2. Exponents

Exercise 2A

1. Question

Evaluate:

(i) 4^{-3}

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

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

(iv) $(-3)^{-4}$

(v) $\left(\frac{-2}{3}\right)^{-5}$

Answer

Some basic formulas are:

$$a^{-n} = \frac{1}{a^n}$$

$$(\frac{a}{b})^n = \frac{a^n}{b^n}$$

Now,(i)

$$4^{-3} = (\frac{1}{4})^3 = \frac{1}{64}$$

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

(iii) $\left(\frac{4}{3}\right)^{-3} = \left(\frac{3}{4}\right)^3 = \frac{3^3}{4^3} = \frac{27}{64}$

(iv) $(-3)^{-4} = \left(-3\right)^{-4} = \left(\frac{1}{-3}\right)^4 = \left(\frac{-1^4}{3^4}\right) = \frac{1}{81}$

(v) $\left(\frac{-2}{3}\right)^{-5} = \left(\frac{-3}{2}\right)^{5} = \frac{(-3)^5}{2^5} = \frac{-243}{32}$

2. Question

Evaluate:

(i) $\left(\frac{5}{3}\right)^{2} \times \left(\frac{5}{3}\right)^{2}$

(ii) $\left(\frac{5}{6}\right)^{6} \times \left(\frac{5}{6}\right)^{-4}$

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

(iv) $\left(\frac{9}{8}\right)^{-3} \times \left(\frac{9}{8}\right)^{2}$

Answer

As we know from the rule of exponents that powers of the same base adds up to acquire new power.

(i) $\left(\frac{5}{3}\right)^{2} \times \left(\frac{5}{3}\right)^{2} = \left(\frac{5}{3}\right)^{4}$

$= \frac{5^4}{3^4} = \frac{625}{81}$

(ii) $\left(\frac{5}{6}\right)^{6} \times \left(\frac{5}{6}\right)^{-4} = \left(\frac{5}{6}\right)^{(6+(-4))}$

$= \left(\frac{5}{6}\right)^{(6-4)} = \left(\frac{5}{6}\right)^{2} = \frac{5^2}{6^2} = \frac{25}{36}$

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

$= \left(\frac{2}{3}\right)^{-3-2} = \left(\frac{2}{3}\right)^{-5} = \left(\frac{3}{2}\right)^{5} = \frac{3^5}{2^5} = \frac{243}{32}$

(iv) $\left(\frac{9}{8}\right)^{-3} \times \left(\frac{9}{8}\right)^{2} = \left(\frac{9}{8}\right)^{-3+2} = \left(\frac{9}{8}\right)^{-1} = \frac{8}{9}$

3. Question

Evaluate:

(i) $\left(\frac{5}{9}\right)^{-2} \times \left(\frac{3}{5}\right)^{-3} \times \left(\frac{3}{5}\right)^{0}$

(ii) $\left(\frac{-3}{5}\right)^{-4} \times \left(\frac{-2}{5}\right)^{2}$

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

Answer

(i) $\left(\frac{5}{9}\right)^{-2} \times \left(\frac{3}{5}\right)^{-3} \times \left(\frac{3}{5}\right)^{0}$

First we add the power of the same base,

$= \left(\frac{5}{9}\right)^{-2} \times \left(\frac{3}{5}\right)^{-3+0}$

Convert the powers in to positive numbers,

$= \left(\frac{5}{9}\right)^{-2} \times \left(\frac{3}{5}\right)^{-3} = \left(\frac{9}{5}\right)^{2} \times \left(\frac{5}{3}\right)^{3}$

$= \frac{9^2}{5^2} \times \frac{5^3}{3^3}$

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

By cross multiplying we get,

$= \frac{3^4}{5^2} \times \frac{5^3}{3^3}$

$= (3^{(4-3)}) \times (5^{(3-2)}) = 3 \times 15 = 15$

(ii) $\left(\frac{-3}{5}\right)^{-4} \times \left(\frac{-2}{5}\right)^{2} = \left(\frac{5}{-3}\right)^{4} \times \left(\frac{-2}{5}\right)^{2}$

$= \frac{5^4}{-3^4} \times \frac{-2^2}{5^2}$

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

$= 25 \times \frac{4}{81} = \frac{100}{81}$

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

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

$$= \frac{3^{(3+2)}}{-2^{(3+2)}} = \frac{3^5}{-2^5} = \frac{-243}{32}$$

4. Question

Evaluate:

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

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

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

Answer

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

$$= \frac{3^4}{(-2)^4} = \frac{3^4}{2^4} = \frac{81}{16}$$

(ii) $\left[\left\{\left(\frac{-1}{3}\right)^2\right\}^{-2}\right]^{-1} = \left[\left(\frac{1}{3}\right)^{2\times(-2)}\right]^{-1} = \left[\left(\frac{-1}{3}\right)^{-4}\right]^{-1}$

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

$$= \frac{-1^4}{3^4} = \frac{1^4}{3^4} = \frac{1}{81}$$

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

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

5. Question

Evaluate $\left\{\left(\frac{1}{3}\right)^{-3} - \left(\frac{1}{2}\right)^{-3}\right\} \div \left(\frac{1}{4}\right)^{-3}$

Answer

Consider $\left\{\left(\frac{1}{3}\right)^{-3}-\left(\frac{1}{2}\right)^{-3}\right\}\div\left(\frac{1}{4}\right)^{-3}$,

As we know,

$$a^{-m}=\frac{1}{a^m}$$

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

$$=\{3^3-2^3\}\div 4^3$$

$$=\{27-8\}\div 64=\frac{19}{64}$$

6. Question

Evaluate $\left\{\left(\frac{4}{3}\right)^{-1}-\left(\frac{1}{4}\right)^{-1}\right\}^{-1}$

Answer

Consider $\left\{\left(\frac{4}{3}\right)^{-1}-\left(\frac{1}{4}\right)^{-1}\right\}^{-1}$,

As we know,

$$a^{-m}=\frac{1}{a^m}$$

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

Now take the LCM of 4 and 1 which is 4.

$$\therefore\left\{\left(\frac{3\times 1}{4\times 1}\right)-\left(\frac{4\times 4}{1\times 4}\right)\right\}^{-1}=\left\{\frac{3}{4}-\frac{16}{4}\right\}^{-1}$$

$$=\left\{\frac{3-16}{4}\right\}^{-1}=\left\{\frac{-13}{4}\right\}^{-1}$$

$$=\left\{\frac{4}{-13}\right\}^{1}=\frac{4}{-13}$$

7. Question

Evaluate $[(5^{-1}\times 3^{-1})^{-1}\div 6^{-1}]$

Answer

For any number a ≠ 0a^{-1} = 1/aSo,[$(5^{-1} \times 3^{-1})^{-1} \div 6^{-1}$]

$$= \left[\left(\frac{1}{5} \times \frac{1}{3}\right)^{-1} \div \frac{1}{6}\right]$$

$$= \left[\left(\frac{1}{15}\right)^{-1} \div \frac{1}{6}\right]$$

= [15 × 6]

= 90

8. Question

Find the value of:

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

(ii) $(2^{-1} \times 3^{-1}) \div 2^{-3}$

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

Answer

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

As we know that by the rule $a^0 = 1$

So,

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

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

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

$$= \left(\frac{4}{3}\right) \times 3^2$$

= 4 × $3^{(2-1)}$ = 4 × 3 = 12 Ans. (ii) $(2^{-1} \times 3^{-1}) \div 2^{-3}$

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

$$= \left(\frac{1}{6}\right) \div \frac{1^3}{2^3} = \left(\frac{1}{6}\right) \div \left(\frac{1}{8}\right)$$

$= \frac{1}{6} \times 8 = \frac{8}{6} = \frac{4}{3}$

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

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

$= 2^2 + 3^2 + 4^2$

= 4 + 9 + 16 = 29 Ans.

9. Question

Find the value of x for which

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

Answer

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

Consider the left side;

$\left(\frac{5}{3}\right)^{-4} \times \left(\frac{5}{3}\right)^{-5} = \left(\frac{5}{3}\right)^{(-4+(-5))} = \left(\frac{5}{3}\right)^{-9}$

Given:

$\left(\frac{5}{3}\right)^{-9} = \left(\frac{5}{3}\right)^{3x}$

Comparing the powers;

-9 = 3x

$= x = \frac{-9}{3}$

x = -3

10. Question

Find the value of x for which

$\left(\frac{4}{9}\right)^{4} \times \left(\frac{4}{9}\right)^{-7} = \left(\frac{4}{9}\right)^{2x-1}$

Answer

Given,

$$\left(\frac{4}{9}\right)^{4} \times \left(\frac{4}{9}\right)^{-7} = \left(\frac{4}{9}\right)^{2x-1}$$

$$\therefore \left(\frac{4}{9}\right)^{(4-7)} = \left(\frac{4}{9}\right)^{-3} = \left(\frac{4}{9}\right)^{2x-1}$$

= 2x – 1 = -3

2x = -3 + 1 = -2

= x = -1

11. Question

By what number should $(-6)^{-1}$ be multiplied so that the product becomes 9^{-1}?

