

Ex - 14 Decimals :-

Summary :- A decimal consists of two parts: the whole number part and the decimal part, separated by a decimal point.

$$\begin{array}{c} 123 \\ \downarrow \\ \text{whole number part} \end{array} \quad \begin{array}{c} 633 \\ \downarrow \\ \text{Decimal part} \end{array}$$

Revision Ex :-

I Convert the following decimals into fractions.

$$a) 2.25 \Rightarrow \frac{225}{100} \quad b) 6.50 \Rightarrow \frac{650}{100} \quad c) 10.75 \Rightarrow \frac{1075}{100}$$

$$d) 120.125 \Rightarrow \frac{120125}{1000}$$

II Convert the following fractions into decimals.

$$a) 1\frac{1}{2} \Rightarrow \frac{3}{2} \times 10 \Rightarrow 3.2 \quad b) 7\frac{3}{4} \Rightarrow \frac{31}{4} \Rightarrow 31.4$$

$$c) 120\frac{1}{5} \Rightarrow \frac{601}{5} \Rightarrow 260\frac{1}{5} \quad d) 250\frac{1}{4} \Rightarrow \frac{1001}{4} \Rightarrow 1001.4$$

III Convert the following unlike decimals into like decimal

$$a) 63.500, 268.250, 50.625, 1.2, 2.25, 3.175, 5.2$$

$$e) 1.200, 2.250, 3.175, 5.200$$

$$b) 20.5, 28.235, 120.6, 385.55$$

$$e) 20.500, 28.235, 120.600, 385.550$$

IV Convert the following like decimal into unlike decimal.

$$a) 63.500, 268.250, 50.626$$

$$\Rightarrow 63.5, 268.25, 50.626$$

$$b) 42.250, 165.300, 275.350$$

$$\Rightarrow 42.25, 165.3, 275.35$$

V Add the following -

$$a) 12.25, 15.62, 25.55 \quad b) 326.123, 210.6 \text{ and } 632.77$$

$$\Rightarrow \begin{array}{r} 12.25 \\ 15.62 \\ 25.55 \\ \hline 53.42 \end{array}$$

$$\begin{array}{r} 326.123 \\ + 210.600 \\ \hline 536.723 \\ + 632.770 \\ \hline 1169.493 \end{array}$$

$$c) 720.62, 523.690, \text{ and } 120.007$$

$$d) 607.12, 190.657, \text{ and } 1930.425$$

$$\Rightarrow 20.620$$

$$+ 523.690$$

$$120.007$$

$$1364.317$$

$$+ 190.657$$

$$1930.425$$

$$3328.202$$

II Find the Difference.

$$a) 300 - 126.75$$

$$\Rightarrow 173.25$$

$$- 126.75$$

$$173.25$$

$$b) 623.123 - 172.256$$

$$\Rightarrow 450.867$$

$$- 172.256$$

$$450.867$$

$$c) 1987.5 - 928.62$$

$$\Rightarrow 1058.88$$

$$- 928.62$$

$$1058.88$$

$$d) 3485.26 - 2123.135$$

$$\Rightarrow 1362.125$$

$$- 2123.135$$

$$1362.125$$

01-01-25

Ex 4.1

2 Find the product of the following.

$$a) 3.5 \times 10$$

$$\Rightarrow 35.0$$

$$b) 1.33 \times 10$$

$$\Rightarrow 13.3$$

$$c) 2.01 \times 10$$

$$\Rightarrow 20.1$$

$$d) 8.9 \times 100$$

$$\Rightarrow 890.0$$

$$e) 0.2415 \times 100$$

$$\Rightarrow 24.15$$

$$f) 16.17 \times 100$$

$$\Rightarrow 1617.0$$

$$g) 6.123 \times 1000$$

$$\Rightarrow 6123.0$$

$$h) 1.53 \times 1000$$

$$\Rightarrow 1530.0$$

II Find the product of the following.

