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Students can use the RD Sharma Solutions for Class 9, which has been solved by subject matter experts in compliance with the CBSE syllabus, if they want to score highly on exams. Students will study several crucial procedures for solving real numbers in Chapter 2.

RD Sharma Class 9 Solutions Maths Chapter 2 PDF

The PDF link for RD Sharma Class 9 Solutions for Maths Chapter 2 on Exponents of Real Numbers is provided below. This PDF contains detailed solutions to all the exercises in the chapter, helping students understand the concepts better and strengthen their problem-solving skills. By referring to these solutions, students can enhance their preparation for exams and aim to achieve better grades in mathematics. Access the PDF link below to download the solutions and start practicing.

RD Sharma Class 9 Solutions Maths Chapter 2 PDF

RD Sharma Class 9 Solutions Maths Chapter 2 Exponents of Real Numbers

The solutions for RD Sharma Class 9 Maths Chapter 2 on Exponents of Real Numbers are provided below. These solutions provide step-by-step explanations to help students understand the concepts thoroughly. By referring to these solutions, students can clarify doubts and improve their problem-solving skills.

With comprehensive solutions available, students can strengthen their grasp of mathematical concepts and prepare effectively for exams. Access the solutions below to enhance your understanding of exponents and score good marks in mathematics.

Exercise 2.1

Question 1: Simplify the following

(i) $3(a^4 b^3)^{10} \times 5 (a^2 b^2)^3$

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

(iii) $\frac{(4\times10^7)(6\times10^{-5})}{8\times10^4}$

(iv) $\frac{4ab^2(-5ab^3)}{10a^2b^2}$

(v) $\left(\frac{x^2y^2}{a^2b^3}\right)^n$

(vi) $\frac{(a^{3n-9})^6}{a^{2n-4}}$

Solution:

Using laws: $(a^m)^n = a^{mn}$, $a^0 = 1$, $a^{-m} = 1/a$ *and* $a^m \times a^n = a^{m+n}$*]*

(i) $3(a^4 b^3)^{10} \times 5 (a^2 b^2)^3$

On simplifying the given equation, we get;

$= 3(a^{40} b^{30}) \times 5 (a^6 b^6)$

$= 15 (a^{46} b^{36})$

[using laws: $(a^m)^n = a^{mn}$ and $a^m \times a^n = a^{m+n}$]

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

On simplifying the given equation, we get;

$= (2^3 x^{-2\times3} y^{3\times3})$

$= 8 x^{-6} y^9$

(iii)

$$\frac{(4\times10^7)(6\times10^{-5})}{8\times10^4}$$

$$= \frac{(24\times10^7\times10^{-5})}{8\times10^4}$$

$$= \frac{(24\times10^{7-5})}{8\times10^4}$$

$$= \frac{(24\times10^2)}{8\times10^4}$$

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

$$= \frac{3}{100}$$

(iv) $\frac{4ab^2\ (-5ab^3)}{10a^2b^2} = \frac{4\times(-5)}{10} \times a^{1+1-2}\ b^{2+3-2}$

$= -2 \times a^0 b^3$

$= -2b^3$

(v) $\left(\frac{x^2y^2}{a^2b^3}\right)^n$

$= \frac{x^{2n}\times y^{2n}}{a^{2n}\ b^{3n}} = \frac{x^{2n}\times y^{2n}}{a^{2n}\ b^{3n}}$

(vi) $\frac{(a^{3n-9})^6}{a^{2n-4}} = \frac{a^{(3n-9)6}}{a^{2n-4}}$

$= \frac{a^{18n-54}}{a^{2n-4}}$

$= a^{18n-54-2n+4} = a^{16n-50}$

Question 2: If a = 3 and b =-2, find the values of:

(i) $a^a + b^b$

(ii) $a^b + b^a$

(iii) $(a+b)^{ab}$

Solution:

(i) $a^a + b^b$

Now putting the values of ‘a’ and ‘b’, we get;

$= 3^3 + (-2)^{-2}$

$= 3^3 + (-1/2)^2$

$= 27 + 1/4$

= 109/4

(ii) $a^b + b^a$

Now putting the values of ‘a’ and ‘b’, we get;

$= 3^{-2} + (-2)^3$

$= (1/3)^2 + (-2)^3$

$= 1/9 - 8$

= −71/9

(iii) $(a+b)^{ab}$

Now putting the values of ‘a’ and ‘b’, we get;

$= (3 + (-2))^{3(-2)}$

$= (3-2))^{-6}$

$= 1^{-6}$

= 1

Question 3: Prove that

(i) $$\left(\frac{x^a}{x^b}\right)^{a^2+ab+b^2} \times \left(\frac{x^b}{x^c}\right)^{b^2+bc+c^2} \times \left(\frac{x^c}{x^a}\right)^{c^2+ca+a^2} = 1$$