Answer

Let take that number be x;

$(x) \times (-6)^{-1} = 9^{-1}$

$$x \times \frac{1}{-6} = \frac{1}{9} = \frac{x}{-6} = \frac{1}{9} \; or \; x = \frac{-6}{9}$$

The greatest common divisor for the numerator and denominator is 3.

$$\therefore x = \frac{-6}{9} = \frac{(-6) \div 3}{9 \div 3} = \frac{-2}{3}$$

12. Question

By what number should $\left(\frac{-2}{3}\right)^{-3}$ be divided so that the quotient may be $\left(\frac{4}{27}\right)^{-2}$?

Answer

Let the number be x,

$$\therefore \left(\frac{-2}{3}\right)^{-3} \div x = \left(\frac{4}{27}\right)^{-2}$$

$$\Rightarrow \left(\frac{3}{-2}\right)^{3} \div x = \left(\frac{27}{4}\right)^{2}$$

$$\Rightarrow \left(\frac{-3}{2}\right)^{3} \div x = \left(\frac{27}{4}\right)^{2}$$

$$\Rightarrow \left(\frac{-3}{2}\right)^{3} \times \frac{1}{x} = \left(\frac{27}{4}\right)^{2}$$

$$\Rightarrow \frac{-3^3}{2^3} \times \frac{1}{x} = \frac{27^2}{4^2}$$

$$\Rightarrow \frac{27}{8} \times \frac{1}{x} = \frac{27^2}{4^2} = \frac{27 \times 27}{4 \times 4} = \frac{27 \times 27}{4 \times 2 \times 2} = \frac{27 \times 27}{8 \times 2}$$

$$\therefore \frac{1}{x} = \frac{\left(\frac{27 \times 27}{8 \times 2}\right)}{\left(\frac{-27}{8}\right)}$$

$$\Rightarrow x = \frac{\left(\frac{-27}{8}\right)}{\left(\frac{27 \times 27}{8 \times 2}\right)} = \left(\frac{-27}{8}\right) \times \left(\frac{8 \times 2}{27 \times 27}\right) = \frac{-2}{27}$$

13. Question

If $5^{2x+1} \div 25 = 125$, find the value of x.

Answer

Given,

$$5^{2x+1} \div 25 = 125$$

We know that,

$25 = 5 \times 5 = 5^2$

$125 = 5 \times 5 \times 5 = 5^3$

$\therefore \frac{5^{2x+1}}{5^2} = 5^3 = 5^{[(2x+1)\ -2]} = 5^3$

$5^{[(2x+1)-2]} = 5^{[2x-1]} = 5^3$

$= 2x - 1 = 3$

$2x = 3 + 1 = 4$

$$x = \frac{4}{2} = 2$$

$\therefore x = 2$

Exercise 2B

1. Question

Write each of the following numbers in standard form:

(i) 57.36

(ii) 3500000

(iii) 273000

(iv) 168000000

(v) 4630000000000

(vi) 345 x10^5

Answer

(i) 57.36 = 5.736 × 10

(ii) 3500000 = 35 × 10^5 = 3.5 × 10^6

(iii) 273000 = 273 × 10^3 = 2.73 × 10^5

(iv) 168000000 = 168 × 10^6 = 1.68 × 10^8

(v) 4630000000000 = 463 × 10^{10} = 4.63 × 10^{12}

(vi) 345 × 10^5 = 34500000 =3.45 × 10^7

2. Question

Write each of the following numbers in usual form:

(i) 3.74 × 10^5

(ii) 6.912 × 10^8

(iii) 4.1253 × 10^7

(iv) 2.5 × 10^4

(v) 5.17 × 10^8

(vi) 1.679 × 10^9

Answer

(i) 3.74 × 10^5 = $\frac{374}{100} \times 10^5 = \frac{374 \times 10^5}{10^2}$ = 374 × $10^{(5-2)}$ = 374 × 10^3 = 374000

(ii) 6.912 × 10^8 = $\frac{6912}{1000} \times 10^8 = \frac{6912 \times 10^8}{10^3}$ = 6912 × $10^{(8-3)}$ = 6912 × 10^5 = 691200000

(iii) 4.1253 × 10^7 = $\frac{41253}{10000} \times 10^7 = \frac{41253 \times 10^7}{10^4}$ = 41253 × $10^{(7-4)}$ = 41253 × 10^3 = 41253000