$$a) 1.5 \times 9$$

$$\Rightarrow 13.5$$

$$b) 1.3 \times 7$$

$$\Rightarrow 9.1$$

$$c) 0.225 \times 13$$

$$\Rightarrow 2.925$$

$$d) 4.9 \times 25$$

$$\Rightarrow 122.5$$

$$e) 1.3 \times 7$$

$$\Rightarrow 9.1$$

$$f) 1.3 \times 7$$

$$\Rightarrow 9.1$$

$$g) 0.225 \times 13$$

$$\Rightarrow 2.925$$

$$h) 4.9 \times 25$$

$$\Rightarrow 122.5$$

$$i) 1.3 \times 7$$

$$\Rightarrow 9.1$$

$$j) 0.225 \times 13$$

$$\Rightarrow 2.925$$

$$c) 19.84 \times 27$$

$$\Rightarrow 19.84 \times 27$$

$$\begin{array}{r} 19.84 \\ \times 27 \\ \hline 13888 \\ 3968+ \\ \hline 535.68 \end{array}$$

$$f) 16.34 \times 9$$

$$\Rightarrow 16.34 \times 9$$

$$\begin{array}{r} 16.34 \\ \times 9 \\ \hline 14706 \\ 9438+ \\ \hline 1099.86 \end{array}$$

$$g) 12.24 \times 6.5$$

$$\Rightarrow 12.24 \times 6.5$$

$$\begin{array}{r} 12.24 \\ \times 6.5 \\ \hline 6120 \\ 7344+ \\ \hline 79.560 \end{array}$$

$$h) 13.25 \times 1.5$$

$$\Rightarrow 13.25 \times 1.5$$

$$\begin{array}{r} 13.25 \\ \times 1.5 \\ \hline 6625 \\ 1325+ \\ \hline 19.875 \end{array}$$

$$i) 19.84 \times 27.9$$

$$\Rightarrow 19.84 \times 27.9$$

$$\begin{array}{r} 19.84 \\ \times 27.9 \\ \hline 17856 \\ 13888+ \\ 53536+ \\ \hline 553.536 \end{array}$$

$$j) 0.235 \times 4.8$$

$$\Rightarrow 0.235 \times 4.8$$

$$\begin{array}{r} 0.235 \\ \times 4.8 \\ \hline 01880 \\ 0940+ \\ \hline 1.1280 \end{array}$$

$$k) 114.2 \times 214$$

$$\Rightarrow 114.2 \times 214$$

$$\begin{array}{r} 114.2 \\ \times 214 \\ \hline 4668 \\ 1142+ \\ 2284+ \\ \hline 24438.8 \end{array}$$

$$l) 3.101 \times 1.007$$

$$\Rightarrow 3.101 \times 1.007$$

$$\begin{array}{r} 3.101 \\ \times 1.007 \\ \hline 21707 \\ 6000+ \\ 0000+ \\ 3101+ \\ \hline 3122.07 \end{array}$$

$$m) 0.427 \times 23.5$$

$$\Rightarrow 0.427 \times 23.5$$

$$\begin{array}{r} 0.427 \\ \times 23.5 \\ \hline 2135 \\ 1281+ \\ 854+ \\ \hline 10.0335 \end{array}$$

$$n) 3.4 \times 1.15 \times 2.2$$

$$\Rightarrow 3.4 \times 1.15 \times 2.2$$

$$\begin{array}{r} 3.4 \\ \times 1.15 \\ \hline 0170 \\ 34+ \\ 34+ \\ \hline 3.910 \end{array}$$

$$\begin{array}{r} 3.910 \\ \times 2.2 \\ \hline 7820 \\ 341+ \\ \hline 8.6020 \end{array}$$

$$o) 6.7 \times 4.4 \times 1.31$$

$$\Rightarrow 6.7 \times 4.4 \times 1.31$$

$$\begin{array}{r} 6.7 \\ \times 4.4 \\ \hline 268 \\ 268+ \\ \hline 29.48 \end{array}$$

$$\begin{array}{r} 29.48 \\ \times 1.31 \\ \hline 2948 \\ 8844+ \\ 2948+ \\ \hline 33.6188 \end{array}$$

$$p) 0.04 \times 0.7 \times 0.02$$

$$\Rightarrow 0.04 \times 0.7 \times 0.02$$

$$\begin{array}{r} 0.04 \\ \times 0.7 \\ \hline 028 \\ 000+ \\ \hline 0.028 \end{array}$$

$$\begin{array}{r} 0.028 \\ \times 0.02 \\ \hline 0000+ \\ 0000+ \\ \hline 0.0056 \end{array}$$

