

3

$$i) 6 \times 6 \times 6 \times 6 \times 6 = 6^5$$

$$ii) t \times t \times t = t^3$$

$$iii) 2 \times 2 \times a \times a \times a \times a = 2^2 \times a^4$$

$$iv) a \times a \times a \times c \times c \times c \times c \times d = a^3 \times c^4 \times d^1$$

4

$$i) 7 \times 10^3 = 7 \times 1000 = 7000$$

$$ii) 2^5 \times 9 = 2 \times 2 \times 2 \times 2 \times 2 \times 9 = 288$$

$$iii) 3^3 \times 10^4 = 3 \times 3 \times 3 \times 10 \times 10 \times 10 \times 10 = 270000$$

5

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

$$= -3 \times -2 \times -2 \times -2$$

$$= 24$$

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

$$= -3 \times -3 \times -5 \times -5$$

$$= 225$$

$$iii) (-2)^3 \times (-10)^4$$

$$= -2 \times -2 \times -2 \times -10 \times -10 \times -10 \times -10$$

$$= -80000$$

$$iv) (-1)^9 = -1 \times -1 \times -1 \times -1 \times -1 \times -1 \times -1 \times -1 \times -1 = -1$$

$$v) 25^2 \times (-1)^{31} = 25 \times 25 \times -1 = -625$$

$$vi) 4^2 \times 3^3 \times (-1)^{122} = 4 \times 4 \times 3 \times 3 \times 3 \times 1 = 432$$

6.

i) $4^3 = 4 \times 4 \times 4 = 64$; $3^4 = 3 \times 3 \times 3 \times 3 = 81$

$\therefore 3^4$ is greater

ii) 7^3 or 3^7

$7^3 = 7 \times 7 \times 7 = 343$; $3^7 = 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 = 2187$

$\therefore 3^7$ is greater

iii) $4^5 = 4 \times 4 \times 4 \times 4 \times 4 = 1024$; $5^4 = 5 \times 5 \times 5 \times 5 = 625$

$\therefore 4^5$ is greater

iv) $2^{10} = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 1024$; $10^2 = 10 \times 10 = 100$

$\therefore 2^{10}$ is greater

7.

i) 8

$= 2 \times 2 \times 2$

$= 2^3$

$$\begin{array}{r|l} 2 & 8 \\ \hline 2 & 4 \\ \hline 2 & 2 \end{array}$$

iii) 1024

$= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$

$2 \times 2 \times 2 \times 2$

$= 2^{10}$

$$\begin{array}{r|l} 2 & 1024 \\ \hline 2 & 512 \\ \hline 2 & 256 \\ \hline 2 & 128 \\ \hline 2 & 64 \\ \hline 2 & 32 \\ \hline 2 & 16 \\ \hline 2 & 8 \\ \hline 2 & 4 \\ \hline 2 & 2 \end{array}$$

ii) 128

$= 2 \times 2 \times 2 \times 2 \times 2 \times 2$

$\times 2 \times 2$

$= 2^7$

$$\begin{array}{r|l} 2 & 128 \\ \hline 2 & 64 \\ \hline 2 & 32 \\ \hline 2 & 16 \\ \hline 2 & 8 \\ \hline 2 & 4 \\ \hline 2 & 2 \end{array}$$

8. Let $(-2)^x = 16$

$$(-2)^x = (-2)^4$$

Base is equal so, exponent should be same

i.e. $x = 4$

\therefore Up to 4 should be raised

9.

i) $9 = -3 \times -3 = (-3)^2$

ii) $-27 = -3 \times -3 \times -3 = (-3)^3$

iii) $81 = -3 \times -3 \times -3 \times -3 = (-3)^4$

10.

