

Chapter 11: Exponents and Powers

NCERT · Class 7 · Maths

Exercise 13.1 · Textbook page 252

Question 1

Find the value of:

(i) 2^6

Solution

Solution:-

The above value can be written as,

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

$$= 64$$

(ii) 9^3

Solution:-

The above value can be written as,

$$= 9 \times 9 \times 9$$

$$= 729$$

(iii) 11^2

Solution:-

The above value can be written as,

$$= 11 \times 11$$

$$= 121$$

(iv) 5^4

Solution:-

The above value can be written as,

$$= 5 \times 5 \times 5 \times 5$$

$$= 625$$

Question 2

Express the following in exponential form:

(i) $6 \times 6 \times 6 \times 6$

Solution**Solution:-**

The given question can be expressed in the exponential form as 6^4 .

(ii) $t \times t$

Solution:-

The given question can be expressed in the exponential form as t^2 .

(iii) $b \times b \times b \times b$

Solution:-

The given question can be expressed in the exponential form as b^4 .

(iv) $5 \times 5 \times 7 \times 7 \times 7$

Solution:-

The given question can be expressed in the exponential form as $5^2 \times 7^3$.

(v) $2 \times 2 \times a \times a$

Solution:-

The given question can be expressed in the exponential form as $2^2 \times a^2$.

(vi) $a \times a \times a \times c \times c \times c \times c \times d$

Solution:-

The given question can be expressed in the exponential form as $a^3 \times c^4 \times d$.

Question 3

Express each of the following numbers using the exponential notation:

(i) 512

Solution

Solution:-

The factors of 512 = $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$

So it can be expressed in the exponential form as 2^9 .

(ii) 343

Solution:-

The factors of 343 = $7 \times 7 \times 7$

So it can be expressed in the exponential form as 7^3 .

(iii) 729

Solution:-

The factors of 729 = $3 \times 3 \times 3 \times 3 \times 3 \times 3$

So it can be expressed in the exponential form as 3^6 .

(iv) 3125

Solution:-

The factors of 3125 = $5 \times 5 \times 5 \times 5 \times 5$

So it can be expressed in the exponential form as 5^5 .

Question 4

Identify the greater number, wherever possible, in each of the following.

(i) 4^3 or 3^4

Solution

Solution:-

The expansion of $4^3 = 4 \times 4 \times 4 = 64$

The expansion of $3^4 = 3 \times 3 \times 3 \times 3 = 81$

Clearly,

$$64 < 81$$

$$\text{So, } 4^3 < 3^4$$

Hence, 3^4 is the greater number.

(ii) 5^3 or 3^5

Solution:-

The expansion of $5^3 = 5 \times 5 \times 5 = 125$

The expansion of $3^5 = 3 \times 3 \times 3 \times 3 \times 3 = 243$

Clearly,

$$125 < 243$$

$$\text{So, } 5^3 < 3^5$$

Hence, 3^5 is the greater number.

(iii) 2^8 or 8^2

Solution:-

The expansion of $2^8 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 256$

The expansion of $8^2 = 8 \times 8 = 64$

Clearly,

$$256 > 64$$

$$\text{So, } 2^8 > 8^2$$

Hence, 2^8 is the greater number.

(iv) 100^2 or 2^{100}

Solution:-

The expansion of $100^2 = 100 \times 100 = 10000$

The expansion of 2^{100}

$$2^{10} = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 1024$$

Then,

$$2^{100} = 1024 \times 1024 \times 1024 \times 1024 \times 1024 \times 1024 \times 1024 \times 1024 \times 1024 \times 1024 = (1024)^{10}$$

Clearly,

$$100^2 < 2^{100}$$

Hence, 2^{100} is the greater number.

(v) 2^{10} or 10^2

Solution:-

$$\text{The expansion of } 2^{10} = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 1024$$

$$\text{The expansion of } 10^2 = 10 \times 10 = 100$$

Clearly,

$$1024 > 100$$

$$\text{So, } 2^{10} > 10^2$$

Hence, 2^{10} is the greater number.

