

Chapter 15 Exercise 15.1

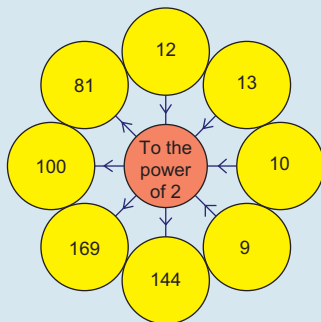
- Q. 1.** (i) $2^3 = 2 \times 2 \times 2 = 8$
 (ii) $3^3 = 3 \times 3 \times 3 = 27$
 (iii) $5^2 = 5 \times 5 = 25$
 (iv) $6^2 = 6 \times 6 = 36$
 (v) $1^{10} = 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 = 1$
 (vi) $4^3 = 4 \times 4 \times 4 = 64$

- Q. 2.** (i) $2^1 = 2$
 (ii) $2^2 = 2 \times 2 = 4$
 (iii) $3^2 = 3 \times 3 = 9$
 (iv) $4^1 = 4$
 (v) $4^2 = 4 \times 4 = 16$
 (vi) $3^4 = 3 \times 3 \times 3 \times 3 = 9 \times 9 = 81$

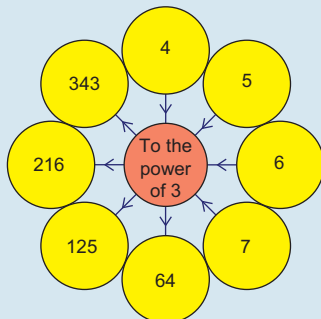
- Q. 3.** (i) 2 (iv) 6
 (ii) 3 (v) 12
 (iii) 7 (vi) 13

- Q. 4.** (i) $5 \times 6 = 30$ (v) $4 \div 2 = 2$
 (ii) $4 \times 7 = 28$ (vi) $10 \div 5 = 2$
 (iii) $9 \times 3 = 27$ (vii) $4 + 3 = 7$
 (iv) $5 \times 2 = 10$ (viii) $8 - 6 = 2$

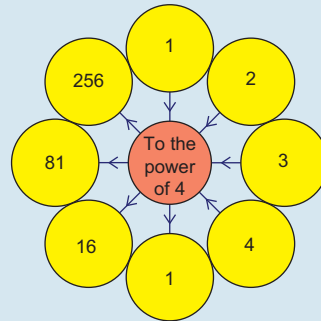
- Q. 5.** (i)



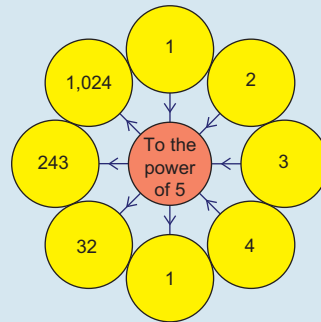
- (ii)



- (iii)



- (iv)



- Q. 6.**

A	B
2^3	27
4^2	64
1^6	16
$\sqrt{49}$	25
3^3	8
4^3	7
5^2	81
$\sqrt{25}$	5
9^2	1
5^3	125

- Q. 7.** (i) 8,000 (iv) 59,049
 (ii) 50,625 (v) 117,649
 (iii) 625 (vi) 16,384

- Q. 8.** (i) 3.46 (iv) 11.05
 (ii) 5.29 (v) 22.36
 (iii) 9.85 (vi) 38.21

- Q. 9.** (i) 1,728 (iv) 130,321
 (ii) 759,375 (v) 289
 (iii) 9,261 (vi) 456,976

- Q. 10.** (i) 3.87 (iv) 11.62
 (ii) 5.39 (v) 30.82
 (iii) 8.31 (vi) 37.03

- Q. 11.** (i) $a = 2, n = 7, b = 2^7 = 128$
(ii) $a = 3, b = 81, n = 4$ (as $3^4 = 81$)
(iii) $n = 3, b = 25 + 100 = 125, a = 5$
(as $5^3 = 125$) $n = 3, b = 125, a = 5$

Q. 12. (i)

2^1	2^2	2^3	2^4	2^5	2^6	2^7	2^8
2	4	8	16	32	64	128	256

(ii)

3^1	3^2	3^3	3^4	3^5	3^6	3^7
3	9	27	81	243	729	2,187

(iii)

4^1	4^2	4^3	4^4	4^5	4^6
4	16	64	256	1,024	4,096

Exercise 15.2

- Q. 1.** (i) 2^5 (iv) $2^5 \times 3^6$
(ii) 5^6 (v) $2^6 \times 5^5$
(iii) $2^3 \times 5^2$ (vi) $2^4 \times 3^5 \times 5^2$