i) $7^x = 343$

$$7^x = 7^3$$

Base is equal, exponent should be same

$x = 3$

ii) $3^x = 729$

$$3^x = 3^6$$

Base equal, exponent is same

i.e. $x = 6$

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

$$\text{iii) } (-8)^x = -512$$

$$(-8)^x = -8 \times -8 \times -8$$

$$(-8)^x = (-8)^3$$

Base is equal, exponent should be same

$$x = 3$$

$$\begin{array}{r|l} 8 & 512 \\ 8 & 64 \\ \hline & 8 \\ \hline & = 8 \times 8 \times 8 \end{array}$$

$$\text{iv) } (-4)^x = -1024$$

$$(-4)^x = -4 \times -4 \times -4 \times -4 \times -4$$

$$(-4)^x = (-4)^5$$

Base is equal, exponent should be same

$$x = 5$$

$$\begin{array}{r|l} 4 & 1024 \\ 4 & 256 \\ \hline 4 & 64 \\ \hline 4 & 16 \\ \hline & 4 \\ \hline & = 4 \times 4 \times 4 \times 4 \times 4 \\ & = 4^5 \end{array}$$

$$\text{v) } \left(\frac{2}{5}\right)^x = \frac{32}{3125}$$

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

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

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

Base equal, exponent should be same

$$\text{i.e. } x = 5$$

$$vi) \left(\frac{-3}{4}\right)^x = \frac{-243}{1024}$$

$$\left(\frac{-3}{4}\right)^x = \frac{-3x-3x-3x-3x-3}{4 \times 4 \times 4 \times 4 \times 4}$$

$$\left(\frac{-3}{4}\right)^x = \frac{(-3)^5}{(4)^5}$$

$$\left(\frac{-3}{4}\right)^x = \left(\frac{-3}{4}\right)^5$$

Base is equal, exponent should be same

$$\therefore x = 5$$

11.

i) 72

$$= 2 \times 2 \times 2 \times 3 \times 3$$

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

$$\begin{array}{r|l} 2 & 72 \\ \hline 2 & 36 \\ \hline 2 & 18 \\ \hline 3 & 9 \\ \hline & 3 \end{array} = 2 \times 2 \times 2 \times 3 \times 3$$

ii) 360

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

$$= 2^3 \times 3^2 \times 5^1$$

$$\begin{array}{r|l} 2 & 360 \\ \hline 2 & 180 \\ \hline 2 & 90 \\ \hline 3 & 45 \\ \hline 3 & 15 \\ \hline & 5 \end{array}$$

iii) 405

$$= 3 \times 3 \times 3 \times 3 \times 5$$

$$= 3^4 \times 5^1$$

$$\begin{array}{r|l} 5 & 405 \\ \hline 3 & 81 \\ \hline 3 & 27 \\ \hline 3 & 9 \\ \hline & 3 \end{array}$$

