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

$2^{100} = 2 \times 2 \times 2 \times 2 \times 2 \times$ .....14 times x ..... x 2 = 16,384 x ..... x 2

Since, $10,000 < 16,384 \times$ ..... x 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) 2×10^3 (ii) $7^2 \times 2^2$

(iii) $2^3 \times 5$ (iv) 3×4^4

(v) 0×10^2 (vi) $5^2 \times 3^3$

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

Answer 6:

(i)	2×10^3	$= 2 \times 10 \times 10 \times 10$	$= 2,000$
(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)	3×4^4	$= 3 \times 4 \times 4 \times 4 \times 4$	$= 768$
(v)	0×10^2	$= 0 \times 10 \times 10$	$= 0$
(vi)	$5^3 \times 3^3$	$= 5 \times 5 \times 3 \times 3 \times 3$	$= 675$
(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) 2.7×10^{12}; 1.5×10^{8} (ii) 4×10^{14}; 3×10^{17}

Answer 8:

(i) 2.7×10^{12} and 1.5×10^{8}

On comparing the exponents of base 10,

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

(ii) 4×10^{14} and 3×10^{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) $3^2 \times 3^4 \times 3^8 = 3^{(2+4+8)} = 3^{14}$ $\left[\because a^m \times a^n = a^{m+n}\right]$

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

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

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

(v) $\left(5^2\right)^3 \div 5^3 = 5^{2\times3} \div 5^3 = 5^6 \div 5^3$ $\left[\because \left(a^m\right)^n = a^{m\times n}\right]$

$= 5^{6-3} = 5^3$ $\left[\because a^m \div a^n = a^{m-n}\right]$

(vi) $2^5 \times 5^5 = (2\times5)^5 = 10^5$ $\left[\because a^m \times b^m = (a\times b)^m\right]$

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

(viii) $\left(3^4\right)^3 = 3^{4\times3} = 3^{12}$ $\left[\because \left(a^m\right)^n = a^{m\times n}\right]$

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

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

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

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

(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) $\left(3^0 + 2^0\right) \times 5^0$

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

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

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

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

Answer 2:

(i) $\frac{2^3 \times 3^4 \times 4}{3 \times 32} = \frac{2^3 \times 3^4 \times 2^2}{3 \times 2^5} = \frac{2^{3+2} \times 3^4}{3 \times 2^5}$ $\left[\because a^m \times a^n = a^{m+n}\right]$

$= \frac{2^5 \times 3^4}{3 \times 2^5} = 2^{5-5} \times 3^{4-3}$ $\left[\because a^m \div a^n = a^{m-n}\right]$

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

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

$= \left[5^{6+4}\right] \div 5^7 = 5^{10} \div 5^7$ $\left[\because a^m \times a^n = a^{m+n}\right]$

$= 5^{10-7} = 5^3$ $\left[\because a^m \div a^n = a^{m-n}\right]$

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

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

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

$= 3^0 \times 7^1 \times 11^5 = 7 \times 11^5$

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

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

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

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

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

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

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

$=(2a)^2$ $\left[\because\ a^m\times b^m=(a\times b)^m\right]$

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

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

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

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

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

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

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. $\left(10^2\right)^{11} = 10^{22}$

Since, L.H.S. ≠ 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. ≠ 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 x 192 (ii) 270

(iii) 729 x 64 (iv) 768

Answer 4:

(i) 108 x 192

108 x 192 $= \left(2^2 \times 3^3\right) \times \left(2^6 \times 3\right)$

$= 2^{2+6} \times 3^{3+1}$

$= 2^8 \times 3^4$

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

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

(iii) 729 x 64

729 x 64 $= 3^6 \times 2^6$

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

(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:

(i) $\dfrac{\left(2^5\right)^2 \times 7^3}{8^3 \times 7} = \dfrac{2^{5\times 2} \times 7^3}{\left(2^3\right)^3 \times 7}$

$= \dfrac{2^{10} \times 7^3}{2^9 \times 7}$

$= 2^{10-9} \times 7^{3-1} = 2 \times 7^2$

$= 2 \text{ x } 49$

$= 98$

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

$= \dfrac{5^{2+2} \times t^{8-4}}{2^3 \times 3^3}$

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

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

$= \dfrac{5t^4}{8}$

(iii) $\dfrac{3^5 \times 10^5 \times 25}{5^7 \times 6^5} = \dfrac{3^5 \times (2\times 5)^5 \times 5^2}{5^7 \times (2\times 3)^5}$

$= \dfrac{3^5 \times 2^5 \times 5^5 \times 5^2}{5^7 \times 2^5 \times 3^5}$

$= \dfrac{3^5 \times 2^5 \times 5^{5+2}}{5^7 \times 2^5 \times 3^5}$

$= \dfrac{3^5 \times 2^5 \times 5^7}{5^7 \times 2^5 \times 3^5}$

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

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

$= 1 \text{ x } 1 \text{ x } 1$

$= 1$

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 x 100000 + 7 x 10000 + 9 x 1000 + 4 x 100 + 0 x 10 + 4 x 1

= $2\times10^5+7\times10^4+9\times10^3+4\times10^2+0\times10^1+4\times10^0$

(ii) 30,06,194 = 30,00,000 + 0 + 0 + 6,000 + 100 + 90 + 4

= 3 x 1000000 + 0 x 100000 + 0 x 10000 + 6 x 1000 + 1 x 100 + 9 x 10 + 4 x 1

= $3\times10^6+0\times10^5+0\times10^4+6\times10^3+1\times10^2+9\times10+4\times10^0$

(iii) 28,06,196 = 20,00,000 + 8,00,000 + 0 + 6,000 + 100 + 90 + 6

= 2 x 1000000 + 8 x 100000 + 0 x 10000 + 6 x 1000 + 1 x 100 + 9 x 10 + 6 x 1

= $2\times10^6+8\times10^5+0\times10^4+6\times10^3+1\times10^2+9\times10+6\times10^0$

(iv) 1,20,719 = 1,00,000 + 20,000 + 0 + 700 + 10 + 9

= 1 x 100000 + 2 x 10000 + 0 x 1000 + 7 x 100 + 1 x 10 + 9 x 1

= $1\times10^5+2\times10^4+0\times10^3+7\times10^2+1\times10^1+9\times10^0$

(v) 20,068 = 20,000 + 00 + 00 + 60 + 8

= 2 x 10000 + 0 x 1000 + 0 x 100 + 6 x 10 + 8 x 1

= $2\times10^4+0\times10^3+0\times10^2+6\times10^1+8\times10^0$

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 x 10000 + 6 x 1000 + 0 x 100 + 4 x 10 + 5 x 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 x 100000 + 0 x 10000 + 5 x 1000 + 3 x 100 + 0 x 10 + 2 x 1

= 400000 + 0 + 5000 + 3000 + 0 + 2

= 4,05,302

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

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

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

$= 30,705$

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

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

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

$= 9,00,230$

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	$= 31865 \times 100000$
		$= 3.1865 \times 10000 \times 100000 = 3.1865 \times 10^9$
(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:

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

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

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

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

(e) In a galaxy there are on an average 100,000,000,0000 stars.

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

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

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

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

(j) 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
= 3.84×10^8 m

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

(c) Diameter of the Earth = 1,27,56,000 m
= 12756 x 1000 m
= 1.2756 x 10000 x 1000 m
= 1.2756×10^7 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
= 1.4×10^9 m

(e) Average of Stars = 100,000,000,000
= 1 x 100,000,000,000
= 1×10^{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
= 1.2×10^{10} years

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

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

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

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