- Q. 2.** (i) 4^5
(ii) $5^3 \times 2^3$
(iii) $2^2 \times 3^2 \times 5^2$
(iv) $2^4 \times 3^4 \times 5^3$
(v) $2^4 \times 3^4 \times 4^4$
(vi) $2^3 \times 3^3 \times 4^3 \times 5^2$

- Q. 3.** (i) x^5 (iv) $x^6 \times z^5$
(ii) y^6 (v) $x^6 \times y^5$
(iii) $x^2 \times y^2 \times z^2$ (vi) $x^4 \times y^5 \times z^2$

- Q. 4.** (i) y^5 (iv) $x^6 \times y^2 \times z^3$
(ii) $x^3 \times y^3$ (v) $x^4 \times y^4 \times z^4$
(iii) $x \times y^2 \times z^2$ (vi) $x^4 \times y^3 \times z^4$

- Q. 5.** (i) $2 \times 2 \times 2$
(ii) $3 \times 3 \times 3 \times 3$
(iii) 5×5
(iv) $6 \times 6 \times 6 \times 6 \times 6$
(v) $7 \times 7 \times 7 \times 7 \times 7 \times 7$
(vi) $3 \times 3 \times 3 \times 3 \times 3$
(vii) $2 \times 2 \times 2 \times 2 \times 2 \times 2$
(viii) $5 \times 5 \times 5 \times 5 \times 5$
(ix) 7×7
(x) $8 \times 8 \times 8 \times 8 \times 8 \times 8$

(xi) $x \times x \times x \times x \times x \times x \times x$

(xii) $y \times y \times y$

(xiii) $z \times z \times z \times z \times z \times z$

(xiv) $a \times a$

(xv) $b \times b \times b \times b$

- Q. 6.** (i) 5 (iv) 7
(ii) 8 (v) 5
(iii) 18

- Q. 7.** (i) 3^9 (iv) 5^{18}
(ii) 4^{11} (v) 10^9
(iii) 5^{13}

- Q. 8.** (i) 5 (iv) 6
(ii) 7 (v) 2
(iii) 3

- Q. 9.** (i) 4^4 (iv) 2^4
(ii) 6^3 (v) 10^5
(iii) 8^4

- Q. 10.** (i) -3^4 (vi) -2^8
(ii) -5^5 (vii) 6^5
(iii) 7^7 (viii) 8^7
(iv) 4^5 (ix) 9^{10}
(v) 9^5 (x) -10^5

- Q. 11.** (i) -2^2 (vi) -8^7
(ii) 4^2 (vii) 7^7
(iii) -6^5 (viii) 10^8
(iv) -6^7 (ix) -3^3
(v) 5^5 (x) 1^2

- Q. 12.** (i) -4^3
(ii) 2^6
(iii) $\frac{-2^8}{2^4} = -2^4$
(iv) $\frac{3^5}{3^2} = 3^3$
(v) $2^2 \times 2^3 = 2^5$
(vi) $-3^3 \times 3^2 = -3^5$
(vii) $4^2 \times -4 = -4^3$
(viii) $\frac{-5^8}{-5^6} = 5^2$
(ix) $\frac{6^3 \times 6^2}{-6^2} = \frac{6^5}{-6^2} = -6^3$
(x) $\frac{6^5 \div 6}{6^3 \times 6^2} = \frac{6^4}{6^5} = 6^{-1}$