iv) 540

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

$$= 2^2 \times 3^3 \times 5^1$$

3	540
3	180
3	60
5	20
2	4
	2

v) 2280

$$= 2 \times 2 \times 2 \times 3 \times 5 \times 19$$

$$= 2^3 \times 3^1 \times 5^1 \times 19^1$$

2	2280
2	1140
2	570
5	285
3	57
	19

vi) 3600

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

$$= 2^4 \times 3^2 \times 5^2$$

3	3600
3	1200
2	400
2	200
2	100
2	50
5	25
	5

vii) 4725

$$= 3 \times 3 \times 3 \times 5 \times 5 \times 7$$

$$= 3^3 \times 5^2 \times 7$$

5	4725
5	945
3	189
3	63
3	21
	7

viii) 8400

$$= 2 \times 2 \times 2 \times 2 \times 3 \times 5 \times 5 \times 7$$

$$= 2^4 \times 3^1 \times 5^2 \times 7$$

5	8400
5	1680
3	336
2	112
2	56
2	28
2	14
	7

EXERCISE: 4.2

1. As we know that $a^m \times a^n = a^{m+n}$

i. $2^7 \times 2^4$

$$= 2^{7+4} = 2^{11}$$

ii. $p^5 \times p^3 = p^{5+3} = p^8$

iii. $(-7)^5 \times (-7)^{11} = (-7)^{5+11} = (-7)^{16}$

iv. $\left(\frac{3}{5}\right)^6 \div \left(\frac{3}{5}\right)^2$

As we know $a^m \div a^n = a^{m-n}$

$$\text{i.e.} = \left(\frac{3}{5}\right)^{6-2} = \left(\frac{3}{5}\right)^4$$

v. $(-6)^7 \div (-6)^3$

$$= (-6)^{7-3}$$

$$= (-6)^4$$

vi. $7^x \times 7^3$

$$= 7^{x+3}$$

2. As we know that $a^m \times a^n = a^{m+n}$; $a^m \div a^n = a^{m-n}$

i) $5^3 \times 5^7 \times 5^{12}$

$$= 5^{3+7+12}$$

$$= 5^{22}$$

$$\text{ii. } a^5 \times a^3 \times a^7$$

$$= a^{5+3+7}$$

$$= a^{15}$$

$$\text{iii. } (7^{12} \times 7^3) \div 7^4$$

$$= 7^{12+3} \div 7^4$$

$$= 7^{15} \div 7^4$$

$$= 7^{15-4}$$

$$= 7^{11}$$

3.

$$\text{i) } (2^2)^{100}$$

As we know $(a^m)^n = a^{mn}$

$$= 2^{2 \times 100} = 2^{200}$$

$$\text{ii. } ((-7)^6)^5$$

$$= (-7)^{6 \times 5} = (-7)^{30}$$

$$\text{iii. } (3^2)^5 \times (3^4)^7$$

$$= 3^{2 \times 5} \times 3^{4 \times 7}$$

$$= 3^{10} \times 3^{28}$$

$$= 3^{10+28}$$

$$= 3^{38}$$

4.

i)

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

$$= \frac{a^{3+5}}{a^{2 \times 2}}$$

$$= \frac{a^8}{a^4}$$

$$= a^{8-4} = a^4$$

ii. $(2^3)^4 \div 2^5$

$$= 2^{3 \times 4} \div 2^5$$

$$= 2^{12} \div 2^5$$

$$= 2^{12-5}$$

$$= 2^7$$

iii. $[(6^2)^3 \div 6^3] \times 6^5$

$$= [6^{2 \times 3} \div 6^3] \times 6^5$$

$$= [6^6 \div 6^3] \times 6^5$$

$$= 6^{6-3} \times 6^5$$

$$= 6^3 \times 6^5$$

$$= 6^{3+5}$$

$$= 6^8$$

5.

i) $5^4 \times 8^4$

As we know that $a^m \times b^m = (a \times b)^m = (ab)^m$

$$= (5 \times 8)^4$$

$$= 40^4$$

ii. $(-3)^6 \times (-5)^6$

$$= (-3 \times -5)^6$$

$$= 15^6$$

iii. $\left(\frac{3}{10}\right)^5 \times \left(\frac{2}{15}\right)^5$

$$= \left[\frac{3}{10} \times \frac{2}{15}\right]^5$$

$$= \left[\frac{1}{25}\right]^5$$

$$\frac{3}{10} \times \frac{2}{15} = \frac{1}{25}$$

6.

