

# Mathematics

(Chapter – 13) (Exponents and Powers)  
(Class – VII)

## Exercise 13.1

### Question 1:

Find the value of:

(i)  $2^6$

(ii)  $9^3$

(iii)  $11^2$

(iv)  $5^4$

### Answer 1:

(i)  $2^6 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$

(ii)  $9^3 = 9 \times 9 \times 9 = 729$

(iii)  $11^2 = 11 \times 11 = 121$

(iv)  $5^4 = 5 \times 5 \times 5 \times 5 = 625$

### Question 2:

Express the following in exponential form:

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

(ii)  $t \times t$

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

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

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

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

### Answer 2:

(i)  $6 \times 6 \times 6 \times 6 = 6^4$

(ii)  $t \times t = t^2$

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

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

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

(vi)  $a \times a \times a \times c \times c \times c \times c \times d = a^3 \times c^4 \times d$

### Question 3:

Express each of the following numbers using exponential notation:

(i) 512

(ii) 343

(iii) 729

(iv) 3125

### Answer 3:

(i) 512

$$512 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^9$$

2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

(ii) 343

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

7	343
7	49
7	7
	1

(iii) 729

$$729 = 3 \times 3 \times 3 \times 3 \times 3 \times 3 = 3^6$$

3	729
3	243
3	81
3	27
3	9
3	3
	1

(iv) 3125

$$3125 = 5 \times 5 \times 5 \times 5 \times 5$$

5	3125
5	625
5	125
5	25
5	5
	1

**Question 4:**

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

(i)  $4^3$  and  $3^4$

(ii)  $5^3$  or  $3^5$

(iii)  $2^8$  or  $8^2$

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

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

**Answer 4:**

(i)  $4^3 = 4 \times 4 \times 4 = 64$

$$3^4 = 3 \times 3 \times 3 \times 3 = 81$$

Since  $64 < 81$

Thus,  $3^4$  is greater than  $4^3$ .

(ii)  $5^3 = 5 \times 5 \times 5 = 125$

$$3^5 = 3 \times 3 \times 3 \times 3 \times 3 = 243$$

Since,  $125 < 243$

Thus,  $3^4$  is greater than  $5^3$ .

(iii)  $2^8 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 256$

$$8^2 = 8 \times 8 = 64$$

Since,  $256 > 64$

Thus,  $2^8$  is greater than  $8^2$ .

(iv)  $100^2 = 100 \times 100 = 10,000$

$$2^{100} = 2 \times 2 \times 2 \times 2 \times 2 \times \dots 14 \text{ times} \times \dots \times 2 = 16,384 \times \dots \times 2$$

Since,  $10,000 < 16,384 \times \dots \times 2$

Thus,  $2^{100}$  is greater than  $100^2$ .

(v)  $2^{10} = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 1,024$

$$10^2 = 10 \times 10 = 100$$

Since,  $1,024 > 100$

Thus,  $2^{10} > 10^2$

**Question 5:**

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

(i) 648

(ii) 405

(iii) 540

(iv) 3,600

**Answer 5:**

(i)  $648 = 2^3 \times 3^4$

2	648
2	324
2	162
3	81
3	27
3	9
3	3
	1

(ii)  $405 = 5 \times 3^4$

5	405
3	81
3	27
3	9
3	3
	1

(iii)  $540 = 2^2 \times 3^3 \times 5$

2	540
2	270
3	135
3	45
3	15
5	5
	1

(iv)  $3,600 = 2^4 \times 3^2 \times 5^2$

2	3600
2	1800
2	900
2	450
3	225
3	75
5	25
5	5
	1

**Question 6:**

Simplify:

(i)  $2 \times 10^3$

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

(iii)  $2^3 \times 5$

(iv)  $3 \times 4^4$

(v)  $0 \times 10^2$

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

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

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

**Answer 6:**

(i)  $2 \times 10^3 = 2 \times 10 \times 10 \times 10 = 2,000$

(ii)  $7^2 \times 2^2 = 7 \times 7 \times 2 \times 2 = 196$

(iii)  $2^3 \times 5 = 2 \times 2 \times 2 \times 5 = 40$

(iv)  $3 \times 4^4 = 3 \times 4 \times 4 \times 4 \times 4 = 768$

(v)  $0 \times 10^2 = 0 \times 10 \times 10 = 0$

(vi)  $5^2 \times 3^3 = 5 \times 5 \times 3 \times 3 \times 3 = 675$

(vii)  $2^4 \times 3^2 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 = 144$