Ex 4.2:-

I Divide the following

a) $34.19 \div 10$
 $\Rightarrow 34.19 \Rightarrow 3.419$

b) $9.69 \div 10$
 $\Rightarrow 9.69 \Rightarrow 0.969$

c) $56.192 \div 10$
 $\Rightarrow 56.192$

d) $13.05 \div 10$

e) $0.01 \div 1000$

f) $0.73 \div 100$

$\Rightarrow 13.05 \Rightarrow 1.305$

$\Rightarrow 0.00001$

$\Rightarrow 4.7426 \Rightarrow 0.0073$

g) $478 \div 100$

h) $100.32 \div 100$

i) $10.01 \div 1000$

$\Rightarrow 4.7925$

$\Rightarrow 1.0032$

$\Rightarrow 0.0101$

j) $167.3 \div 1000$

k) $0.76 \div 1000$

l) $8754.5 \div 1000$

$\Rightarrow 0.1673$

$\Rightarrow 0.00076$

$\Rightarrow 8.7545$

II Find the quotient of the following.

a) $4.9 \div 0.7$

b) $80 \div 1.6$

$\Rightarrow 4.9 \div 0.7$

$\Rightarrow 80 \times \frac{10}{10} \Rightarrow 800$

$\frac{4.9}{0.7} \times \frac{10}{10} \Rightarrow \frac{49.0}{7.0}$

$\Rightarrow 70$

$\Rightarrow \frac{49}{7} \Rightarrow 7$

$\Rightarrow 50$

c) $5.45 \div 0.25$

$\Rightarrow \frac{5.45}{0.25} \times \frac{100}{100} \Rightarrow \frac{545.0}{25.0} \Rightarrow \frac{5450}{25} \Rightarrow 218$

d) $9.69 \div 1.9$

$\Rightarrow \frac{9.69}{1.9} \times \frac{100}{100} \Rightarrow \frac{969}{190} \Rightarrow 5.1$

e) $56.192 \div 3.2$

$\Rightarrow \frac{56.192}{3.2} \times \frac{1000}{1000} \Rightarrow \frac{56192}{3200} \Rightarrow 17.56$

f) $289.6 \div 6.4$

$\Rightarrow \frac{289.6}{6.4} \times \frac{10}{10} \Rightarrow \frac{2896}{64} \Rightarrow 45.25$

g) $0.0102 \div 1.7$

$\Rightarrow \frac{0.0102}{1.7} \times \frac{10000}{10000} \Rightarrow \frac{0.102}{17000} \Rightarrow 0.006$

h) $0.759 \div 0.3$

$\Rightarrow \frac{0.759}{0.3} \times \frac{1000}{1000} \Rightarrow \frac{759}{300} \Rightarrow 2.53$

$$j) 28.395 \div 1.5$$

$$\Rightarrow \frac{28.395 \times 1000}{1500} \Rightarrow \frac{28395}{1500} \Rightarrow 18.93$$

$$j) 2.0484 \div 0.18$$

$$\Rightarrow \frac{2.0484 \times 100}{18} \Rightarrow \frac{204.84}{18} \Rightarrow 11.38$$

$$k) 11.13 \div 0.21$$

$$\Rightarrow \frac{11.13 \times 100}{21} \Rightarrow \frac{1113}{21} \Rightarrow 53$$

$$l) 236.6 \div 0.26$$

$$\Rightarrow \frac{236.6 \times 100}{26} \Rightarrow \frac{23660}{26} \Rightarrow 910$$

30.04.25

Ex 4.3

Convert the units and fill in the blanks.

