

Find:

Solution

Express 64 in terms of 8

Express 32 in terms of 2

Express 125 in terms of 5

$$= (5^3)^{\frac{1}{3}} = 5^{3 \times \frac{1}{3}} = 5^1 = 5$$

Find:

Solution

Express 9 in terms of 3

Express 32 in terms of 2

Express 16 in terms of 4

Express 125 in terms of 5

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

Simplify:

Solution

$$(i) 2^{\frac{3}{7}} \cdot 2^{\frac{1}{7}}$$

By using property $X^a \cdot X^b = X^{a+b}$

$$= 2^{\frac{3}{7} + \frac{1}{7}} = 2^{\frac{17}{10}}$$

$$(ii) \left(\frac{1}{3^3}\right)^7$$

By using property $\left(\frac{x}{y}\right)^a = \frac{x^a}{y^b}$

$$= \frac{1}{(3^3)^7}$$

$$= \frac{1}{3^{21}} \dots [\because (x^a)^b = x^{ab}]$$

$$(iii) \frac{11^{\frac{1}{2}}}{11^{\frac{1}{4}}}$$

By using property $\frac{X^a}{X^b} = X^{a-b}$

$$= 11^{\frac{1}{2} - \frac{1}{4}} = 11^{\frac{1}{4}}$$

$$(iv) 7^{\frac{1}{2}} \cdot 8^{\frac{1}{2}}$$

$$= 56^{\frac{1}{2}} \dots [\because x^a y^a = (xy)^a]$$

#463724

Evaluate:

$$(i) 3^{-2}$$

$$(ii) (-4)^{-2}$$

$$(iii) \left(\frac{1}{2}\right)^{-5}$$

Solution

$$(i) 3^{-2} = \frac{1}{3^2} = \frac{1}{9}$$

$$(ii) (-4)^{-2} = \frac{1}{(-4)^2} = \frac{1}{4^2} = \frac{1}{16}$$

$$(iii) \left(\frac{1}{2}\right)^{-5} = \frac{1}{(2)^{-5}} = 2^5 = 32$$

#463725

Simplify and express the result in power notation with positive exponent.

$$(i) (-4)^5 \div (-4)^8$$

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

$$(iii) (-3)^4 \times \left(\frac{5}{3}\right)^4$$

$$(iv) (3^{-7} \div 3^{-10}) \times 3^{-5}$$

$$(v) 2^{-3} \times (-7)^{(-3)}$$

Solution

$$(i) \quad (-4)^5 \div (-4)^8 = \frac{(-4)^5}{(-4)^8} = (-4)^{5-8} = (-4)^{-3} = \frac{1}{(-4)^3}$$

$$(ii) \quad \left(\frac{1}{2^3}\right)^2 = \frac{1}{2^{3 \times 2}} = \frac{1}{2^6}$$

$$(iii) \quad (-3)^4 \times \left(\frac{5}{3}\right)^4 = (-1)^4 \times (3)^4 \times \left(\frac{5}{3}\right)^4 = (-1)^4 \times 5^4 = 5^4$$

$$(iv) \quad (3^{-7} \div 3^{-10}) \times 3^{-5} = \left(\frac{3^{-7}}{3^{-10}}\right) \times (3)^{-5} = 3^{-7+10} \times 3^{-5} \\ = 3^{3-5} \\ = 3^{-2} = \frac{1}{3^2}$$

$$(v) \quad 2^{-3} \times (-7)^{(-3)} = \frac{1}{2^3} \times \frac{1}{(-7)^3} = \left(\frac{1}{2 \times (-7)}\right)^3 \\ = \frac{1}{(-14)^3}$$

#463729

Find the value of:

$$(i) \quad (3^0 + 4^{-1}) \times 2^2$$

$$(ii) \quad (2^{-1} \times 4^{-1}) \div 2^{-2}$$

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

$$(iv) \quad (3^{-1} + 4^{-1} + 5^{-1})^0$$

$$(v) \quad \left(\left(\frac{-2}{3}\right)^{-2}\right)^2$$

Solution

$$(i) \quad (3^0 + 4^{-1}) \times 2^2 = \left(1 + \frac{1}{4}\right) \times 2^2 = \frac{5}{4} \times 4 = 5$$

$$(ii) \quad (2^{-1} \times 4^{-1}) \div 2^{-2} = \frac{2^{-1} \times (2^2)^{-1}}{2^{-2}} = \frac{2^{-1+(-2)}}{2^{-2}} \\ = \frac{2^{-3}}{2^{-2}} = 2^{-3-(-2)} = 2^{-1} = \frac{1}{2}$$

$$(iii) \quad \left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2} \\ = 2^2 + 3^2 + 4^2 = 4 + 9 + 16 = 29$$

$$(iv) \quad (3^{-1} + 4^{-1} + 5^{-1})^0 = 1$$

$$(v) \quad \left(\left(\frac{-2}{3}\right)^{-2}\right)^2 = \left(\frac{9}{4}\right)^2 = \frac{81}{16}$$