(iv) 2.5 × 10^4 = $\frac{25}{10} \times 10^4 = \frac{25 \times 10^4}{10}$ = 25 × $10^{(4-1)}$ = 25 × 10^3 = 25000

(v) 5.17 × 10^6 = $\frac{517}{100} \times 10^6 = \frac{517 \times 10^6}{10^2}$ = 517 × $10^{(6-2)}$ = 517 × 10^4 = 5170000

(vi) 1.679 × 10^9 = $\frac{1679}{1000} \times 10^9 = \frac{1679 \times 10^9}{10^3}$ = 1679 × $10^{(9-3)}$ = 1679 × 10^6 = 1679000000

3 A. Question

The height of Mount Everest is 8848 m. Write it in standard form.

Answer

Height of the Mount Everest = 8848m

If we wrights it in standard form we have,

$8848 = 8.848 \times 1000m = 8.848 \times 10^3$ m.

3 B. Question

The speed of light is 300000000 m/sec. express it in standard form.

Answer

Speed of the light = 300000000 m/sec

In standard for we will get,

$300000000 = 3 \times 100000000$ m/sec $= 3 \times 10^8$ m/sec

3 C. Question

The distance from the earth to the sun is 149600000000 m. Write it in standard form.

Answer

Distance from earth to sun = 149600000000 m

In standard form we have,

$149600000000 = 1496 \times 100000000$

$= 1.496 \times 1000 \times 100000000$

$= 1.496 \times 10^3 \times 10^8 = 1.496 \times 10^{11}$ m.

4. Question

Mass of earth is (5.97×10^{24}) kg and mass of moon is (7.35×10^{22}) kg. What is the total mass of the two?

Answer

Given,

Mass of the earth $= 5.97 \times 10^{24}$ kg

Mass of the moon $= 7.35 \times 10^{22}$ kg

Now,

Mass of the earth $= 5.97 \times 10^{24} = 5.97 \times 10^{(2+22)} = 5.97 \times 10^2 \times 10^{22} = 597 \times 10^{22}$

So,

We can also Wright the mass of the earth as 597×10^{22} kg

Sum of the masses of the earth and the moon;

$= (597 \times 10^{22}) + (7.35 \times 10^{22}) = (597+7.35) \times 10^{22} = 604.35 \times 10^{22}$ kg

$= 6.0435 \times 100 \times 10^{22} = 6.0435 \times 10^2 \times 10^{22} = 6.0435 \times 10^{(2+22)} = 6.0435 \times 10^{24}$ kg

5. Question

Write each of the following numbers in standard form:

(i) 0.0006

(ii) 0.00000083

(iii) 0.0000000534

(iv) 0.0027

(v) 0.00000165

(vi) 0.00000000689

Answer

(i) $0.0006 = \frac{6}{10^4} = 6 \times 10^{-4}$

(ii) $0.00000083 = \frac{83}{10^8} = \frac{8.3 \times 10}{10^8} = 8.3 \times 10^{(1-8)} = 8.3 \times 10^{-7}$

(iii) $0.0000000534 = \frac{534}{10^{10}} = \frac{5.34 \times 10^2}{10^{10}} = 5.34 \times 10^{(2-10)} = 5.34 \times 10^{-8}$

(iv) $0.0027 = \frac{27}{10^4} = \frac{27 \times 10}{10^4} = 2.7 \times 10^{(1-4)} = 2.7 \times 10^{-3}$

(v) $0.00000165 = \frac{165}{10^8} = \frac{1.65 \times 10^2}{10^8} = 1.65 \times 10^{(2-8)} = 1.65 \times 10^{-6}$

(vi) $0.00000000689 = \frac{689}{10^{11}} = \frac{6.89 \times 10^2}{10^{11}} = 6.89 \times 10^{(2-11)} = 6.89 \times 10^{-9}$

6 A. Question

1 micron = $\frac{1}{1000000}$ m. Express it in standard form.

Answer

1 micron = $\frac{1}{1000000} m = 1 \times 10^{-6}$ m.

6 B. Question

Size of a bacteria = 0.0000004 m. Express it in standard form.

Answer

Size of the bacteria = 0.0000004 m = $\frac{4}{10^7} m = (4 \times 10^{-7})$m

6 C. Question

Thickness of a paper = 0.03 mm. Express it in standard form.