Question 5

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

(i) 648

Solution

Solution:-

Factors of 648 = $2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3$

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

(ii) 405

Solution:-

Factors of 405 = $3 \times 3 \times 3 \times 3 \times 5$

$$= 3^4 \times 5$$

(iii) 540

Solution:-

Factors of 540 = $2 \times 2 \times 3 \times 3 \times 3 \times 5$

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

(iv) 3,600

Solution:-

Factors of 3600 = $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5$

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

Question 6

Simplify:

(i) 2×10^3

Solution

Solution:-

The above question can be written as,

$$= 2 \times 10 \times 10 \times 10$$

$$= 2 \times 1000$$

$$= 2000$$

(ii) $7^2 \times 2^2$

Solution:-

The above question can be written as,

$$= 7 \times 7 \times 2 \times 2$$

$$= 49 \times 4$$

$$= 196$$

(iii) $2^3 \times 5$

Solution:-

The above question can be written as,

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

$$= 8 \times 5$$

$$= 40$$

(iv) 3×4^4

Solution:-

The above question can be written as,

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

$$= 3 \times 256$$

$$= 768$$

(v) 0×10^2

Solution:-

The above question can be written as,

$$= 0 \times 10 \times 10$$

$$= 0 \times 100$$

$$= 0$$

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

Solution:-

The above question can be written as,

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

$$= 25 \times 27$$

$$= 675$$

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

Solution:-

The above question can be written as,

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

$$= 16 \times 9$$

$$= 144$$

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

Solution:-

The above question can be written as,

$$= 3 \times 3 \times 10 \times 10 \times 10 \times 10$$

$$= 9 \times 10000$$

$$= 90000$$

Question 7**Simplify:**

(i) $(-4)^3$

Solution**Solution:-**

The expansion of -4^3

$$= -4 \times -4 \times -4$$

$$= -64$$

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

Solution:-

The expansion of $(-3) \times (-2)^3$

$$= -3 \times -2 \times -2 \times -2$$

$$= -3 \times -8$$

$$= 24$$

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

Solution:-

The expansion of $(-3)^2 \times (-5)^2$

$$= -3 \times -3 \times -5 \times -5$$

$$= 9 \times 25$$

$$= 225$$

$$(iv) (-2)^3 \times (-10)^3$$

Solution:-

The expansion of $(-2)^3 \times (-10)^3$

$$= -2 \times -2 \times -2 \times -10 \times -10 \times -10$$

$$= -8 \times -1000$$

$$= 8000$$

Question 8

Compare the following numbers:

$$(i) 2.7 \times 10^{12} ; 1.5 \times 10^8$$

Solution

Solution:-

By observing the question

Comparing the exponents of base 10,

Clearly,

$$2.7 \times 10^{12} > 1.5 \times 10^8$$

(ii) 4×10^{14} ; 3×10^{17}

Solution:-

By observing the question

Comparing the exponents of base 10,

Clearly,

$$4 \times 10^{14} < 3 \times 10^{17}$$

Exercise 13.2 · Textbook page 260

Question 1

Using laws of exponents, simplify and write the answer in exponential form:

(i) $3^2 \times 3^4 \times 3^8$

Solution

Solution:-

By the rule of multiplying the powers with the same base = $a^m \times a^n = a^{m+n}$

Then,

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

$$= 3^{14}$$

(ii) $6^{15} \div 6^{10}$

Solution:-

By the rule of dividing the powers with the same base = $a^m \div a^n = a^{m-n}$

Then,

$$= (6)^{15-10}$$

$$= 6^5$$

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

Solution:-

By the rule of multiplying the powers with the same base $= a^m \times a^n = a^{m+n}$

Then,

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

$$= a^5$$

(iv) $7^x \times 7^2$

Solution:-

By the rule of multiplying the powers with the same base $= a^m \times a^n = a^{m+n}$

Then,

$$= (7)^{x+2}$$

(v) $(5^2)^3 \div 5^3$

Solution:-

By the rule of taking the power of as power $= (a^m)^n = a^{mn}$

$(5^2)^3$ can be written as $= (5)^{2 \times 3}$

$$= 5^6$$

Now, $5^6 \div 5^3$

By the rule of dividing the powers with the same base $= a^m \div a^n = a^{m-n}$

Then,

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

$$= 5^3$$

(vi) $2^5 \times 5^5$

Solution:-

By the rule of multiplying the powers with the same exponents $= a^m \times b^m = ab^m$