(viii)  $3^2 \times 10^4 = 3 \times 3 \times 10 \times 10 \times 10 \times 10 = 90,000$

**Question 7:**

Simplify:

(i)  $(-4)^3$

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

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

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

**Answer 7:**

(i)  $(-4)^3 = (-4) \times (-4) \times (-4) = -64$

(ii)  $(-3) \times (-2)^3 = (-3) \times (-2) \times (-2) \times (-2) = 24$

(iii)  $(-3)^2 \times (-5)^2 = (-3) \times (-3) \times (-5) \times (-5) = 225$

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

**Question 8:**

Compare the following numbers:

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

(ii)  $4 \times 10^{14}$ ;  $3 \times 10^{17}$

**Answer 8:**

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

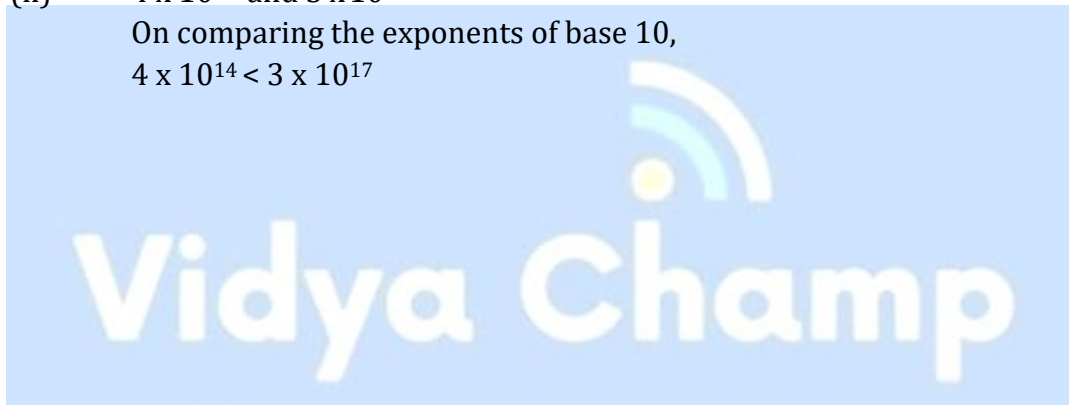
On comparing the exponents of base 10,

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

(ii)  $4 \times 10^{14}$  and  $3 \times 10^{17}$

On comparing the exponents of base 10,

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



## Exercise 13.2

### Question 1:

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

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

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

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

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

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

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

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

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

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

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

### Answer 1:

(i)  $3^2 \times 3^4 \times 3^8 = 3^{(2+4+8)} = 3^{14}$   $[\because a^m \times a^n = a^{m+n}]$

(ii)  $6^{15} \div 6^{10} = 6^{15-10} = 6^5$   $[\because a^m \div a^n = a^{m-n}]$

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

(iv)  $7^x \times 7^2 = 7^{x+2}$   $[\because a^m \times a^n = a^{m+n}]$

(v)  $(5^2)^3 \div 5^3 = 5^{2 \times 3} \div 5^3 = 5^6 \div 5^3$   $[\because (a^m)^n = a^{m \times n}]$   
 $= 5^{6-3} = 5^3$   $[\because a^m \div a^n = a^{m-n}]$

(vi)  $2^5 \times 5^5 = (2 \times 5)^5 = 10^5$   $[\because a^m \times b^m = (a \times b)^m]$

(vii)  $a^4 \times b^4 = (a \times b)^4$   $[\because a^m \times b^m = (a \times b)^m]$

(viii)  $(3^4)^3 = 3^{4 \times 3} = 3^{12}$   $[\because (a^m)^n = a^{m \times n}]$

(ix)  $(2^{20} \div 2^{15}) \times 2^3 = (2^{20-15}) \times 2^3$   $[\because a^m \div a^n = a^{m-n}]$

$= 2^5 \times 2^3 = 2^{5+3} = 2^8$   $[\because a^m \times a^n = a^{m+n}]$

(x)  $8^t \div 8^2 = 8^{t-2}$   $[\because a^m \div a^n = a^{m-n}]$

### Question 2:

Simplify and express each of the following in exponential form:

(i)  $\frac{2^3 \times 3^4 \times 4}{3 \times 32}$

(ii)  $\left[ (5^2)^3 \times 5^4 \right] \div 5^7$

(iii)  $25^4 \div 5^3$

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

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

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

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

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

(ix)  $\left( \frac{2^8 \times a^5}{4^3 \times a^3} \right) \times \left( \frac{4^5 \times a^8 b^3}{4^5 \times a^8 b^3} \right)$

(x)  $\left( \frac{a^5}{a^3} \right) \times a^8$

(xi)  $\left( \frac{4^5 \times a^5 b^2}{4^5 \times a^5 b^2} \right)$

(xii)  $(2^3 \times 2)$

### Answer 2:

(i)  $\frac{2^3 \times 3^4 \times 4}{3 \times 32} = \frac{2^3 \times 3^4 \times 2^2}{3 \times 2^5} = \frac{2^{3+2} \times 3^4}{3 \times 2^5}$   $\left[ \begin{array}{l} \because a^m \times a^n = a^{m+n} \\ \therefore \frac{a^m \times a^n}{a} = a^{m+n-1} \end{array} \right]$   
 $= \frac{2^5 \times 3^4}{3 \times 2^5} = 2^{5-5} \times 3^{4-3}$   $\left[ \begin{array}{l} \because \frac{a^m}{a^n} = a^{m-n} \\ \therefore \frac{a^m \times a^n}{a} = a^{m+n-1} \end{array} \right]$   
 $= \frac{2^0 \times 3^1}{1 \times 3^3} = 1 \times 3^3 = 3^3$

(ii)  $\left[ (5^2)^3 \times 5^4 \right] \div 5^7 = [5^6 \times 5^4] \div 5^7$   $\left[ \because (a^m)^n = a^{m \times n} \right]$   
 $= [5^{6+4}] \div 5^7 = 5^{10} \div 5^7$   $\left[ \because a^m \times a^n = a^{m+n} \right]$   
 $= 5^{10-7} = 5^3$   $\left[ \because a^m \div a^n = a^{m-n} \right]$

(iii)  $25^4 \div 5^3 = (5^2)^4 \div 5^3 = 5^8 \div 5^3$   $\left[ \because (a^m)^n = a^{m \times n} \right]$   
 $= 5^{8-3} = 5^5$   $\left[ \because a^m \div a^n = a^{m-n} \right]$

(iv)  $\frac{3 \times 7^2 \times 11^8}{21 \times 11^3} = \frac{3 \times 7^2 \times 11^8}{3 \times 7 \times 11^3} = 3^{1-1} \times 7^{2-1} \times 11^{8-3}$   $\left[ \because \frac{a^m}{a^n} = a^{m-n} \right]$   
 $= 3^0 \times 7^1 \times 11^5 = 7 \times 11^5$



$$(v) \quad \frac{3^7}{3^4 \times 3^3} = \frac{3^7}{3^{4+3}} = \frac{3^7}{3^7} \quad [ \because a^m \times a^n = a^{m+n} ]$$

$$= 3^{7-7} = 3^0 = 1 \quad [ \because a^m \div a^n = a^{m-n} ]$$

$$(vi) \quad 2^0 + 3^0 + 4^0 = 1 + 1 + 1 = 3 \quad [ \because a^0 = 1 ]$$

$$(vii) \quad 2^0 \times 3^0 \times 4^0 = 1 \times 1 \times 1 = 1 \quad [ \because a^0 = 1 ]$$

$$(viii) \quad (3^0 + 2^0) \times 5^0 = (1 + 1) \times 1 = 2 \times 1 = 2 \quad [ \because a^0 = 1 ]$$

$$(ix) \quad \frac{2^8 \times a^5}{4^3 \times a^3} = \frac{2^8 \times a^5}{(2^2)^3 \times a^3} = \frac{2^8 \times a^5}{2^6 \times a^3} \quad [ \because (a^m)^n = a^{m \times n} ]$$

$$= 2^{8-6} \times a^{5-3} = 2^2 \times a^2$$

$$= (2a)^2$$

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

$$[ \because a^m \times b^m = (a \times b)^m ]$$

$$(x) \quad \left( \frac{a^5}{a^3} \right)^8 \times a = (a^{5-3})^8 \times a = a^2 \times a^8 \quad [ \because a^m \div a^n = a^{m-n} ]$$

$$= a^{2+8} = a^{10} \quad [ \because a^m \times a^n = a^{m+n} ]$$

$$(xi) \quad \frac{4^5 \times a^8 b^3}{4^5 \times a^5 b^2} = 4^{5-5} \times a^{8-5} \times b^{3-2} = 4^0 \times a^3 \times b \quad [ \because a^m \div a^n = a^{m-n} ]$$

$$= 1 \times a^3 \times b = a^3 b \quad [ \because a^0 = 1 ]$$

$$(xii) \quad (2^3 \times 2)^2 = (2^{3+1})^2 = (2^4)^2 \quad [ \because a^m \times a^n = a^{m+n} ]$$

$$= 2^{4 \times 2} = 2^8$$

**Question 3:**

Say true or false and justify your answer:

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

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

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

(iv)  $3^0 = (1000)^0$

**Answer 3:**

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

L.H.S.  $10^{1+11} = 10^{12}$

and R.H.S.  $(10^2)^{11} = 10^{22}$

Since, L.H.S.  $\neq$  R.H.S.

Therefore, it is false.

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

L.H.S.  $2^3 = 8$

and R.H.S.  $5^2 = 25$

Since, L.H.S. is not greater than R.H.S.

Therefore, it is false.

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

L.H.S.  $2^3 \times 3^2 = 8 \times 9 = 72$

and R.H.S.  $6^5 = 7,776$

Since, L.H.S.  $\neq$  R.H.S.

Therefore, it is false.

(iv)  $3^0 = (1000)^0$

L.H.S.  $3^0 = 1$

and R.H.S.  $(1000)^0 = 1$

Since, L.H.S. = R.H.S.

Therefore, it is true.

**Question 4:**

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

(i)  $108 \times 192$

(ii) 270

(iii)  $729 \times 64$

(iv) 768

**Answer 4:**

(i)  $108 \times 192$

$$\begin{aligned}
 108 \times 192 &= (2^2 \times 3^3) \times (2^6 \times 3) \\
 &= 2^{2+6} \times 3^{3+1} \\
 &= 2^8 \times 3^4
 \end{aligned}$$

2	192
2	96
2	48
2	24
2	12
2	6
3	3
	1

2	108
2	54
3	27
3	9
3	3
	1

(ii) 270

$$270 = 2 \times 3^3 \times 5$$

2	270
3	135
3	45
3	15
5	5
	1

(iii)

$$\begin{aligned}
 729 \times 64 & \\
 729 \times 64 &= 3^6 \times 2^6
 \end{aligned}$$

2	64
2	32
2	16
2	8

2	4
2	2
	1

3	729
3	243
3	81
3	27
3	9
3	3
	1

(iv) 768

$$768 = 2^8 \times 3$$

2	768
2	384
2	192
2	96
2	48
2	24
2	12
2	6
3	3
	1



**Question 5:**

Simplify:

(i)  $\frac{(2^5)^2 \times 7^3}{8^3 \times 7}$

(ii)  $\frac{25 \times 5^2 \times t^8}{10^3 \times t^4}$

(iii)  $\frac{3^5 \times 10^5 \times 25}{5^7 \times 6^5}$

**Answer 5:**

$$\begin{aligned} \text{(i)} \quad \frac{(2^5)^2 \times 7^3}{8^3 \times 7} &= \frac{2^{5 \times 2} \times 7^3}{(2^3)^3 \times 7} \\ &= \frac{2^{10} \times 7^3}{2^9 \times 7} \\ &= 2^{10-9} \times 7^{3-1} = 2 \times 7^2 \\ &= 2 \times 49 \\ &= 98 \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad \frac{25 \times 5^2 \times t^8}{10^3 \times t^4} &= \frac{5^2 \times 5^2 \times t^8}{(5 \times 2)^3 \times t^4} \\ &= \frac{5^{2+2} \times t^{8-4}}{2^3 \times 3^3} \\ &= \frac{5^4 \times t^4}{2^3 \times 5^3} \\ &= \frac{5^{4-3} \times t^4}{2^3} \\ &= \frac{5t^4}{8} \end{aligned}$$

$$\begin{aligned} \text{(iii)} \quad \frac{3^5 \times 10^5 \times 25}{5^7 \times 6^5} &= \frac{3^5 \times (2 \times 5)^5 \times 5^2}{5^7 \times (2 \times 3)^5} \\ &= \frac{3^5 \times 2^5 \times 5^5 \times 5^2}{5^7 \times 2^5 \times 3^5} \\ &= \frac{3^5 \times 2^5 \times 5^{5+2}}{5^7 \times 2^5 \times 3^5} \\ &= \frac{3^5 \times 2^5 \times 5^7}{5^7 \times 2^5 \times 3^5} \\ &= 2^{5-5} \times 3^{5-5} \times 5^{5-5} \\ &= 2^0 \times 3^0 \times 5^0 \\ &= 1 \times 1 \times 1 \\ &= 1 \end{aligned}$$

