RS Aggarwal Solutions Class 8 Mathematics
Exponents Exercise 2A

Q1

Answer:

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

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

Q2

Answer:

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

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

Q3

Answer :

(i)

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

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

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

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

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

(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)

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

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

Q4

Answer :

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

(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) $\left\{\left(\frac{3}{2}\right)^{-2}\right\}^{2} = \left(\frac{3}{2}\right)^{-2\times2} = \left(\frac{3}{2}\right)^{-4} = \left(\frac{2}{3}\right)^{4} = \frac{2^4}{3^4} = \frac{16}{81}$

Q5

Answer :

$$\left\{\left(\frac{1}{3}\right)^{-3} - \left(\frac{1}{2}\right)^{-3}\right\} \div \left(\frac{1}{4}\right)^{-3} = \left\{3^3 - 2^3\right\} \div 4^3 = \{27 - 8\} \div 64 = \frac{19}{64}$$

Q6

Answer :

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

The L.C.M. of 4 and 1 is 4.

$$\therefore \left\{\left(\frac{3\times1}{4\times1}\right) - \left(\frac{4\times4}{1\times4}\right)\right\}^{-1}$$

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

$$= \frac{4\times-1}{-13\times-1} = \frac{-4}{13}$$

Q7

Answer :

$$\left[\left(5^{-1} \times 3^{-1}\right)^{-1} \div 6^{-1}\right] = \left[\left(\frac{1}{5} \times \frac{1}{3}\right)^{-1} \div \frac{1}{6}\right] = \left[\left(\frac{1}{15}\right)^{-1} \div \frac{1}{6}\right] = [15 \times 6] = 90$$

Q8

Answer :

(i)

$\left(2^0 + 3^{-1}\right) \times 3^2 = \left(1 + \frac{1}{3}\right) \times 3^2$ $\left(\text{because } 2^0 = 1 \text{ and } 3^{-1} = \frac{1}{3}\right)$

$= \left(\frac{1\times3}{1\times3} + \frac{1\times1}{3\times1}\right) \times 3^2 = \left(\frac{3}{3} + \frac{1}{3}\right) \times 3^2 = \left(\frac{4}{3}\right) \times 3^2 = 4 \times 3^{(2-1)} = 4 \times 3 = 12$

(ii)

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

$\left(\frac{1}{6}\right) \div \frac{1^3}{2^3} = \left(\frac{1}{6}\right) \div \left(\frac{1}{8}\right) = \frac{1}{6} \times 8 = \frac{8}{6} = \frac{4}{3}$

(iii)

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

Q9

Answer :

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:

$-9 = 3x \Rightarrow x = -3$

Q10

Answer :

Given:

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

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

$\Rightarrow 2x - 1 = -3$
$2x = -3 + 1 = -2$
$\Rightarrow x = -1$

Q11

Answer :

Let the required number be x.

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

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

or $x = \frac{-6}{9}$

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

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

Q12

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Answer :

Let the number be x.

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

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

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

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

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

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

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

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

Q13

Answer :

Given:

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

We know :

$$25 = 5 \times 5 = 5^{2}$$
$$125 = 5 \times 5 \times 5 = 5^{3}$$

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

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

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

$$\therefore x = 2$$

Exponents Exercise 2B

Q1

Answer :

(i) $57.36 = 5.736 \times 10$
(ii) $3500000 = 3.5 \times 10^6$
(iii) $273000 = 2.73 \times 10^5$
(iv) $168000000 = 1.68 \times 10^8$
(v) $4630000000000 = 4.63 \times 10^{12}$
(vi) $345 \times 10^5 = 3.45 \times 10^7$

Q2

Answer :

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

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

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

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

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

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

Q3

Answer :

(i) The height of the Mount Everest is 8848 m.
In standard form, we have:
$8848 = 8.848 \times 1000 \, \text{m} = 8.848 \times 10^3 \text{m}$
(ii) The speed of light is 300000000 m/s.
In standard form, we have:
$300000000 = 3 \times 100000000 \, \text{m/s} = 3 \times 10^8 \, \text{m/s}$
(iii) The Sun−Earth distance is 149600000000 m.
In standard form, we have:
$149600000000 = 1496 \times 100000000 = 1.496 \times 1000 \times 100000000 = 1.496 \times 10^3 \times 10^8 = 1.496 \times 10^{11} \text{m}$

Q4

Answer :

Mass of the Earth = 5.97×10^{24} kg

Now, $5.97 \times 10^{24} = 5.97 \times 10^{(2+22)} = 5.97 \times 10^2 \times 10^{22} = 597 \times 10^{22}$

So, the mass of the Earth can also be written as 597×10^{22} kg.