(ii) $$\left(\frac{x^a}{x^{-b}}\right)^{a^2-ab+b^2} \times \left(\frac{x^b}{x^{-c}}\right)^{b^2-bc+c^2} \times \left(\frac{x^c}{x^{-a}}\right)^{c^2-ca+a^2} = 1$$

(iii) $$\left(\frac{x^a}{x^b}\right)^{c} \times \left(\frac{x^b}{x^c}\right)^{a} \times \left(\frac{x^c}{x^a}\right)^{b} = 1$$

Solution:

(i) L.H.S. =

$$\frac{x^{a^3+a^2b+ab^2}}{x^{a^2b+ab^2+b^3}} \times \frac{x^{b^3+b^2c+bc^2}}{x^{b^2c+bc^2+c^3}} \times \frac{x^{c^3+c^2a+ca^2}}{x^{c^2a+ca^2+a^3}}$$
$$= x^{a^3+a^2b+ab^2-(b^3+a^2b+ab^2)} \times x^{b^3+b^2c+bc^2-(c^3+b^2c+bc^2)} \times x^{c^3+c^2a+ca^2-(a^3+c^2a+ca^2)}$$
$$= x^{a^3-b^3} \times x^{b^3-c^3} \times x^{c^3-a^3}$$
$$= x^{a^3-b^3+b^3-c^3+c^3-a^3}$$
$$= x^0$$
$$= 1$$

= *R.H.S.*

(ii) We have to prove here;

$$(\frac{x^a}{x^{-b}})^{a^2-ab+b^2} \times (\frac{x^b}{x^{-c}})^{b^2-bc+c^2} \times (\frac{x^c}{x^{-a}})^{c^2-ca+a^2} = x^{2(a^3+b^3+c^3)}$$

L.H.S. =

$$= x^{(a+b)(a^2-ab+b^2)} \times x^{(b+c)(b^2-bc+c^2)} \times x^{(c+a)(c^2-ca+a^2)}$$
$$= x^{a^3+b^3} \times x^{b^3+c^3} \times x^{c^3+a^3}$$
$$= x^{a^3+b^3+b^3+c^3+c^3+a^3}$$
$$= x^{2(a^3+b^3+c^3)}$$

=R.H.S.

(iii) L.H.S. =

$$(\frac{x^a}{x^b})^c \times (\frac{x^b}{x^c})^a \times (\frac{x^c}{x^a})^b$$

$$= (\frac{x^{ac}}{x^{bc}}) \times (\frac{x^{ba}}{x^{ca}}) \times (\frac{x^{bc}}{x^{ab}})$$

$$= x^{ac-bc} \times x^{ba-ca} \times x^{bc-ab}$$

$$= x^{ac-bc+ba-ca+bc-ab}$$

$$= x^0$$

$$= 1$$

= *R.H.S.*

Question 4: Prove that

$$(i) \frac{1}{1+x^{a-b}} + \frac{1}{1+x^{b-a}} = 1$$

$$(ii) \frac{1}{1+x^{b-a}+x^{c-a}} + \frac{1}{1+x^{a-b}+x^{c-b}} + \frac{1}{1+x^{b-c}+x^{a-c}}$$

Solution:

(i) L.H.S

$$= \frac{1}{1+\frac{x^a}{x^b}} + \frac{1}{1+\frac{x^b}{x^a}}$$

$$= \frac{x^b}{x^b+x^a} + \frac{x^a}{x^a+x^b}$$

$$= \frac{x^b+x^a}{x^a+x^b}$$

$$= 1$$

= *R.H.S.*

(ii) L.H.S

$$= \frac{1}{1+\frac{x^b}{x^a}+\frac{x^c}{x^a}} + \frac{1}{1+\frac{x^a}{x^b}+\frac{x^c}{x^b}} + \frac{1}{1+\frac{x^b}{x^c}+\frac{x^a}{x^c}}$$

$$= \frac{x^a}{x^a+x^b+x^c} + \frac{x^b}{x^b+x^a+x^c} + \frac{x^c}{x^c+x^b+x^a}$$

$$= \frac{x^a+x^b+x^c}{x^a+x^b+x^c}$$

$$= 1$$

= *R.H.S.*

Question 5: Prove that

$$(i) \quad \frac{a+b+c}{a^{-1}b^{-1}+b^{-1}c^{-1}+c^{-1}a^{-1}} = abc$$

$$ii) \quad (a^{-1}+b^{-1})^{-1} = \frac{ab}{a+b}$$

Solution:

(i) L.H.S.

$$= \frac{a+b+c}{\frac{1}{ab}+\frac{1}{bc}+\frac{1}{ca}}$$

$$= \frac{a+b+c}{\frac{a+b+c}{abc}}$$

$$= abc$$

= *R.H.S.*

(ii)

L.H.S.

$$= \frac{1}{(a^{-1} + b^{-1})}$$

$$= \frac{1}{(\frac{1}{a} + \frac{1}{b})}$$

$$= \frac{1}{(\frac{a+b}{ab})}$$

$$= \frac{ab}{a+b}$$

= R.H.S.