$$1. 0.39m = \underline{\hspace{2cm}} cm$$

$$\Rightarrow 1m = 100cm$$

$$0.39m = 0.39 \times 100$$

$$= 39cm$$

$$2. 5km = \underline{\hspace{2cm}} cm$$

$$\Rightarrow 1km = 1000m$$

$$5km = 5000m$$

$$1m = 100cm$$

$$5000m = 5000 \times 100cm$$

$$\Rightarrow 500,000cm$$

$$3. 5m 60cm = \underline{\hspace{2cm}} cm$$

$$\Rightarrow 1m = 100cm$$

$$5m = 5 \times 100cm = 500cm$$

$$\therefore 500cm + 60cm$$

$$4. 165 \text{ mm} = \underline{\hspace{2cm}} \text{ m}$$

$$\Rightarrow 1 \text{ mm} = \frac{1}{1000} \text{ m}$$

$$165 \text{ mm} = \frac{165}{1000} \text{ m}$$

$$0.165 \text{ m}$$

$$8.075 \text{ km} = \underline{\hspace{2cm}} \text{ m}$$

$$\Rightarrow 1 \text{ km} = 1000 \text{ m}$$

$$8.075 \text{ km} = 8.075 \times 1000 \text{ m}$$

$$8075 \text{ m}$$

$$9.725 \text{ mL} = \underline{\hspace{2cm}} \text{ L}$$

$$\Rightarrow 1 \text{ mL} = \frac{1}{1000} \text{ L}$$

$$9.725 \text{ mL} = 9.725 \times 1000 \text{ L}$$

$$\Rightarrow 1 \text{ mL} = \frac{1}{100} \text{ L}$$

$$725 \text{ mL} = \frac{725}{1000} \text{ L}$$

$$0.725 \text{ L}$$

$$6. 8.73 \text{ Kg} = \underline{\hspace{2cm}} \text{ g}$$

$$\Rightarrow 1 \text{ Kg} = 1000 \text{ g}$$

$$8.73 \text{ Kg} = 8.73 \times 1000$$

$$\Rightarrow 8730 \text{ g}$$

$$10.3 \text{ g} = 20 \text{ mg}$$

$$\Rightarrow 1 \text{ g} = 1000 \text{ mg}$$

$$3 \text{ g} = 3 \times 1000 \text{ mg}$$

$$3000 \text{ mg} + 20 \text{ mg}$$

$$3020 \text{ mg}$$

$$7. 73 \text{ m} = \underline{\hspace{2cm}} \text{ cm}$$

$$\Rightarrow 1 \text{ m} = 100 \text{ cm}$$

$$73 \text{ m} = 73 \times 100 \text{ cm}$$

$$\Rightarrow 7300 \text{ cm}$$

$$11.7 \text{ KL} = \underline{\hspace{2cm}} \text{ L}$$

$$\Rightarrow 1 \text{ KL} = 1000 \text{ L}$$

$$11.7 \text{ KL} = 11.7 \times 1000 \text{ L}$$

$$11700 \text{ L}$$

$$12. 0.35 \text{ m} = \underline{\hspace{2cm}} \text{ mm}$$

$$\Rightarrow 1 \text{ m} = 1000 \text{ mm}$$

$$0.35 \text{ m} = 0.35 \times 1000 \text{ mm}$$

$$350 \text{ mm}$$

$$\text{Ex 4.4}$$

1) The product of two decimal numbers is 131.58

If one of them is 2.15, find the other.

2) Given,

Product of 2 numbers = 131.58

One of the numbers = 2.15

Let the other no = x

$$\therefore x \times 2.15 = 131.58$$

$$2.15x = 131.58$$

$$x = \frac{131.58}{2.15}$$

$$x = \frac{131.58 \times 100}{2.15} = \frac{13158}{2.15}$$

$$\Rightarrow 612$$

2. The price of one metre of cloth is ₹ 62.85.
Find the price of 23 metres of cloth.

⇒ Given,

Price of one metre of cloth = ₹ 62.85

∴ Price of 23 metres of cloth

$$= 62.85 \times 23$$

$$= ₹ 1445.55$$

3. A pile of books is 54.4 cm high. If each book is 3.2 cm thick, how many books are there in the pile?

⇒ Given

Pile of books = 54.4 cm

Thickness of each book = 3.2 cm

Total no. of books in a pile = $\frac{54.4}{3.2}$

$$= \frac{54.4 \times 10}{3.2} = \frac{544}{32} = 17$$

4. A shirt requires 2.7 m of cloth. How many such shirts can be made from a piece of cloth of 40.5 m length?

⇒

Total quantity of cloth = 40.5 m
Total length of cloth required to stitch each shirt = 2.7 m

∴ Total shirts that can be stitched using the total length of cloth = $\frac{40.5}{2.7}$ m

$$= \frac{1405^{15}}{2.7} = 15$$

$$= \frac{40.5}{2.7} \times \frac{10}{10}$$

5. Shubham saves 0.2 part of his salary every month. If his monthly salary is ₹ 55,000, how much will he save in one year?