Then,

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

$$= 10^5$$

(vii) $a^4 \times b^4$

Solution:-

By the rule of multiplying the powers with the same exponents $= a^m \times b^m = ab^m$

Then,

$$= (a \times b)^4$$

$$= ab^4$$

(viii) $(3^4)^3$

Solution:-

By the rule of taking the power of as power $= (a^m)^n = a^{mn}$

$$(3^4)^3 \text{ can be written as } = (3)^{4 \times 3}$$

$$= 3^{12}$$

(ix) $(2^{20} \div 2^{15}) \times 2^3$

Solution:-

By the rule of dividing the powers with the same base $= a^m \div a^n = a^{m-n}$

$(2^{20} \div 2^{15})$ can be simplified as,

$$= (2)^{20-15}$$

$$= 2^5$$

Then,

By the rule of multiplying the powers with the same base = $a^m \times a^n = a^{m+n}$

$2^5 \times 2^3$ can be simplified as,

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

$$= 2^8$$

(x) $8^t \div 8^2$

Solution:-

By the rule of dividing the powers with the same base = $a^m \div a^n = a^{m-n}$

Then,

$$= (8)^{t-2}$$

Question 2

Simplify and express each of the following in exponential form:

(i) $(2^3 \times 3^4 \times 4) / (3 \times 32)$

Solution

Solution:-

$$\text{Factors of } 32 = 2 \times 2 \times 2 \times 2 \times 2$$

$$= 2^5$$

$$\text{Factors of } 4 = 2 \times 2$$

$$= 2^2$$

Then,

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

$$= (2^{3+2} \times 3^4) / (3 \times 2^5) \dots [\because a^m \times a^n = a^{m+n}]$$

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

$$= 2^{5-5} \times 3^{4-1} \dots [\because a^m \div a^n = a^{m-n}]$$

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

$$= 1 \times 3^3$$

$$= 3^3$$

$$\text{(ii) } ((5^2)^3 \times 5^4) \div 5^7$$

Solution:-

$$(5^2)^3 \text{ can be written as } = (5)^{2 \times 3} \dots [\because (a^m)^n = a^{mn}]$$

$$= 5^6$$

Then,

$$= (5^6 \times 5^4) \div 5^7$$

$$= (5^{6+4}) \div 5^7 \dots [\because a^m \times a^n = a^{m+n}]$$

$$= 5^{10} \div 5^7$$

$$= 5^{10-7} \dots [\because a^m \div a^n = a^{m-n}]$$

$$= 5^3$$

$$\text{(iii) } 25^4 \div 5^3$$

Solution:-

$$(25)^4 \text{ can be written as } = (5 \times 5)^4$$

$$= (5^2)^4$$

$$(5^2)^4 \text{ can be written as } = (5)^{2 \times 4} \dots [\because (a^m)^n = a^{mn}]$$

$$= 5^8$$

Then,

$$= 5^8 \div 5^3$$

$$= 5^{8-3} \dots [\because a^m \div a^n = a^{m-n}]$$

$$= 5^5$$

$$\text{(iv) } (3 \times 7^2 \times 11^8) / (21 \times 11^3)$$

Solution:-

$$\text{Factors of } 21 = 7 \times 3$$

Then,

$$= (3 \times 7^2 \times 11^8) / (7 \times 3 \times 11^3)$$

$$= 3^{1-1} \times 7^{2-1} \times 11^{8-3}$$

$$= 3^0 \times 7 \times 11^5$$

$$= 1 \times 7 \times 11^5$$

$$= 7 \times 11^5$$

(v) $3^7 / (3^4 \times 3^3)$

Solution:-

$$= 3^7 / (3^{4+3}) \dots [\because a^m \times a^n = a^{m+n}]$$

$$= 3^7 / 3^7$$

$$= 3^{7-7} \dots [\because a^m \div a^n = a^{m-n}]$$

$$= 3^0$$

$$= 1$$

(vi) $2^0 + 3^0 + 4^0$

Solution:-

$$= 1 + 1 + 1$$

$$= 3$$

(vii) $2^0 \times 3^0 \times 4^0$

Solution:-

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

$$= 1$$

(viii) $(3^0 + 2^0) \times 5^0$

Solution:-

$$= (1 + 1) \times 1$$

$$= (2) \times 1$$

$$= 2$$

$$\text{(ix) } (2^8 \times a^5) / (4^3 \times a^3)$$

Solution:-

$$(4)^3 \text{ can be written as } = (2 \times 2)^3$$

$$= (2^2)^3$$

$$(2^2)^3 \text{ can be written as } = (2)^{2 \times 3} \dots [\because (a^m)^n = a^{mn}]$$