i. $\frac{2^4 \times 2 \times 2^3 \times 2^6}{2^3 \times 2^4}$

$$= \frac{2^{4+1} \times 2^{3+6}}{2^3 \times 2^4}$$

$$= \frac{2^5 \times 2^9}{2^3 \times 2^4}$$

$$= \frac{2^5}{2^3} \times \frac{2^9}{2^4}$$

$$= 2^{5-3} \times 3^{9-4}$$

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

$$\text{ii. } \frac{(3^2)^3 \times (-2)^5}{(-2)^3}$$

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

$$= 3^6 \times \frac{(-2)^5}{(-2)^3}$$

$$= 3^6 \times (-2)^{5-3}$$

$$= 3^6 \times (-2)^2$$

$$\text{iii. } \frac{2^8 \times a^5}{4^3 \times a^3}$$

$$\text{As } 4 = 2^2$$

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

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

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

$$= 2^2 \times a^2 = (2 \times a)^2 = 4a^2$$

$$\text{iv. } \frac{3 \times 3^2 \times 11^8}{21 \times 11^3}$$

$$\text{As } 21 = 7 \times 3$$

$$= \frac{3 \times 3^2 \times 11^8}{7 \times 3 \times 11^3}$$

$$= \frac{3^2}{3^1} \times \frac{11^8}{11^3}$$

$$= 3^{2-1} \times 11^{8-3}$$

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

$$\text{v. } (2^0 + 3^0) 4^0$$

$$\text{As we know } a^0 = 1$$

$$\text{i.e. } 2^0 = 1 ; 3^0 = 1 ; 4^0 = 1$$

$$= (1+1) \times 1 = 2 \times 1 = 2$$

$$\text{vi. } 3^0 \times 4^0 \times 5^0$$

$$\text{As we know } a^0 = 1$$

$$3^0 = 1 ; 4^0 = 1 ; 5^0 = 1$$

$$= 1 \times 1 \times 1$$

$$= 1$$

7

$$i) \frac{25}{64}$$

$$= \frac{5^2}{2^6}$$

$$5 \overline{) 25}$$

$$5$$

$$= 5 \times 5$$

$$= 5^2$$

$$2 \overline{) 64}$$

$$2 \overline{) 32}$$

$$2 \overline{) 16}$$

$$2 \overline{) 8}$$

$$2 \overline{) 4}$$

$$2$$

$$= 2 \times 2 \times 2 \times 2 \times 2 \times 2$$

$$= 2^6$$

$$ii) - \frac{125}{216}$$

$$= - \frac{5^3}{6^3}$$

$$= \left(-\frac{5}{6} \right)^3$$

$$5 \overline{) 125}$$

$$5 \overline{) 25}$$

$$5$$

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

$$= 5^3$$

$$3 \overline{) 216}$$

$$2 \overline{) 72}$$

$$2 \overline{) 36}$$

$$2 \overline{) 18}$$

$$3 \overline{) 9}$$

$$3$$

$$= 2 \times 2 \times 2 \times 3 \times 3 \times 3$$

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

$$= 6^3$$

$$iii) - \frac{343}{729}$$

$$= - \frac{7^3}{9^3}$$

$$= \left(-\frac{7}{9} \right)^3$$

$$7 \overline{) 343}$$

$$7 \overline{) 49}$$

$$7$$

$$= 7 \times 7 \times 7$$

$$= 7^3$$

$$9 \overline{) 729}$$

$$9 \overline{) 81}$$

$$9$$

$$= 9 \times 9 \times 9$$

$$= 9^3$$

8.

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

$$8 = 2^3$$

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

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

$$= 2^1 \times 7^2 = 2 \times 49 = 98$$

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

$$10 = 5 \times 2 ; 25 = 5 \times 5 = 5^2$$

$$= \frac{5^2 \times 5^2 \times t^8}{(5 \times 2)^3 \times t^4}$$

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

$$= \frac{5^4}{5^3} \times \frac{t^8}{t^4} \times \frac{1}{2^3}$$

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

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

$$\text{As } 10 = 5 \times 2 \ ; \ 25 = 5 \times 5 \ ; \ 6 = 3 \times 2$$

$$= \frac{3^5 \times (5 \times 2)^5 \times 5 \times 5}{5^7 \times 6^5}$$

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

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

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

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

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

$$= 1 \times 1 \times 1 = 1$$

$$\text{iv) } \left(\frac{-3}{5}\right)^{-3}$$

$$\text{As we know } a^{-n} = \frac{1}{a^n}$$

$$= \frac{1}{\left(\frac{-3}{5}\right)^3}$$

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

9.

i. $\left[-\frac{1}{2}\right]^5 \times 2^6 \times \left(\frac{3}{4}\right)^3$

$$\begin{aligned}
 &= \frac{(-1)^5 \times 2^6 \times 3^3}{(-2)^5 \times 4^3} \\
 &= \frac{+1 \times 64 \times 27}{+32 \times 64} \\
 &= \frac{27}{32}
 \end{aligned}$$