## Exercise 13.3

### Question 1:

Write the following numbers in the expanded form:

279404, 3006194, 2806196, 120719, 20068

### Answer 1:

- (i)  $2,79,404 = 2,00,000 + 70,000 + 9,000 + 400 + 00 + 4$   
 $= 2 \times 100000 + 7 \times 10000 + 9 \times 1000 + 4 \times 100 + 0 \times 10 + 4 \times 1$   
 $= 2 \times 10^5 + 7 \times 10^4 + 9 \times 10^3 + 4 \times 10^2 + 0 \times 10^1 + 4 \times 10^0$
- (ii)  $30,06,194 = 30,00,000 + 0 + 0 + 6,000 + 100 + 90 + 4$   
 $= 3 \times 1000000 + 0 \times 100000 + 0 \times 10000 + 6 \times 1000 + 1 \times 100 + 9 \times 10 + 4 \times 1$   
 $= 3 \times 10^6 + 0 \times 10^5 + 0 \times 10^4 + 6 \times 10^3 + 1 \times 10^2 + 9 \times 10 + 4 \times 10^0$
- (iii)  $28,06,196 = 20,00,000 + 8,00,000 + 0 + 6,000 + 100 + 90 + 6$   
 $= 2 \times 1000000 + 8 \times 100000 + 0 \times 10000 + 6 \times 1000 + 1 \times 100 + 9 \times 10 + 6 \times 1$   
 $= 2 \times 10^6 + 8 \times 10^5 + 0 \times 10^4 + 6 \times 10^3 + 1 \times 10^2 + 9 \times 10 + 6 \times 10^0$
- (iv)  $1,20,719 = 1,00,000 + 20,000 + 0 + 700 + 10 + 9$   
 $= 1 \times 100000 + 2 \times 10000 + 0 \times 1000 + 7 \times 100 + 1 \times 10 + 9 \times 1$   
 $= 1 \times 10^5 + 2 \times 10^4 + 0 \times 10^3 + 7 \times 10^2 + 1 \times 10^1 + 9 \times 10^0$
- (v)  $20,068 = 20,000 + 00 + 00 + 60 + 8$   
 $= 2 \times 10000 + 0 \times 1000 + 0 \times 100 + 6 \times 10 + 8 \times 1$   
 $= 2 \times 10^4 + 0 \times 10^3 + 0 \times 10^2 + 6 \times 10^1 + 8 \times 10^0$

### Question 2:

Find the number from each of the following expanded forms:

- (a)  $8 \times 10^4 + 6 \times 10^3 + 0 \times 10^2 + 4 \times 10^1 + 5 \times 10^0$   
(b)  $4 \times 10^5 + 5 \times 10^3 + 3 \times 10^2 + 2 \times 10^0$   
(c)  $3 \times 10^4 + 7 \times 10^2 + 5 \times 10^0$   
(d)  $9 \times 10^5 + 2 \times 10^2 + 3 \times 10^1$

### Answer 2:

- (a)  $8 \times 10^4 + 6 \times 10^3 + 0 \times 10^2 + 4 \times 10^1 + 5 \times 10^0$   
 $= 8 \times 10000 + 6 \times 1000 + 0 \times 100 + 4 \times 10 + 5 \times 1$   
 $= 80000 + 6000 + 0 + 40 + 5$   
 $= 86,045$
- (b)  $4 \times 10^5 + 5 \times 10^3 + 3 \times 10^2 + 2 \times 10^0$   
 $= 4 \times 100000 + 0 \times 10000 + 5 \times 1000 + 3 \times 100 + 0 \times 10 + 2 \times 1$   
 $= 400000 + 0 + 5000 + 3000 + 0 + 2$   
 $= 4,05,302$

$$\begin{aligned}
 \text{(c)} \quad & 3 \times 10^4 + 7 \times 10^2 + 5 \times 10^0 \\
 & = 3 \times 10000 + 0 \times 1000 + 7 \times 100 + 0 \times 10 + 5 \times 1 \\
 & = 30000 + 0 + 700 + 0 + 5 \\
 & = 30,705 \\
 \text{(d)} \quad & 9 \times 10^5 + 2 \times 10^2 + 3 \times 10^1 \\
 & = 9 \times 100000 + 0 \times 10000 + 0 \times 1000 + 2 \times 100 + 3 \times 10 + 0 \times 1 \\
 & = 900000 + 0 + 0 + 200 + 30 + 0 \\
 & = 9,00,230
 \end{aligned}$$