⇒

Monthly salary of Shubham = ₹ 55,000

He saves 0.2 part of his salary every month

$$\text{i.e. } 55000 \times \frac{2}{10}$$

$$= ₹ 11000 \text{ per month}$$

$$\therefore \text{Total amount saved in 1 year} = ₹ 11000 \times 12$$

$$= ₹ 132000$$

2. The price of one metre of cloth is ₹ 62.85.
Find the price of 23 metres of cloth.

⇒ Given,

Price of one metre of cloth = ₹ 62.85

∴ Price of 23 metres of cloth

$$= 62.85 \times 23$$

$$= ₹ 1445.55$$

3. A pile of books is 54.4 cm high. If each book is 3.2 cm thick, how many books are there in the pile?

⇒ Given

Pile of books = 54.4 cm

Thickness of each book = 3.2 cm

Total no. of books in a pile = $\frac{54.4}{3.2}$

$$= \frac{54.4}{3.2} \times \frac{10}{10} = \frac{544}{32} = 17$$

4. A shirt requires 2.7 m of cloth. How many such shirts can be made from a piece of cloth of 40.5 m length?

⇒ Total quantity of cloth = 40.5 m

Total length of cloth required to stitch each shirt = 2.7 m

∴ Total shirts that can be stitched using the total length of cloth = $\frac{40.5}{2.7}$

$$= \frac{40.5}{2.7} \times \frac{10}{10}$$

$$= \frac{405}{27} = 15$$

5. Shubham saves 0.2 part of his salary every month. If his monthly salary is ₹ 55,000, how much will he save in one year?

⇒ Monthly salary of Shubham = ₹ 55,000

He saves 0.2 part of his salary every month

$$\text{i.e. } 55000 \times \frac{2}{10}$$

$$= ₹ 11000 \text{ per month}$$

$$\therefore \text{Total amount saved in 1 year} = ₹ 11000 \times 12$$

$$= ₹ 132000$$

6. If 1 m is equal to 39.37 inches, how many inches will be equal to 16 m?

$$\begin{array}{r} \text{m} \\ 1 \quad \times \quad 39.37 \\ 16 \quad \times \quad x \end{array}$$

$$\therefore 1 \times x = 16 \times 39.37$$

$$x = 16 \times 39.37 \Rightarrow 629.92$$

7. A school purchased 15 steel chairs for ₹ 1706.25. Find the cost of one steel chair.

$$\Rightarrow \text{cost of 15 steel chairs} = 1706.25 \text{ Rs}$$

$$\therefore \text{cost of 1 steel chair} = \frac{1706.25}{15}$$

$$\Rightarrow 113.75$$

8. How much would a dozen oranges cost if the price of one orange is ₹ 6.45?

$$\Rightarrow \text{No. of oranges} = \text{cost (Rs)}$$

$$\begin{array}{r} 1 \quad \times \quad 6.45 \\ 12 \quad \times \quad x \end{array}$$

$$\therefore 1 \times x = 6.45 \times 12$$

$$x = 6.45 \times 12 \Rightarrow ₹ 77.40$$

9. In a school, 0.4 part of the total number of the students is boys and the number of girls is 360. Find the number of boys in the school.

$$\Rightarrow \text{Let total no. of students} = x$$

$$\begin{array}{l} \text{Boys} = 0.4x \\ \text{girls} = 360 \end{array}$$

$$\therefore x = 0.4x + 360$$

$$x - 0.4x = 360$$

$$0.6x = 360$$

$$x = \frac{360}{0.6}$$

$$x = \frac{360 \times 10}{0.6 \times 10} \Rightarrow \frac{3600}{6} = 600$$

$$x = 600$$

$$\text{Total no. of boys} = 600$$

$$- 360$$

$$\underline{240}$$

10. The total 43 bags of cement weigh 4106.25 kg. Find the weight of 100 such bags of cement.

$$\Rightarrow \text{Cement weight}$$

$$\Rightarrow 43 \times x = 4106.25$$

$$\Rightarrow x = \frac{4106.25}{43}$$

$$\begin{array}{r} 43 \quad \times \quad 4106.25 \\ 100 \quad \times \quad x \end{array}$$

$$43x = 4106.25$$

$$\Rightarrow x = 95.625$$

11. A bus takes 4.5 hours to cover the distance of 180 km between Delhi and Roankee. How much time will it take to cover a distance of 280 km?

