RD SHARMA

Solutions

Class 8 Maths

Chapter 2

Ex 2.2

Q1. Write each of the following in exponential form:

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

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

Solution:

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

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

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

$a^m \times a^n = a^{m+n} = \left(\frac{2}{5}\right)^{-6}$

Q2. Evaluate:

(i) 5^{-2}

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

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

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

Solution:

(i) $5^{-2} = \frac{1}{5^2} = \frac{1}{25}$

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

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

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

Q3. Express each of the following as a rational number in the form $\frac{p}{q}$:

(i) 6^{-1}

(ii) -7^{-1}

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

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

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

Solution:

(i) $6^{-1} = \frac{1}{6}$

(ii) $-7^{-1} = \frac{1}{-7} = \frac{-1}{7}$

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

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

$= \frac{1}{-4} \times = \frac{2}{-3} = \frac{1}{6}$

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

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

Q4. Simplify:

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

(ii) $\{5^{-1} \div 6^{-1}\}^3$

(iii) $\{2^{-1} + 3^{-1}\}^{-1}$

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

(v) $\{4^{-1} + 5^{-1}\}^{-1} + 3^{-1}$

Solution:

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

$= \left(\frac{1}{12}\right)^2 = \left(\frac{1}{144}\right)$

(ii) $(5^{-1} \div 6^{-1})^3 = (\frac{1}{5} \div \frac{1}{6})^3$

$= (\frac{6}{5})^3 = (\frac{216}{125})$

(iii) $\{2^{-1} + 3^{-1}\}^{-1} = (\frac{1}{2} + \frac{1}{3})^{-1}$

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

(iv) $\{3^{-1} + 4^{-1}\}^{-1} \times 5^{-1} = (\frac{1}{3} \times \frac{1}{4})^{-1} \times \frac{1}{5}$

$= (\frac{1}{12})^{-1} \times \frac{1}{5}$

$= 12 \times \frac{1}{5} = \frac{12}{5}$

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

$= (\frac{5-4}{20}) \times 3$

$= \frac{1}{20} \times 3 = \frac{3}{20}$

Q5. Express each of the following rational numbers with a negative exponent:

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

(ii) $(3)^5$

(iii) $(\frac{3}{5})^4$

(iv) $\{(\frac{3}{2})^4\}^{-3}$

(v) $\{(\frac{7}{4})^4\}^{-3}$

Solution:

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

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

(ii) $(3)^5$

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

(iii) $(\frac{3}{5})^4$

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

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

$$= \left(\frac{3}{2}\right)^{-12}$$

(v) $\left\{\left(\frac{7}{4}\right)^4\right\}^{-3}$

$$= \left(\frac{7}{3}\right)^{-12}$$

Q6. Express each of the following rational numbers with a positive exponent.

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

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

(iii) $4^3 \times 4^{-9}$

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

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

Solution:

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

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

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

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

(iii) $4^3 \times 4^{-9}$

$$= 4^{3-9} = 4^{-6}$$

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

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

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

$= \left(\frac{4}{3}\right)^{12}$

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

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

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

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

Q7. Simplify:

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

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

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

(iv) $\left[\left\{\left(\frac{-1}{4}\right)^{2}\right\}^{-2}\right]^{-1}$

(v) $\left\{\left(\frac{2}{3}\right)^{2}\right\}^{3} \times \left(\frac{1}{3}\right)^{-4} \times 3^{-1} \times 6^{-1}$

Solution:

(i)

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

$$= \left(\frac{1}{(1/27)}-\frac{1}{(1/8)}\right) \div \frac{1}{(1/64)}$$

$$= \left(\frac{27}{1}-\frac{8}{1}\right) \div 64$$

$$= (19) \times \frac{1}{64}$$

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

(ii)

$$(3^2-2^2) \times \left(\frac{2}{3}\right)^{-3} = (9-4) \times \frac{1}{(2/3)^2}$$

$$= 5 \times \frac{27}{8}$$

$$= \frac{135}{8}$$

(iii)

