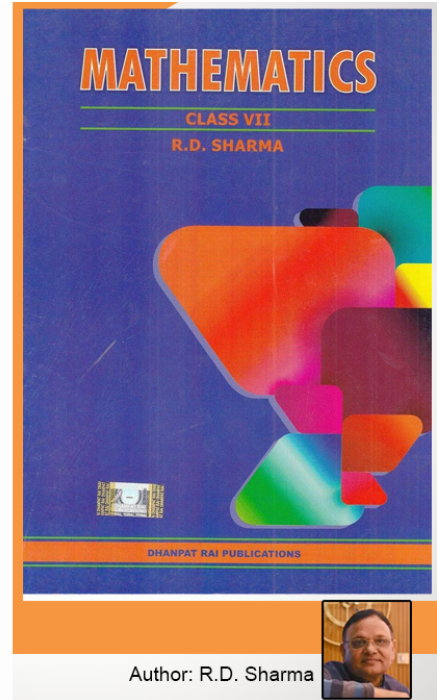


Class 7 - Chapter 6 Exponents



RD Sharma Solutions for Class 7 Maths: Chapter 6–Exponents

Class 7: Maths Chapter 6 solutions. Complete Class 7 Maths Chapter 6 Notes.

RD Sharma Solutions for Class 7 Maths Chapter 6–Exponents

RD Sharma 7th Maths Chapter 6, Class 7 Maths Chapter 6 solutions

Exercise 6.1 Page No: 6.12

1. Find the values of each of the following:

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(i) 13^2

(ii) 7^3

(iii) 3^4

Solution:

(i) Given 13^2

$$13^2 = 13 \times 13 = 169$$

(ii) Given 7^3

$$7^3 = 7 \times 7 \times 7 = 343$$

(iii) Given 3^4

$$3^4 = 3 \times 3 \times 3 \times 3$$

$$= 81$$

2. Find the value of each of the following:

(i) $(-7)^2$

(ii) $(-3)^4$

(iii) $(-5)^5$

Solution:

(i) Given $(-7)^2$

We know that $(-a)^{\text{even number}} = \text{positive number}$

$(-a)^{\text{odd number}} = \text{negative number}$

We have, $(-7)^2 = (-7) \times (-7)$

$$= 49$$

(ii) Given $(-3)^4$

We know that $(-a)^{\text{even number}} = \text{positive number}$

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$(-a)^{\text{odd number}} = \text{negative number}$

We have, $(-3)^4 = (-3) \times (-3) \times (-3) \times (-3)$

$= 81$

(iii) Given $(-5)^5$

We know that $(-a)^{\text{even number}} = \text{positive number}$

$(-a)^{\text{odd number}} = \text{negative number}$

We have, $(-5)^5 = (-5) \times (-5) \times (-5) \times (-5) \times (-5)$

$= -3125$

3. Simplify:

(i) 3×10^2

(ii) $2^2 \times 5^3$

(iii) $3^3 \times 5^2$

Solution:

(i) Given 3×10^2

$3 \times 10^2 = 3 \times 10 \times 10$

$= 3 \times 100$

$= 300$

(ii) Given $2^2 \times 5^3$

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

$= 4 \times 125$

$= 500$

(iii) Given $3^3 \times 5^2$

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

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$$= 27 \times 25$$

$$= 675$$

4. Simply:

(i) $3^2 \times 10^4$

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

(iii) $5^2 \times 3^4$

Solution:

(i) Given $3^2 \times 10^4$

$$3^2 \times 10^4 = 3 \times 3 \times 10 \times 10 \times 10 \times 10$$

$$= 9 \times 10000$$

$$= 90000$$

(ii) Given $2^4 \times 3^2$

$$2^4 \times 3^2 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$$

$$= 16 \times 9$$

$$= 144$$

(iii) Given $5^2 \times 3^4$

$$5^2 \times 3^4 = 5 \times 5 \times 3 \times 3 \times 3 \times 3$$

$$= 25 \times 81$$

$$= 2025$$

5. Simplify:

(i) $(-2) \times (-3)^3$

(ii) $(-3)^2 \times (-5)^3$

(iii) $(-2)^5 \times (-10)^2$

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Solution:

(i) Given $(-2) \times (-3)^3$

$$(-2) \times (-3)^3 = (-2) \times (-3) \times (-3) \times (-3)$$

$$= (-2) \times (-27)$$

$$= 54$$

(ii) Given $(-3)^2 \times (-5)^3$

$$(-3)^2 \times (-5)^3 = (-3) \times (-3) \times (-5) \times (-5) \times (-5)$$

$$= 9 \times (-125)$$

$$= -1125$$

(iii) Given $(-2)^5 \times (-10)^2$

$$(-2)^5 \times (-10)^2 = (-2) \times (-2) \times (-2) \times (-2) \times (-2) \times (-10) \times (-10)$$

$$= (-32) \times 100$$

$$= -3200$$

6. Simplify:

(i) $(3/4)^2$

(ii) $(-2/3)^4$

(iii) $(-4/5)^5$

Solution:

(i) Given $(3/4)^2$

$$(3/4)^2 = (3/4) \times (3/4)$$

$$= (9/16)$$

(ii) Given $(-2/3)^4$

$$(-2/3)^4 = (-2/3) \times (-2/3) \times (-2/3) \times (-2/3)$$

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$$= (16/81)$$

(iii) Given $(-4/5)^5$

$$(-4/5)^5 = (-4/5) \times (-4/5) \times (-4/5) \times (-4/5) \times (-4/5)$$

$$= (-1024/3125)$$

7. Identify the greater number in each of the following:

(i) 2^5 or 5^2

(ii) 3^4 or 4^3

(iii) 3^5 or 5^3

Solution:

(i) Given 2^5 or 5^2

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

$$= 32$$

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

$$= 25$$

Therefore, $2^5 > 5^2$

(ii) Given 3^4 or 4^3

$$3^4 = 3 \times 3 \times 3 \times 3$$

$$= 81$$

$$4^3 = 4 \times 4 \times 4$$

$$= 64$$

Therefore, $3^4 > 4^3$

(iii) Given 3^5 or 5^3

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

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$$= 243$$

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

$$= 125$$

Therefore, $3^5 > 5^3$

8. Express each of the following in exponential form:

(i) $(-5) \times (-5) \times (-5)$

(ii) $(-5/7) \times (-5/7) \times (-5/7) \times (-5/7)$

(iii) $(4/3) \times (4/3) \times (4/3) \times (4/3) \times (4/3)$

Solution:

(i) Given $(-5) \times (-5) \times (-5)$

Exponential form of $(-5) \times (-5) \times (-5) = (-5)^3$

(ii) Given $(-5/7) \times (-5/7) \times (-5/7) \times (-5/7)$

Exponential form of $(-5/7) \times (-5/7) \times (-5/7) \times (-5/7) = (-5/7)^4$

(iii) Given $(4/3) \times (4/3) \times (4/3) \times (4/3) \times (4/3)$

Exponential form of $(4/3) \times (4/3) \times (4/3) \times (4/3) \times (4/3) = (4/3)^5$

9. Express each of the following in exponential form:

(i) $x \times x \times x \times x \times x \times a \times a \times b \times b \times b$

(ii) $(-2) \times (-2) \times (-2) \times (-2) \times a \times a \times a$

(iii) $(-2/3) \times (-2/3) \times x \times x \times x$

Solution:

(i) Given $x \times x \times x \times x \times x \times a \times a \times b \times b \times b$

Exponential form of $x \times x \times x \times x \times x \times a \times a \times b \times b \times b = x^5 a^2 b^3$

(ii) Given $(-2) \times (-2) \times (-2) \times (-2) \times a \times a \times a$

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Exponential form of $(-2) \times (-2) \times (-2) \times (-2) \times a \times a \times a = (-2)^4 a^3$

(iii) Given $(-2/3) \times (-2/3) \times x \times x \times x$

Exponential form of $(-2/3) \times (-2/3) \times x \times x \times x = (-2/3)^2 x^3$

10. Express each of the following numbers in exponential form:

(i) 512

(ii) 625

(iii) 729

Solution:

(i) Given 512

Prime factorization of 512 = $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$