Question 6: If abc = 1, show that

$$\frac{1}{1+a+b^{-1}} + \frac{1}{1+b+c^{-1}} + \frac{1}{1+c+a^{-1}} = 1$$

Solution:

$$= \frac{1}{1+a+\frac{1}{b}} + \frac{1}{1+b+\frac{1}{c}} + \frac{1}{1+c+\frac{1}{a}}$$

$$= \frac{b}{b+ab+1} + \frac{c}{c+bc+1} + \frac{a}{a+ac+1} \quad ...(1)$$

Given, abc = 1

So, c = 1/ab

By putting the value c in equation (1)

$$= \frac{b}{b+ab+1} + \frac{\frac{1}{ab}}{\frac{1}{ab}+b(\frac{1}{ab})+1} + \frac{a}{a+a(\frac{1}{ab})+1}$$

$$= \frac{b}{b+ab+1} + \frac{\frac{1}{ab}\times ab}{1+b+ab} + \frac{ab}{1+ab+b}$$

$$= \frac{b}{b+ab+1} + \frac{1}{1+b+ab} + \frac{ab}{1+ab+b}$$

$$= \frac{1+ab+b}{b+ab+1}$$

$$= 1$$

Exercise 2.2

Question 1: Assuming that x, y, z are positive real numbers, simplify each of the following:

(i) $\left(\sqrt{(x^{-3})}\right)^5$ (ii) $\sqrt{x^3y^{-2}}$ (iii) $\left(x^{-\frac{2}{3}}y^{-\frac{1}{2}}\right)^2$

(iv) $(\sqrt{x})^{-\frac{2}{3}}\sqrt{y^4} \div \sqrt{xy^{-\frac{1}{2}}}$ (v) $\sqrt[5]{243x^{10}y^5z^{10}}$

(vi) $\left(\frac{x^{-4}}{y^{-10}}\right)^{\frac{5}{4}}$ (vii) $\left(\frac{\sqrt{2}}{\sqrt{3}}\right)^5\left(\frac{6}{7}\right)^2$

Solution:

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

$$\left(\frac{1}{x^{\frac{3}{2}}}\right)^5 = \frac{1}{x^{\frac{15}{2}}}$$

(ii) $\sqrt{x^3y^{-2}} = \frac{x^{\frac{3}{2}}}{y^{2\times\frac{1}{2}}} = \frac{x^{\frac{3}{2}}}{y}$

(iii) $\left(x^{-\frac{2}{3}}y^{-\frac{1}{2}}\right)^2$

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

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

$$= \frac{1}{x^{\frac{4}{3}}y}$$

(iv) $\left(\sqrt{x}\right)^{-\frac{2}{3}}\sqrt{y^4} \div \sqrt{xy^{-\frac{1}{2}}}$

$$= \left(x^{\frac{1}{2}}\right)^{-\frac{2}{3}}\left(y^2\right) \div \sqrt{xy^{-\frac{1}{2}}}$$

$$= \frac{x^{-\frac{1}{3}}y^2}{x^{\frac{1}{2}}y^{-\frac{1}{2}\times\frac{1}{2}}}$$

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

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

$$= \left(x^{\frac{-2-3}{6}}\right)\left(y^{\frac{8+1}{4}}\right)$$

$$= \left(x^{-\frac{5}{6}}\right)\left(y^{\frac{9}{4}}\right)$$

$$= \frac{y^{\frac{9}{4}}}{x^{\frac{5}{6}}}$$

(v) $\sqrt[5]{243x^{10}y^5z^{10}}$

$= \left(243x^{10}y^5z^{10}\right)^{\frac{1}{5}}$

$= (243)^{\frac{1}{5}} x^{\frac{10}{5}} y^{\frac{5}{5}} z^{\frac{10}{5}}$

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

$= 3x^2yz^2$

(vi) $\left(\frac{x^{-4}}{y^{-10}}\right)^{\frac{5}{4}}$

$= \left(\frac{y^{10}}{x^4}\right)^{\frac{5}{4}}$

$= \left(\frac{y^{10\times\frac{5}{4}}}{x^{4\times\frac{5}{4}}}\right)$

$= \left(\frac{y^{\frac{25}{2}}}{x^5}\right)$

(vii) $\left(\frac{\sqrt{2}}{\sqrt{3}}\right)^5 \left(\frac{6}{7}\right)^2$

$= \left(\sqrt{\frac{2}{3}}\right)^5 \left(\frac{6}{7}\right)^{\frac{4}{2}}$

$= \left(\frac{2}{3}\right)^{\frac{5}{2}} \left(\frac{6}{7}\right)^{\frac{4}{2}}$

$= \left(\frac{2^5}{3^5}\right)^{\frac{1}{2}} \left(\frac{6^4}{7^4}\right)^{\frac{1}{2}}$

$= \left(\frac{2^5}{3^5} \times \frac{6^4}{7^4}\right)^{\frac{1}{2}}$

$= \left(\frac{2\times2\times2\times2\times2}{3\times3\times3\times3\times3} \times \frac{6\times6\times6\times6}{7\times7\times7\times7}\right)$

