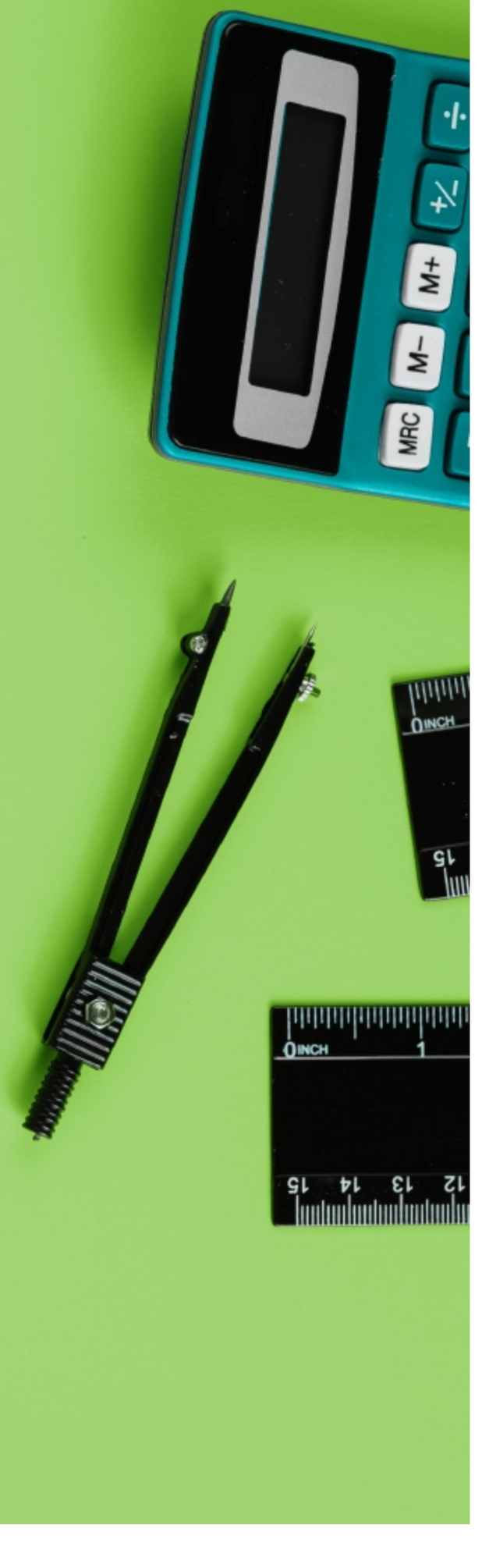
RD Sharma Solutions

Class 7

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Exercise 6.2

Q.1 Using laws of exponents, simplify and write the answer in exponential form.

(i) $2^3 \times 2^4 \times 2^5$ (ii) $5^{12} \div 5^3$ (iii) $(7^2)^3$

(iv) $(3^2)^5 \div 3^4$ (v) $3^7 \times 2^7$ (vi) $(5^{21} \div 5^{13}) \times 5$

Solution (i) $2^3 \times 2^4 \times 2^5$

$= 2^{(3+4+5)}$ $\{\because x^a \times x^b = x^{a+b}\}$

$= 2^{12}$

(ii) $5^{12} \div 5^3 = 5^{12-3} = 5^9$ $\{x^a \div x^b = x^{a-b}\}$

(iii) $(7^2)^3 = 7^{2\times 3} = 7^6$ $\{(x^a)^b = x^{a\times b}\}$

(iv) $(3^2)^5 \div 3^4 = 3^{2\times 5} \div 3^4$

$= 3^{10} \div 3^4$

$= 3^{10-4} = 3^6$

(v) $3^7 \times 2^7 = (3\times 2)^7$ $\{x^a \times y^a = (x\times y)^a\}$

$= 6^7$

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(vi) $(5^{21} \div 5^{13}) \times 5^7$

$= (5^{21-13}) \times 5^7 = 5^8 \times 5^7$

$= 5^{8+7}$

$= 5^{15}$

Q.2 Simplify and express each of the following in exponential form:

(i) $\{(2^3)^4 \times 2^8\} \div 2^{12}$ (ii) $(8^2 \times 8^4) \div 8^3$

(iii) $\left(\frac{5^7}{5^2}\right) \times 5^3$ (iv) $\frac{5^4 \times x^{10} y^5}{5^4 \times x^7 y^4}$

Solution:

