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 x 2 x 2 x 2 x 2 x 2 = 64

 (ii) 9^3 = 9 x 9 x 9 = 729

 (iii) 11^2 = 11 x 11 = 121

 (iv) 5^4= 5 x 5 x 5 x 5 = 625

Question 2:

Express the following in exponential form:

 (i)   6 x 6 x 6 x 6   (ii) $t \times t$

 (iii) $b \times b \times b \times b$ (iv)   5 x 5 x 7 x 7 x 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 x 6 x 6 x 6 = 6^4

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

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

 (iv)   5 x 5 x 7 x 7 x 7 = 5^2 x 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:

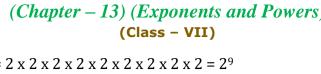Express each of the following numbers using exponential notation:

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

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

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

            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 x 3^4

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

    (ii)   405 = 5 x 3^4

5	405
3	81
3	27
3	9
3	3
	1

    (iii)   540 = 2^2 x 3^3 x 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)	$\left(-4\right)^3$	(ii)	$\left(-3\right) \times \left(-2\right)^3$
(iii)	$\left(-3\right)^2 \times \left(-5\right)^2$	(iv)	$\left(-2\right)^3 \times \left(-10\right)^3$

Answer 7:

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

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

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

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

Question 8:

Compare the following numbers:

    (i) $\quad 2.7 \times 10^{12}$; 1.5×10^{8} (ii) $\quad 4 \times 10^{14}$; 3×10^{17}

Answer 8:

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

         On comparing the exponents of base 10,

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

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

         On comparing the exponents of base 10,

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