### Question 3:

Express the following numbers in standard form:

- |                      |                |
|----------------------|----------------|
| (i) 5,00,00,000      | (ii) 70,00,000 |
| (iii) 3,18,65,00,000 | (iv) 3,90,878  |
| (v) 39087.8          | (vi) 3908.78   |

### Answer 3:

- |                      |                                                                                       |
|----------------------|---------------------------------------------------------------------------------------|
| (i) 5,00,00,000      | = $5 \times 1,00,00,000 = 5 \times 10^7$                                              |
| (ii) 70,00,000       | = $7 \times 10,00,000 = 7 \times 10^6$                                                |
| (iii) 3,18,65,00,000 | = $31865 \times 100000$<br>= $3.1865 \times 10000 \times 100000 = 3.1865 \times 10^9$ |
| (iv) 3,90,878        | = $3.90878 \times 100000 = 3.90878 \times 10^5$                                       |
| (v) 39087.8          | = $3.90878 \times 10000 = 3.90878 \times 10^4$                                        |
| (vi) 3908.78         | = $3.90878 \times 1000 = 3.90878 \times 10^3$                                         |

### Question 4:

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

- The distance between Earth and Moon is 384,000,000 m.
- Speed of light in vacuum is 300,000,000 m/s.
- Diameter of Earth is 1,27,56,000 m.
- Diameter of the Sun is 1,400,000,000 m.
- In a galaxy there are on an average 100,000,000,000 stars.
- The universe is estimated to be about 12,000,000,000 years old.
- The distance of the Sun from the centre of the Milky Way Galaxy is estimated to be 300,000,000,000,000,000 m.
- 60,230,000,000,000,000,000 molecules are contained in a drop of water weighing 1.8 gm.
- The Earth has 1,353,000,000 cubic km of sea water.
- The population of India was about 1,027,000,000 in march, 2001.

**Answer 4:**

(a) The distance between Earth and Moon = 384,000,000 m  
= 384 x 1000000 m  
= 3.84 x 100 x 1000000  
=  $3.84 \times 10^8$  m

(b) Speed of light in vacuum = 300,000,000 m/s  
= 3 x 100000000 m/s  
=  $3 \times 10^8$  m/s

(c) Diameter of the Earth = 1,27,56,000 m  
= 12756 x 1000 m  
= 1.2756 x 10000 x 1000 m  
=  $1.2756 \times 10^7$  m

(d) Diameter of the Sun = 1,400,000,000 m  
= 14 x 100,000,000 m  
= 1.4 x 10 x 100,000,000 m  
=  $1.4 \times 10^9$  m

(e) Average of Stars = 100,000,000,000  
= 1 x 100,000,000,000  
=  $1 \times 10^{11}$

(f) Years of Universe = 12,000,000,000 years  
= 12 x 1000,000,000 years  
= 1.2 x 10 x 1000,000,000 years  
=  $1.2 \times 10^{10}$  years

(g) Distance of the Sun from the centre of the Milky Way Galaxy  
= 300,000,000,000,000,000 m  
= 3 x 100,000,000,000,000,000 m  
=  $3 \times 10^{20}$  m

(h) Number of molecules in a drop of water weighing 1.8 gm  
= 60,230,000,000,000,000,000  
= 6023 x 10,000,000,000,000,000  
= 6.023 x 1000 x 10,000,000,000,000,000  
=  $6.023 \times 10^{22}$



(i) The Earth has Sea water                    = 1,353,000,000 km<sup>3</sup>  
                                                                 = 1,353 x 1000000 km<sup>3</sup>  
                                                                 = 1.353 x 1000 x 1000,000 km<sup>3</sup>  
                                                                 = 1.353×10<sup>9</sup> km<sup>3</sup>

(j) The population of India                        = 1,027,000,000  
                                                                 = 1027 x 1000000  
                                                                 = 1.027 x 1000 x 1000000  
                                                                 = 1.027 ×10<sup>9</sup>