#463730

Evaluate:

$$(i) \quad \frac{8^{-1} \times 5^3}{2^{-4}}$$

$$(iii) \quad (5^{-1} \times 2^{-1}) \times 6^{-1}$$

Solution

$$\begin{aligned} \text{(i)} \quad & \frac{8^{-1} \times 5^3}{\frac{2^{-4}}{2^{-3} \times 5^3}} \\ &= \frac{2^{-4}}{2^{-4} \times 5^3} \\ &= \frac{2^4 \times 5^3}{2^3} = 250 \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad & (5^{-1} \times 2^{-1}) \times 6^{-1} \\ &= \left(\frac{1}{5} \times \frac{1}{2}\right) \times \frac{1}{6} \\ &= \frac{1}{60} \end{aligned}$$

#463732

Find the value of m for which $5^m / 5^{-3} = 5^5$.

Solution

$$\begin{aligned} \frac{5^m}{5^{-3}} &= 5^5 \\ \Rightarrow 5^m &= 5^5 \times 5^{-3} = 5^2 \\ \Rightarrow m &= 2 \end{aligned}$$

When the bases are same, the powers can be equated.

#463734

Evaluate:

$$\begin{aligned} \text{(i)} \quad & \left(\frac{1}{3}\right)^{-1} - \left(\frac{1}{4}\right)^{-1} \\ \text{(ii)} \quad & \left(\frac{5}{8}\right)^{-7} \times \left(\frac{8}{5}\right)^{-4} \end{aligned}$$

Solution

$$\text{(i)} \quad \left(\frac{1}{3}\right)^{-1} - \left(\frac{1}{4}\right)^{-1}$$

$$= [3 - 4]^{-1} = (-1)$$

$$\text{(ii)} \quad \left(\frac{5}{8}\right)^{-7} \times \left(\frac{8}{5}\right)^{-4}$$

$$= \left(\frac{8}{5}\right)^7 \times \left(\frac{5}{8}\right)^4$$

$$= \frac{512}{125}$$

#463736

Simplify

$$\text{(i)} \quad \frac{25 \times t^{-4}}{5^{-3} \times 10 \times t^{-8}}$$

$$\text{(ii)} \quad \frac{3^{-5} \times 10^{-5} \times 125}{5^{-7} \times 6^{-5}}$$

Solution

$$(i) \frac{25 \times t^{-4}}{5^{-3} \times 10 \times t^{-8}}$$

$$= \frac{5^{2+2} \times t^{-4+8}}{2}$$

$$= \frac{625t^4}{2}$$

$$(ii) \frac{3^{-5} \times 10^{-5} \times 125}{5^{-7} \times 6^{-5}}$$

$$= 3^0 \times 2^0 \times 5^5$$

$$= 5^5$$

#463738

Express the following numbers in the standard form :

$$(i) 0.0000000000085$$

$$(ii) 0.00000000000942$$

$$(iii) 6020000000000000$$

$$(iv) 0.00000000837$$

$$(v) 31860000000$$

Solution

$$(i) 0.0000000000085 = 8.5 \times 10^{-12}$$

$$(ii) 0.00000000000942 = 9.42 \times 10^{-12}$$

$$(iii) 6020000000000000 = 6.02 \times 10^{15}$$

$$(iv) 0.00000000837 = 8.37 \times 10^{-9}$$

$$(v) 31860000000 = 3.186 \times 10^{10}$$

#463740

Express the following numbers in usual form

$$(i) 3.02 \times 10^{-6}$$

$$(ii) 4.5 \times 10^4$$

$$(iii) 3 \times 10^{-8}$$

$$(iv) 1.0001 \times 10^9$$

$$(v) 5.8 \times 10^{12}$$

$$(vi) 3.61492 \times 10^6$$

Solution

$$(i) 3.02 \times 10^{-6} = 0.00000302$$

$$(ii) 4.5 \times 10^4 = 45000$$

$$(iii) 3 \times 10^{-8} = 0.00000003$$

$$(iv) 1.0001 \times 10^9 = 1000100000$$

$$(v) 5.8 \times 10^{12} = 5800000000000$$

$$(vi) 3.61492 \times 10^6 = 3614920$$

#463743

Express the number appearing in the following statements in standard form:

(i) 1 micron is equal to $\frac{1}{1000000}$ m

(ii) charge of an electron is 0.000, 000, 000, 000, 000, 16 coulomb

(iii) size of bacteria is 0.0000005 m

(iv) size of plant cell is 0.00001275 m

(v) Thickness of a thick paper is 0.07 mm

Solution

(i) $1000000 = 1 \times 10^{-6}$

(ii) $0.000, 000, 000, 000, 000, 16 = 1.6 \times 10^{-19}$

(iii) $0.0000005 = 5 \times 10^{-7}$

(iv) $0.00001275 = 1.275 \times 10^{-5}$

(v) $0.07 = 7 \times 10^{-2}$