$$= 2^6$$

Then,

$$= (2^8 \times a^5) / (2^6 \times a^3)$$

$$= 2^{8-6} \times a^{5-3} \dots [\because a^m \div a^n = a^{m-n}]$$

$$= 2^2 \times a^2 \dots [\because (a^m)^n = a^{mn}]$$

$$= 2a^2$$

$$\text{(x) } (a^5/a^3) \times a^8$$

Solution:-

$$= (a^{5-3}) \times a^8 \dots [\because a^m \div a^n = a^{m-n}]$$

$$= a^2 \times a^8$$

$$= a^{2+8} \dots [\because a^m \times a^n = a^{m+n}]$$

$$= a^{10}$$

$$\text{(xi) } (4^5 \times a^8 b^3) / (4^5 \times a^5 b^2)$$

Solution:-

$$= 4^{5-5} \times (a^{8-5} \times b^{3-2}) \dots [\because a^m \div a^n = a^{m-n}]$$

$$= 4^0 \times (a^3b)$$

$$= 1 \times a^3b$$

$$= a^3b$$

$$\text{(xii) } (2^3 \times 2)^2$$

Solution:-

$$= (2^{3+1})^2 \dots [\because a^m \times a^n = a^{m+n}]$$

$$= (2^4)^2$$

$$(2^4)^2 \text{ can be written as } = (2^4)^{2 \times 1} \dots [\because (a^m)^n = a^{mn}]$$

$$= 2^8$$

Question 3

Say true or false and justify your answer:

$$\text{(i) } 10 \times 10^{11} = 100^{11}$$

Solution

Solution:-

$$\text{Let us consider Left Hand Side (LHS)} = 10 \times 10^{11}$$

$$= 10^{1+11} \dots [\because a^m \times a^n = a^{m+n}]$$

$$= 10^{12}$$

$$\text{Now, consider Right Hand Side (RHS)} = 100^{11}$$

$$= (10 \times 10)^{11}$$

$$= (10^{1+1})^{11}$$

$$= (10^2)^{11}$$

$$= (10)^{2 \times 11} \dots [\because (a^m)^n = a^{mn}]$$

$$= 10^{22}$$

By comparing LHS and RHS,

$$\text{LHS} \neq \text{RHS}$$

Hence, the given statement is false.

(ii) $2^3 > 5^2$

Solution:-

Let us consider $\text{LHS} = 2^3$

Expansion of $2^3 = 2 \times 2 \times 2$

$$= 8$$

Now, consider $\text{RHS} = 5^2$

Expansion of $5^2 = 5 \times 5$

$$= 25$$

By comparing LHS and RHS,

$$\text{LHS} < \text{RHS}$$

$$2^3 < 5^2$$

Hence, the given statement is false.

(iii) $2^3 \times 3^2 = 6^5$

Solution:-

Let us consider $\text{LHS} = 2^3 \times 3^2$

Expansion of $2^3 \times 3^2 = 2 \times 2 \times 2 \times 3 \times 3$

$$= 72$$

Now, consider $\text{RHS} = 6^5$

Expansion of $6^5 = 6 \times 6 \times 6 \times 6 \times 6$

$$= 7776$$

By comparing LHS and RHS,

$$72 \neq 7776$$

$$\text{LHS} \neq \text{RHS}$$

Hence, the given statement is false.

$$\text{(iv)} \quad 3^0 = (1000)^0$$

Solution:-

$$\text{Let us consider LHS} = 3^0$$

$$= 1$$

$$\text{Now, consider RHS} = 1000^0$$

$$= 1$$

By comparing LHS and RHS,

$$\text{LHS} = \text{RHS}$$

$$3^0 = 1000^0$$

Hence, the given statement is true.

