

# EXPONENTS

①

## (Chapter 5)

### Exercise 5.1

1. Write the base and exponent of each of the following:

i,  $2^4$ ; Base = 2, Exponent = 4

ii,  $(-10)^{10}$ ; Base = -10, Exponent = 10

iii,  $(3 \times 3)^5$ ; Base =  $3 \times 3$ , Exponent = 5

iv,  $-(4)^8$ ; Base = 4, Exponent = 8

v,  $(-7)^3$ ; Base = -7, Exponent = 3

2. Write in exponential notation:

i,  $5 \times 5 \times 5 \times 5 \times 5 = 5^5$

ii,  $(-4) \times (-4) \times (-4) \times (-4) = (-4)^4$

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

iv,  $3 \times 3 \times 3 \times (-7) \times (-7) \times 5 \times 5 \times 5 \times 5$   
 $= 3^3 \times (-7)^2 \times 5^4$

v,  $(-17) \times (-17) \times 7 \times 7 \times 7 \times 8 \times 8$   
 $= (-17)^2 \times (7)^3 \times (8)^2$

vi,  $a \times a \times a \times b \times b \times c \times c = a^3 \times b^2 \times c^2$   
 $= a^3 b^2 c^2$

3. Express each of the following as product of powers of their prime factors.

$$\begin{array}{r} \downarrow \\ 5 \overline{) 405} \\ 3 \overline{) 81} \\ 3 \overline{) 27} \\ 3 \overline{) 9} \\ 3 \overline{) 3} \\ \hline 1 \end{array}$$

$$\begin{aligned} \therefore 405 &= 3 \times 3 \times 3 \times 3 \times 5 \\ &= 3^4 \times 5^1 \end{aligned}$$

$$\begin{array}{r} \downarrow \\ 2 \overline{) 850} \\ 5 \overline{) 425} \\ 5 \overline{) 85} \\ \hline 17 \end{array}$$

$$\begin{aligned} \therefore 850 &= 2 \times 5 \times 5 \times 17 \\ &= 2^1 \times 5^2 \times 17^1 \end{aligned}$$

$$\begin{array}{r} \downarrow \\ 2 \overline{) 3600} \\ 2 \overline{) 1800} \\ 2 \overline{) 900} \\ 2 \overline{) 450} \\ 5 \overline{) 225} \\ 5 \overline{) 45} \\ 3 \overline{) 9} \\ 3 \overline{) 3} \\ \hline 1 \end{array}$$

$$\begin{aligned} \therefore 3600 &= 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times \\ &\quad 5 \times 5 \\ &= 2^4 \times 3^2 \times 5^2 \end{aligned}$$

$$\begin{array}{r} \downarrow \\ 2 \overline{) 18000} \\ 2 \overline{) 9000} \\ 2 \overline{) 4500} \\ 2 \overline{) 2250} \\ 5 \overline{) 1125} \\ 5 \overline{) 225} \\ 5 \overline{) 45} \\ 3 \overline{) 9} \\ 3 \overline{) 3} \\ \hline 1 \end{array}$$

$$\begin{aligned} \therefore 18000 &= 2 \times 2 \times 2 \times 2 \times 3 \times 3 \\ &\quad \times 5 \times 5 \times 5 \\ &= 2^4 \times 3^2 \times 5^3 \end{aligned}$$

4. Evaluate:

$$i), (-3)^2 \times (-2)^2 = (-3) \times (-3) \times (-2) \times (-2)$$

$$= 9 \times 4 = 36$$

$$ii), 4^3 \times 3^2 \times 2 = (4 \times 4 \times 4) \times (3 \times 3) \times 2$$

$$= 64 \times 9 \times 2 = 1152$$

$$= 64 \times 18$$

$$= 1152$$

$$iii), (-1)^{82} \times 5^3 = 1 \times 5 \times 5 \times 5$$

$$= (1) \times 125$$

$$= 1 \times 125$$

$$= 125$$

$$iv), (-8)^3 \times (-1)^{52} \times (-2)^2$$

$$= [(-8) \times (-8) \times (-8)] \times 1 \times (-2) \times (-2)$$

$$= (-512) \times (1) \times 4$$

$$= (-512) \times 4$$

$$= -2048$$

$$v), 8^3 - (-2)^4 = (8 \times 8 \times 8) - [(-2) \times (-2) \times (-2) \times (-2)]$$