= 2^9

(ii) Given 625

Prime factorization of 625 = $5 \times 5 \times 5 \times 5$

= 5^4

(iii) Given 729

Prime factorization of 729 = $3 \times 3 \times 3 \times 3 \times 3 \times 3$

= 3^6

11. Express each of the following numbers as a product of powers of their prime factors:

(i) 36

(ii) 675

(iii) 392

Solution:

(i) Given 36

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Prime factorization of $36 = 2 \times 2 \times 3 \times 3$

$$= 2^2 \times 3^2$$

(ii) Given 675

Prime factorization of $675 = 3 \times 3 \times 3 \times 5 \times 5$

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

(iii) Given 392

Prime factorization of $392 = 2 \times 2 \times 2 \times 7 \times 7$

$$= 2^3 \times 7^2$$

12. Express each of the following numbers as a product of powers of their prime factors:

(i) 450

(ii) 2800

(iii) 24000

Solution:

(i) Given 450

Prime factorization of $450 = 2 \times 3 \times 3 \times 5 \times 5$

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

(ii) Given 2800

Prime factorization of $2800 = 2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 7$

$$= 2^4 \times 5^2 \times 7$$

(iii) Given 24000

Prime factorization of $24000 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 5 \times 5 \times 5$

$$= 2^6 \times 3 \times 5^3$$

13. Express each of the following as a rational number of the form (p/q) :

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(i) $(\frac{3}{7})^2$

(ii) $(\frac{7}{9})^3$

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

Solution:

(i) Given $(\frac{3}{7})^2$

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

$$= (\frac{9}{49})$$

(ii) Given $(\frac{7}{9})^3$

$$(\frac{7}{9})^3 = (\frac{7}{9}) \times (\frac{7}{9}) \times (\frac{7}{9})$$

$$= (\frac{343}{729})$$

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

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

$$= (\frac{16}{81})$$

14. Express each of the following rational numbers in power notation:

(i) $(\frac{49}{64})$

(ii) $(-\frac{64}{125})$

(iii) $(-\frac{12}{16})$

Solution:

(i) Given $(\frac{49}{64})$

We know that $7^2 = 49$ and $8^2 = 64$

$$\text{Therefore } (\frac{49}{64}) = (\frac{7}{8})^2$$

(ii) Given $(-\frac{64}{125})$

We know that $4^3 = 64$ and $5^3 = 125$

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Therefore $(-64/125) = (-4/5)^3$

(iii) Given $(-1/216)$

We know that $1^3 = 1$ and $6^3 = 216$

Therefore $-1/216 = -(1/6)^3$

15. Find the value of the following:

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

(ii) $(-3/5)^4 \times (4/9)^4 \times (-15/18)^2$

Solution:

(i) Given $(-1/2)^2 \times 2^3 \times (3/4)^2$

$$(-1/2)^2 \times 2^3 \times (3/4)^2 = 1/4 \times 8 \times 9/16$$

$$= 9/8$$

(ii) Given $(-3/5)^4 \times (4/9)^4 \times (-15/18)^2$

$$(-3/5)^4 \times (4/9)^4 \times (-15/18)^2 = (81/625) \times (256/6561) \times (225/324)$$

$$= (64/18225)$$

16. If $a = 2$ and $b = 3$, find the values of each of the following:

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

(ii) $(a b)^b$

(iii) $(b/a)^b$

(iv) $((a/b) + (b/a))^a$

Solution:

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

Given $a = 2$ and $b = 3$

$$(a + b)^a = (2 + 3)^2$$

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$$= (5)^2$$

$$= 25$$

(ii) Given $a = 2$ and $b = 3$

Consider, $(a \cdot b)^b = (2 \times 3)^3$

$$= (6)^3$$

$$= 216$$

(iii) Given $a = 2$ and $b = 3$

Consider, $(b/a)^b = (3/2)^3$

$$= 27/8$$

(iv) Given $a = 2$ and $b = 3$

Consider, $((a/b) + (b/a))^a = ((2/3) + (3/2))^2$

$$= (4/9) + (9/4)$$

LCM of 9 and 4 is 36

$$= 169/36$$

Exercise 6.2 Page No: 6.28

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

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Solution:

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

We know that first law of exponents states that $a^m \times a^n \times a^p = a^{(m+n+p)}$