Answer

Thickness of paper = 0.03 mm = $\frac{1}{10^2}\ mm$ = (3 × 10^{-2}) mm

7. Question

Write each of the following numbers in usual form:

(i) 2.06x10^{-5}

(ii) 5 x10^{-7}

(iii) 6.82 x 10^{-6}

(iv) 5.673x10^{-4}

(v) 1.8 x10^{-2}

(vi) 4.129 x10^{-3}

Answer

(i) 2.06 × 10^{-5} = $\frac{206}{100} \times \frac{1}{10^5}$

$$= \frac{206}{10^2 \times 10^5}$$

$$= \frac{206}{10^{(5+2)}}$$

$$= \frac{206}{10^7}$$

$$= \frac{206}{10000000} = 0.0000206$$

(ii) 5 × 10^{-7} = $\frac{5}{10^7}$

$$= \frac{5}{10000000} = 0.0000005$$

(iii) 6.82 × 10^{-6} = $\frac{682}{100} \times \frac{1}{10^6}$

$$= \frac{682}{10^2 \times 10^6}$$

$$= \frac{682}{10^{(2+6)}} = \frac{682}{10^8}$$

$$= \frac{682}{100000000} = 0.00000682$$

(iv) $5.673 \times 10^{-4} = \frac{5673}{1000} \times \frac{1}{10^4}$

$$= \frac{5673}{10^3 \times 10^4} = \frac{5673}{10^{(3+4)}}$$

$$= \frac{5673}{10^7} = \frac{5673}{10000000} = 0.0005673$$

(v) $1.8 \times 10^{-2} = \frac{18}{10} \times \frac{1}{10^2}$

$$= \frac{18}{10 \times 10^2} = \frac{18}{10^{(1+2)}}$$

$= \frac{18}{10^3} = \frac{18}{1000} = 0.018$

(vi) $4.129 \times 10^{-3} = \frac{4129}{1000} \times \frac{1}{10^3}$

$$= \frac{4129}{10^3 \times 10^3} = \frac{4129}{10^{(3+3)}}$$

$= \frac{4129}{10^6} = \frac{4129}{1000000} = 0.004129$

Exercise 2C

1. Question

The value of $\left(\frac{2}{5}\right)^{-3}$ is

A. $-\frac{8}{125}$

B. $\frac{25}{4}$

C. $\frac{125}{8}$

D. $-\frac{2}{5}$

Answer

$$\left(\frac{2}{5}\right)^{-3} = \left(\frac{5}{2}\right)^{3} = \frac{5^3}{2^3} = \frac{125}{8}$$

2. Question

The value of $(-3)^{-4}$ is

A. 12

B. 81

C. $-\frac{1}{12}$

D. $\frac{1}{81}$

Answer

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

3. Question

The value of $(-2)^{-5}$ is

A. -32

B. $\frac{-1}{32}$

C. 32

D. $\frac{1}{32}$

Answer

$(-2)^{-5} = \frac{1}{(-2)^5} = \frac{1}{-32} = \frac{1 \times (-1)}{-32 \times (-1)} = \frac{-1}{32}$

4. Question

The value of $(2^{-5} \div 2^{-2})$ is

A. $\frac{1}{128}$

B. $\frac{-1}{128}$

C. $-\frac{1}{8}$

D. $\frac{1}{8}$

Answer

Consider $(2^{-5} \div 2^{-2})$,

We know,For any non zero number "a"

$$a^{-1} = \frac{1}{a}$$

So,

$$(2^{-5} \div 2^{-2}) = \left(\frac{1}{2^5} \div \frac{1}{2^2}\right) = \left(\frac{1}{32} \div \frac{1}{4}\right) = \left(\frac{1}{32} \times 4\right) = \frac{4}{32} = \frac{1}{8}$$

5. Question

The value of $\left(3^{-1} + 4^{-1}\right) \div 5^{-1}$ is

A. $\frac{7}{10}$

B. $\frac{60}{7}$

C. $\frac{7}{5}$

D. $\frac{7}{15}$

Answer

$$(3^{-1} + 4^{-1})^{-1} \div 5^{-1} = \left(\frac{1}{3} + \frac{1}{4}\right)^{-1} \div \frac{1}{5}$$

$$= \left(\frac{4+3}{12}\right)^{-1} \div \frac{1}{5} = \left(\frac{7}{12}\right)^{-1} \div \frac{1}{5}$$

$$= \left(\frac{12}{7}\right) \div \frac{1}{5} = \frac{12}{7} \times 5 = \frac{60}{7}$$

6. Question

Choose the correct answer: $\left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2} = ?$