Question 4

Express each of the following as a product of prime factors only in exponential form:

$$\text{(i)} \quad 108 \times 192$$

Solution

Solution:-

$$\text{The factors of } 108 = 2 \times 2 \times 3 \times 3 \times 3$$

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

$$\text{The factors of } 192 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3$$

$$= 2^6 \times 3$$

Then,

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

$$= 2^{2+6} \times 3^{3+1} \dots [\because a^m \times a^n = a^{m+n}]$$

$$= 2^8 \times 3^4$$

(ii) 270

Solution:-

The factors of 270 = $2 \times 3 \times 3 \times 3 \times 5$

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

(iii) 729 × 64

The factors of 729 = $3 \times 3 \times 3 \times 3 \times 3 \times 3$

$$= 3^6$$

The factors of 64 = $2 \times 2 \times 2 \times 2 \times 2 \times 2$

$$= 2^6$$

Then,

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

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

(iv) 768

Solution:-

The factors of 768 = $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3$

$$= 2^8 \times 3$$

Question 5

Simplify:

(i) $((2^5)^2 \times 7^3) / (8^3 \times 7)$

Solution

Solution:-

8^3 can be written as $= (2 \times 2 \times 2)^3$

$$= (2^3)^3$$

We have,

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

$$= (2^{5 \times 2} \times 7^3) / (2^{3 \times 3} \times 7) \dots [\because (a^m)^n = a^{mn}]$$

$$= (2^{10} \times 7^3) / (2^9 \times 7)$$

$$= (2^{10-9} \times 7^{3-1}) \dots [\because a^m \div a^n = a^{m-n}]$$

$$= 2 \times 7^2$$

$$= 2 \times 7 \times 7$$

$$= 98$$

$$(ii) (25 \times 5^2 \times t^8) / (10^3 \times t^4)$$

Solution:-

25 can be written as $= 5 \times 5$

$$= 5^2$$

10^3 can be written as $= 10^3$

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

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

We have,

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

$$= (5^{2+2} \times t^8) / (5^3 \times 2^3 \times t^4) \dots [\because a^m \times a^n = a^{m+n}]$$

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

$$= (5^{4-3} \times t^{8-4}) / 2^3 \dots [\because a^m \div a^n = a^{m-n}]$$

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

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

$$(iii) (3^5 \times 10^5 \times 25) / (5^7 \times 6^5)$$

Solution:-

$$10^5 \text{ can be written as } = (5 \times 2)^5$$

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

$$25 \text{ can be written as } = 5 \times 5$$

$$= 5^2$$

$$6^5 \text{ can be written as } = (2 \times 3)^5$$

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

Then we have,

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

$$= (3^5 \times 5^{5+2} \times 2^5) / (5^7 \times 2^5 \times 3^5) \dots [\because a^m \times a^n = a^{m+n}]$$

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

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

$$= (3^0 \times 5^0 \times 2^0) \dots [\because a^m \div a^n = a^{m-n}]$$

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

$$= 1$$

Exercise 13.3 · Textbook page 263

Question 1

Write the following numbers in the expanded forms:

(a) 279404

Solution

Solution:-

The expanded form of the number 279404 is,

$$= (2 \times 100000) + (7 \times 10000) + (9 \times 1000) + (4 \times 100) + (0 \times 10) + (4 \times 1)$$

Now we can express it using powers of 10 in the exponent form,

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

(b) 3006194

Solution:-

The expanded form of the number 3006194 is,

$$= (3 \times 1000000) + (0 \times 100000) + (0 \times 10000) + (6 \times 1000) + (1 \times 100) + (9 \times 10) + (4 \times 1)$$

Now we can express it using powers of 10 in the exponent form,

$$= (3 \times 10^6) + (0 \times 10^5) + (0 \times 10^4) + (6 \times 10^3) + (1 \times 10^2) + (9 \times 10^1) + (4 \times 10^0)$$

(c) 2806196

Solution:-

The expanded form of the number 2806196 is,

$$= (2 \times 1000000) + (8 \times 100000) + (0 \times 10000) + (6 \times 1000) + (1 \times 100) + (9 \times 10) + (6 \times 1)$$