Therefore above equation can be written as $2^3 \times 2^4 \times 2^5 = 2^{(3+4+5)}$

$$= 2^{12}$$

(ii) Given $5^{12} \div 5^3$

According to the law of exponents we have $a^m \div a^n = a^{m-n}$

Therefore given question can be written as $5^{12} \div 5^3 = 5^{12-3} = 5^9$

(iii) Given $(7^2)^3$

According to the law of exponents we have $(a^m)^n = a^{mn}$

Therefore given question can be written as $(7^2)^3 = 7^6$

(iv) Given $(3^2)^5 \div 3^4$

According to the law of exponents we have $(a^m)^n = a^{mn}$

$$\text{Therefore } (3^2)^5 \div 3^4 = 3^{10} \div 3^4$$

According to the law of exponents we have $a^m \div a^n = a^{m-n}$

$$3^{10} \div 3^4 = 3^{(10-4)} = 3^6$$

(v) Given $3^7 \times 2^7$

We know that law of exponents states that $a^m \times b^m = (a \times b)^m$

$$3^7 \times 2^7 = (3 \times 2)^7 = 6^7$$

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

According to the law of exponents we have $a^m \div a^n = a^{m-n}$

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

$$= 5^8 \times 5^7$$

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According to the law of exponents we have $a^m \times a^n = a^{(m+n)}$

$$= 5^{(8+7)} = 5^{15}$$

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) $(5^7/5^2) \times 5^3$

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

Solution:

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

$$\{(2^3)^4 \times 2^8\} \div 2^{12} = \{2^{12} \times 2^8\} \div 2^{12} \text{ [According to the law of exponents we have } (a^m)^n = a^{mn}]$$

$$= 2^{(12+8)} \div 2^{12} \text{ [According to the law of exponents we have } a^m \times a^n = a^{(m+n)}]$$

$$= 2^{20} \div 2^{12} \text{ [According to the law of exponents we have } a^m \div a^n = a^{m-n}]$$

$$= 2^{(20-12)}$$

$$= 2^8$$

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

$$(8^2 \times 8^4) \div 8^3 \text{ [According to the law of exponents we have } a^m \times a^n = a^{(m+n)}]$$

$$= 8^{(2+4)} \div 8^3$$

$$= 8^6 \div 8^3 \text{ [According to the law of exponents we have } a^m \div a^n = a^{m-n}]$$

$$= 8^{(6-3)} = 8^3 = (2^3)^3 = 2^9$$

(iii) Given $(5^7/5^2) \times 5^3$

$$= 5^{(7-2)} \times 5^3 \text{ [According to the law of exponents we have } a^m \div a^n = a^{m-n}]$$

$$= 5^5 \times 5^3 \text{ [According to the law of exponents we have } a^m \times a^n = a^{(m+n)}]$$

$$= 5^{(5+3)} = 5^8$$

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

$$= (5^{4-4} \times x^{10-7}y^{5-4}) \text{ [According to the law of exponents we have } a^m \div a^n = a^{m-n}]$$

$$= 5^0x^3y^1 \text{ [since } 5^0 = 1]$$

$$= 1x^3y$$

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

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

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

(iii) $(5/2)^6 \times (5/2)^2$

(iv) $(2/3)^5 \times (3/5)^5$

Solution:

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

$$= \{3^6 \times 2^6\} \times 5^6 \text{ [According to the law of exponents we have } (a^m)^n = a^{mn}]$$

$$= 6^6 \times 5^6 \text{ [since law of exponents states that } a^m \times b^m = (a \times b)^m]$$

$$= 30^6$$

(ii) Given $(x/y)^{12} \times y^{24} \times (2^3)^4$

$$= (x^{12}/y^{12}) \times y^{24} \times 2^{12}$$

$$= x^{12} \times y^{24-12} \times 2^{12} \text{ [According to the law of exponents we have } a^m \div a^n = a^{m-n}]$$

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

$$= (2xy)^{12}$$

(iii) Given $(5/2)^6 \times (5/2)^2$

$$= (5/2)^{6+2} \text{ [According to the law of exponents we have } a^m \times a^n = a^{(m+n)}]$$

$$= (5/2)^8$$

(iv) Given $(2/3)^5 \times (3/5)^5$

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$$= (2/5)^5 [\text{since law of exponents states that } a^m \times b^m = (a \times b)^m]$$