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

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

$$= \left(\tfrac{1}{-2}\right)$$

$$= \frac{1}{1/(-2)}$$

$$= -2$$

(iv) $\left(\left(\left(\tfrac{-1}{4}\right)^{2}\right)^{-2}\right)^{-1} = \left(\left(\tfrac{(-1)^2}{4^2}\right)^{-2}\right)^{-1}$

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

$$= \left(\left(\tfrac{1}{(1/16)^2}\right)\right)^{-1}$$

$$= \left(\tfrac{1}{(1/256)}\right)^{-1}$$

$$= 256^{-1} = \tfrac{1}{256}$$

(v)

$$\left\{\left(\tfrac{2}{3}\right)^{2}\right\}^{3} \times \left(\tfrac{1}{3}\right)^{-4} \times 3^{-1} \times 6^{-1}$$

$$= \left(\tfrac{2^2}{3^2}\right)^{3} \times \tfrac{1}{(1/3)^4} \times \tfrac{1}{3} \times \tfrac{1}{6}$$

$$= \tfrac{4^3}{9^3} \times 81 \times \tfrac{1}{18}$$

$$= \tfrac{64}{729} \times 81 \times \tfrac{1}{18}$$

$$= \tfrac{64}{9} \times \tfrac{1}{18}$$

$$= 64 \times \tfrac{1}{162}$$

$$= \tfrac{64}{162}$$

$$= \tfrac{32}{81}$$

Q8. By what number should 5^{-1} be multiplies so that the product may be equal to $(-7)^{-1}$?

Solution:

Expressing in fraction form, we get:

$5^{-1} = \tfrac{1}{5}$

And $(-7)^{-1} = \tfrac{1}{-7}$

We have to find a number x such that

$\tfrac{1}{5}x = \tfrac{-1}{7}$

Multiplying both side by 5, we get:

$x = -\tfrac{5}{7}$

Hence, 5^{-1} be multiplied by $-\tfrac{5}{7}$ to obtain $(-7)^{-1}$.

Q9. By what number should $\left(\tfrac{1}{2}\right)^{-1}$ be multiplies so that the product may be equal to $\left(\tfrac{-4}{7}\right)^{-1}$?

Solution:

Expressing in fraction form, we get

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

And $\left(\frac{-4}{7}\right)^{-1} = -\frac{7}{4}$

We have to find a number x such that:

$2x = -\frac{7}{4}$

Dividing both side by 2, we get

$x = -\frac{7}{8}$

Hence, $\left(\frac{1}{2}\right)^{-1}$ should be multiplies by $-\frac{7}{8}$ to obtain $\left(\frac{-4}{7}\right)^{-1}$.

Q10. By what number should $(-15)^{-1}$ be divided so that the quotient may be equal to $(-5)^{-1}$

Solution:

Expressing in fraction form, we get:

$(-15)^{-1} = -\frac{1}{15}$ (using $a^{-1} = \frac{1}{a}$)

And

$(-5)^{-1} = -\frac{1}{5}$ (using $a^{-1} = \frac{1}{a}$)

We have to find a number xx such that

$-\frac{1}{15} \div x = -\frac{1}{5}$

Solving this equation, we get:

$-\frac{1}{15} \times \frac{1}{x} = -\frac{1}{5}$ $-\frac{1}{15} = -\frac{x}{5}$ $\frac{-5}{-15} = x$ $x = \frac{1}{3}$

Hence, $(-15)^{-1}$ should be divided by $\frac{1}{3}$ to obtain $(-5)^{-1}$

Q11. By what number should $\left(\frac{5}{3}\right)^{-2}$ be multiplies so that the product may be $\left(\frac{7}{3}\right)^{-1}$?