(i) $\{(2^3)^4 \times 2^8\} \div 2^{12}$

$= \{2^{12} \times 2^8\} \div 2^{12}$ $\{(x^a)^b = x^{a \times b}\}$

$= 2^{12+8} \div 2^{12}$ $\{x^a \times x^b = x^{a+b}\}$

$= 2^{20} \div 2^{12}$

$= 2^{20-12}$ $\{x^a \div x^b = x^{a-b}\}$

$= 2^8$

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(ii) $(8^2 \times 8^4) \div 8^3$

$= 8^{2+4} \div 8^3$ $\{x^a \times x^b = x^{a+b}\}$

$= 8^6 \div 8^3$

$= 8^{6-3}$ $\{x^a \div x^b = x^{a-b}\}$

$= 8^3$

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

$= (5^{7-2}) \times 5^3$ $\{x^a \div x^b = x^{a-b}\}$

$= 5^5 \times 5^3$

$= 5^{5+3}$ $\{x^a \times x^b = x^{a+b}\}$

$= 5^8$

(iv) $\frac{5^4 \times x^{10} y^5}{5^4 \times x^7 y^4}$

$= 5^{4-4} \times x^{10-7} \times y^{5-4}$ $\{x^a \div x^b = x^{a-b}\}$

$= 5^0 \times x^3 \times y^1$ $\{\because a^0 = 1\}$

$= 1 \times x^3 y$

$= x^3 y$

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Q.3 Simplify and express each of the following in exponential form:

(i) $\{(3^2)^3 \times 2^6\} \times 5^6$ (ii) $\left(\frac{x}{y}\right)^{12} \times y^{24} \times (2^3)^4$

(iii) $\left(\frac{5}{2}\right)^6 \times \left(\frac{5}{2}\right)^2$ (iv) $\left(\frac{2}{3}\right)^5 \times \left(\frac{3}{5}\right)^5$

Solution (i) $\{(3^2)^3 \times 2^6\} \times 5^6$

$= \{3^6 \times 2^6\} \times (5^6)$

$= (3\times2)^6 \times (5^6)$ $\{\because x^a \times y^a = (x\times y)^a\}$

$= 6^6 \times 5^6$

$= (6\times5)^6 = 30^6$

(ii) $\left(\frac{x}{y}\right)^{12} \times y^{24} \times (2^3)^4$

$= \frac{x^{12}}{y^{12}} \times y^{24} \times 2^{3\times4}$ $\{\because (x^a)^b = x^{ab}\}$

$= x^{12} \times y^{24-12} \times 2^{12}$

$= x^{12} \times y^{12} \times 2^{12}$ $\{\because x^a \times y^a = (x\times y)^a\}$

$= (x\times y\times 2)^{12}$

$= (2xy)^{12}$

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(iii) $\left(\frac{5}{2}\right)^6 \times \left(\frac{5}{2}\right)^2$

$= \left(\frac{5}{2}\right)^{6+2} = \left(\frac{5}{2}\right)^8$ $\{\because x^a \times x^b = x^{a+b}\}$

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

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

Q.4 Write $9 \times 9 \times 9 \times 9 \times 9$ in exponential form with base 3.

Solution: $9 \times 9 \times 9 \times 9 \times 9 = (9)^5$

$= (3^2)^5$ $(\because 9 = 3^2)$

$= 3^{2 \times 5} = 3^{10}$

Q.5 Simplify and write each of the following in exponential form:

(i) $(25)^3 \div 5^3$ (ii) $(81)^5 \div (3^2)^5$

(iii) $\frac{9^8 \times (x^2)^5}{(27)^4 \times (x^3)^2}$ (iv) $\frac{3^2 \times 7^8 \times 13^6}{21^2 \times 91^3}$

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Solution: (i) $(25)^3 \div (5)^3$

$= \left(\frac{25}{5}\right)^3$ $\{x^a \div y^a = (x \div y)^a\}$

$= (5)^3$

(ii) $(81)^5 \div (3^2)^5$

$= (81)^5 \div (9)^5$ $\{x^a \div y^a = (x \div y)^a\}$

$= \left(\frac{81}{9}\right)^5 = (9)^5$

$= (3^2)^5 = 3^{2\times5} = 3^{10}$

(iii) $\frac{9^8 \times (x^2)^5}{(27)^4 \times (x^3)^2} = \frac{(3^2)^8 \times x^{2\times5}}{(3^3)^4 \times x^{3\times2}}$ $\{\because 9 = 3^2, 27 = 3^3\}$