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

Solution:

$$\text{Given } 9 \times 9 \times 9 \times 9 \times 9 = (9)^5 = (3^2)^5$$

$$= 3^{10}$$

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) $9^8 \times (x^2)^5 / (27)^4 \times (x^3)^2$

(iv) $3^2 \times 7^8 \times 13^6 / 21^2 \times 91^3$

Solution:

(i) Given $(25)^3 \div 5^3$

$$= (5^2)^3 \div 5^3 [\text{According to the law of exponents we have } (a^m)^n = a^{mn}]$$

$$= 5^6 \div 5^3 [\text{According to the law of exponents we have } a^m \div a^n = a^{m-n}]$$

$$= 5^{6-3}$$

$$= 5^3$$

(ii) Given $(81)^5 \div (3^2)^5$ [According to the law of exponents we have $(a^m)^n = a^{mn}$]

$$= (81)^5 \div 3^{10} [81 = 3^4]$$

$$= (3^4)^5 \div 3^{10} [\text{According to the law of exponents we have } (a^m)^n = a^{mn}]$$

$$= 3^{20} \div 3^{10}$$

$$= 3^{20-10} [\text{According to the law of exponents we have } a^m \div a^n = a^{m-n}]$$

$$= 3^{10}$$

(iii) Given $9^8 \times (x^2)^5 / (27)^4 \times (x^3)^2$

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$$= (3^2)^8 \times (x^2)^5 / (3^3)^4 \times (x^3)^2 \text{ [According to the law of exponents we have } (a^m)^n = a^{mn}]$$

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

$$= 3^{16-12} \times x^{10-6} \text{ [According to the law of exponents we have } a^m \div a^n = a^{m-n}]$$

$$= 3^4 \times x^4$$

$$= (3x)^4$$

$$\text{(iv) Given } (3^2 \times 7^8 \times 13^6) / (21^2 \times 91^3)$$

$$= (3^2 \times 7^2 7^6 \times 13^6) / (21^2 \times 13^3 \times 7^3) \text{ [According to the law of exponents we have } (a^m)^n = a^{mn}]$$

$$= (21^2 \times 7^6 \times 13^6) / (21^2 \times 13^3 \times 7^3)$$

$$= (7^6 \times 13^6) / (13^3 \times 7^3)$$

$$= 91^6 / 91^3 \text{ [According to the law of exponents we have } a^m \div a^n = a^{m-n}]$$

$$= 91^{6-3}$$

$$= 91^3$$

6. Simplify:

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

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

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

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

Solution:

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

$$= (3)^{55} \times (3)^{60} - (3)^{90} \times (3)^{25} \text{ [According to the law of exponents we have } (a^m)^n = a^{mn}]$$

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

$$= 3^{115} - 3^{115}$$

$$= 0$$

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

$$= (2^4 \times 2^{(n+1)} - 2^2 \times 2^n) / (2^4 \times 2^{(n+2)} - 2^{n+1} \times 2^2) \text{ [According to the law of exponents we have } (a^m)^n = a^{mn}]$$

$$= 2^2 \times 2^{(n+3-2n)} / 2^2 \times 2^{(n+4-2n+1)}$$

$$= 2^n \times 2^3 - 2^n / 2^n \times 2^4 - 2^n \times 2$$

$$= 2^n(2^3 - 1) / 2^n(2^4 - 1) \text{ [According to the law of exponents we have } a^m \div a^n = a^{m-n}]$$

$$= 8 - 1 / 16 - 2$$

$$= 7/14$$

$$= (1/2)$$

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

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

$$= (10 \times 5^{n+1} + 5 \times 5^{n+1}) / (3 \times 5^{n+2} + (2 \times 5) \times 5^{n+1}) \text{ [According to the law of exponents we have } (a^m)^n = a^{mn}]$$

$$= 5^{n+1} (10+5) / 5^{n+1} (10+15) \text{ [According to the law of exponents we have } a^m \div a^n = a^{m-n}]$$

$$= 15/25$$

$$= (3/5)$$

(iv) Given $(16)^7 \times (25)^5 \times (81)^3 / (15)^7 \times (24)^5 \times (80)^3$