$= \left(\frac{512}{7203}\right)^{\frac{1}{2}}$

Question 2: Simplify

(i) $(16^{-1/5})^{5/2}$ (ii) $\sqrt[5]{(32)^{-3}}$

(iii) $\sqrt[3]{(343)^{-2}}$ (iv) $(0.001)^{1/3}$

(v) $\frac{(25)^{3/2} \times (243)^{3/5}}{(16)^{5/4} \times (8)^{4/3}}$ (vi) $\left(\frac{\sqrt{2}}{5}\right)^8 \div \left(\frac{\sqrt{2}}{5}\right)^{13}$

(vii) $\left(\frac{5^{-1} \times 7^2}{5^2 \times 7^{-4}}\right)^{\frac{7}{2}} \times \left(\frac{5^{-2} \times 7^3}{5^3 \times 7^{-5}}\right)^{\frac{-5}{2}}$

Solution:

(i) $\left(16^{-\frac{1}{5}}\right)^{\frac{5}{2}}$

$= (16)^{-\frac{1}{5} \times \frac{5}{2}} = (16)^{-\frac{1}{2}}$

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

(ii) $\sqrt[5]{(32)^{-3}} = \left[(2^5)^{-3}\right]^{\frac{1}{5}} = (2^{-15})^{\frac{1}{5}}$

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

(iii) $\sqrt[3]{(343)^{-2}} = \left[(343)^{-2}\right]^{\frac{1}{3}} = (343)^{-2 \times \frac{1}{3}}$

$= (7^3)^{-\frac{2}{3}} = (7^{-2}) = \left(\frac{1}{7^2}\right) = \left(\frac{1}{49}\right)$

(iv) $(0.001)^{\frac{1}{3}}$

$= \left(\frac{1}{10^3}\right)^{\frac{1}{3}} = \frac{1}{10^{3 \times \frac{1}{3}}}$

$= \frac{1}{10} = 0.1$

(v) $\dfrac{(25)^{\frac{3}{2}} \times (243)^{\frac{3}{5}}}{(16)^{\frac{5}{4}} \times (8)^{\frac{4}{3}}}$

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

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

$= \dfrac{125 \times 27}{32 \times 16}$

$= \dfrac{3375}{512}$

(vi) $\left(\dfrac{\sqrt{2}}{5}\right)^{8} \div \left(\dfrac{\sqrt{2}}{5}\right)^{13} = \left(\dfrac{\sqrt{2}}{5}\right)^{8-13}$

$= \left(\dfrac{\sqrt{2}}{5}\right)^{-5} = \dfrac{5^5}{2^{\frac{5}{2}}} = \dfrac{3125}{4\sqrt{2}}$

(vii) $\left(\dfrac{5^{-1} \times 7^{2}}{5^{2} \times 7^{-4}}\right)^{\frac{7}{2}} \times \left(\dfrac{5^{-2} \times 7^{3}}{5^{3} \times 7^{-5}}\right)^{\frac{-5}{2}}$

$= \dfrac{5^{-1\times\frac{7}{2}} \times 7^{2\times\frac{7}{2}}}{5^{2\times\frac{7}{2}} \times 7^{-4\times\frac{7}{2}}} \times \dfrac{5^{-2\times\left(\frac{-5}{2}\right)} \times 7^{3\times\left(\frac{-5}{2}\right)}}{5^{3\times\left(\frac{-5}{2}\right)} \times 7^{-5\times\left(\frac{-5}{2}\right)}}$

$= \dfrac{5^{\frac{-7}{2}} \times 7^{7}}{5^{7} \times 7^{-14}} = \dfrac{5^{5} \times 7^{\frac{-15}{2}}}{5^{\frac{-15}{2}} \times 7^{\frac{25}{2}}}$

$= 5^{\frac{-7}{2}+5-7+\frac{15}{2}} \times 7^{7-\frac{15}{2}+14-\frac{25}{2}}$

$= 5^{\frac{25}{2}-\frac{21}{2}} \times 7^{21-\frac{40}{2}} = 5^{\frac{4}{2}} \times 7^{\frac{2}{2}}$

$= 5^2 \times 7^1 = 25 \times 7 = 175$

Question 3: Prove that

(i) $\left(\sqrt{3\times5^{-3}}\div\sqrt[3]{3^{-1}}\sqrt{5}\right)\times\sqrt[6]{3\times5^{6}}=\frac{3}{5}$

(ii) $9^{\frac{3}{2}}-3\times5^{0}-\left(\frac{1}{81}\right)^{-\frac{1}{2}}=15$

(iii) $\left(\frac{1}{4}\right)^{-2}-3\times8^{\frac{2}{3}}\times4^{0}+\left(\frac{9}{16}\right)^{-\frac{1}{2}}=\frac{16}{3}$