$$\Rightarrow$$

Time	Distance
4.5	180
x	280

$$\Rightarrow x \times 180 = 4.5 \times 280$$

$$180x = 12600$$

$$x = \frac{12600}{180}$$

$$x = \frac{600}{10} = 60$$

$$40 \quad 30$$

$$x = \frac{2500}{30} = 83.33$$

3

12. The thickness of 12 sheets of paper is 2.16 mm. Find the thickness of 1 sheet of paper.

$$\Rightarrow$$

Thickness	Sheet
2.16	12
x	1

$$\Rightarrow x \times 12 = 2.16 \times 1$$

$$\Rightarrow 12x = 2.16$$

$$x = \frac{2.16}{12}$$

$$= 0.18 \text{ mm}$$

Exponents and Powers

SUMMARY :-

Repeated multiplication - action of a number of the Product	Exponential form	Base	Exponent
$2 \times 2 \times 2 \times 2$	2^4	2	4
$5 \times 5 \times 5$	5^3	5	3
$6 \times 6 \times 6 \times 6 \times 6$	6^5	6	5
7×7	7^2	7	2
$a \times a \times \dots \times a$ m times	a^m	a	m

From the table, we conclude that, if a is a rational number and m is a positive integer, then $a \times a \times a \times \dots \times a$ m times = a^m (m^{th} power of a).

Here ' a ' is called the base and ' m ' is called the exponent or index.

Numbers expressed using exponents are called powers.

In the exponential form, the number which

is repeatedly multiplied is called the base and the number of times it is multiplied is called the base and the number of times it is multiplied is called the exponent or index. This ~~notation~~ notation of a rational number by itself several times is called the exponential notation.

Law of Exponents :-

Law 1:- $x^a \times x^b = x^{a+b}$

Law 2:- $x^a \div x^b = x^{a-b}$, when $a > b$
 $x^a \div x^b = \frac{1}{x^{b-a}}$, when $b > a$

Law 3:- $x^{-a} = \frac{1}{x^a}$

Law 4:- $x^a \times y^a = (xy)^a$
 $x^a \div y^a = \left(\frac{x}{y}\right)^a$

Law 5:- $(x^a)^b = x^{ab}$

Law 6:- $x^0 = 1$

Law 7:- $x^1 = x$

Find the base and exponent of the following exponential notations:

a) $(-7)^9$

$\Rightarrow$ $9 \rightarrow$ Power
 $-7 \rightarrow$ Base

b) $(-25)^3$

$\Rightarrow$ $3 \rightarrow$ Power
 $-25 \rightarrow$ Base

c) $(-15)^{-4}$

$\Rightarrow$ $-4 \rightarrow$ Power
 $-15 \rightarrow$ Base

d) $(32)^{-8}$

$\Rightarrow$ $-8 \rightarrow$ Power
 $32 \rightarrow$ Base

Find the value of the following:-

a) $(-12)^2$

$\Rightarrow -12 \times -12$
 $\underline{\underline{144}}$

b) 6^3

$\Rightarrow 6 \times 6 \times 6$
 $\underline{\underline{216}}$

c) $(-7)^3$

$\Rightarrow -7 \times -7 \times -7$
 $\underline{\underline{-343}}$

d) $10 \times 10 \times 10$
 $\underline{\underline{1000}}$

e) 4^4

$\Rightarrow 4 \times 4 \times 4 \times 4$
 $\underline{\underline{256}}$

f) 5^4

$\Rightarrow 5 \times 5 \times 5 \times 5$
 $\underline{\underline{625}}$

g) $(-8)^4 \Rightarrow -8 \times -8 \times -8 \times -8$

$\Rightarrow 4096$

h) $(-3)^5 \Rightarrow -3 \times -3 \times -3 \times -3 \times -3$

$\Rightarrow -243$

Simplify the following:-

a) $\left[\frac{13}{15}\right]^2 \Rightarrow \frac{13}{15} \times \frac{13}{15} \Rightarrow \frac{169}{225}$