$$= 512 - 16$$

$$= 496$$

$$vi), (-7)^2 - (-2)^3 + 3^2 = [(-7) \times (-7)] - [(-2) \times (-2) \times (-2)] + (3 \times 3)$$

$$= 49 - (-8) + 9$$

$$= 49 + 8 + 9 = 66$$

$$\begin{aligned} \text{vii, } (10)^3 \div (2)^2 &= \frac{10 \times 10 \times 10}{1 \times 2 \times 2} \\ &= 10 \times 5 \times 5 \\ &= 10 \times 25 \\ &= 250 \end{aligned}$$

$$\begin{aligned} \text{viii, } 2 \times (-1)^{36} \times (-1)^{45} \times (-3)^4 &= 2 \times 1 \times (-1) \times (-3) \quad 187/783 \quad \triangleleft \\ &= -2 \times 81 \\ &= -162 \end{aligned}$$

$$\begin{aligned} \text{ix, } 6^3 + (-3)^2 - (-1)^8 &= (6 \times 6 \times 6) \\ &\quad + [(-3) \times (-3)] \\ &\quad - 1 \\ &= 216 + 9 - 1 \\ &= 224 \end{aligned}$$

$$\begin{aligned} \text{x, } 3^5 + (-2)^2 - 4^3 &= (3 \times 3 \times 3 \times 3 \times 3) \\ &\quad + [(-2) \times (-2)] \\ &\quad - (4 \times 4 \times 4) \\ &= 243 + 4 - 64 \\ &= 183 \end{aligned}$$

$$\begin{aligned} \text{xi, } 24^2 \div (-1)^{10} &= \frac{24 \times 24}{(-1)^{10}} \\ &= \frac{576}{1} = 576 \end{aligned}$$

(3)

$$\begin{aligned}
 \text{xii, } (-8)^3 - (-7)^3 &= [(-8) \times (-8) \times (-8)] \\
 &\quad - [(-7) \times (-7) \times (-7)] \\
 &= [-512] - [-343] \\
 &= -512 + 343 \\
 &= 343 - 188/783 \\
 &= -169
 \end{aligned}$$

$$\begin{aligned}
 \text{xiii, } 4^3 \times (-1)^5 + 7^2 &= (4 \times 4 \times 4) \times (-1) + (7 \times 7) \\
 &= 64 \times (-1) + 49 \\
 &= -64 + 49 \\
 &= -15
 \end{aligned}$$

$$\begin{aligned}
 \text{xiv, } 2^5 \times (-3)^4 - (-4)^3 &= (2 \times 2 \times 2 \times 2 \times 2) \\
 &\quad \times (-3) \times (-3) \times (-3) \times (-3) \\
 &\quad - [(-4) \times (-4) \times (-4)] \\
 &= 32 \times 81 - (-64) \\
 &= 2592 + 64 = 2656
 \end{aligned}$$

Find the value of  $x$  :

$$\begin{aligned}
 \text{i) } 8^x &= 512 \\
 &= (2 \times 2 \times 2) \times 2 \times 2 \\
 &\quad \times 2 \times 2 \times 2 \times 2 \\
 &= 8 \times 8 \times 8 \\
 8^x &= 8^3 \\
 \therefore x &= 3
 \end{aligned}$$

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

$$\begin{aligned} \text{ii), } (-7)^x &= -343 \\ &= (-7) \times (-7) \times (-7) \\ (-7)^x &= (-7)^3 \\ \therefore x &= 3 \end{aligned}$$

7	343
7	49
7	7
	1

$$\begin{aligned} \text{iii), } 4^x &= 256 \\ &= (\underline{2 \times 2}) \times (\underline{2 \times 2}) \\ &\quad \times (\underline{2 \times 2}) \times (\underline{2 \times 2}) \\ &= 4 \times 4 \times 4 \times 4 \\ 4^x &= 4^4 \\ \therefore x &= 4 \end{aligned}$$