(iv) $\frac{2^{\frac{1}{2}}\times3^{\frac{1}{3}}\times4^{\frac{1}{4}}}{10^{-\frac{1}{5}}\times5^{\frac{3}{5}}}\div\frac{3^{\frac{4}{3}}\times5^{-\frac{7}{5}}}{4^{-\frac{3}{5}}\times6}$ =10

(v) $\sqrt{\frac{1}{4}}+(0.01)^{-\frac{1}{2}}-(27)^{\frac{2}{3}}=\frac{3}{2}$

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

(vii) $\left(\frac{64}{125}\right)^{-\frac{2}{3}}+\frac{1}{\left(\frac{256}{625}\right)^{\frac{1}{4}}}+\left(\frac{\sqrt{25}}{\sqrt[3]{64}}\right)^{0}=\frac{61}{16}$

(viii) $\frac{3^{-3}\times6^{2}\times\sqrt{98}}{5^{2}\times\sqrt[3]{\frac{1}{25}}\times(15)^{-\frac{4}{3}}\times3^{\frac{1}{3}}}=28\sqrt{2}$

(ix) $\frac{(0.6)^{0}-(0.1)^{-1}}{\left(\frac{3}{8}\right)^{-1}\left(\frac{3}{2}\right)^{3}+\left(\frac{1}{3}\right)^{-1}}=\frac{-3}{2}$

Solution:

(i) L.H.S.

$$\left(\sqrt{3\times5^{-3}}\div\sqrt[3]{3^{-1}}\sqrt{5}\right)\times\sqrt[6]{3\times5^{6}}$$

$$=\left(\left(3\times5^{-3}\right)^{\frac{1}{2}}\div\left(3^{-1}\right)^{\frac{1}{3}}(5)^{\frac{1}{2}}\right)\times\left(3\times5^{6}\right)^{\frac{1}{6}}$$

$$=\left((3)^{\frac{1}{2}}\left(5^{-3}\right)^{\frac{1}{2}}\div\left(3^{-1}\right)^{\frac{1}{3}}(5)^{\frac{1}{2}}\right)\times\left(3\times5^{6}\right)^{\frac{1}{6}}$$

$$=\left((3)^{\frac{1}{2}}(5)^{\frac{-3}{2}}\div(3)^{\frac{-1}{3}}(5)^{\frac{1}{2}}\right)\times\left((3)^{\frac{1}{6}}\times(5)^{\frac{6}{6}}\right)$$

$$=\left((3)^{\frac{1}{2}-\left(-\frac{1}{3}\right)}\times(5)^{-\frac{3}{2}-\frac{1}{2}}\right)\times\left((3)^{\frac{1}{6}}\times(5)\right)$$

$$=\left((3)^{\frac{3+2}{6}}\times(5)^{-\frac{4}{2}}\right)\times\left((3)^{\frac{1}{6}}\times(5)\right)$$

$$=\left((3)^{\frac{5}{6}}\times(5)^{-2}\right)\times\left((3)^{\frac{1}{6}}\times(5)\right)$$

$$=\left((3)^{\frac{5}{6}+\frac{1}{6}}\times(5)^{-2+1}\right)$$

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

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

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

$$=\left((3)\times\left(\tfrac{1}{5}\right)\right)$$

$$=\left(\tfrac{3}{5}\right)$$

=R.H.S.

(ii) $9^{\frac{3}{2}} - 3 \times 5^0 - \left(\frac{1}{81}\right)^{-\frac{1}{2}}$

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

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

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

$= 27 - 3 - 9$

$= 15$

(iii) $\left(\frac{1}{4}\right)^{-2} - 3 \times 8^{\frac{2}{3}} \times 4^0 + \left(\frac{9}{16}\right)^{-\frac{1}{2}}$

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

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

$= 16 - 3 \times 4 + \frac{4}{3}$

$= \frac{12+4}{3}$

$= \frac{16}{3}$

(iv) $\dfrac{2^{\frac{1}{2}} \times 3^{\frac{1}{3}} \times 4^{\frac{1}{4}}}{10^{-\frac{1}{5}} \times 5^{\frac{3}{5}}} \div \dfrac{3^{\frac{4}{3}} \times 5^{-\frac{7}{5}}}{4^{-\frac{3}{5}} \times 6}$

$$= \frac{2^{\frac{1}{2}} \times 3^{\frac{1}{3}} \times (2^2)^{\frac{1}{4}} \ (2^2)^{-\frac{3}{5}} \times (2 \times 3)}{(2 \times 5)^{-\frac{1}{5}} \times 5^{\frac{3}{5}} \times 3^{\frac{4}{3}} \times 5^{-\frac{7}{5}}}$$

$$= \frac{2^{\frac{1}{2}} \times 2^{\frac{1}{2}} \times (2^2)^{-\frac{6}{5}} \times 2^1 \times 3^{\frac{1}{3}} \times 3}{2^{-\frac{1}{5}} \times 5^{-\frac{1}{5}} \times 5^{\frac{3}{5}} \times 3^{\frac{4}{3}} \times 5^{-\frac{7}{5}}}$$