$= \frac{3^{16} \times x^{10}}{3^{12} \times x^6}$

$= 3^{16-12} \times x^{10-6}$ $\{\because x^a \div x^b = x^{a-b}\}$

$= 3^4 \times x^4$ $\{\because x^a \times y^a = (x \times y)^a\}$

$= (3x)^4$

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(iv) $\dfrac{3^2 \times 7^8 \times 13^6}{21^2 \times 91^3} = \dfrac{3^2 \times 7^8 \times 13^6}{(3\times7)^2 \times (13\times7)^3}$

$= \dfrac{3^2 \times 7^8 \times 13^6}{3^2 \times 7^2 \times 13^3 \times 7^3}$ $\{(x\times y)^a = x^a \times y^a\}$

$= 3^{2-2} \times 7^{8-2-3} \times 13^{6-3}$

$= 3^0 \times 7^3 \times 13^3$

$= 1 \times 7^3 \times 13^3 = (7\times13)^3 = (91)^3$

Q.6 Simplify

(i) $(3^5)^{11} \times (3^{15})^4 - (3^5)^{18} \times (3^5)^5$

(ii) $\dfrac{16 \times 2^{n+1} - 4 \times 2^n}{16 \times 2^{n+2} - 2 \times 2^{n+2}}$

(iii) $\dfrac{10 \times 5^{n+1} + 25 \times 5^n}{3 \times 5^{n+2} + 10 \times 5^{n+1}}$

(iv) $\dfrac{(16)^7 \times (25)^5 \times (81)^3}{(15)^7 \times (24)^5 \times (80)^3}$

Solution: (i) $(3^5)^{11} \times (3^{15})^4 - (3^5)^{18} \times (3^5)^5$

$= 3^{55} \times 3^{60} - 3^{90} \times 3^{25}$

$= 3^{55+60} - 3^{90+25} = 3^{115} - 3^{115}$

$= 0$

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(ii) $$\frac{16\times 2^{n+1}-4\times 2^{n}}{16\times 2^{n+2}-2\times 2^{n+2}}$$

$$= \frac{16\times 2^{n}\times 2^{1}-4\times 2^{n}}{16\times 2^{n}\times 2^{2}-2\times 2^{n}\times 2^{2}}$$

$$= \frac{32\times 2^{n}-4\times 2^{n}}{64\times 2^{n}-8\times 2^{n}} = \frac{2^{n}(32-4)}{2^{n}(64-8)}$$

$$= \frac{28}{56}$$

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

(iii) $$\frac{10\times 5^{n+1}+25\times 5^{n}}{3\times 5^{n+2}+10\times 5^{n+1}} = \frac{10\times 5^{n}\times 5^{1}+25\times 5^{n}}{3\times 5^{n}\times 5^{2}+10\times 5^{n}\times 5^{1}}$$

$$= \frac{50\times 5^{n}+25\times 5^{n}}{75\times 5^{n}+50\times 5^{n}}$$

$$= \frac{5^{n}(50+25)}{5^{n}(75+50)} = \frac{75}{125}$$

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

(iv) $$\frac{(16)^{7}\times(25)^{5}\times(81)^{3}}{(15)^{7}\times(24)^{5}\times(80)^{3}}$$

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

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$$= \frac{2^{28} \times 5^{10} \times 3^{12}}{3^7 \times 5^7 \times (2^3 \times 3^1)^5 \times (2^4 \times 5^1)^3}$$

$$= \frac{2^{28} \times 5^{10} \times 3^{12}}{3^7 \times 5^7 \times (2^3)^5 \times 3^5 \times (2^4)^3 \times (5)^3}$$

$$= \frac{2^{28} \times 5^{10} \times 3^{12}}{3^7 \times 5^7 \times 2^{15} \times 3^5 \times 2^{12} \times 5^3} = \frac{2^{28} \times 5^{10} \times 3^{12}}{3^{7+5} \times 5^{7+3} \times 2^{15+12}}$$

$$= \frac{2^{28} \times 5^{10} \times 3^{12}}{3^{12} \times 5^{10} \times 2^{27}}$$

$$= 2^{28-27} \times 5^{10-10} \times 3^{12-12}$$

$$= 2^1 \times 5^0 \times 3^0$$

$$= 2 \times 1 \times 1 = 2$$

Q.7 Find the values of n in each of the following

(i) $5^{2n} \times 5^3 = 5^{11}$ (ii) $9 \times 3^n = 3^7$ (iii) $8 \times 2^{n+2} = 32$