A. $\frac{61}{144}$

B. $\frac{144}{61}$

C. 29

D. $\frac{1}{29}$

Answer

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

$= 2^2+3^2+4^2$

$= 4+9+16$

$= 29$

7. Question

Choose the correct answer: $\left\{\left(\frac{1}{3}\right)^{-3}-\left(\frac{1}{2}\right)^{-3}\right\}\div\left(\frac{1}{4}\right)^{-3}=?$

A. $\frac{19}{64}$

B. $\frac{27}{16}$

C. $\frac{64}{19}$

D. $\frac{16}{25}$

Answer

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

$$=\{3^3-2^3\}\div 4^3$$

$$=\{27-8\}\div 64$$

$$=19\div 64=\frac{19}{64}$$

8. Question

Choose the correct answer: $\left[\left\{\left(\frac{-1}{3}\right)^{2}\right\}^{-2}\right]^{-1}$ =?

A. $\frac{1}{16}$

B. 16

C. $-\frac{1}{16}$

D. -16

Answer

$$\left[\left\{\left(-\frac{1}{2}\right)^2\right\}^{-2}\right]^{-1}$$

$$= \left[\left\{-\frac{1}{2}\right\}^{-4}\right]^{-1}$$

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

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

9. Question

The value of x for which $\left(\frac{7}{12}\right)^{-4} \times \left(\frac{7}{12}\right)^{3x} = \left(\frac{7}{12}\right)^5$ is

A. -1

B. 1

C. 2

D. 3

Answer

$$\left(\frac{7}{12}\right)^{-4} \times \left(\frac{7}{12}\right)^{3x} = \left(\frac{7}{12}\right)^5$$

$$\Rightarrow \left(\frac{7}{12}\right)^{-4+3x} = \left(\frac{7}{12}\right)^5$$

$\Rightarrow$ 3x-4 = 5

3x = 9

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

10. Question

If $(2^{3x+1}+10)\div 7 = 6$, then x is equal to

A. -2

B. 0

C. 1

D. 2

Answer

$(2^{3x-1} + 10) \div 7 = 6$

$= \frac{(2^{3x-1} + 10)}{7} = \frac{6}{1}$

Now by cross multiplying,

$(2^{3x-1} + 10) \times 1 = 6 \times 7 = 42$

$2^{3x-1} = 42-10$

$2^{3x-1} = 32$

$2^{3x-1} = 2^5$

$3x-1 = 5$

$3x = 6$

$x = \frac{6}{3} = 2$

Therefore x = 2

11. Question

Choose the correct answer: $\left(\frac{2}{3}\right)^0 = ?$

A. $\frac{3}{2}$

B. $\frac{2}{3}$

C. 1

D. 0

Answer

By using the law of exponents $\left(\frac{a}{b}\right)^0 = 1$

$\therefore \left(\frac{2}{3}\right)^0 = 1$

12. Question

Choose the correct answer: $\left(\frac{-5}{3}\right)^{-1} = ?$

A. $\frac{5}{3}$

B. $\frac{3}{5}$

C. $\frac{-3}{5}$

D. None of these

Answer

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

13. Question

Choose the correct answer: $\left(-\frac{1}{2}\right)^{3} = ?$

A. $\frac{-1}{6}$

B. $\frac{1}{6}$

C. $\frac{1}{8}$

D. $\frac{-1}{8}$

Answer

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

14. Question

Choose the correct answer: $\left(-\frac{3}{4}\right)^{2} = ?$

A. $\frac{-9}{16}$

B. $\frac{9}{16}$

C. $\frac{16}{9}$

D. $\frac{-16}{9}$

Answer

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

15. Question

3670000 in standard form is

A. 367×10^4

B. 36.7×10^5

C. 3.67×10^6

D. None of these

Answer

$3670000 = 367 \times 10^4$

The standard form is written as one decimal number with any integer power.Therefore, $3670000 = 367 \times 10^4$

$= 36.7 \times 10^5$

$= 3.67 \times 10^6$

Thus, 3.67×10^6 is the standard form.