Exercise 15.3

Q. 1. (i) $(2^3)^5$ means 5 copies of 2^3 multiplied together, which is:

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

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

$$= 2^{3+3+3+3+3}$$

$$= 2^{15}$$

Q. 2. (i) $(3^6)^3$ means 3 copies of 3^6 multiplied together, which is:

$$3^6 \times 3^6 \times 3^6$$

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

$$= 3^{6+6+6}$$

$$= 3^{18}$$

Q. 3. (i) $(5^5)^4 = 5^5 \times 5^5 \times 5^5 \times 5^5$ because $(5^5)^4$ means 4 copies of 5^5 multiplied together.

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

$$= 5^{5+5+5+5}$$

$$= 5^{20}$$

Q. 4. (i) 12 (vii) 30

(ii) 15 (viii) 4

(iii) 8 (ix) 42

(iv) 20 (x) 99

(v) 25 (xi) 15

(vi) 14 (xii) 6

Q. 5. (i) 8^{12} (iv) 5^{54}

(ii) 7^{45} (v) 18^{40}

(iii) 10^{20} (vi) 12^{35}

Q. 6. (i) 3^{12} (vii) 19^5

(ii) 5^6 (viii) 10^4

(iii) 12^3 (ix) -3^1

(iv) 8^{40} (x) -5^5

(v) 16^6 (xi) 6^{12}

(vi) 18^4 (xii) 12^7

Q. 7. (i) $32 = 2^5 = 2^2 \times 2^3 = (2^1)^5 = 2^7 \div 2^2$

(ii) $81 = 3^4 = 3^1 \times 3^3 = (3^2)^2 = 3^{11} \div 3^7$

(iii) $64 = 2^6 = 2^2 \times 2^4 = (2^2)^3 = 2^9 \div 2^3$

(iv) $625 = 5^4 = 5^2 \times 5^2 = (5^2)^2 = 5^{171} \div 5^{167}$

Q. 8. (i) $-(3^2)^3 = -3^6$

(ii) $(-4^3)^4 = -(4^3)^4 = -4^{12}$

(iii) $-(2^8)^5 = -2^{40}$

(iv) $-(5^2)^6 = -5^{12}$

(v) $-(6^3)^3 = -6^9$

(vi) $-(4^5)^7 = -4^{35}$

(vii) $-(8^3)^9 = -8^{27}$

(viii) $-(11^2)^5 = -11^{10}$

(ix) $-(10^3)^7 = -10^{21}$

(x) $-(12^5)^9 = -12^{45}$

(xi) $-(20^3)^4 = -20^{12}$

(xii) $-(3^7)^9 = -3^{63}$

Exercise 15.4

Q. 1. (i) 1.5×10^1 (iv) 1.5×10^4

(ii) 1.5×10^2 (v) 1.5×10^5

(iii) 1.5×10^3 (vi) 1.5×10^8

Q. 2. (i) 3.5×10^2 (iv) 6.3×10^8

(ii) 5.6×10^3 (v) 7.89×10^4

(iii) 3.45×10^6 (vi) 4.7823×10^4

Q. 3. (i) 6.8×10^2 (iv) 3×10^6

(ii) 3.28×10^3 (v) 4.568×10^5

(iii) 6.578×10^4 (vi) 6×10^0

Q. 4. (i) 1.65×10^2 (iv) 1.95×10^8

(ii) 1.785×10^4 (v) 1.75×10^9

(iii) 1.5×10^6 (vi) 7.87×10^5

Q. 5. (i) 300,000 (iv) 6,400

(ii) 9,000,000 (v) 6,120

(iii) 240 (vi) 738,000

Q. 6. (i) 2,000,000 (iv) 647,000

(ii) 16,900 (v) 61.2

(iii) 2,480 (vi) 8,670

Q. 7. (i) 3.6×10^1 (vi) 6.8×10^4

(ii) 5.613×10^3 (vii) 3.28×10^6

(iii) 3.45×10^2 (viii) 6.578×10^7

(iv) 6.349×10^3 (ix) 9×10^9

(v) 7.89×10^6 (x) 5.6×10^7

- Q. 8.** (i) 1,500 (iv) 6,670,000
(ii) 25,400 (v) 815
(iii) 350,000 (vi) 91,820,000

- Q. 9.** (i) $1,239,868 \rightarrow 10^6$
 $345 \rightarrow 10^2$
Ans: $6 - 2 = 4$
(ii) $345,789,213 \rightarrow 10^9$
 $4538 \rightarrow 10^3$
Ans: $9 - 3 = 6$
(iii) $767,894,567,000 \rightarrow 10^{12}$
 $23,000,000 \rightarrow 10^7$
Ans: $12 - 7 = 5$
(iv) $23 \rightarrow 10^1$
 $234,678 \rightarrow 10^5$
Ans: $5 - 1 = 4$
(v) $1.8 \rightarrow 10^0$
 $234 \rightarrow 10^2$
Ans: $2 - 0 = 2$

Exercise 15.5

- Q. 1.** (i) $\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \frac{1}{8}, \frac{1}{10}$
(ii) $1, \frac{1}{3}, \frac{1}{5}, \frac{1}{7}, \frac{1}{9}$
(iii) $\frac{1}{2}, \frac{1}{3}, \frac{1}{5}, \frac{1}{7}, \frac{1}{11}, \frac{1}{13}$
(iv) $\frac{1}{5}, \frac{1}{10}, \frac{1}{15}, \frac{1}{20}, \frac{1}{25}, \frac{1}{30}$

- Q. 2.** (i) 2, 4, 6, 8, 10
(ii) 3, 5, 7, 9, 11, 13
(iii) 5, 10, 15, 20, 25, 30
(iv) 23, 29, 31, 37, 41
(v) 4, 9, 16, 25, 36, 49

- Q. 3.** (i) $\frac{3}{2}, \frac{4}{3}, \frac{5}{4}, \frac{6}{5}, \frac{7}{6}, \frac{8}{7}$
(ii) $\frac{5}{3}, \frac{7}{5}, \frac{9}{7}, \frac{11}{9}, \frac{13}{11}$
(iii) $\frac{5}{2}, \frac{7}{4}, \frac{3}{2}, \frac{11}{8}, \frac{13}{10}$