2	189/783
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

6) Fill in the blanks:

$$\text{i), } (-1)^{100} \times (-1)^{25} = 1 \times (-1) = -1$$

$$\text{ii), } (-1)^{204} + (-1)^{32} + (-1)^8 = 1 + 1 + 1 = 3$$

$$\text{iii), } (-1)^{86} \div (-1)^{35} = 1 \div (-1) = \frac{1}{-1} = -1$$

$$\text{iv), } (-1)^{18} - (-1)^{24} = 1 - 1 = 0$$

7) Compare the following using  $>$ ,  $<$  or  $=$  sign:

$$\text{i), } 2 \times 3^2 = 2 \times 9 = 18$$

$$3 \times 2^2 = 3 \times 4 = 12$$

$$18 > 12 \implies 2 \times 3^2 > 3 \times 2^2$$

$$\begin{aligned} \text{(ii)} \quad (-2)^3 \times (-3)^3 &= (-2) \times (-2) \times (-2) \\ &\quad \times (-3) \times (-3) \times (-3) \\ &= (-8) \times (-27) \\ &= 216 \end{aligned}$$

$$\begin{aligned} 2^3 \times 3^3 &= 2 \times 2 \times 2 \times 3 \times 3 \times 3 \\ &= 8 \times 27 = 190/783 \end{aligned}$$

$$\therefore (-2)^3 \times (-3)^3 \equiv 2^3 \times 3^3$$

$$\text{(iii)} \quad (-4)^2 \times (-5)^3 \square (-4)^2 \times 5^3$$

$$(-1)^5 = -1$$

$$(-1)^2 = 1$$

$$\therefore (-1)^5 < (-1)^2$$

$$\therefore (-4)^2 \times (-5)^3 \square (-4)^2 \times 5^3$$

$$\text{(iv)} \quad 4^3 \times (-2)^7 \square 2^8 \times (-4)^6$$

$$(-1)^7 = -1 \text{ and } (-1)^6 = 1$$

$$\therefore (-1)^7 < (-1)^6$$

$$\therefore 4^3 \times (-2)^7 \square 2^8 \times (-4)^6$$

### EXERCISE - 5.2

1. Express in exponential form:

$$\begin{aligned} \text{i)} \quad \frac{2}{7} \times \frac{2}{7} \times \frac{2}{7} &= \frac{2 \times 2 \times 2}{7 \times 7 \times 7} \\ &= \frac{2^3}{7^3} = \left(\frac{2}{7}\right)^3 \end{aligned}$$

$$\begin{aligned}
 \text{ii), } & \left(\frac{-3}{5}\right) \times \left(\frac{-3}{5}\right) \times \left(\frac{-3}{5}\right) \times \left(\frac{-3}{5}\right) \\
 &= \frac{(-3) \times (-3) \times (-3) \times (-3)}{5 \times 5 \times 5 \times 5} \\
 &= \frac{(-3)^4}{5^4} = \left(\frac{-3}{5}\right)^4
 \end{aligned}$$

$$\begin{aligned}
 \text{iii), } & \left(\frac{-5}{11}\right) \times \left(\frac{-5}{11}\right) \times \left(\frac{-5}{11}\right) \times \left(\frac{-5}{11}\right) \times \left(\frac{-5}{11}\right) \quad 191/783 \\
 &= \frac{(-5) \times (-5) \times (-5) \times (-5) \times (-5)}{11 \times 11 \times 11 \times 11 \times 11} \\
 &= \frac{(-5)^5}{11^5} = \left(\frac{-5}{11}\right)^5
 \end{aligned}$$

