826

From the antilog table antilog 0.382 = 2.410

Mean Value of 6 is 0.003

Thus, antilog 0.3826 = 2.410+0.003 = 2.413

Now as the characteristic is –1, therefore we will move decimal

–1+1=0 places left in 2.413

∴ antilog $\bar{1}$.3826 = 0.2413

(iv) Characteristic is $\bar{3}$ = –3

Mantissa is 0.6037

From the antilog table antilog 0.603 = 4.009

Mean Value of 7 is 0.006

Thus, antilog 0.6037 = 4.009+0.006 = 4.015

Now as the characteristic is –3,

therefore we will move decimal

–3+1=2 places left in 4.015

∴ antilog $\bar{3}$.6037 = 0.004015

(v) Characteristic is 0

Mantissa is 0.2732

From the antilog table antilog 0.273 = 1.875

Mean value 2 is 0.001

Thus, antilog 0.2732 = 1.875+0.001 = 1.876

Now as the characteristic is 0, therefore we will place the decimal after 0+1=1 numbers in 1876

∴ antilog 0.2732 = 1.876

(vi) Characteristic is $\bar{2}$ = –2

Mantissa is 0.1798

From the antilog table antilog 0.179 = 1.510

Mean Value of 8 is 0.003

Thus, antilog 0.1798 = 1.510+0.003 = 1.513

Now as the characteristic is –2, therefore we will move decimal

–2+1=1 places left in 1.513

∴ antilog $\bar{2}$.1798 = 0.01513

6 A. Question

Evaluate:

816.3 × 37.42

Answer

Let x = 816.3 × 37.42

Taking log on both side we get,

⇒ logx = log (816.3 × 37.42)

= log 816.3 + log 37.42 (since, log a× b = log a + log b)

= 2.9118+1.5731

⇒ logx = 4.4849

⇒ x = antilog 4.4849 = 30542

6 B. Question

Evaluate:

816.3 ÷ 37.42

Answer

Let x = 816.3 ÷ 37.42

Taking log on both side we get,

⇒ logx = log (816.3 ÷ 37.42)

= log 816.3 – log 37.42 (since, log a ÷ b = log a – log b)

= 2.9118–1.5731

⇒ logx = 1.3387

⇒ x = antilog 1.3387 = 21.812

6 C. Question

Evaluate:

0.000645 × 82.3

Answer

Let x = 0.000645 × 82.3

Taking log on both side we get,

⇒ logx = log (0.000645 × 82.3)

= log 0.000645 +log 82.3 (since, log a × b = log a +log b)

=$\bar{3}$.1904 + 1.9153

= –3.1904+1.9153

=–1. 2751

⇒ logx = –1.2751 =$\bar{1}$. 2751

⇒ x = antilog$\bar{1}$.2751 = 0.05307

6 D. Question

Evaluate:

0.3421 ÷ 0.09782

Answer

Let x = 0.3421 ÷ 0.09782

Taking log on both side we get,

⇒ logx = log (0.3421 ÷ 0.09782)

= log 0.3421 – log 0.09782 (since, log a÷b = log a –log b)

=$\bar{1}$.4658 –$\bar{1}$.00957

= –0.04658 – (–1.00957)

= –0.04658 + 1.00957

=0.54377

⇒ logx = 0.54377

⇒ x = antilog 0.54377= 3.497

6 E. Question

Evaluate:

$(50.49)^5$

Answer

Let x = $(50.49)^5$

Taking log on both side

⇒ log x = 5 log (50.49) (∵ log a^n = n loga)

= 5 × 1.7032

logx = 8.516

⇒ x = antilog 8.516 = 32810000

6 F. Question

Evaluate:

$\sqrt[3]{561.4}$

Answer

Let x = $\sqrt[3]{561.4}$

Taking log on both side

$\Rightarrow \log x = \frac{1}{3} \times \log (561.4)$ (∵ log a^n = n loga)

$= \frac{1}{3} \times 2.749$

logx = 0.9163

⇒ x = antilog 0.9163 = 8.247

6 G. Question

Evaluate:

$$\frac{175.23 \times 22.159}{1828.56}$$

Answer

Let $x = \frac{175.23 \times 22.159}{1828.56}$

Taking log on both side we get,

$$\Rightarrow \log x = \log \frac{175.23 \times 22.159}{1828.56}$$

= log (175.23 × 22.159) – log (1828.56)

(∵ log a÷ b = loga – log b)

= log 175.23 + log 22.159 – log 1828.56

(∵ log a×b = loga + log b)

