POWERS AND EXPONENTS

A **factor** is one of at least 2 numbers multiplied together to create a product.

A **power** represents a factor being multiplied repeatedly. The **base** of a power is the repeated factor and the **exponent** is the number of times the factor is repeated.

Power: $2^4 = 2 \cdot 2 \cdot 2 \cdot 2 = 16$ (exponent; base; means multiplication)

"2 to the fourth power"

How do you say…

4^2? 4 squared

8^3? 8 cubed

Write the power as a product of the same factor.

a) $3^5 =$ 3·3·3·3·3

b) $6^8 =$ 6·6·6·6·6·6·6·6

c) $11^4 =$ 11·11·11·11

d) $m^3 =$ m·m·m

Write the following products as a power using exponents.

a) $7 \cdot 7 \cdot 7 \cdot 7 =$ 7^4

b) $12 \cdot 12 \cdot 12 \cdot 12 \cdot 12 \cdot 12 \cdot 12 =$ 12^7

c) $9.2 \cdot 9.2 \cdot 9.2 \cdot 9.2 \cdot 9.2 =$ 9.2^5

d) $p \cdot p \cdot p \cdot p \cdot p \cdot p \cdot p \cdot p \cdot p \cdot p =$ p^{10}

Write in standard form.

1) $12^2 =$ 144 (12·12)

2) $1^{10} =$ 1 (1·1·1·1·1·1·1·1·1·1; 1# = 1)

3) $8^1 =$ 8 (# ¹ = #)

4) $5^3 =$ 125 (5·5·5)

5) $4^4 =$ 256 (4·4·4·4; 16·16)

6) $0^{19} =$ 0

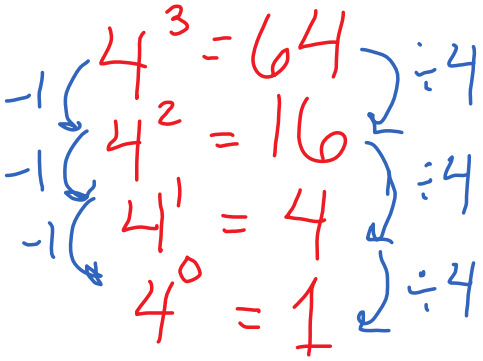
7) $1.1^3 =$ 1.331 (1.1(1.1)(1.1); 1.21(1.1); 121 × 11 = 1210 + 121 = 1331)

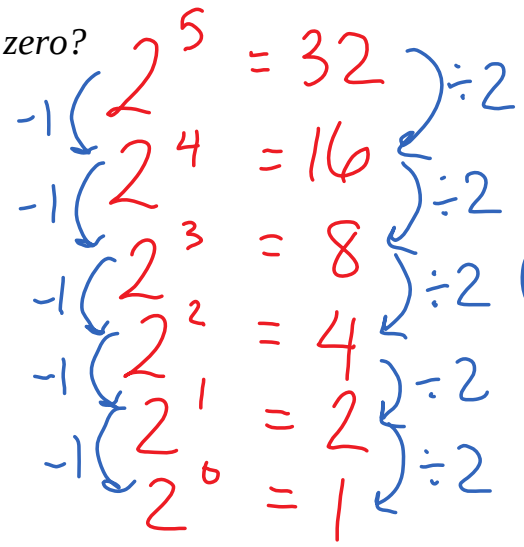
8) $(\frac{2}{3})^4 =$ $\frac{16}{81}$ ($\frac{2}{3} \cdot \frac{2}{3} \cdot \frac{2}{3} \cdot \frac{2}{3}$; 9; 9)

9) $21^2 =$ 441 (21 × 21 = 21 + 420 = 441)

What if a power has an exponent of zero?

Example: 4^0





Simplifying Expressions using Powers

a) $7 \cdot 7 \cdot 7 \cdot 7 + 8 \cdot 8 \cdot 8 =$ $7^4 + 8^3$

b) $4 \cdot 4 \cdot 9 \cdot 9 \cdot 9 =$ $4^2 \cdot 9^3$

c) $10 \cdot 10 \cdot 10 \cdot 11 \cdot 12 \cdot 12 =$ $10^3 \cdot 11 \cdot 12^2$

d) $5 \cdot 5 \cdot 5 + (6 \cdot 6 + 6) =$ $5^3 + (6^2 + 6)$

***Now you try!* Simplify each expression using powers.**

1) $3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 7 \cdot 7 \cdot 7 =$ $3^5 \cdot 7^3$

2) $8 \cdot 8 + 2 \cdot 2 \cdot 2 \cdot 2 =$ $8^2 + 2^4$

3) $9 \cdot 9 \cdot 9 + 9 \cdot 7 + 6 \cdot 6 \cdot 6 =$ $9^3 + 9 \cdot 7 + 6^3$

4) $5(2 \cdot 2 + 2) \cdot 4 \cdot 4 \cdot 4 =$ $5(2^2 + 2) \cdot 4^3$