2. Evaluate:

$$\begin{aligned}
 \text{i), } & \left(\frac{2}{3}\right)^4 = \frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} \\
 &= \frac{2 \times 2 \times 2 \times 2}{3 \times 3 \times 3 \times 3} = \frac{16}{81}
 \end{aligned}$$

$$\begin{aligned}
 \text{ii), } & \left(\frac{1}{7}\right)^3 = \frac{1}{7} \times \frac{1}{7} \times \frac{1}{7} \\
 &= \frac{1 \times 1 \times 1}{7 \times 7 \times 7} = \frac{1}{343}
 \end{aligned}$$

$$\begin{aligned}
 \text{iii), } & \left(\frac{-3}{4}\right)^3 = \left(\frac{-3}{4}\right) \times \left(\frac{-3}{4}\right) \times \left(\frac{-3}{4}\right) \\
 &= \frac{(-3) \times (-3) \times (-3)}{4 \times 4 \times 4} = \frac{-27}{64}
 \end{aligned}$$



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## (Chapter 5)

### Exercise 5.1

1. Write the base and exponent of each of the following:

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ii,  $(-10)^{10}$ ; Base = -10, Exponent = 10

iii,  $(3 \times 3)^5$ ; Base =  $3 \times 3$ , Exponent = 5

iv,  $-(4)^8$ ; Base = 4, Exponent = 8

v,  $(-7)^3$ ; Base = -7, Exponent = 3

2. Write in exponential notation:

i,  $5 \times 5 \times 5 \times 5 \times 5 = 5^5$

ii,  $(-4) \times (-4) \times (-4) \times (-4) = (-4)^4$

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

iv,  $3 \times 3 \times 3 \times (-7) \times (-7) \times 5 \times 5 \times 5 \times 5$   
 $= 3^3 \times (-7)^2 \times 5^4$

v,  $(-17) \times (-17) \times 7 \times 7 \times 7 \times 8 \times 8$   
 $= (-17)^2 \times (7)^3 \times (8)^2$

vi,  $a \times a \times a \times b \times b \times c \times c = a^3 \times b^2 \times c^2$   
 $= a^3 b^2 c^2$

3. Express each of the following as product of powers of their prime factors

$$\begin{array}{r}
 \text{i), } 5 \overline{) 405} \\
 \underline{3 \quad 81} \\
 3 \quad 27 \\
 \underline{3 \quad 9} \\
 3 \quad 3 \\
 \underline{3 \quad 3} \\
 1
 \end{array}$$

$$\begin{aligned}
 \therefore 405 &= 3 \times 3 \times 3 \times 3 \times 5 \\
 &= 3^4 \times 5^1
 \end{aligned}$$

$$\begin{array}{r}
 \text{ii), } 2 \overline{) 850} \\
 \underline{5 \quad 425} \\
 5 \quad 85 \\
 \underline{\quad 17}
 \end{array}$$

185/783

$$\begin{aligned}
 \therefore 850 &= 2 \times 5 \times 5 \times 17 \\
 &= 2^1 \times 5^2 \times 17^1
 \end{aligned}$$

$$\begin{array}{r}
 \text{iii), } 2 \overline{) 3600} \\
 \underline{2 \quad 1800} \\
 2 \quad 900 \\
 \underline{2 \quad 450} \\
 5 \quad 225 \\
 \underline{5 \quad 45} \\
 3 \quad 9 \\
 \underline{3 \quad 3} \\
 1
 \end{array}$$

$$\begin{aligned}
 \therefore 3600 &= 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times \\
 &\quad 5 \times 5 \\
 &= 2^4 \times 3^2 \times 5^2
 \end{aligned}$$

$$\begin{array}{r}
 \text{iv), } 2 \overline{) 18000} \\
 \underline{2 \quad 9000} \\
 2 \quad 4500 \\
 \underline{2 \quad 2250} \\
 5 \quad 1125 \\
 \underline{5 \quad 225} \\
 5 \quad 45 \\
 \underline{3 \quad 9} \\
 3 \quad 3 \\
 1
 \end{array}$$

$$\begin{aligned}
 \therefore 18000 &= 2 \times 2 \times 2 \times 2 \times 3 \times 3 \\
 &\quad \times 5 \times 5 \times 5 \\
 &= 2^4 \times 3^2 \times 5^3
 \end{aligned}$$