b) $\left[\frac{-5}{7}\right]^3 \Rightarrow \frac{-5}{7} \times \frac{-5}{7} \times \frac{-5}{7} \Rightarrow -\frac{125}{343}$

c) $\left[\frac{1}{3}\right]^4 \Rightarrow \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} \Rightarrow \frac{1}{81}$

d) $\left[\frac{-3}{5}\right]^4 \Rightarrow \frac{-3}{5} \times \frac{-3}{5} \times \frac{-3}{5} \times \frac{-3}{5} \Rightarrow \frac{81}{625}$

e) $\left[\frac{6}{7}\right]^4 \Rightarrow \frac{6}{7} \times \frac{6}{7} \times \frac{6}{7} \times \frac{6}{7} \Rightarrow \frac{1296}{2401}$

f) $\left[\frac{-3}{5}\right]^5 \Rightarrow \frac{-3}{5} \times \frac{-3}{5} \times \frac{-3}{5} \times \frac{-3}{5} \times \frac{-3}{5} \Rightarrow -\frac{243}{3125}$

Convert the following into exponential notation.

a) $\frac{-8}{27} \Rightarrow \frac{-2 \times -2 \times -2}{3 \times 3 \times 3} \Rightarrow \left[\frac{-2}{3}\right]^3$

$$h) \frac{49}{81} \Rightarrow \frac{7 \times 7}{9 \times 9} \Rightarrow \left[\frac{7^2}{9} \right]$$

$$c) \frac{1}{26} \Rightarrow \frac{1 \times 1 \times 1}{6 \times 6 \times 6} \Rightarrow \left[\frac{1}{6} \right]^3$$

$$d) \frac{8}{125} \Rightarrow \frac{2 \times 2 \times 2}{5 \times 5 \times 5} \Rightarrow \left[\frac{2}{5} \right]^3$$

$$e) \frac{25}{100} \Rightarrow \frac{5 \times 5}{10 \times 10} \Rightarrow \left[\frac{5}{10} \right]^2$$

$$f) \frac{49}{144} \Rightarrow \frac{7 \times 7}{12 \times 12} \Rightarrow \left[\frac{7}{12} \right]^2$$

$$g) \frac{-32}{243} \Rightarrow \frac{-2 \times -2 \times -2 \times -2 \times -2}{3 \times 3 \times 3 \times 3 \times 3} \Rightarrow \left[\frac{-2}{3} \right]^5$$

$$h) \frac{625}{2401} \Rightarrow \frac{5 \times 5 \times 5 \times 5}{7 \times 7 \times 7 \times 7} \Rightarrow \left[\frac{5}{7} \right]^4$$

Express the following as a single exponent.

$$a) b^2 \times b^3$$

$$\Rightarrow a=b, m=2, n=3 \Rightarrow a^m \times a^n \Rightarrow b^2 \times b^3 \Rightarrow b^5$$

$$b) a^3 \times a^2 \times a$$

$$\Rightarrow a^m \times a^n \times a^p, m=3, n=2, p=1 \Rightarrow a^m \times a^n \times a^p \Rightarrow a^6$$

$$c) a^3 \times a^5$$

$$\Rightarrow a^m \times a^n, m=3, n=5 \Rightarrow a^m \times a^n \Rightarrow a^8$$

$$d) (-1)^2 \times (-1)^3$$

$$\Rightarrow a^{-m} \times a^{-n}, m=2, n=3 \Rightarrow a^{-m} \times a^{-n} \Rightarrow a^{-5}$$

$$e) \left[\frac{12}{13} \right]^4 \times \left[\frac{12}{13} \right]^5$$

$$\Rightarrow a^m \times a^n, m=4, n=5 \Rightarrow a^m \times a^n \Rightarrow a^9$$

$$f) \left[\frac{-2}{3} \right]^3 \times \left[\frac{-2}{3} \right]^4$$

$$\Rightarrow a^m \times a^n, m=3, n=4 \Rightarrow a^m \times a^n \Rightarrow a^7$$