$$= \frac{2^{\frac{1}{5}} \times 2^{\frac{1}{2}} \times 2^{\frac{1}{2}} \times 2^{-\frac{6}{5}} \times 2 \times 3^{\frac{1}{3}} \times 3 \times 3^{-\frac{4}{3}}}{5^{-\frac{1}{5}} \times 5^{\frac{3}{5}} \times 5^{-\frac{7}{5}}}$$

$$= \frac{(2)^{\frac{1}{2}+\frac{1}{2}-\frac{6}{5}+1+\frac{1}{5}} \times (3)^{\frac{1}{3}+1-\frac{4}{3}}}{5^{-\frac{1}{5}} \times 5^{\frac{3}{5}} \times 5^{-\frac{7}{5}}}$$

$$= \frac{(2)^{\frac{1}{5}+2-\frac{6}{5}} \times (3)^{1-1}}{5^{-1}}$$

$= \dfrac{(2)^1 \times (3)^0}{5^{-1}}$

$= 2 \times 1 \times 5$

$=10$

(v) $\sqrt{\frac{1}{4}} + (0.01)^{-\frac{1}{2}} - (27)^{\frac{2}{3}}$

$= \frac{1}{2} + \frac{1}{(0.01)^{\frac{1}{2}}} - \left(3^3\right)^{\frac{2}{3}}$

$= \frac{1}{2} + \frac{1}{(0.1)^{2\times\frac{1}{2}}} - (3)^{3\times\frac{2}{3}}$

$= \frac{1}{2} + \frac{1}{(0.1)^1} - (3)^2$

$= \frac{1}{2} + \frac{1}{(0.1)} - 9$

$= \frac{3}{2}$

(vi) $\dfrac{2^n + 2^{n-1}}{2^{n+1} - 2^n}$

$= \dfrac{2^n + 2^n \times 2^{-1}}{2^n \times 2^1 - 2^n}$

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

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

$= \frac{3}{2}$

(vii) $\left(\frac{64}{125}\right)^{-\frac{2}{3}} + \frac{1}{\left(\frac{256}{625}\right)^{\frac{1}{4}}} + \left(\frac{\sqrt{25}}{\sqrt[3]{64}}\right)^{0}$

$$= \left(\frac{125}{64}\right)^{\frac{2}{3}} + \frac{1}{\left(\frac{4^4}{5^4}\right)^{\frac{1}{4}}} + 1$$

$$= \left(\frac{5^3}{4^3}\right)^{\frac{2}{3}} + \frac{1}{\left(\frac{4}{5}\right)} + 1$$

$$= \left(\frac{5}{4}\right)^{2} + \frac{5}{4} + 1$$

$$= \frac{25}{16} + \frac{9}{4}$$

$$= \frac{25}{16} + \frac{36}{16}$$

$$= \frac{61}{16}$$

(viii) $$\frac{3^{-3}\times 6^2\times\sqrt{98}}{5^2\times\sqrt[3]{\frac{1}{25}}\times(15)^{-\frac{4}{3}}\times 3^{\frac{1}{3}}}$$

$$=\frac{3^{-3}\times 36\times\sqrt{7\times 7\times 2}}{5^2\times\left(\frac{1}{25}\right)^{\frac{1}{3}}\times(15)^{-\frac{4}{3}}\times 3^{\frac{1}{3}}}$$

$$=\frac{3^{-3}\times 2^2\times 3^2\times 2^{\frac{1}{2}}\times(7^2)^{\frac{1}{2}}}{5^2\times(5^2)^{\frac{-1}{3}}\times 3^{\frac{-4}{3}}\times 5^{\frac{-4}{3}}\times 3^{\frac{1}{3}}}$$

$$=2^2.2^{\frac{1}{2}}\cdot 3^{-3+2+\frac{4}{3}-\frac{1}{3}}\cdot 5^{\frac{2}{3}-2+\frac{4}{3}}.7^1$$

$$=4\sqrt{2}\times 3^0\times 5^0\times 7^1$$

$$=4\sqrt{2}\times 1\times 1\times 7$$

$$=28\sqrt{2}$$

(ix) $$\frac{(0.6)^0-(0.1)^{-1}}{\left(\frac{3}{8}\right)^{-1}\left(\frac{3}{2}\right)^3+\left(\frac{1}{3}\right)^{-1}}$$

$$=\frac{1-\frac{1}{0.1}}{\frac{8}{3}\times\left(\frac{3}{2}\right)^3-3}$$

$$=\frac{1-10}{\frac{8}{3}\times\frac{3^3}{2^3}-3}$$

$$=\frac{-9}{3^2-3}$$

$=-3/2$

Question 4.

