Exponents

Laws of exponents

1. Use a calculator to complete the following two tables.

3^1	3^2	3^3	3^4	3^5		3^7	3^8
				243	729	2 187	6 561

	5^2	5^3	5^4		5^6		
5				3 125	15 625	78 125	390 625

Tip

Calculate each power individually before performing any operation.
$4^2 + 2^3 = 16 + 8 = 24$

2. Use the answers in Question 1 to complete the following:
The first one has been done for you.

a) $3^2 \times 3^3 = 3^5 = 9 \times 27 = 243 = 3^5$

b) $5^4 + 5^1 =$ ____ $=$ ____

c) $5^6 \div 5^2 = 15\,625 \div$ ____ $=$ ____ $= 5$ ____

d) $3^6 - 3^2 =$ ____ $=$ ____

e) $5^4 \times 5^2 =$ ____ $=$ ____ $=$ ____

f) $3^7 \div 3^5 =$ ____ $=$ ____ $=$ ____

g) $5^6 - 5^3 =$ ____ $=$ ____

h) $3^4 + 3^5 =$ ____ $=$ ____

3. Now fill in = or ≠.

a) $7^5 + 7^3$ ____ 7^8

b) $2^9 - 2^5$ ____ 2^4

c) $5^{12} \times 5^8$ ____ 5^{20}

d) $3^{10} \div 3^6$ ____ 3^4

e) $a^5 + a^3$ ____ a^8

f) $b^9 - b^5$ ____ b^4

g) $c^{12} \times c^8$ ____ c^{20}

h) $d^{10} \div d^6$ ____ d^4

4. Complete the calculations. Tick each correct conclusion with a [✓]. Draw big crosses through the incorrect conclusions.

	Calculations	Conclusion
a)	$(3^4)^2 =$ ____ $\times$ ____ $= 81 \times 81 = 6\,561$	$(3^4)^2 = 3^8$
b)	$(5^2)^3 = (5^2) \times (5^2) \times (5^2) =$ ____ $\times$ ____ $\times$ ____ $= 15\,625$	$(5^2)^3 = 5^5$
c)	$(3 \times 5)^3 = ($____ $\times$ ____$) \times ($____ $\times$ ____$) \times ($____ ____ ____$)$ $= 3 \times 3 \times 3 \times 5 \times 5 \times 5$	$(3 \times 5)^3 = 3^3 \times 5^3$
d)	$(5 + 3)^3 = (5 + 3) \times (5 + 3) \times (5 + 3)$ $= 8$ ____ ____ ____ ____	$(5 + 3)^3 = 5^3 + 3^3$

5. Now fill in = or ≠.

a) $(12^4)^6$ ____ 12^{24}

b) $(7 \times 19)^5$ ____ $7^5 \times 19^5$

c) $(7 + 9)^5$ ____ $7^5 + 9^5$

d) $(x^4)^6$ ____ x^{24}

e) $(y \times z)^5$ ____ $y^5 \times z^5$

f) $(x + y)^5$ ____ $x^5 + y^5$

Exponents

Calculations; scientific notation

Reminder

$a^b.a^c = a^{b+c}$ $\quad (ad)^b = a^b.d^b$

$a^b \div a^c = a^{b-c}$ $\quad a^0 = 1$

$(a^b)^c = a^{bc}$

1. Simplify. (Leave answers in exponential form if possible.)

a) $(12^4)^{10} =$

b) $17^{15} \div 17^8 =$

c) $210^0 =$

d) $5^2 + 5^3 =$

e) $21^8 \div 21^8 =$

f) $3^{12} \times 3^8 \times 3^5 =$

g) $(5 \times 11 \times 17)^6 =$

h) $-1 \times (6^5)^8 =$

i) $11^8 \div 11^3 =$

j) $-8 \times 24^0 =$

k) $2^6 - 2^3 =$

l) $7^2 \times 5^3 \times 7^4 \times 5 =$

2. Simplify to show the difference between:

a) $(5 + 1)^3$ and $5^3 + 1^3$

b) $\sqrt{36 + 64}$ and $\sqrt{36} + \sqrt{64}$

3. Complete the table.

	City and country	Population in ordinary notation	Population in scientific notation
a)	Madrid, Spain	3 233 527	
b)	Ngerulmud, Palau		$3{,}91 \times 10^2$
c)	Asuncion, Paraguay	520 722	
d)	Tokyo, Japan		$3{,}712\,6 \times 10^7$
e)	Vaduz, Liechtenstein	5 248	
f)	Mbabane, Swaziland		$8{,}159\,4 \times 10^4$

http://www.worldatlas.com/capcitys.htm#.Ud_xA2diYTB

4. Arrange the cities in Question 3 in ascending order according to their population.

5. Nelly inherited R$1{,}23 \times 10^5$. She spent R$9{,}95 \times 10^3$ on a laptop and bought a car for R$4{,}87 \times 10^4$. How much money is left? (Write the answer in ordinary notation and in scientific notation.)