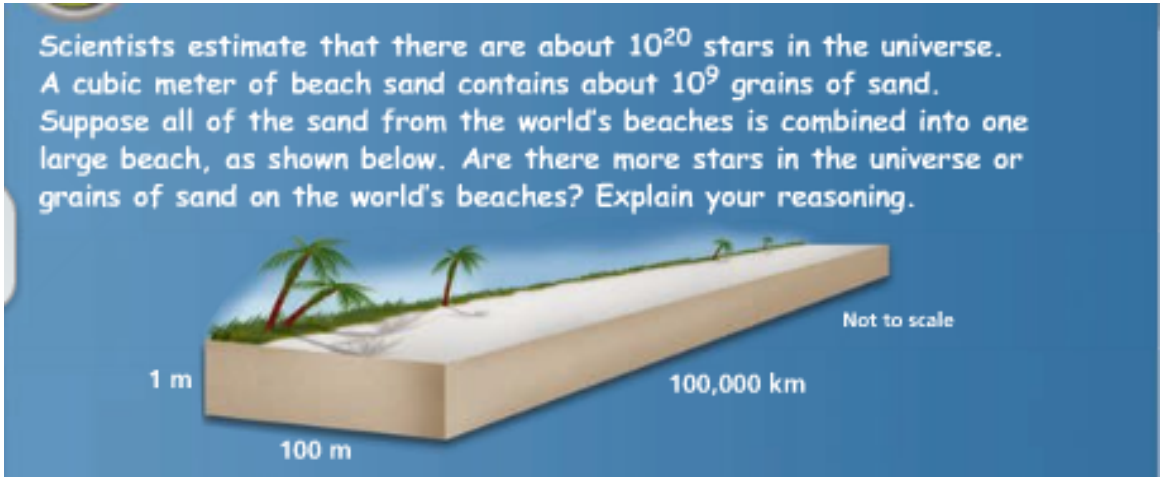
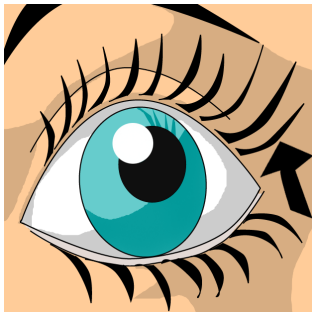
7-3
Multiplying Powers with the Same Base

Eye Opener





Rewrite each expression using exponents.

$t \cdot t \cdot t \cdot t \cdot t \cdot t \cdot t$

$5 \cdot 5 \cdot 5 \cdot s \cdot s \cdot s$

$(6 - m)(6 - m)(6 - m)$

$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot x \cdot x \cdot x$

$(r + 2)(r + 2)(r + 2)(r + 2)$

$8 \cdot 8 \cdot (x - 1)(x - 1)(x - 1)$

t^7

$5^3 s^3 = 125 s^3$

$(6-m)^3$

$2^5 x^3$

$32x^3$

$(r+2)^4$

$8^2 (x-1)^3$

$64(x-1)^3$

Essential Understanding

You can use a property of exponents to multiply powers with the same base.

You can write a product of powers with the same base using one exponent.

take note

Property Multiplying Powers With the Same Base

Words To multiply powers with the same base, add the exponents.

Algebra $a^m \cdot a^n = a^{m+n}$, where $a \neq 0$ and m and n are integers

Examples $4^3 \cdot 4^5 = 4^{3+5} = 4^8$ $b^7 \cdot b^{-4} = b^{7+(-4)} = b^3$

RULE:

$x^a * x^b =$ x^{a+b}

$x^7 * x^{23} =$ x^{30}

$x^5 * x^{-5} =$ $x^0 = 1$

$x^{-10} * x^7 =$ $x^{-3} = \frac{1}{x^3}$

$x^{-4} * x^{-3} =$ $x^{-7} = \frac{1}{x^7}$

RULE:

$x^a \div x^b = x^{a-b}$

$\frac{x^4}{x^2} = x^2$

$\frac{x^3}{x^5} = x^{-2} = \frac{1}{x^2}$

$x^{-2}y^3 = \frac{y^3}{x^2}$

RULE: $x^0 =$ 1

$3^0 =$ 1

$\frac{x^5}{x^5} =$ 1

$\frac{3x^0y^2}{y^2} =$ 3

RULE: $x^{-b} = \frac{1}{x^{b}}$

$x^{-3} = \frac{1}{x^{3}}$

$\frac{1}{x^{-4}} = x^{4}$

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

$11^4 * 11^3 =$ 11^7

$5^{-2} * 5^2 =$ 1

$1x^1 * 1x^2 * 1x^4 =$ $1x^7$

$2x^3 * 3x^5 * -4x^{-2} =$ $-24x^6$

$-m^2 * 4r^3 * 12r^{-4} * 5m =$ $\frac{-240m^3}{r}$

$(-1 \times 4 \times 12 \times 5)$

$(m^2 \times m)$

$(r^3 \times r^{-4})$

$\frac{-240m^3}{r}$

$(5x^5)(3y^6)(3x^2) =$ $45x^7y^6$ $(5 \times 3 \times 3)(x^5)(x^2)(y^6)$

$m^{-4} * m^{?} = \frac{1}{m^9}$ -5

$5^2 * 5^{?} = 5^{11}$ 9

$a^{?} * a^4 = 1$ -4

$x^2 * \frac{1}{x^{-5}} =$ x^7

$c^{1} * c^{-4} =$ c^{-3} $\frac{1}{c^3}$

$8m^3 (m^2 + 7) =$ $8m^5 + 56m^3$

$3^x * 3^{(2-x)} * 3^2 =$ $3^4 = 81$

$3^x * 2^y * 3^2 * 2^x =$ $3^{x+2} \cdot 2^{x+y}$

$(x + 3)^{7} (x + 3)^{-5} =$ $(x+3)^2$

Word Problems

A human body contains aout $3.2 * 10^4$ microliters of blood for each pound of body weight. Each microliter of blood contains about $5 * 10^6$ red blood cells. Find the approximate number of red blood cells in 125 lb person.

$(3.2 \times 10^4)(125)(5 \cdot 10^6)$

$(3.2 \cdot 10^4)(1.25 \cdot 10^2)(5 \cdot 10^6)$

$3.2 \cdot 1.25 \cdot 5 \cdot 10^{12}$

$2E13 \quad \text{or} \quad 2 \times 10^{13}$

20,000,000,000,000

There are about $3.35 * 10^{25}$ molecules in a liter of water. Pine Lake has about $2 * 10^{8}$ liters of water. About how many molecules of water does the lake have?

$3.35 \cdot 10^{25} \cdot 2 \cdot 10^{8}$

$6.7 \cdot 10^{33}$

6700000000000000000000000000000000 . . .

Find the volume of a rectangular prism with length $1.3 * 10^{-3}$ km, width $1.5 * 10^{-3}$ km and height $9.4 * 10^{-4}$ km.

$V = l \cdot w \cdot h$

18.33×10^{-10}

$1.833 \times 10^{1} \times 10^{-10}$

1.833×10^{-9}