Show that:

$$(i)\frac{1}{1+x^{a-b}}+\frac{1}{1+x^{b-a}}=1$$

$$(ii)\left[\left(\frac{x^{a(a-b)}}{x^{a(a+b)}}\right)\div\left(\frac{x^{b(b-a)}}{x^{b(b+a)}}\right)\right]^{a+b}=1$$

$$(iii)\left(x^{\frac{1}{a-b}}\right)^{\frac{1}{a-c}}\left(x^{\frac{1}{b-c}}\right)^{\frac{1}{b-a}}\left(x^{\frac{1}{c-a}}\right)^{\frac{1}{c-b}}=1$$

$$(iv)\left(\frac{x^{a^2+b^2}}{x^{ab}}\right)^{a+b}\left(\frac{x^{b^2+c^2}}{x^{bc}}\right)^{b+c}\left(\frac{x^{c^2+a^2}}{x^{ac}}\right)^{a+c}=x^{2(a^3+b^3+c^3)}$$

(v) $\left(x^{a-b}\right)^{a+b}\left(x^{b-c}\right)^{b+c}\left(x^{c-a}\right)^{c+a}=1$

$$(vi)\left[\left(x^{a-a^{-1}}\right)^{\frac{1}{a-1}}\right]^{\frac{a}{a+1}}=x$$

$$(vii)\left[\frac{a^{x+1}}{a^{y+1}}\right]^{x+y}\left[\frac{a^{y+2}}{a^{z+2}}\right]^{y+z}\left[\frac{a^{z+3}}{a^{x+3}}\right]^{z+x}=1$$

$$(viii)\left(\frac{3^a}{3^b}\right)^{a+b}\left(\frac{3^b}{3^c}\right)^{b+c}\left(\frac{3^c}{3^a}\right)^{c+a}=1$$

Solution:

$$(i)\frac{1}{1+x^{a-b}}+\frac{1}{1+x^{b-a}}$$

$$=\frac{1}{1+\frac{x^a}{x^b}}+\frac{1}{1+\frac{x^b}{x^a}}$$

$$=\frac{x^b}{x^b+x^a}+\frac{x^a}{x^a+x^b}$$

$$=\frac{x^b+x^a}{x^a+x^b}$$

$$=1$$

$$(ii)\left[\left(\frac{x^{a(a-b)}}{x^{a(a+b)}}\right)\div\left(\frac{x^{b(b-a)}}{x^{b(b+a)}}\right)\right]^{a+b}$$

$$=\left[\left(\frac{x^{a^2-ab}}{x^{a^2+ab}}\right)\div\left(\frac{x^{b^2-ab}}{x^{b^2+ab}}\right)\right]^{a+b}$$

$$=\left[x^{\left(a^2-ab\right)-\left(a^2-ab\right)}\div x^{\left(b^2-ab\right)-\left(b^2-ab\right)}\right]^{a+b}$$

$$=\left[x^{-2ab-(-2ab)}\right]^{a+b}$$

$$=\left[x^0\right]^{a+b}=[1]^{a+b}=1$$

$$(iii)\left(x^{\frac{1}{a-b}}\right)^{\frac{1}{a-c}}\left(x^{\frac{1}{b-c}}\right)^{\frac{1}{b-a}}\left(x^{\frac{1}{c-a}}\right)^{\frac{1}{c-b}}$$

$$=\left(x^{\frac{1}{(a-b)(a-c)}}\right)\left(x^{\frac{1}{(b-c)(b-a)}}\right)\left(x^{\frac{1}{(c-a)(c-b)}}\right)$$

$$=x^{\left(\frac{1}{(a-b)(a-c)}+\frac{-1}{(b-c)(a-b)}+\frac{1}{(a-c)(b-c)}\right)}$$

$$=x^{\left(\frac{b-c-a+c+a-b}{(a-b)(a-c)(b-c)}\right)}$$

$$=x^0=1$$

$$(iv)\left(\frac{x^{a^2+b^2}}{x^{ab}}\right)^{a+b}\left(\frac{x^{b^2+c^2}}{x^{bc}}\right)^{b+c}\left(\frac{x^{c^2+a^2}}{x^{ac}}\right)^{a+c}:$$

$$=\left(x^{a^2+b^2-ab}\right)^{a+b}\left(x^{b^2+c^2-bc}\right)^{b+c}\left(x^{c^2+a^2-ac}\right)^{a+c}$$

$$=\left(x^{a+b\left(a^2+b^2-ab\right)}\right)\left(x^{b+c\left(b^2+c^2-bc\right)}\right)\left(x^{a+c\left(c^2+a^2-ac\right)}\right)$$

$$=\left(x^{a^3+ab^2-a^2b+ab^2+b^3-ab^2}\right)\left(x^{b^3+bc^2-b^2c+cb^2+c^3-bc^2}\right)\left(x^{ac^2+a^3-a^2c+c^3+a^2c-ac^2}\right)$$