$$= (16)^7 \times (5^2)^5 \times (3^4)^3 / (3 \times 5)^7 \times (3 \times 8)^5 \times (16 \times 5)^3$$

$$= (16)^7 \times (5^2)^5 \times (3^4)^3 / 3^7 \times 5^7 \times 3^5 \times 8^5 \times 16^3 \times 5^3$$

$$= (16)^7 / 8^5 \times 16^3$$

$$= (16)^4 / 8^5$$

$$= (2 \times 8)^4 / 8^5$$

$$= 2^4 / 8$$

$$= (16/8)$$

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$$= 2$$

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

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

Solution:

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

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

On equating the coefficients, we get

$$2n + 3 = 11$$

$$\Rightarrow 2n = 11 - 3$$

$$\Rightarrow 2n = 8$$

$$\Rightarrow n = (8/2)$$

$$\Rightarrow n = 4$$

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

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

$$= (3)^{2+n} = 3^7$$

On equating the coefficients, we get

$$2 + n = 7$$

$$\Rightarrow n = 7 - 2 = 5$$

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(iii) Given $8 \times 2^{n+2} = 32$

$$= (2)^3 \times 2^{n+2} = (2)^5 \quad [\text{since } 2^3 = 8 \text{ and } 2^5 = 32]$$

$$= (2)^{3+n+2} = (2)^5$$

On equating the coefficients, we get

$$3 + n + 2 = 5$$

$$\Rightarrow n + 5 = 5$$

$$\Rightarrow n = 5 - 5$$

$$\Rightarrow n = 0$$

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

$$= 7^{2n+1} \div 7^2 = 7^3 \quad [\text{since } 49 = 7^2]$$

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

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

On equating the coefficients, we get

$$2n - 1 = 3$$

$$\Rightarrow 2n = 3 + 1$$

$$\Rightarrow 2n = 4$$

$$\Rightarrow n = 4/2 = 2$$

(v) Given $(3/2)^4 \times (3/2)^5 = (3/2)^{2n+1}$

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

$$= (3/2)^9 = (3/2)^{2n+1}$$

On equating the coefficients, we get

$$2n + 1 = 9$$

$$\Rightarrow 2n = 9 - 1$$

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$$\Rightarrow 2n = 8$$

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

$$(vi) \text{ Given } (2/3)^{10} \times \{(3/2)^2\}^5 = (2/3)^{2n-2}$$

$$= (2/3)^{10} \times (3/2)^{10} = (2/3)^{2n-2}$$

$$= 2^{10} \times 3^{10}/3^{10} \times 2^{10} = (2/3)^{2n-2}$$

$$= 1 = (2/3)^{2n-2}$$

$$= (2/3)^0 = (2/3)^{2n-2}$$

On equating the coefficients, we get

$$0 = 2n - 2$$

$$2n - 2 = 0$$

$$2n = 2$$

$$n = 1$$

8. If $(9^n \times 3^2 \times 3^n - (27)^n) / (3^3)^5 \times 2^3 = (1/27)$, find the value of n.

Solution:

$$\text{Given } (9^n \times 3^2 \times 3^n - (27)^n) / (3^3)^5 \times 2^3 = (1/27)$$

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

$$= 3^{(2n+2+n)} - (3^3)^n / (3^{15} \times 2^3) = (1/27)$$

$$= 3^{(3n+2)} - (3^3)^n / (3^{15} \times 2^3) = (1/27)$$

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

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

$$= 3^{3n} \times (9 - 1) / (3^{15} \times 2^3) = (1/27)$$

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

$$= 3^{3n} \times 2^3 / (3^{15} \times 2^3) = (1/27)$$

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$$= 3^{3n}/3^{15} = (1/27)$$

$$= 3^{3n-15} = (1/27)$$

$$= 3^{3n-15} = (1/3^3)$$

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

On equating the coefficients, we get

$$3n - 15 = -3$$

$$\Rightarrow 3n = -3 + 15$$

$$\Rightarrow 3n = 12$$

$$\Rightarrow n = 12/3 = 4$$

Exercise 6.3 Page No: 6.30

Express the following numbers in the standard form:

(i) 3908.78

(ii) 5,00,00,000

(iii) 3,18,65,00,000

(iv) 846×10^7

(v) 723×10^9

Solution:

(i) Given 3908.78

$$3908.78 = 3.90878 \times 10^3 \text{ [since the decimal point is moved 3 places to the left]}$$

(ii) Given 5,00,00,000

$$5,00,00,000 = 5,00,00,000.00 = 5 \times 10^7 \text{ [since the decimal point is moved 7 places to the left]}$$

(iii) Given 3,18,65,00,000

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$$3,18,65,00,000 = 3,18,65,00,000.00$$

$$= 3.1865 \times 10^9 \text{ [since the decimal point is moved 9 places to the left]}$$

(iv) Given 846×10^7

$$846 \times 10^7 = 8.46 \times 10^2 \times 10^9 \text{ [since the decimal point is moved 2 places to the left]}$$

$$= 8.46 \times 10^9 \text{ [since } a^m \times a^n = a^{m+n}]$$

(v) Given 723×10^9

$$723 \times 10^9 = 7.23 \times 10^2 \times 10^9 \text{ [since the decimal point is moved 2 places to the left]}$$

$$= 7.23 \times 10^{11} \text{ [since } a^m \times a^n = a^{m+n}]$$

2. Write the following numbers in the usual form:

(i) 4.83×10^7

(ii) 3.21×10^5

(iii) 3.5×10^3

Solution:

(i) Given 4.83×10^7

$$4.83 \times 10^7 = 483 \times 10^{7-2} \text{ [since the decimal point is moved two places to the right]}$$

$$= 483 \times 10^5$$

$$= 4, 83, 00,000$$

(ii) Given 3.21×10^5

$$3.21 \times 10^5 = 321 \times 10^{5-2} \text{ [since the decimal point is moved two places to the right]}$$

$$= 321 \times 10^3$$

$$= 3, 21,000$$

(iii) Given 3.5×10^3

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$$3.5 \times 10^3 = 35 \times 10^{3-1} \text{ [since the decimal point is moved one place to the right]}$$

$$= 35 \times 10^2$$

$$= 3,500$$

3. Express the numbers appearing in the following statements in the standard form:

(i) The distance between the Earth and the Moon is 384,000,000 meters.

(ii) Diameter of the Earth is 1, 27, 56,000 meters.

(iii) Diameter of the Sun is 1,400,000,000 meters.

(iv) The universe is estimated to be about 12,000,000,000 years old.

Solution:

(i) Given the distance between the Earth and the Moon is 384,000,000 meters.

The distance between the Earth and the Moon is 3.84×10^8 meters.[Since the decimal point is moved 8 places to the left.]

(ii) Given diameter of the Earth is 1, 27, 56,000 meters.

The diameter of the Earth is 1.2756×10^7 meters.[Since the decimal point is moved 7 places to the left.]

(iii) Given diameter of the Sun is 1,400,000,000 meters.

The diameter of the Sun is 1.4×10^9 meters.[Since the decimal point is moved 9 places to the left.]

(iv) Given the universe is estimated to be about 12,000,000,000 years old.

The universe is estimated to be about 1.2×10^{10} years old.[Since the decimal point is moved 10 places to the left.]

Exercise 6.4 Page No: 6.31

1. Write the following numbers in the expanded exponential forms:

(i) 20068

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(ii) 420719

(iii) 7805192

(iv) 5004132

(v) 927303

Solution:

(i) Given 20068

$$20068 = 2 \times 10^4 + 0 \times 10^3 + 0 \times 10^2 + 6 \times 10^1 + 8 \times 10^0$$

(ii) Given 420719

$$420719 = 4 \times 10^5 + 2 \times 10^4 + 0 \times 10^3 + 7 \times 10^2 + 1 \times 10^1 + 9 \times 10^0$$

(iii) Given 7805192

$$7805192 = 7 \times 10^6 + 8 \times 10^5 + 0 \times 10^4 + 5 \times 10^3 + 1 \times 10^2 + 9 \times 10^1 + 2 \times 10^0$$

(iv) Given 5004132

$$5004132 = 5 \times 10^6 + 0 \times 10^5 + 0 \times 10^4 + 4 \times 10^3 + 1 \times 10^2 + 3 \times 10^1 + 2 \times 10^0$$

