Calculating Powers

There is a short way of writing repeated multiplication by the same number :

	How you write it	How you say it
3x3	3^2	3 to the power 2 usually called 3 squared
3x3x3	3^3	3 to the power 3 usually called 3 cubed
3x3x3x3	3^4	3 to the power 4 usually called 3 to the fourth

Exercise 1 Find the value of these powers :

5^2 =.....

2^3 =.....

10^5 =.....

5^3 =.....

3^4 =.....

1^7 =.....

10^6 =.....

Multiplying powers of the same number

Sometimes you need to write the product of two or more powers of a number as a single power of the same number.

Example :

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

Exercise 2 Write these expressions as a single power of the number :

$2^2 \times 2^2 =$.....

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

$7^2 \times 7^8 =$.....

$13^2 \times 13 =$.....

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

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

Dividing powers of the same number

You can use a similar method when you divide one power of a number by another power of the same number

Example $\frac{5^6}{5^2}=\frac{5\times5\times5\times5\times5\times5}{5\times5}=5\times5\times5\times5=5^4$

Exercise 3 Write these expressions as a single power of the number :

$\frac{3^5}{3^3}=$.....

$\frac{7^6}{7^3}=$.....

$\frac{13^4}{13^3}=$.....

$\frac{17^3}{17^3}=$.....

Raising a power of a number to a further power

Example
$(2^4)^3=(2\times2\times2\times2)\times(2\times2\times2\times2)\times(2\times2\times2\times2)=2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2=2^{12}$

Exercise 4 Simplify these expressions by writing as a single power of the number

$(3^2)^2=$.....

$(5^3)^2=$.....

$(5^2)^3=$.....

$(7^3)^4=$.....

Exercise 5 Multiplying different numbers to the same power

Example
$3^2\times5^2=3\times3\times5\times5=3\times5\times3\times5=15\times15=15^2$

$3^2\times2^2=$.....

$5^3\times2^3=$.....

$3^4\times10^4=$.....

Powers of ten

Write as a power of ten and as a decimal number

$10^5 \times 10^4 =$.....

$10^3 \times 10^2 \times 10 =$.....

$\frac{10^6}{10^4} =$.....

$\frac{10^7}{10^6} =$.....

$\frac{10^5}{10^5} =$.....

$\frac{10^5}{10^6} =$.....

$\frac{10^3}{10^5} =$.....

$\frac{10^3}{10^{10}} =$.....

$10^6 \times 10^6 =$.....

$\frac{10^5 \times 10^4}{10^3} =$.....

$\frac{10^3 \times 10^4}{10^5 \times 10^2} =$.....

$\frac{10^2 \times 10^3}{10^4 \times 10^2} =$.....

$\frac{(10^3)^2}{10^2 \times 10^2} =$.....

$\frac{(10^2)^2}{(10^3)^3} =$.....

Write as decimal number

$10^5 =$.....	$10^3 =$.....	$10^9 =$.....	$10^1 =$.....
$10^0 =$.....	$10^{-1} =$.....	$10^{-2} =$.....	$10^{-5} =$.....