$$=\left(x^{a^3+b^3}\right)\left(x^{b^3+c^3}\right)\left(x^{a^3+c^3}\right)$$

$$=\left(x^{a^3+b^3+b^3+c^3+a^3+c^3}\right)$$

$$=\left(x^{2a^3+2b^3+2c^3}\right)$$

$$=\left(x^{2\left(a^3+b^3+c^3\right)}\right)$$

(v) $\left(x^{a-b}\right)^{a+b}\left(x^{b-c}\right)^{b+c}\left(x^{c-a}\right)^{c+a}=1$

$$\left(x^{a-b}\right)^{a+b}\left(x^{b-c}\right)^{b+c}\left(x^{c-a}\right)^{c+a}$$
$$=x^{a^2-b^2}x^{b^2-c^2}x^{c^2-a^2}$$
$$=x^{a^2-b^2+b^2-c^2+c^2-a^2}$$
$$=x^0$$
$$=1$$

$$(vi)\ \left[\left(x^{a-a^{-1}}\right)^{\frac{1}{a-1}}\right]^{\frac{a}{a+1}}$$

$$= \left[\left(x^{\frac{a-a^{-1}}{a-1}}\right)\right]^{\frac{a}{a+1}}$$

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

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

$$= x^1 = x$$

$$(vii)\ \left[\frac{a^{x+1}}{a^{y+1}}\right]^{x+y} \left[\frac{a^{y+2}}{a^{z+2}}\right]^{y+z} \left[\frac{a^{z+3}}{a^{x+3}}\right]^{z+x}$$

$$= \left[a^{(x+1)-(y+1)}\right]^{x+y} \left[a^{(y+2)-(z+2)}\right]^{y+z} \left[a^{(z+3)-(x+3)}\right]^{z+x}$$

$$= \left[a^{x-y}\right]^{x+y} \left[a^{y-z}\right]^{y+z} \left[a^{z-x}\right]^{z+x}$$

$$= \left[a^{x^2-y^2}\right] \left[a^{y^2-z^2}\right] \left[a^{z^2-x^2}\right]$$

$$= a^{x^2-y^2+y^2-z^2+z^2-x^2} = a^0 = 1$$

$$(viii)\ \left(\frac{3^a}{3^b}\right)^{a+b} \left(\frac{3^b}{3^c}\right)^{b+c} \left(\frac{3^c}{3^a}\right)^{c+a}$$

$$= \left(3^{a-b}\right)^{a+b} \left(3^{b-c}\right)^{b+c} \left(3^{c-a}\right)^{c+a}$$

$$= 3^{a^2-b^2} \times 3^{b^2-c^2} \times 3^{c^2-a^2}$$

$$= 3^{a^2-b^2+b^2-c^2+c^2-a^2}$$

$$= 3^0 = 1$$

Exercise-VSAQs

Question 1: Write $(625)^{-1/4}$ in decimal form.

Solution:

$(625)^{-1/4} = (5^4)^{-1/4} = 5^{-1} = 1/5 = 0.2$

Question 2: State the product law of exponents:

Solution:

To multiply two parts having same base, add the exponents.

Mathematically: $x^m \times x^n = x^{m+n}$

Question 3: State the quotient law of exponents.

Solution:

To divide two exponents with the same base, subtract the powers.

Mathematically: $x^m \div x^n = x^{m-n}$

Question 4: State the power law of exponents.

Solution:

Power law of exponents :

$(x^m)^n = x^{m \times n} = x^{mn}$

Question 5: For any positive real number x, find the value of

$$\left(\frac{x^a}{x^b}\right)^{a+b}\left(\frac{x^b}{x^c}\right)^{b+c}\left(\frac{x^c}{x^a}\right)^{c+a}$$

Solution:

$$\left(\frac{x^a}{x^b}\right)^{a+b}\left(\frac{x^b}{x^c}\right)^{b+c}\left(\frac{x^c}{x^a}\right)^{c+a}$$

$$= (x^{a-b})^{a+b} \times (x^{b-c})^{b+c} \times (x^{c-a})^{c+a}$$

$$= x^{a^2-b^2} \times x^{b^2-c^2} \times x^{c^2-a^2}$$

$$= x^{a^2-b^2+b^2-c^2+c^2-a^2}$$
$$= 1$$

Question 6: Write the value of $\{5(8^{1/3} + 27^{1/3})^3\}^{1/4}$.

Solution:

$\{5(8^{1/3} + 27^{1/3})^{3}\}^{1/4}$

$= \{5(2^{3\times1/3} + 3^{3\times1/3})^{3}\}^{1/4}$

$= \{ 5(2 + 3)^3\}^{1/4}$

$= (5^4)^{1/4}$

= *5*

RD Sharma Solutions for Class 9 Maths Chapter 2 Exponents of Real Numbers Summary

In the 2nd chapter of RD Sharma Solutions for Class 9, students will delve into significant concepts regarding Exponents of Real Numbers, encompassing the following:

1. Introduction to Exponents of Real Numbers
2. Integral exponents of a Real Number
3. Laws of Integral Exponents
4. Rational Exponents of Real Number
5. nth root of a positive Real Number
6. Laws of Rational Exponents