= 2.2436 + 1.3455 – 3.2621

⇒ log x = 0.327

⇒ x = antilog 0.327 = 2.123

6 H. Question

Evaluate:

$$\frac{\sqrt[3]{28} \times \sqrt[5]{729}}{\sqrt{46.35}}$$

Answer

Let $x = \frac{\sqrt[3]{28} \times (729)^{\frac{1}{5}}}{\sqrt{46.35}}$

Taking log on both side we get,

$$\Rightarrow \log x = \log \frac{\sqrt[3]{28} \times (729)^{\frac{1}{5}}}{\sqrt{46.35}}$$

$$= \log(\sqrt[3]{28} \times (729)^{\frac{1}{5}}) - \log\sqrt{46.35}$$

(∵ log a÷ b = loga – log b)

$$= \log\sqrt[3]{28} + \log(729)^{\frac{1}{5}} - \log\sqrt{46.35}$$

(∵ log a×b = loga + log b)

$= \frac{1}{3}\log 28 + \frac{1}{5}\log 729 - \frac{1}{2}\log 46.35$ (since, log a^n = n log a)

$$= \frac{1}{3} \times 1.4471 + \frac{1}{5} \times 2.8627 - \frac{1}{2} \times 1.6660$$

= 0.4823 + 0.5725 – 0.833

⇒ log x = 0.2218

⇒ x = antilog 0.2218 = 1.666

6 I. Question

Evaluate:

$$\frac{(76.25)^3 \times \sqrt[3]{1.928}}{(42.75)^5 \times 0.04623}$$

Answer

Let $x = \frac{\left((76.25)^3 \times \sqrt[3]{1.928}\right)}{(42.75)^5 \times 0.04623}$

Taking log on both side

$$\Rightarrow \log x = \log \frac{\left((76.25)^3 \times \sqrt[3]{1.928}\right)}{(42.75)^5 \times 0.04623}$$

⇒ log x = log ($(76.23)^3 \times \sqrt[3]{1.928}$) – log ($(42.75)^5 \times 0.04623$)

(∵ log a÷ b = loga – log b)

$\Rightarrow \log x = \log (76.23)^3 + \log \sqrt[3]{1.928} - (\log (42.75)^5 + \log 0.04623)$

($\because \log a \times b = \log a + \log b$)

$\Rightarrow \log x = \log (76.23)^3 + \log \sqrt[3]{1.928} - \log (42.75)^5 - \log 0.04623$

$$\Rightarrow \log x = 3 \times \log (76.23) + \frac{1}{3} \times \log 1.928 - 5 \times \log 42.75 - \log 0.04623$$

(since, $\log a^n = n \log a$)

$$\Rightarrow \log x = 3 \times 1.8821 + \frac{1}{3} \times 0.2851 - 5 \times 1.6309 - (-1.3350)$$

$\Rightarrow \log x = 5.6463 + 0.0950 - 8.1545 + 1.3350$

$\Rightarrow \log x = -1.0782 = \bar{1}.0782$

$\Rightarrow x = \text{antilog } \bar{1}.0782 = 0.08352$

6 J. Question

Evaluate:

$$\sqrt[3]{\frac{0.7214 \times 20.37}{69.8}}$$

Answer

Let $x = \sqrt[3]{\frac{0.7214 \times 20.37}{69.8}}$

Taking log on both side,

$\Rightarrow \log x = \frac{1}{3} \times \log \left(\frac{0.7214 \times 20.37}{69.8}\right)$ (since, $\log a^n = n \log a$)

$$\Rightarrow \log x = \frac{1}{3} \times (\log(0.7214 \times 20.37) - \log 69.8)$$

($\because \log a \div b = \log a - \log b$)

$$\Rightarrow \log x = \frac{1}{3} \times (\log(0.7214) + \log(20.37) - \log 69.8)$$

($\because \log a \times b = \log a + \log b$)

$$\Rightarrow \log x = \frac{1}{3} \times (-0.1418 + 1.3089 - 1.8438)$$

$$\Rightarrow \log x = \frac{1}{3} \times (-0.6767)$$

⇒ log x = –0.2255

⇒ x = antilog (–0.2255) = antilog $\bar{0}.2255$ = 0.5948

6 K. Question

Evaluate:

$\log_9 63.28$

Answer

Let $\log_9 63.28 = \log_{10}63.28 \times \log_9 10$

(since, $\log_a M = \log_b M \times \log_a b$)

$$= \log_{10} 63.28 \times \frac{1}{\log_{10} 9}$$

$$(\because \log_a b = \frac{1}{\log_b a})$$

$$= \frac{1.8012}{0.9542} = x \text{ (say)}$$

Then $x = \frac{1.8012}{0.9542}$

Taking log on both side

$$\Rightarrow \log x = \log \frac{1.8012}{0.9542}$$

⇒ log x = log 1.8012 – log 0.9542

(∵ log a÷ b = loga – log b)

⇒ log x = 0.2555 – (–0.0203)