- Q. 4.** (i) $2\frac{1}{2} = \frac{5}{2}$ (ii) $3\frac{1}{3} = \frac{10}{3}$
 $\therefore \text{Ans: } \frac{2}{5}$ $\therefore \text{Ans: } \frac{3}{10}$

- (iii) $4\frac{1}{4} = \frac{17}{4}$ (v) $6\frac{1}{6} = \frac{37}{6}$
 $\therefore \text{Ans: } \frac{4}{17}$ $\therefore \text{Ans: } \frac{6}{37}$
(iv) $5\frac{1}{5} = \frac{26}{5}$ (vi) $7\frac{1}{7} = \frac{50}{7}$
 $\therefore \text{Ans: } \frac{5}{26}$ $\therefore \text{Ans: } \frac{7}{50}$

Q. 5.

	(a)	(b)
(i)	$\frac{1}{5} = 0.2$	0.191
(ii)	$\frac{1}{10} = 0.1$	0.101
(iii)	$\frac{1}{4} = 0.25$	0.236
(iv)	$\frac{1}{20} = 0.05$	0.051
(v)	$\frac{1}{4} = 0.25$	0.251
(vi)	$\frac{1}{2} = 0.5$	0.407

- Q. 6.** (i) -2 (vi) -8
(ii) $-\frac{1}{4}$ (vii) $-\frac{7}{12}$
(iii) $-\frac{5}{11}$ (viii) $-\frac{5}{6}$
(iv) $-\frac{10}{3}$ (ix) $-\frac{4}{3}$
(v) $-\frac{5}{57}$ (x) $-\frac{8}{15}$

Revision Exercises

- Q. 1.** (a) (i) $3^4 = 3 \times 3 \times 3 \times 3 = 81$
(ii) $5^3 = 5 \times 5 \times 5 = 125$
(iii) $26 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$
(iv) $(-3)^4 = -3 \times -3 \times -3 \times -3 = 81$
(v) $(-5)^3 = -5 \times -5 \times -5 = -125$
(vi) $(-2)^6 = -2 \times -2 \times -2 \times -2 \times -2 \times -2 = 64$
(b) (i) 8
(ii) $8 + 4 = 12$
(iii) $8 + 4 \times 2 = 8 + 8 = 16$

- Q. 2.** (i) 5 (iv) 100
(ii) 2 (v) 1
(iii) 9

- Q. 3.** (a) (i) 244.14 (iii) 19,770.61
(ii) 4.21

- (b) (i) Mars
 (ii) Mercury
 (iii) $1.5 \times 10^{11} - 6.0 \times 10^{10}$
 $= 9 \times 10^{10}$

- Q. 4.** (a) (i) $870,000 = 8.7 \times 10^5$
 (ii) $396,000 = 3.96 \times 10^5$
 (iii) $4,307,600 = 4.3076 \times 10^6$
 (b) (i) $\sqrt{16} \times \frac{10}{2} - (2)^2 = 4 \times 5 - 4$
 $= 20 - 4 = 16$
 (ii) 18.44

- Q. 5.** (a) 31,400
 (b) $\sqrt{65^2 - 63^2} = \sqrt{256} = 16$
 (c) $300 \times 6 \times 10^{25}$
 $= 1800 \times 10^{25}$
 $= 1.8 \times 10^{25}$ kg

- Q. 6.** (i) 2^{11} (v) -7^5
 (ii) 3^{12} (vi) 4^{21}
 (iii) 5^5 (vii) -5^{10}
 (iv) $-(5^2)^{15} = -5^{30}$ (viii) $\frac{7^8}{-7^3} = -7^5$

- Q. 7.** (i) 0.38 (iii) 0.78
 (ii) 0.08 (iv) 0.44

Q. 8.

	(a)	(b)
(i)	$6^2 - \sqrt{25} = 36 - 5 = 31$	29.71
(ii)	$\frac{5 - \sqrt{9}}{1^2 + 1} = \frac{5 - 3}{2} = \frac{2}{2} = 1$	0.88
(iii)	$\sqrt{16} \times \frac{15}{3} - (2)^2$ $= 4 \times 5 - 4$ $= 20 - 4$ $= 16$	14.12

Q. 9.

n	5^n
6	15,625
7	78,125
8	390,625

$8^5 = 32,768$

Answer: 7

Q. 10. Saturn: $5.69 \times 10^{29} \rightarrow 10^{30}$

Earth: $6.04 \times 10^{24} \rightarrow 10^{25}$

Ans: 5

- Q. 11.** (a) 1.02×10^8
 (b) (i) $\frac{C^7}{C^6} = C^1 = c$
 (ii) 28

- Q. 12.** (i) $2^2, 2^3, 2^4$
 (ii) 2^{64}
 (iii) $2^n = 128$
 $n = 7$
 7th square.