Write the following by simplifying the exponents.

$$a) (4^3)^2$$

$$\Rightarrow (a^m)^n, m=3, n=2$$

$$(a^m)^n \Rightarrow a^{mn}$$

$$\Rightarrow (4^3)^2 \Rightarrow 4^6$$

$$b) [(-3)^5]^4$$

$$\Rightarrow (a^m)^n, m=5, n=4$$

$$(a^m)^n \Rightarrow a^{mn}$$

$$\Rightarrow [(-3)^5]^4 \Rightarrow (-3)^{20}$$

$$b) \frac{49}{81} \Rightarrow \frac{7 \times 7}{9 \times 9} \Rightarrow \left[\frac{7}{9} \right]^2$$

$$c) \frac{1}{216} \Rightarrow \frac{1 \times 1 \times 1}{6 \times 6 \times 6} \Rightarrow \left[\frac{1}{6} \right]^3$$

$$d) \frac{8}{125} \Rightarrow \frac{2 \times 2 \times 2}{5 \times 5 \times 5} \Rightarrow \left[\frac{2}{5} \right]^3$$

$$e) \frac{25}{100} \Rightarrow \frac{5 \times 5}{10 \times 10} \Rightarrow \left[\frac{5}{10} \right]^2$$

$$f) \frac{49}{144} \Rightarrow \frac{7 \times 7}{12 \times 12} \Rightarrow \left[\frac{7}{12} \right]^2$$

$$g) \frac{-32}{243} \Rightarrow \frac{-2 \times -2 \times -2 \times -2 \times -2}{3 \times 3 \times 3 \times 3 \times 3} \Rightarrow \left[\frac{-2}{3} \right]^5$$

$$h) \frac{625}{2401} \Rightarrow \frac{5 \times 5 \times 5 \times 5}{7 \times 7 \times 7 \times 7} \Rightarrow \left[\frac{5}{7} \right]^4$$

Express the following as a single exponent.

a) $b^2 \times b^3$

$\Rightarrow a^2 \cdot b, m=2, n=3 \Rightarrow a^m \cdot a^n \Rightarrow b^2 \times b^3 \Rightarrow b$

b) $a^3 \times a^2 \times a$

$\Rightarrow a \cdot a, m=3, n=2 \Rightarrow a^m \cdot a^n \Rightarrow a^3 \times a^2 \Rightarrow a^5$
 $\Rightarrow a^6 \times a \Rightarrow a=a, m=6, n=1 \Rightarrow a^m \cdot a^n \Rightarrow a^7$

c) $a^3 \times a^5$

$\Rightarrow a^2 \cdot a, m=3, n=5 \Rightarrow a^m \cdot a^n \Rightarrow a^3 \times a^5 \Rightarrow a^8$

d) $(-1)^2 \times (-1)^3$

$\Rightarrow a^2 \cdot a^{-1}, m=2, n=3 \Rightarrow a^m \cdot a^n \Rightarrow (-1)^2 \times (-1)^3 \Rightarrow -1$

e) $\left[\frac{12}{13} \right]^4 \times \left[\frac{12}{13} \right]^5$

$\Rightarrow a^{-12}, m=4, n=5 \Rightarrow a^m \cdot a^n \Rightarrow \frac{12^4}{13^4} \times \frac{12^5}{13^5}$

f) $\left[\frac{-2}{3} \right]^3 \times \left[\frac{-2}{3} \right]^4$

$\Rightarrow a^{-2}, m=3, n=4 \Rightarrow a^m \cdot a^n \Rightarrow \frac{-2^3}{3^3} \times \frac{-2^4}{3^4}$

Write the following by simplifying the exponents.

a) $(4^3)^2$

b) $[(-3)^3]^4$

$\Rightarrow x^4 = 4, x^3 = 3, b=2$

$(x^a)^b \Rightarrow x^{ab}$

$\Rightarrow (4^3)^2 \Rightarrow 4^6$

$\Rightarrow [(-3)^3]^4 \Rightarrow (-3)^{12}$

$$c) (a^3)^4$$

$$\Rightarrow x=a, a=3, b=4$$

$$(x^a)^b \Rightarrow x^{ab}$$

$$(a^3)^4 \Rightarrow a^{12}$$