(iv) $7^{2n+1} \div 49 = 7^3$ (v) $\left(\frac{3}{2}\right)^4 \times \left(\frac{3}{2}\right)^5 = \left(\frac{3}{2}\right)^{2n+1}$

(vi) $\left(\frac{2}{3}\right)^{10} \times \left\{\left(\frac{3}{2}\right)^2\right\}^5 = \left(\frac{2}{3}\right)^{2n-2}$

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Solution: (i) $5^{2n} \times 5^3 = 5^{11}$

$\Rightarrow 5^{2n+3} = 5^{11} \Rightarrow 2n+3 = 11$

$\Rightarrow 2n = 11-3$

$\Rightarrow 2n = 8$

$\Rightarrow n = 4$

(ii) $9 \times 3^n = 3^7$

$\Rightarrow (3)^2 \times 3^n = 3^7$

$\Rightarrow 3^{2+n} = 3^7 \Rightarrow 2+n = 7$

$\Rightarrow n = 7-2 = 5$

(iii) $8 \times 2^{n+2} = 32 \Rightarrow 2^3 \times 2^{n+2} = 2^5$

$\Rightarrow 2^{3+n+2} = 2^5$

$\Rightarrow 2^{n+5} = 2^5 \Rightarrow n+5 = 5$

$\Rightarrow n = 5-5 = 0$

$\therefore n = 0$

(iv) $7^{2n+1} \div 49 = 7^3$

$= 7^{2n+1} \div 7^2 = 7^3$

$\Rightarrow 7^{2n+1-2} = 7^3$

$\Rightarrow 7^{2n-1} = 7^3 \Rightarrow 2n-1 = 3$

$\Rightarrow 2n = 4$

$\Rightarrow n = 2$

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

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

$\Rightarrow \left(\frac{3}{2}\right)^9 = \left(\frac{3}{2}\right)^{2n+1}$

$\Rightarrow 9 = 2n+1$

$\Rightarrow 2n = 8 \Rightarrow n = 4$

(vi) $\left(\frac{2}{3}\right)^{10} \times \left\{\left(\frac{3}{2}\right)^2\right\}^5 = \left(\frac{2}{3}\right)^{2n-2}$

$\Rightarrow \left(\frac{2}{3}\right)^{10} \times \left(\frac{3}{2}\right)^{10} = \left(\frac{2}{3}\right)^{2n-2}$

$\Rightarrow \left(\frac{2}{3}\right)^{10} \times \left(\frac{2}{3}\right)^{-10} = \left(\frac{2}{3}\right)^{2n-2}$

$\Rightarrow \left(\frac{2}{3}\right)^{10-10} = \left(\frac{2}{3}\right)^{2n-2}$

$\Rightarrow \left(\frac{2}{3}\right)^0 = \left(\frac{2}{3}\right)^{2n-2} \Rightarrow 2n-2 = 0$

$\Rightarrow 2n = 2$

$\Rightarrow n = 1$

Q.8 If $\dfrac{9^n \times 3^2 \times 3^n - (27)^n}{(3)^5 \times 2^3} = \dfrac{1}{27}$

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Solution: $\dfrac{9^n \times 3^2 \times 3^n - (27)^n}{(3^3)^5 \times 2^3} = \dfrac{1}{27}$

$\Rightarrow \dfrac{(3^2)^n \times 3^2 \times 3^n - (3^3)^n}{3^{15} \times 8} = \dfrac{1}{27}$

$= \dfrac{3^{2n} \times 9 \times 3^n - 3^{3n}}{3^{15} \times 8} = \dfrac{1}{3^3}$

$= \dfrac{3^{2n+n} \times 9 - 3^{3n}}{3^{15} \times 8} = \dfrac{1}{3^3}$

$= \dfrac{3^{3n} \times 9 - 3^{3n}}{3^{15} \times 8} = \dfrac{1^3}{3^3}$

$= \dfrac{3^{3n}(9-1)}{3^{15} \times 8} = \dfrac{1}{3^3}$ $\left\{\dfrac{1}{x^a} = x^{-a}\right\}$

$\Rightarrow \dfrac{3^{3n-15} \times 8}{8} = 3^{-3}$

$= 3^{3n-15} = 3^{-3} \Rightarrow 3n-15 = -3$

$\Rightarrow 3n = -3+15$

$\Rightarrow 3n = 12$

$\Rightarrow n = \dfrac{12}{3} = 4$

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