4. Evaluate:

$$\text{i), } (-3)^2 \times (-2)^2 = (-3) \times (-3) \times (-2) \times (-2) \\ = 9 \times 4 = 36$$

$$\text{ii), } 4^3 \times 3^2 \times 2 = (4 \times 4 \times 4) \times (3 \times 3) \times 2 \\ = 64 \times 9 \times 2 \\ = 64 \times 18 \\ = 1152$$

$$\text{iii), } (-1)^{82} \times 5^3 = 1 \times 5 \times 5 \times 5 \\ = (1) \times 125 \\ = 1 \times 125 \\ = 125$$

$$\text{iv), } (-8)^3 \times (-1)^{52} \times (-2)^2 \\ = [(-8) \times (-8) \times (-8)] \times 1 \times (-2) \times (-2) \\ = (-512) \times (1) \times 4 \\ = (-512) \times 4 \\ = -2048$$

$$\text{v), } 8^3 - (-2)^4 = (8 \times 8 \times 8) - [(-2) \times (-2) \times (-2) \times (-2)] \\ = 512 - 16 \\ = 496$$

$$\text{vi), } (-7)^2 - (-2)^3 + 3^2 = [(-7) \times (-7)] - [(-2) \times (-2) \times (-2)] \\ + (3 \times 3) \\ = 49 - (-8) + 9 \\ = 49 + 8 + 9 = 66$$



$$\begin{aligned} \text{vii, } (10)^3 \div (2)^2 &= \frac{10 \times 10 \times 10}{1 \times 2 \times 2} \\ &= 10 \times 5 \times 5 \\ &= 10 \times 25 \\ &= 250 \end{aligned}$$

$$\begin{aligned} \text{viii, } 2 \times (-1)^{36} \times (-1)^{45} \times (-3)^4 \\ &= 2 \times 1 \times (-1) \times (-81) \\ &= -2 \times 81 \\ &= -162 \end{aligned}$$

$$\begin{aligned} \text{ix, } 6^3 + (-3)^2 - (-1)^8 &= (6 \times 6 \times 6) \\ &\quad + [(-3) \times (-3)] \\ &\quad - 1 \\ &= 216 + 9 - 1 \\ &= 224 \end{aligned}$$

$$\begin{aligned} \text{x, } 3^5 + (-2)^2 - 4^3 &= (3 \times 3 \times 3 \times 3 \times 3) \\ &\quad + [(-2) \times (-2)] \\ &\quad - (4 \times 4 \times 4) \\ &= 243 + 4 - 64 \\ &= 183 \end{aligned}$$

$$\begin{aligned} \text{xi, } 24^2 \div (-1)^{10} &= \frac{24 \times 24}{(-1)^{10}} \\ &= \frac{576}{1} = 576 \end{aligned}$$

$$\begin{aligned}
 \text{xii, } (-8)^3 - (-7)^3 &= [(-8) \times (-8) \times (-8)] \\
 &\quad - [(-7) \times (-7) \times (-7)] \\
 &= [-512] - [-343] \\
 &= -512 + 343 \\
 &= 343 - 512 \\
 &= -169
 \end{aligned}$$

$$\begin{aligned}
 \text{xiii, } 4^3 \times (-1)^5 + 7^2 &= (4 \times 4 \times 4) \times (-1) + 49 \\
 &= 64 \times (-1) + 49 \\
 &= -64 + 49 \\
 &= -15
 \end{aligned}$$

$$\begin{aligned}
 \text{xiv, } 2^5 \times (-3)^4 - (-4)^3 &= (2 \times 2 \times 2 \times 2 \times 2) \\
 &\quad \times (-3) \times (-3) \times (-3) \times (-3) \\
 &\quad - [(-4) \times (-4) \times (-4)] \\
 &= 32 \times 81 - (-64) \\
 &= 2592 + 64 = 2656
 \end{aligned}$$

5) Find the value of x :

$$\begin{aligned}
 \downarrow \quad 8^x &= 512 \\
 &= (2 \times 2 \times 2) \times 2 \times 2 \\
 &\quad \times 2 \times (2 \times 2 \times 2) \\
 &= 8 \times 8 \times 8 \\
 8^x &= 8^3 \\
 \therefore x &= 3
 \end{aligned}$$