= 0.2555+0.0203

= 0.2758

⇒ x = antilog 0.2758 = 1.887

6 L. Question

Evaluate:

$\log_3 7$

Answer

Let $\log_3 7 = \log_{10}7 \times \log_3 10$

(since, $\log_a M = \log_b M \times \log_a b$)

$$= \log_{10} 7 \times \frac{1}{\log_{10} 3}$$

$$(\because \log_a b = \frac{1}{\log_b a})$$

$$= \frac{0.8450}{0.4771} = x \text{ (say)}$$

Then $x = \frac{0.8450}{0.4771}$

Taking log on both side

$$\Rightarrow \log x = \log \frac{0.8450}{0.4771}$$

⇒ log x = log 0.8450 – log 0.4771

(∵ log a÷ b = loga – log b)

⇒ log x = –0.0731– (–0.3213)

= – 0.0731 + 0.3213

= 0.2482

⇒ x = antilog 0.2482 = 1.771

Exercise 2.4

1. Question

Convert 45_{10} to base 2

Answer

2	45
2	22 - 1
2	11 - 0
2	5 - 1
2	2- 1
	1-0

Thus, $45_{10} = 101101_2$

2. Question

Convert 73_{10} to base 2.

Answer

2	73
2	36 - 1
2	18 - 0
2	9 - 0
2	4- 1
2	2-0
2	1-0

Thus, $73_{10} = 1001001_2$

3. Question

Convert 1101011_2 to base 10.

Answer

$1101011_2 = 1 \times 2^6 + 1 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 +$

$1 \times 2^1 + 1 \times 2^0$

$= 64 + 32 + 0 + 8 + 0 + 2 + 1 = 107_{10}$

Thus, $1101011_2 = 107_{10}$

4. Question

Convert 111_2 to base 10.

Answer

$111_2 = 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$

$= 4 + 2 + 1 = 7_{10}$

Thus, $111_2 = 7_{10}$

5. Question

Convert 987_{10} to base 5.

Answer

5	987
5	197 - 2
5	39 - 2
5	7- 4
	1- 2

Thus, $987_{10} = 12422_5$

6. Question

Convert 1238_{10} to base 5.

Answer

5	1238
5	247 - 3
5	49 - 2
5	9- 4
	1- 4

Thus, $1238_{10} = 14423_5$

7. Question

Convert 10234_5 to base 10.

Answer

$10234_5 = 1 \times 5^4 + 0 \times 5^3 + 2 \times 5^2 + 3 \times 5^1 + 4 \times 5^0$

$= 625 + 0 + 50+15+4 = 694_{10}$

Thus, $10234_5 = 694_{10}$

8. Question

Convert 211423_5 to base 10.

Answer

$211423_5 = 2 \times 5^5 + 1 \times 5^4 + 1 \times 5^3 + 4 \times 5^2 + 2 \times 5^1 +$

3×5^0

$= 6250 + 625+ 125+100+10+3 = 7113_{10}$

Thus, $211423_5 = 7113_{10}$

9. Question

Convert 98567_{10} to base 8.

Answer

8	98567
8	12320 - 7
8	1540 - 0
8	192- 4
8	24- 0
	3-0

Thus, $98567_{10} = 300407_8$

10. Question

Convert 688_{10} to base 8.

Answer

8	688
8	86- 0
8	10 - 6
8	1- 2

Thus, $688_{10} = 1260_8$

11. Question

Convert 47156_8 to base 10.

Answer

$47156_8 = 4 \times 8^4 + 7 \times 8^3 + 1 \times 8^2 + 5 \times 8^1 + 6 \times 8^0$

$= 16384+3584+64+40+6 = 20078_{10}$

Thus, $47156_8 = 20078_{10}$

12. Question

Convert 585_{10} to base 2,5 and 8.

Answer

2	585
2	292 - 1
2	146 - 0
2	73- 0
2	36- 1
2	18-0
2	9-0
2	4-1
2	2-0
	1-0

Thus, $585_{10} = 1001001001_2$

5	585
5	117 – 0
5	23 - 2
	4- 3

Thus, $585_{10} = 4320_5$

8	585
8	73 – 1
8	9 - 1
	1- 1

Thus, $585_{10} = 1111_8$

Exercise 2.5

1. Question

The scientific notation of 923.4 is

A. 9.234×10^{-2}

B. 9.234×10^{2}

C. 9.234×10^{3}

D. 9.234×10^{-3}

Answer

Let N = 923.4

Divide N by 10 to remove decimal, we get

$$N = 923.4 = \frac{9234}{10}$$

Multiply and Divide N by 1000, we get

$$N = \frac{9234}{10} \times \frac{1000}{1000} = \frac{9234}{1000} \times 100 = 9.234 \times 10^{2}$$