(v) Given 927303

$$927303 = 9 \times 10^5 + 2 \times 10^4 + 7 \times 10^3 + 3 \times 10^2 + 0 \times 10^1 + 3 \times 10^0$$

2. Find the number from each of the following expanded forms:

(i) $7 \times 10^4 + 6 \times 10^3 + 0 \times 10^2 + 4 \times 10^1 + 5 \times 10^0$

(ii) $5 \times 10^5 + 4 \times 10^4 + 2 \times 10^3 + 3 \times 10^0$

(iii) $9 \times 10^5 + 5 \times 10^2 + 3 \times 10^1$

(iv) $3 \times 10^4 + 4 \times 10^2 + 5 \times 10^0$

Solution:

(i) Given $7 \times 10^4 + 6 \times 10^3 + 0 \times 10^2 + 4 \times 10^1 + 5 \times 10^0$

$$= 7 \times 10000 + 6 \times 1000 + 0 \times 100 + 4 \times 10 + 5 \times 1$$

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$$= 70000 + 6000 + 0 + 40 + 5$$

$$= 76045$$

(ii) Given $5 \times 10^5 + 4 \times 10^4 + 2 \times 10^3 + 3 \times 10^0$

$$= 5 \times 100000 + 4 \times 10000 + 2 \times 1000 + 3 \times 1$$

$$= 500000 + 40000 + 2000 + 3$$

$$= 542003$$

(iii) Given $9 \times 10^5 + 5 \times 10^2 + 3 \times 10^1$

$$= 9 \times 100000 + 5 \times 100 + 3 \times 10$$

$$= 900000 + 500 + 30$$

$$= 900530$$

(iv) Given $3 \times 10^4 + 4 \times 10^2 + 5 \times 10^0$

$$= 3 \times 10000 + 4 \times 100 + 5 \times 1$$

$$= 30000 + 400 + 5$$

$$= 30405$$



Chapterwise RD Sharma

Solutions for Class 7 Maths :

- Chapter 1–Integers
- Chapter 2–Fractions
- Chapter 3–Decimals
- Chapter 4–Rational Numbers
- Chapter 5–Operations On Rational Numbers
- Chapter 6–Exponents
- Chapter 7–Algebraic Expressions
- Chapter 8–Linear Equations in One Variable
- Chapter 9–Ratio And Proportion
- Chapter 10–Unitary Method
- Chapter 11–Percentage
- Chapter 12–Profit And Loss
- Chapter 13–Simple Interest
- Chapter 14–Lines And Angles
- Chapter 15–Properties of Triangles
- Chapter 16–Congruence
- Chapter 17–Constructions
- Chapter 18–Symmetry
- Chapter 19–Visualising Solid Shapes
- Chapter 20–Mensuration - I (Perimeter and area of rectilinear figures)
- Chapter 21–Mensuration - II (Area of Circle)
- Chapter 22–Data Handling - I (Collection and Organisation of Data)
- Chapter 23–Data Handling - II Central Values
- Chapter 24–Data Handling - III (Constructions of Bar Graphs)
- Chapter 25–Data Handling - IV (Probability)

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About RD Sharma

RD Sharma isn't the kind of author you'd bump into at lit fests. But his bestselling books have helped many CBSE students lose their dread of maths. Sunday Times profiles the tutor turned internet star

He dreams of algorithms that would give most people nightmares. And, spends every waking hour thinking of ways to explain concepts like 'series solution of linear differential equations'. Meet Dr Ravi Dutt Sharma — mathematics teacher and author of 25 reference books — whose name evokes as much awe as the subject he teaches. And though students have used his thick tomes for the last 31 years to ace the dreaded maths exam, it's only recently that a spoof video turned the tutor into a YouTube star.

R D Sharma had a good laugh but said he shared little with his on-screen persona except for the love for maths. "I like to spend all my time thinking and writing about maths problems. I find it relaxing," he says. When he is not writing books explaining mathematical concepts for classes 6 to 12 and engineering students, Sharma is busy dispensing his duty as vice-principal and head of department of science and humanities at Delhi government's Guru Nanak Dev Institute of Technology.

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