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

ii),  $(-7)^x = -343$   
 $= (-7) \times (-7) \times (-7)$   
 $(-7)^x = (-7)^3$   
 $\therefore x = 3$

7	343
7	49
7	7
	1

iii),  $4^x = 256$   
 $= (2 \times 2) \times (2 \times 2)$   
 $\times (2 \times 2) \times (2 \times 2)$   
 $= 4 \times 4 \times 4 \times 4$   
 $4^x = 4^4$   
 $\therefore x = 4$

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

6) Fill in the blanks:

i),  $(-1)^{100} \times (-1)^{25} = 1 \times (-1) = -1$

ii),  $(-1)^{204} + (-1)^{32} + (-1)^8 = 1 + 1 + 1 = 3$

iii),  $(-1)^{26} \div (-1)^{35} = 1 \div (-1) = \frac{1}{-1} = -1$

iv),  $(-1)^{18} - (-1)^{24} = 1 - 1 = 0$

7) Compare the following using  $>$ ,  $<$  or  $=$  sign:

i),  $2 \times 3^2 = 2 \times 9 = 18$

$3 \times 2^2 = 3 \times 4 = 12$

$18 > 12 \implies 2 \times 3^2 > 3 \times 2^2$

$$\begin{aligned} \text{ii), } (-2)^3 \times (-3)^3 &= (-2) \times (-2) \times (-2) \\ &\quad \times (-3) \times (-3) \times (-3) \\ &= (-8) \times (-27) \\ &= 216 \end{aligned}$$

$$\begin{aligned} 2^3 \times 3^3 &= 2 \times 2 \times 2 \times 3 \times 3 \times 3 \\ &= 8 \times 27 = 216 \end{aligned}$$

$$\therefore (-2)^3 \times (-3)^3 \equiv 2^3 \times 3^3$$

$$\text{iii), } (-4)^2 \times (-5)^3 \square (-4)^2 \times 5^3 \quad 190/783$$

$$(-1)^5 = -1$$

$$(-1)^2 = 1$$

$$\therefore (-1)^5 < (-1)^2$$

$$\therefore (-4)^2 \times (-5)^3 \square (-4)^2 \times 5^3$$

$$\text{iv), } 4^3 \times (-2)^7 \square 2^8 \times (-4)^6$$

$$(-1)^7 = -1 \text{ and } (-1)^6 = 1$$

$$\therefore (-1)^7 < (-1)^6$$

$$\therefore 4^3 \times (-2)^7 \square 2^8 \times (-4)^6$$

### EXERCISE - 5.2

1. Express in exponential form:

$$\begin{aligned} \text{i) } \frac{2}{7} \times \frac{2}{7} \times \frac{2}{7} &= \frac{2 \times 2 \times 2}{7 \times 7 \times 7} \\ &= \frac{2^3}{7^3} = \left(\frac{2}{7}\right)^3 \end{aligned}$$

$$\begin{aligned}
 \text{(ii), } \left(\frac{-3}{5}\right) \times \left(\frac{-3}{5}\right) \times \left(\frac{-3}{5}\right) \times \left(\frac{-3}{5}\right) \\
 &= \frac{(-3) \times (-3) \times (-3) \times (-3)}{5 \times 5 \times 5 \times 5} \\
 &= \frac{(-3)^4}{5^4} = \left(\frac{-3}{5}\right)^4
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii), } \left(\frac{-5}{11}\right) \times \left(\frac{-5}{11}\right) \times \left(\frac{-5}{11}\right) \times \left(\frac{-5}{11}\right) \times \left(\frac{-5}{11}\right) \quad 191/783 \\
 &= \frac{(-5) \times (-5) \times (-5) \times (-5) \times (-5)}{11 \times 11 \times 11 \times 11 \times 11} \\
 &= \frac{(-5)^5}{11^5} = \left(\frac{-5}{11}\right)^5
 \end{aligned}$$