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

$$3^3 = 3 \times 3 \times 3 = 27$$

$$2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$$

$$4^3 = 4 \times 4 \times 4 = 64$$

ii. $\left[\left(-\frac{3}{4}\right)^3 \div \left(-\frac{5}{2}\right)^3\right] \times \left(-\frac{2}{3}\right)^4$

$$\begin{aligned}
 &= \left(\frac{+3}{4} \times \frac{2}{+5}\right)^3 \times \left(-\frac{2}{3}\right)^4 \\
 &= \frac{3^3}{10^3} \times \frac{-2 \times -2 \times -2 \times -2}{3 \times 3 \times 3 \times 3}
 \end{aligned}$$

$$= \frac{27 \times 16^2}{1000 \times 8^4}$$

$$= \frac{2}{375}$$

10.

i) $\left(\frac{3}{2}\right)^{-1} \div \left(-\frac{2}{5}\right)^{-1}$

$$\left(\frac{3}{2}\right)^{-1} = \frac{1}{\left(\frac{3}{2}\right)} = \frac{2}{3}$$

$$\left(-\frac{2}{5}\right)^{-1} = \frac{1}{\left(-\frac{2}{5}\right)} = \frac{5}{-2}$$

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

$$= \frac{-5}{3}$$

ii. $\left[\left\{\left(-\frac{1}{4}\right)^2\right\}^{-1}\right]^{-2}$

$$= \left(-\frac{1}{4}\right)^{2 \times -1 \times -2}$$

$$= \left(-\frac{1}{4}\right)^4 = \frac{(-1)^4}{4^4}$$

$$= \frac{-1 \times -1 \times -1 \times -1}{4 \times 4 \times 4 \times 4}$$

$$= \frac{1}{256}$$

11. $\left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2} + \left(\frac{1}{5}\right)^{-2} - \left(\frac{1}{6}\right)^{-2}$

As we know $a^{-n} = \frac{1}{a^n}$

$$\frac{1}{\left(\frac{1}{3}\right)^2} + \frac{1}{\left(\frac{1}{4}\right)^2} + \frac{1}{\left(\frac{1}{5}\right)^2} - \frac{1}{\left(\frac{1}{6}\right)^2}$$

$$= 3^2 + 4^2 + 5^2 - 6^2$$

$$= 9 + 16 + 25 - 36$$

$$= 50 - 36$$

$$= 14$$

12

i) 108×192

$$108 = 3 \times 3 \times 3 \times 2 \times 2$$

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

$$192 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$$

$$= 2^5 \times 3^1$$

3		108
3		36
3		12
2		4
2		

3		192
2		64
2		32
2		16
2		8
2		4
2		

$$\begin{aligned} 108 \times 192 &= 2^2 \times 3^3 \times 2^5 \times 3^1 \\ &= 2^{2+5} \times 3^{3+1} \\ &= 2^7 \times 3^4 \end{aligned}$$

ii. 729×64

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

$$64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^6$$

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

$$\begin{array}{r} 3 \overline{) 729} \\ 3 \overline{) 243} \\ 3 \overline{) 81} \\ 3 \overline{) 27} \\ 3 \overline{) 9} \\ 3 \end{array}$$

$$\begin{array}{r} 2 \overline{) 64} \\ 2 \overline{) 32} \\ 2 \overline{) 16} \\ 2 \overline{) 8} \\ 2 \overline{) 4} \\ 2 \overline{) 2} \\ 2 \end{array}$$

iii) 384×147

$$384 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$$

$$= 2^7$$

$$147 = 3 \times 7 \times 7$$

$$= 3 \times 7^2$$

$$384 \times 147 = 2^7 \times 3 \times 7^2$$

$$\begin{array}{r} 3 \overline{) 384} \\ 2 \overline{) 128} \\ 2 \overline{) 64} \\ 2 \overline{) 32} \\ 2 \overline{) 16} \\ 2 \overline{) 8} \\ 2 \overline{) 4} \\ 2 \end{array}$$

$$\begin{array}{r} 3 \overline{) 147} \\ 3 \overline{) 49} \\ 7 \overline{) 7} \\ 7 \end{array}$$