16. Question

0.0000463 in standard form is

A. 463×10^{-7}

B. 4.63×10^{-5}

C. 4.63×10^{-9}

D. 46.3×10^{-6}

Answer

0.0000463 in standard form is written as:

0.0000463

$= 0.463 \times 10^{-4}$

$= 4.63 \times 10^{-5}$

17. Question

0.000367×10^4 in usual form is

A. 3.67

B. 36.7

C. 0.367

D. 0.0367

Answer

The usual form of 0.000367 $\times 10^4$ is written as:

0.000367×10^4

$= 0.00367 \times 10^3$

$=0.0367 \times 10^2$

$= 0.367 \times 10^1$

$= 3.67$

CCE Test Paper-2

1. Question

Evaluate

(i) 3^{-4}

(ii) $(-4)^3$

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

(iv) $\left(\frac{5}{7}\right)^{0}$

Answer

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

(ii) $(-4)^3 = (-1)^3 \times (4)^3 = -1 \times 64 = -64$

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

(iv) $\left(\frac{-2}{3}\right)^{-5} = \left(\frac{3}{-2}\right)^{5} = \frac{3^5}{-2^5} = \frac{243}{-32} = \frac{243 \times -1}{-32 \times -1} = \frac{-243}{32}$

(v) Using the property $\left(\frac{a}{b}\right)^0 = 1$ we will get,

$\left(\frac{5}{7}\right)^0 = 1$

2. Question

Evaluate: $\left\{\left(\frac{-2}{3}\right)^3\right\}^{-2}$

Answer

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

As we know $(a^m)^n = a^{mn}$

$$\left\{\left(\frac{-2}{3}\right)^3\right\}^{-2} = \left(\frac{-2}{3}\right)^{-6} = \left(\frac{3}{-2}\right)^6 = \frac{3^6}{2^6} = \frac{729}{64}$$

3. Question

Simplify: $\left(3^{-1}+6^{-1}\right) \div \left(\frac{3}{4}\right)^{-1}$

Answer

$$(3^{-1}+6^{-1}) \div \left(\frac{3}{4}\right)^{-1} = \left(\frac{1}{3}+\frac{1}{6}\right) \div \left(\frac{4}{3}\right)^1$$

$$= \left(\left[\frac{1 \times 2}{3 \times 2}\right] + \left[\frac{1 \times 1}{6 \times 1}\right]\right) \div \left(\frac{4}{3}\right)$$

$$= \left(\frac{2+1}{6}\right) \div \left(\frac{4}{3}\right)$$

$$= \left(\frac{3}{6}\right) \div \left(\frac{4}{3}\right)$$

$$= \left(\frac{1}{2}\right) \div \left(\frac{4}{3}\right)$$

$$= \left(\frac{1}{2}\right) \times \left(\frac{3}{4}\right) = \frac{3}{8}$$

4. Question

By what number should $\left(\frac{-2}{3}\right)^{-3}$ be divided so that the quotient is $\left(\frac{4}{9}\right)^{-2}$?

Answer

Suppose the number is x

So we have,

$$\left(\frac{-2}{3}\right)^{-3} \div x = \left(\frac{4}{9}\right)^{-2}$$

$$\Rightarrow \left(\frac{3}{-2}\right)^{3} \div x = \left(\frac{9}{4}\right)^{2}$$

$$\Rightarrow \frac{\left(\frac{3}{-2}\right)^{3}}{x} = \left(\frac{9}{4}\right)^{2}$$

$$\Rightarrow \frac{\frac{3^3}{-2^3}}{x} = \frac{9^2}{4^2}$$

$$\Rightarrow x = \frac{\left(\frac{3^3}{-2^3}\right)}{\left(\frac{9^2}{4^2}\right)}$$

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

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

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

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

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

$$= \frac{2 \times -1}{-3 \times -1} = \frac{-2}{3}$$

5. Question

By what number should $(-3)^{-1}$ be multiplied so that the quotient is 6^{-1}?

Answer

Let’s suppose the number is x

$(-3)^{-1} \times (x) = (6)^{-1}$

$$\Rightarrow \frac{1}{-3} \times x = \frac{1}{6}$$

$$\Rightarrow \frac{1 \times -1}{-3 \times -1} \times x = \frac{1}{6}$$

$$\therefore \frac{x}{3} = \frac{1}{6}$$

On cross multiplying:

(-x) × 6 = 1 × 3

-6x = 3

6x = -3

$$\therefore x = \frac{-3}{6} = \frac{-1}{2}$$

6. Question

Express each of the following in standard form:

(i) 345

(ii) 180000

(iii) 0.000003

(iv) 0.000027

Answer

(i) 345 = 3.45 × 100 = 3.45 × 10^2

(ii) 180000 = 18 × 1000 = 18 × 10^4 = 1.8 × 10 × 10^4 =1.8 × $10^{(1+4)}$ =1.8 × 10^5

(iii) 0.000003 = $\frac{3}{1000000}$ = 3 × 10^{-6}

(iv) 0.000027 = $\frac{27}{1000000} = \frac{27}{10^6} = \frac{2.7 \times 10}{10^6}$ = 2.7 × $10^{(1-6)}$ = 2.7 × 10^{-5}