2. Evaluate:

$$\begin{aligned}
 \text{(i), } \left(\frac{2}{3}\right)^4 &= \frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} \\
 &= \frac{2 \times 2 \times 2 \times 2}{3 \times 3 \times 3 \times 3} = \frac{16}{81}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii), } \left(\frac{1}{7}\right)^3 &= \frac{1}{7} \times \frac{1}{7} \times \frac{1}{7} \\
 &= \frac{1 \times 1 \times 1}{7 \times 7 \times 7} = \frac{1}{343}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii), } \left(\frac{-3}{4}\right)^3 &= \left(\frac{-3}{4}\right) \times \left(\frac{-3}{4}\right) \times \left(\frac{-3}{4}\right) \\
 &= \frac{(-3) \times (-3) \times (-3)}{4 \times 4 \times 4} = \frac{-27}{64}
 \end{aligned}$$



$$\begin{aligned}
 \text{iv), } \left(\frac{-5}{4}\right)^4 &= \left(\frac{-5}{4}\right) \times \left(\frac{-5}{4}\right) \times \left(\frac{-5}{4}\right) \times \left(\frac{-5}{4}\right) \\
 &= \frac{(-5) \times (-5) \times (-5) \times (-5)}{4 \times 4 \times 4 \times 4} \\
 &= \frac{625}{256}
 \end{aligned}$$

192/783

$$\begin{aligned}
 \text{v), } \left(\frac{-2}{-5}\right)^3 &= \left(\frac{-2}{-5}\right) \times \left(\frac{-2}{-5}\right) \times \left(\frac{-2}{-5}\right) \\
 &= \frac{2}{5} \times \frac{2}{5} \times \frac{2}{5} \\
 &= \frac{2 \times 2 \times 2}{5 \times 5 \times 5} = \frac{8}{125}
 \end{aligned}$$

(3) Express in exponential notation:

$$\begin{aligned}
 \frac{125}{27} &= \frac{5 \times 5 \times 5}{3 \times 3 \times 3} \\
 &= \frac{5}{3} \times \frac{5}{3} \times \frac{5}{3} \\
 &= \left(\frac{5}{3}\right)^3
 \end{aligned}$$

5   125	3   27
5   25	3   9
5   5	3   3
1	1

$$\begin{aligned}
 \frac{-64}{125} &= \frac{-2 \times 2 \times 2 \times 2 \times 2 \times 2}{5 \times 5 \times 5} \\
 &= \frac{(-4) \times (-4) \times (-4)}{5 \times 5 \times 5} \\
 &= \left(\frac{-4}{5}\right) \times \left(\frac{-4}{5}\right) \times \left(\frac{-4}{5}\right) \\
 &= \left(\frac{-4}{5}\right)^3
 \end{aligned}$$

2   64	5   125
2   32	5   25
2   16	5   5
2   8	1
2   4	
2   2	
1	

$$\frac{-32}{243} = \frac{-2 \times 2 \times 2 \times 2 \times 2}{3 \times 3 \times 3 \times 3 \times 3}$$

$$= \frac{(-2) \times (-2) \times (-2) \times (-2) \times (-2)}{3 \times 3 \times 3 \times 3 \times 3}$$

$$= \left(\frac{-2}{3}\right) \times \left(\frac{-2}{3}\right) \times \left(\frac{-2}{3}\right) \times \left(\frac{-2}{3}\right) \times \left(\frac{-2}{3}\right)$$

$$= \left(\frac{-2}{3}\right)^5$$

2	32
2	16
2	8
2	4
2	2
	1

3	243
3	81
3	27
3	9
3	3
	1

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$$\frac{729}{64} = \frac{3 \times 3 \times 3 \times 3 \times 3 \times 3}{2 \times 2 \times 2 \times 2 \times 2 \times 2}$$

$$= \left(\frac{3}{2}\right) \times \left(\frac{3}{2}\right) \times \left(\frac{3}{2}\right) \times \left(\frac{3}{2}\right) \times \left(\frac{3}{2}\right) \times \left(\frac{3}{2}\right)$$

$$= \left(\frac{3}{2}\right)^6$$

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

2	64
2	32
2	16
2	8
2	4
2	2
	1

$$\frac{25}{64} = \frac{5 \times 5}{2 \times 2 \times 2 \times 2 \times 2 \times 2}$$