13.

i) $3^3 \times 2^2 + 2^2 \times 5^0$

$$= 3 \times 3 \times 3 \times 2 \times 2 + 2 \times 2 \times 1$$

$$= 108 + 4$$

$$= 112$$

$$= 2 \times 2 \times 2 \times 2 \times 7$$

$$= 2^4 \times 7^1$$

$$\begin{array}{r} 2 \overline{) 112} \\ 2 \overline{) 56} \\ 2 \overline{) 28} \\ 2 \overline{) 14} \\ 7 \end{array}$$

ii) $9^2 + 11^2 - 2^2 \times 3 \times 17^0$

$$2^2 \times 3 \times 17^0 = 4 \times 3 \times 1 = 12$$

$$9^2 = 9 \times 9 = 81$$

$$11^2 = 11 \times 11 = 121$$

$$= 81 + 121 - 12$$

$$= 202 - 12$$

$$= 190.$$

14. i) Let the number multiplied be x

$$\therefore x \times 3^4 = 3^7$$

$$x = \frac{3^7}{3^4}$$

$$x = 3^{7-4}$$

$$x = 3^3 = 3 \times 3 \times 3$$

$$x = 27$$

$\therefore 27$ should be multiplied in order to get 3^7

ii. Let the number multiplied be x .

$$(-6)^{-1} \times x = 10^{-1}$$

$$\frac{1}{-6} \times x = \frac{1}{10}$$

$$x = \frac{-6}{10}$$

$$x = \frac{-3}{5}$$

So, $-\frac{3}{5}$ should be multiplied in order to get 10^{-1} .

$$15. \left(\frac{12}{13}\right)^4 \times \left(\frac{13}{12}\right)^{-8} = \left(\frac{12}{13}\right)^{2x}$$

$$\left(\frac{12}{13}\right)^4 \times \frac{1}{\left(\frac{13}{12}\right)^8} = \left(\frac{12}{13}\right)^{2x}$$

$$\left(\frac{12}{13}\right)^4 \times \left(\frac{12}{13}\right)^8 = \left(\frac{12}{13}\right)^{2x}$$

$$\left(\frac{12}{13}\right)^{4+8} = \left(\frac{12}{13}\right)^{2x}$$

$$\left(\frac{12}{13}\right)^{12} = \left(\frac{12}{13}\right)^{2x}$$

Base equal, exponent should be same

$$2x = 12$$

$$\boxed{x = 6}$$

EXERCISE: 4.3.

1

$$i) 530.7 = 5.307 \times 10^2$$

$$ii) 3908.78 = 3.90878 \times 10^3$$

$$iii) 39087.8 = 3.90878 \times 10^4$$

iv) 2.35, it is a standard form.

$$v) 3,43,000 = 3.43000 \times 10^5$$

$$vi) 70,00,000 = 7.000000 \times 10^6$$

$$vii) 3,18,65,00,000 = 3.186500000 \times 10^9$$

$$viii) 893,000,000 = 8.93000000 \times 10^8$$

$$ix) 70,040,000,000 = 7.0040000000 \times 10^{10}$$

2

$$i) 4.7 \times 10^3 = 4700$$

$$ii) 1.205 \times 10^5 = 120500$$

$$iii) 1.234 \times 10^6 = 1234000$$

$$iv) 4.87 \times 10^7 = 48700000$$

$$v) 6.05 \times 10^8 = 605000000$$

$$vi) 9.083 \times 10^{11} = 908300000000$$

3

i) The distance between earth and the moon is 384,000,000
 $= 3.84 \times 10^8 \text{ m}$

ii) The diameter of sun = 1,400,000,000
 $= 1.4 \times 10^9 \text{ m}$

iii) The universe is estimated to be about 12,000,000,000 years old.
 $= 1.2 \times 10^{10}$ years old.