7. Question

The value of $(-3)^{-3}$ is

A. -27

B. 9

C. $\frac{-1}{27}$

D. $\frac{1}{27}$

Answer

$(-3)^{-3} = \left(\frac{1}{-3}\right)^3 = \frac{1^3}{-3^3} = \frac{1}{-27} = \frac{1 \times -1}{-27 \times -1} = \frac{-1}{27}$

8. Question

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

A. $\frac{-27}{64}$

B. $\frac{64}{27}$

C. $\frac{-9}{4}$

D. $\frac{27}{64}$

Answer

$\left(\frac{3}{4}\right)^{-3} = \left(\frac{4}{3}\right)^3 = \frac{4^3}{3^3} = \frac{64}{27}$

9. Question

Choose the corret answer: $(3^{-6} \div 3^4) = ?$

A. 3^{-2}

B. 3^2

C. 3^{-10}

D. 3^{10}

Answer

$3^{-6} \div 3^4 = \left(\frac{1}{3^6} \div 3^4\right)$

$= \frac{1}{3^6} \times \frac{1}{3^4} = \frac{1}{3^{(6+4)}}$

$= \frac{1}{3^{10}} = 3^{-10}$

10. Question

If $\left(\frac{5}{12}\right)^{-4} \times \left(\frac{5}{12}\right)^{3x} = \left(\frac{5}{12}\right)^{5}$, then x=?

A. -1

B. 1

C. 2

D. 3

Answer

$$\left(\frac{5}{12}\right)^{-4} \times \left(\frac{5}{12}\right)^{3x} = \left(\frac{5}{12}\right)^{5}$$

$$\Longrightarrow \left(\frac{5}{12}\right)^{-4+3x} = \left(\frac{5}{12}\right)^{5}$$

$\Longrightarrow$ -4 + 3x = 5

$\Longrightarrow$ 3x = 5 + 4 = 9

$\Longrightarrow x = \frac{9}{3} = 3$

11. Question

Choose the correct answer: $\left(\frac{3}{5}\right)^{0} = ?$

A. $\frac{5}{3}$

B. $\frac{3}{5}$

C. 1

D. 0

Answer

By the law of exponents $\left(\frac{a}{b}\right)^{0} = 1$

We will get,

$$\left(\frac{3}{5}\right)^{0} = 1$$

12. Question

Choose the correct answer: $\left(\frac{-6}{5}\right)^{-1} = ?$

A. $\frac{6}{5}$

B. $\frac{-6}{5}$

C. $\frac{5}{6}$

D. $\frac{-5}{6}$

Answer

$$\left(\frac{-6}{5}\right)^{-1} = \left(\frac{5}{-6}\right)^{1} = \frac{5}{-6} = \frac{5 \times -1}{-6 \times -1} = \frac{-5}{6}$$

13. Question

Choose the correct answer: $\left(\frac{-1}{5}\right)^{3} = ?$

A. $\frac{-1}{9}$

B. $\frac{1}{9}$

C. $\frac{-1}{27}$

D. $\frac{1}{27}$

Answer

$$\left(\frac{-1}{3}\right)^{3} = \frac{-1^{3}}{3^{3}} = \frac{-1}{27}$$

14. Question

Fill in the blanks.

(i) 360000 written in standard form is…..

(ii) 0.0000123 written in standard form is…..

(iii) $\left(\frac{-2}{3}\right)^{-2} =$ .....

(iv) 3×10^{-3} in usual form is…..

(v) 5.32×10^{-4} in usual form is…..

Answer

(i) 360000 written in standard form is 3.6×10^5

$360000 = 36 \times 10^4 = 3.6 \times 10 \times 10^4 = 3.6 \times 10^{(1+4)} = 3.6 \times 10^5$

(ii) 0.0000123 written in standard form is 1.23×10^{-5}

$0.0000123 = \frac{123}{10000000} = \frac{123}{10^7}$

$= \frac{1.23 \times 100}{10^7} = \frac{1.23 \times 10^2}{10^7}$

$= 1.23 \times 10^{(2-7)} = 1.23 \times 10^{-5}$

(iii) $\left(\frac{-2}{3}\right)^{-2} = \frac{9}{4}$

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

(iv) 3×10^{-3} in usual form is 0.003

$3 \times 10^{-3} = \frac{3}{10^3} = \frac{3}{1000} = 0.003$

(v) 5.32×10^{-4} in usual form is 0.000532

$5.32 \times 10^{-4} = \frac{5.32}{10^4} = \frac{5.32}{10000} = 0.000532$