Thus, scientific notation of 923.4 = 9.234×10^{2}

Correct answer is (B)

2. Question

The scientific notation of 0.00036 is

A. 3.6×10^{-3}

B. 3.6×10^{3}

C. 3.6×10^{-4}

D. 3.6×10^{4}

Answer

Let N = 0.00036

Divide N by 10^5 to remove decimal, we get

$$N = 0.00036 = \frac{36}{10^5}$$

Multiply and Divide N by 10, we get

$$N = \frac{36}{10^5} \times \frac{10}{10} = \frac{36}{10} \times \frac{1}{10^4} = 3.6 \times 10^{-4}$$

Thus, scientific notation of 0.00036= 3.6×10^{-4}

Correct answer is (C)

3. Question

The decimal form of 2.57 x $10^3$is

A. 257

B. 2570

C. 25700

D. 257000

Answer

2.57 x 10^3 = 2.57 × 1000 = 2570

Correct answer is (B)

4. Question

The decimal form of 3.506×10^{-2} is

A. 0.03506

B. 0.003506

C. 35.06

D. 350.6

Answer

$$3.506 \text{ x } 10 - 2 = 3.506 \times \frac{1}{100} = 0.03506$$

Correct answer is (A)

5. Question

The logarithmic form of $5^2 = 25$ is

A. $\log_5 2 = 25$

B. $\log_2 5 = 25$

C. $\log_5 25 = 2$

D. $\log_{25} 5 = 2$

Answer

We know that $x = \log_a b$ is the logarithmic form of the exponential form $b = a^x$

Thus, here exponential form $5^2 = 25$ is given

Where b = 25, a =5, x =2

Thus, its logarithmic form is $2 = \log_5 25$

Hence, correct answer is (C)

6. Question

The exponential form of $\log_2 16 = 4$ is

A. $2^4 = 16$

B. $4^2 = 16$

C. $2^{16} = 4$

D. $4^{16} = 2$

Answer

We know that $x = \log_a b$ is the logarithmic form of the exponential form $b = a^x$

Thus, here logarithmic form $\log_2 16 = 4$ is given

Where b = 16, a =2, x =4

Thus, its logarithmic form is $2^4 = 16$

Hence, correct answer is (A)

7. Question

The value of $\log_{\frac{3}{4}}\left(\frac{4}{3}\right)$ is

A. – 2

B. 1

C. 2

D. – 1

Answer

Ans. Let $x = \log_{\frac{3}{4}}\frac{4}{3}$

Thus, its exponential form is

$\left(\frac{3}{4}\right)^x = \frac{4}{3} \Rightarrow \left(\frac{3}{4}\right)^x = \left(\frac{3}{4}\right)^{-1}$

On equating power of the base $\frac{3}{4}$ we get,

$\Rightarrow x = -1$

Thus, correct answer is (D)

8. Question

The value of $\log_{49} 7$ is

A. 2

B. $\frac{1}{2}$

C. $\frac{1}{7}$

D. 1

Answer

Let $x = \log_{49}7$

Thus, its exponential form is

$\Rightarrow 49^x = 7$

$\Rightarrow (7^2)^x = 7$

$\Rightarrow 7^{2x} = 7$

On equating power of the base 7 we get,

$\Rightarrow 2x = 1$

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

Thus, correct answer is (B)

9. Question

The value of $\log_{\frac{1}{2}} 4$ is

A. – 2

B. 0

C. $\frac{1}{2}$

D. 2

Answer

Let $x = \log_{\frac{1}{2}} 4$

Thus, its exponential form is

$\left(\frac{1}{2}\right)^x = 4 \Rightarrow \left(\frac{1}{2}\right)^x = 2^2$

$\Rightarrow \left(\frac{1}{2}\right)^x = \left(\frac{1}{2}\right)^{-2}$

On equating power of the base $\frac{1}{2}$ we get,

$\Rightarrow x = -2$

Thus, correct answer is (A)

10. Question

$\log_{10}8 + \log_{10}5 - \log_{10}4 =$

A. $\log_{10}9$

B. $\log_{10}36$

C. 1

D. – 1

Answer

Consider, $\log_{10}8 + \log_{10}5 - \log_{10}4 = \log_{10}(8\times 5) - \log_{10}4$

(since, $\log_a M + \log_a N = \log_a (M \times N)$)

$\Rightarrow \log_{10} 8 + \log_{10} 5 - \log_{10} 4 = \log_{10} (40) - \log_{10} 4$

$= \log_{10} (40 \div 4)$

(since, $\log_a M - \log_a N = \log_a (M \div N)$)

$\Rightarrow \log_{10} 8 + \log_{10} 5 - \log_{10} 4 = \log_{10} (10) = 1$ (since, $\log_a a = 1$)

Thus, correct answer is (C)