Mass of the Moon = 7.35×10^{22} kg

Sum of the masses of the Earth and the Moon:

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

Q5

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

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

Q6

Answer :

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

(ii) 0.0000004 m $= \frac{4}{10^7}$ m $= \left(4 \times 10^{-7}\right)$ m

(iii) Thickness of paper $= 0.03$ mm $= \frac{3}{10^2}$ mm $= \left(3 \times 10^{-2}\right)$ mm

Q7

Answer :

(i) $2.06 \times 10^{-5} = \frac{206}{100} \times \frac{1}{10^5} = \frac{206}{10^2 \times 10^5} = \frac{206}{10^{(5+2)}} = \frac{206}{10^7} = \frac{206}{10000000} = 0.0000206$

(ii) $5 \times 10^{-7} = \frac{5}{10^7} = \frac{5}{10000000} = 0.0000005$

(iii) $6.82 \times 10^{-6} = \frac{682}{100} \times \frac{1}{10^6} = \frac{682}{10^2 \times 10^6} = \frac{682}{10^{(2+6)}} = \frac{682}{10^8} = \frac{682}{100000000} = 0.00000682$

(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) $4.129 \times 10^{-3} = \frac{4129}{1000} \times \frac{1}{10^3} = \frac{4129}{10^3 \times 10^3} = \frac{4129}{10^{(3+3)}} = \frac{4129}{10^6} = \frac{4129}{1000000} = 0.004129$

Q1

Answer :

(c) $\frac{125}{8}$

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

Q2

Answer :

(d) $\frac{1}{81}$

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

Q3

Answer :

(b) $\frac{-1}{32}$

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

Q4

Answer :

(d) $\frac{1}{8}$

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

Q5

Answer :

(b) $\frac{60}{7}$

$$\left(3^{-1} + 4^{-1}\right)^{-1} \div 5^{-1} = \left(\frac{1}{3} + \frac{1}{4}\right)^{-1} \div \frac{1}{5} = \left(\frac{4+3}{12}\right)^{-1} \div \frac{1}{5} = \left(\frac{7}{12}\right)^{-1} \div \frac{1}{5} = \left(\frac{12}{7}\right) \div \frac{1}{5} = \frac{12}{7}$$
$$\times 5 = \frac{60}{7}$$

Q6

Answer :

(c) 29

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

Q7

Answer :

(a) $\frac{19}{64}$

$$\left\{ \left(\tfrac{1}{3}\right)^{-3} - \left(\tfrac{1}{2}\right)^{-3} \right\} \div \left(\tfrac{1}{4}\right)^{-3}$$
$$= \left\{ 3^3 - 2^3 \right\} \div 4^3$$
$$= \left\{ 27 - 8 \right\} \div 64$$
$$= 19 \div 64$$
$$= \tfrac{19}{64}$$

Q8

Answer :

(a) $\frac{1}{16}$

$$\left[\left\{ \left(-\tfrac{1}{2}\right)^2 \right\}^{-2} \right]^{-1}$$
$$= \left[\left\{ -\tfrac{1}{2} \right\}^{-4} \right]^{-1}$$
$$= \left(-\tfrac{1}{2}\right)^{(-4 \times -1)}$$
$$= \left(-\tfrac{1}{2}\right)^4$$
$$= \tfrac{1}{16}$$

Q9

Answer :

(d) 3

$$\left(\tfrac{7}{12}\right)^{-4} \times \left(\tfrac{7}{12}\right)^{3x} = \left(\tfrac{7}{12}\right)^5$$
$$\Rightarrow \left(\tfrac{7}{12}\right)^{-4+3x} = \left(\tfrac{7}{12}\right)^5$$
$$\Rightarrow 3x - 4 = 5$$
$$3x = 9$$
$$\text{or } x = \tfrac{9}{3} = 3$$

Q10

Answer :

(d) 2

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

On cross multiplying :

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

$\Rightarrow 2^{3x-1} = 42 - 10$
$\Rightarrow 2^{3x-1} = 32$
$\Rightarrow 2^{3x-1} = 2^5$
$\Rightarrow 3x - 1 = 5$
$\Rightarrow 3x = 6$
Therefore, $x = 2$

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Q11

Answer :

(c) 1

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

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

Q12

Answer :

(c) $\frac{-3}{5}$

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

Q13

Answer :

(d) $\frac{-1}{8}$

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

Q14

Answer :

(b) $\frac{9}{16}$

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

Q15

Answer :

(c) 3.67×10^6

$3670000 = 367 \times 10^4 = 3.67 \times 100 \times 10^4 = 3.67 \times 10^2 \times 10^4 = 3.67 \times 10^{(2+4)} = 3.67 \times 10^6$

Q16

Answer :

(b) 4.63×10^{-5}

$0.0000463 = \frac{463}{10^7} = \frac{4.63 \times 10^2}{10^7} = 4.63 \times 10^{(2-7)} = 4.63 \times 10^{-5}$

Q17

Answer :

(a) 3.67

$0.000367 \times 10^4 = \frac{367}{10^6} \times 10^4 = 367 \times 10^{(4-6)} = 367 \times 10^{-2} = \frac{367}{10^2} = \frac{367}{100} = 3.67$