Now we can express it using powers of 10 in the exponent form,

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

(d) 120719

Solution:-

The expanded form of the number 120719 is,

$$= (1 \times 100000) + (2 \times 10000) + (0 \times 1000) + (7 \times 100) + (1 \times 10) + (9 \times 1)$$

Now we can express it using powers of 10 in the exponent form,

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

(e) 20068

Solution:-

The expanded form of the number 20068 is,

$$= (2 \times 10000) + (0 \times 1000) + (0 \times 100) + (6 \times 10) + (8 \times 1)$$

Now we can express it using powers of 10 in the exponent form,

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

Question 2

Find the number from each of the following expanded forms:

(a) $(8 \times 10)^4 + (6 \times 10)^3 + (0 \times 10)^2 + (4 \times 10)^1 + (5 \times 10)^0$

Solution

Solution:-

The expanded form is,

$$= (8 \times 10000) + (6 \times 1000) + (0 \times 100) + (4 \times 10) + (5 \times 1)$$

$$= 80000 + 6000 + 0 + 40 + 5$$

$$= 86045$$

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

Solution:-

The expanded form is,

$$= (4 \times 100000) + (0 \times 10000) + (5 \times 1000) + (3 \times 100) + (0 \times 10) + (2 \times 1)$$

$$= 400000 + 0 + 5000 + 300 + 0 + 2$$

$$= 405302$$

(c) $(3 \times 10)^4 + (7 \times 10)^2 + (5 \times 10)^0$

Solution:-

The expanded form is,

$$= (3 \times 10000) + (0 \times 1000) + (7 \times 100) + (0 \times 10) + (5 \times 1)$$

$$= 30000 + 0 + 700 + 0 + 5$$

$$= 30705$$

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

Solution:-

The expanded form is,

$$= (9 \times 100000) + (0 \times 10000) + (0 \times 1000) + (2 \times 100) + (3 \times 10) + (0 \times 1)$$

$$= 900000 + 0 + 0 + 200 + 30 + 0$$

$$= 900230$$

Question 3

Express the following numbers in standard form:

(i) 5,00,00,000

Solution

Solution:-

The standard form of the given number is 5×10^7

(ii) 70,00,000

Solution:-

The standard form of the given number is 7×10^6

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

Solution:-

The standard form of the given number is 3.1865×10^9

(iv) 3,90,878

Solution:-

The standard form of the given number is 3.90878×10^5

(v) 39087.8

Solution:-

The standard form of the given number is 3.90878×10^4

(vi) 3908.78

Solution:-

The standard form of the given number is 3.90878×10^3

Question 4

Express the number appearing in the following statements in standard form.

(a) The distance between Earth and Moon is 384,000,000 m.

Solution

Solution:-

The standard form of the number appearing in the given statement is 3.84×10^8 m.

(b) Speed of light in a vacuum is 300,000,000 m/s.

Solution:-

The standard form of the number appearing in the given statement is 3×10^8 m/s.

(c) Diameter of the Earth is 1,27,56,000 m.

Solution:-

The standard form of the number appearing in the given statement is 1.2756×10^7 m.

(d) Diameter of the Sun is 1,400,000,000 m.

Solution:-

The standard form of the number appearing in the given statement is 1.4×10^9 m.

(e) In a galaxy, there are, on average, 100,000,000,000 stars.

Solution:-

The standard form of the number appearing in the given statement is 1×10^{11} stars.

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

Solution:-

The standard form of the number appearing in the given statement is 1.2×10^{10} years old.

(g) The distance of the Sun from the centre of the Milky Way Galaxy is estimated to be 300,000,000,000,000,000 m.

Solution:-

The standard form of the number appearing in the given statement is 3×10^{20} m.

(h) 60,230,000,000,000,000,000 molecules are contained in a drop of water weighing 1.8 gm.

Solution:-

The standard form of the number appearing in the given statement is 6.023×10^{22} molecules.

(i) The Earth has 1,353,000,000 cubic km of seawater.

Solution:-

The standard form of the number appearing in the given statement is 1.353×10^9 cubic km.

(j) The population of India was about 1,027,000,000 in March 2001.

Solution:-

The standard form of the number appearing in the given statement is 1.027×10^9 .