Solution:

Expressing as a positive exponent, we have:

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

$$= \frac{1}{25/9}$$

$$= \frac{9}{25}$$

and

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

We have to find a number x such that

$$\frac{9}{25} \times x = \frac{3}{7}$$

Multiplying both sides by 25/9, we get:

$x = \frac{3}{7} \times \frac{25}{9} = \frac{1}{7} \times \frac{25}{3} = \frac{25}{21}$

Hence, $\left(\frac{5}{3}\right)^{-2}$ should be multiplies by $\frac{25}{21}$ top obtain $\left(\frac{7}{3}\right)^{-1}$.

Q12. Find x, if:

(i) $\left(\frac{1}{4}\right)^{-4} \times \left(\frac{1}{4}\right)^{-8} = \left(\frac{1}{4}\right)^{-4x}$

(ii) $\left(\frac{-1}{2}\right)^{-19} \times \left(\frac{-1}{2}\right)^{8} = \left(\frac{-1}{2}\right)^{-2x+1}$

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

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

(v) $\left(\frac{5}{4}\right)^{-x} \div \left(\frac{5}{4}\right)^{-4} = \left(\frac{5}{4}\right)^{5}$

(vi) $\left(\frac{8}{3}\right)^{2x+1} \times \left(\frac{8}{3}\right)^{5} = \left(\frac{8}{3}\right)^{x+2}$

Answer:

(i) We have:

$$\left(\frac{1}{4}\right)^{-4} \times \left(\frac{1}{4}\right)^{-8} = \left(\frac{1}{4}\right)^{-4x}$$

$$\left(\frac{1}{4}\right)^{-12} = \left(\frac{1}{4}\right)^{-4x}$$

$$-12 = -4x$$

$$3 = x$$

Therefore, x = 3

(ii) We have:

$$\left(\frac{-1}{2}\right)^{-19} \times \left(\frac{-1}{2}\right)^{8} = \left(\frac{-1}{2}\right)^{-2x+1}$$

$$\left(\frac{-1}{2}\right)^{-11} = \left(\frac{-1}{2}\right)^{-2x+1}$$

$$-11 = -2x + 1$$

$$-12 = -2x$$

$$6 = x$$

Therefore, x = 6

(iii) We have:

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

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

$$2 = 2x + 1$$

$$1 = 2x$$

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

Therefore, x = $\frac{1}{2}$

(iv) We have:

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

$$\left(\frac{2}{5}\right)^{12} = \left(\frac{2}{5}\right)^{2x+1}$$

$$12 = 2 + 3x$$

$$10 = 3x$$

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

Therefore, x = $\frac{10}{3}$

(v) We have:

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

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

$$-x + 4 = 5$$

$$-x = 1$$

$$x = -1$$

Therefore, x = -1

(vi) We have:

$$\left(\frac{8}{3}\right)^{2x+1} \times \left(\frac{8}{3}\right)^{5} = \left(\frac{8}{3}\right)^{x+2}$$

$$\left(\frac{8}{3}\right)^{2x+6} = \left(\frac{8}{3}\right)^{x+2}$$

$$2x + 6 = x + 2$$

$$x = -4$$

Therefore, x = -4

Q13.

(i) if $x = \left(\frac{3}{2}\right)^{2} \times \left(\frac{2}{3}\right)^{-4}$**, find the value of** x^{-2}**.**

(ii) If $x = \left(\frac{4}{5}\right)^{-2} \div \left(\frac{1}{4}\right)^{2}$**, find the value of** x^{-1}**.**

Answer:

(i) First, we have to find x.

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

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

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

Hence, x^{-2} is:

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

$$= \left(\frac{3}{2}\right)^{-12}$$

$$= \left(\frac{2}{3}\right)^{12}$$

(ii) First we will have to find x.

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

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

$$= \frac{4^{0}}{5^{-2}}$$

$$(5^{2})^{-1}$$

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

Q14. Find the value of x for which $5^{2x} \div 5^{-3} = 5^{5}$**.**

Answer: We have:

$$5^{2x} \div 5^{-3} = 5^{5}$$

$$5^{2x+3} = 5^{5}$$

$$2x + 3 = 5$$

$$2x = 2$$

$$x = 1$$

Hence, x is 1.