$$= \frac{5 \times 5}{(2 \times 2 \times 2) \times (2 \times 2 \times 2)}$$

$$= \frac{5 \times 5}{8 \times 8}$$

$$= \frac{5}{8} \times \frac{5}{8}$$

$$= \left(\frac{5}{8}\right)^2$$

5	25
5	5
	1

2	64
2	32
2	16
2	8
2	4
2	2
	1

4. Find the reciprocal of :

$$i) \left(\frac{5}{7}\right)^4 = \frac{5 \times 5 \times 5 \times 5}{7 \times 7 \times 7 \times 7} = \frac{625}{2401}$$

$$\therefore \text{Reciprocal of } \left(\frac{5}{7}\right)^4 = \frac{2401}{625} = \left(\frac{7}{5}\right)^4$$

$$\text{(ii), } (-11)^5 = (-11) \times (-11) \times (-11) \times (-11) \times (-11) \\ = -1,61,051$$

$$\therefore \text{Reciprocal of } (-11)^5 = \frac{1}{-161,051} \\ = \frac{-1}{161,051} \\ = \left(\frac{-1}{11}\right)^5$$

$$\text{(iii), } (-1)^7 = (-1) \times (-1) \times (-1) \times (-1) \times (-1) \times (-1) \times (-1) \\ = 1 \times 1 \times 1 \times (-1) \\ = -1$$

$$\therefore \text{Reciprocal of } (-1)^7 = \frac{1}{-1} = \left(\frac{1}{-1}\right)^7 = (-1)^7$$

$$\text{(iv), } \left(\frac{-15}{8}\right)^3 = \left(\frac{-15}{8}\right) \times \left(\frac{-15}{8}\right) \times \left(\frac{-15}{8}\right) \\ = \frac{(-15) \times (-15) \times (-15)}{8 \times 8 \times 8} \\ = -\frac{3,375}{512}$$

$$\therefore \text{Reciprocal of } \left(\frac{-15}{8}\right)^3 = \frac{512}{-3,375} \\ = -\frac{512}{3,375} = \left(\frac{-8}{15}\right)^3$$

$$\begin{aligned}
 \text{v), } \left(\frac{-3}{8}\right)^6 &= \frac{(-3) \times (-3) \times (-3) \times (-3) \times (-3) \times (-3)}{8 \times 8 \times 8 \times 8 \times 8 \times 8} \\
 &= \frac{(-27) \times (-27)}{64 \times 64 \times 64} \\
 &= \frac{729}{262,144}
 \end{aligned}$$

$$\begin{aligned}
 \therefore \text{Reciprocal of } \left(\frac{-3}{8}\right)^6 &= \frac{262,144}{729} \\
 &= \left(\frac{-8}{3}\right)^6
 \end{aligned}$$

$$\text{vi), } \left(\frac{-1}{8}\right)^{12} = \frac{1^{12}}{8^{12}}$$

$$\therefore \text{Reciprocal of } \left(\frac{-1}{8}\right)^{12} = \left(\frac{-8}{1}\right)^{12} = (-8)^{12}$$

$$\text{vii), Reciprocal of } \left(\frac{-6}{11}\right)^{10} = \left(\frac{-11}{6}\right)^{10}$$

$$\text{viii), Reciprocal of } \left(\frac{-5}{3}\right)^{50} = \left(\frac{3}{5}\right)^{50}$$

Q. Evaluate:

$$\begin{aligned}
 \text{i), } (-3)^2 \div \left(\frac{-9}{4}\right)^2 &= (-3)^2 \times \left(\frac{-4}{9}\right)^2 \\
 &= (-3) \times (-3) \times \left(\frac{-4}{9}\right) \times \left(\frac{-4}{9}\right) \\
 &= 9 \times \frac{(-4) \times (-4)}{9 \times 9} \\
 &= \frac{9}{1} \times \frac{16}{9 \times 9} = \frac{19 \times 16}{19 \times 9} = \frac{16}{9}
 \end{aligned}$$