iv) In a galaxy there are on an average 100,000,000,000 stars
 $= 1.0 \times 10^{11}$ stars

v) The distance of sun from the centre of milky way is
 300,000,000,000,000,000
 $= 3 \times 10^{17} \text{ km}$

vi) A light year is about 9,463,500,000,000 km
 $= 9.4635 \times 10^{12} \text{ km}$

4

i) 4.7×10^{14} ; 3.01×10^{13}

The given numbers are 4.7×10^{14} and 3.01×10^{13} . Note that both the numbers are in standard form.

Since the power of 10 in 4.3×10^{14} is less than power of 10 in 3.01×10^{17} .

$$\therefore 4.3 \times 10^{14} < 3.01 \times 10^{17}.$$

ii. The given numbers are 1.439×10^{12} and 1.4335×10^{12} . Note that both the numbers are in standard form. Also note that both the numbers have same power of 10.

So, we compare their significant.

The significant in 1.439×10^{12} is 1.439 and the significant in 1.4335×10^{12} is 1.4335.

As, $1.439 > 1.4335$, so

$$\therefore 1.439 \times 10^{12} > 1.4335 \times 10^{12}$$

5 i) 279404

$$279404 = 2 \times 100000 + 7 \times 10000 + 9 \times 1000 + 4 \times 100 + 0 \times 10 + 4 \times 1$$

$$= 2 \times 10^5 + 7 \times 10^4 + 9 \times 10^3 + 4 \times 10^2 + 0 \times 10^1 + 4 \times 10^0$$

$$= 2 \times 10^5 + 7 \times 10^4 + 9 \times 10^3 + 4 \times 10^2 + 4 \times 10^0.$$

$$\text{ii) } 3006194 = 3 \times 1000000 + 0 \times 100000 + 0 \times 10000 + 6 \times 1000 + 1 \times 100 + 9 \times 10 + 4 \times 1$$

$$= 3 \times 10^6 + 0 \times 10^5 + 0 \times 10^4 + 6 \times 10^3 + 1 \times 10^2 + 9 \times 10^1 + 4 \times 10^0$$

$$= 3 \times 10^6 + 6 \times 10^3 + 1 \times 10^2 + 9 \times 10^1 + 4 \times 10^0$$

$$\text{iii) } 28061906 = 2 \times 10000000 + 8 \times 1000000 + 0 \times 100000 + 6 \times 10000 + 1 \times 1000 + 9 \times 100 + 0 \times 10 + 6 \times 1$$

$$= 2 \times 10^7 + 8 \times 10^6 + 0 \times 10^5 + 6 \times 10^4 + 1 \times 10^3 + 9 \times 10^2 + 0 \times 10^1 + 6 \times 10^0$$

$$= 2 \times 10^7 + 8 \times 10^6 + 6 \times 10^4 + 1 \times 10^3 + 9 \times 10^2 + 6 \times 10^0$$

6.

$$\text{i) } 3 \times 10^4 + 7 \times 10^2 + 5 \times 10^0$$

$$= 3 \times 10000 + 7 \times 100 + 5 \times 1$$

$$= 30000 + 700 + 5$$

$$= 30705$$

$$\text{ii) } 4 \times 10^5 + 5 \times 10^3 + 3 \times 10^2 + 2 \times 10^0$$

$$= 4 \times 100000 + 5 \times 1000 + 3 \times 100 + 2 \times 1$$

$$= 400000 + 5000 + 300 + 2$$

$$= 405302$$

$$\text{iii) } 8 \times 10^8 + 3 \times 10^4 + 7 \times 10^3 + 5 \times 10^2 + 8 \times 10^1$$

$$= 8 \times 100000000 + 3 \times 10000 + 7 \times 1000 + 5 \times 100 + 80$$

$$= 800000000 + 30000 + 7000 + 500 + 80$$

$$= 80037580$$