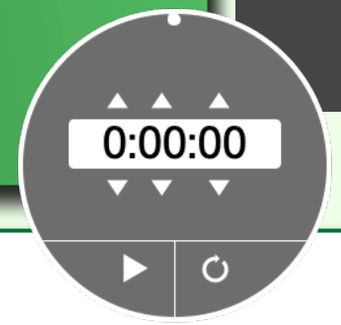
Notes 2.2 - Logarithms

* WARM UP *



Evaluate.

4^{-3} = $\frac{1}{4^3}$ $\frac{1}{64}$

$16^{\frac{1}{4}}$ = 2

$\left(\frac{2}{3}\right)^{-3}$ = $\frac{27}{8}$

$(2)^6(2)^8$ 2^{14}

$(3)^{-2}(3)^5$ 3^3 = 27

$\frac{3^7}{3^4}$ = 27

$\frac{4^3}{4^{-1}}$ = 4^4 256

$(7^3)^5$ 7^{15}

$8^{\frac{2}{3}}$ $\sqrt[3]{8^2}$ = 4 $(\sqrt[3]{8})^2$ = 4

Notes 2.2 - Logarithms

* EXPLORATION *

What is a logarithm?

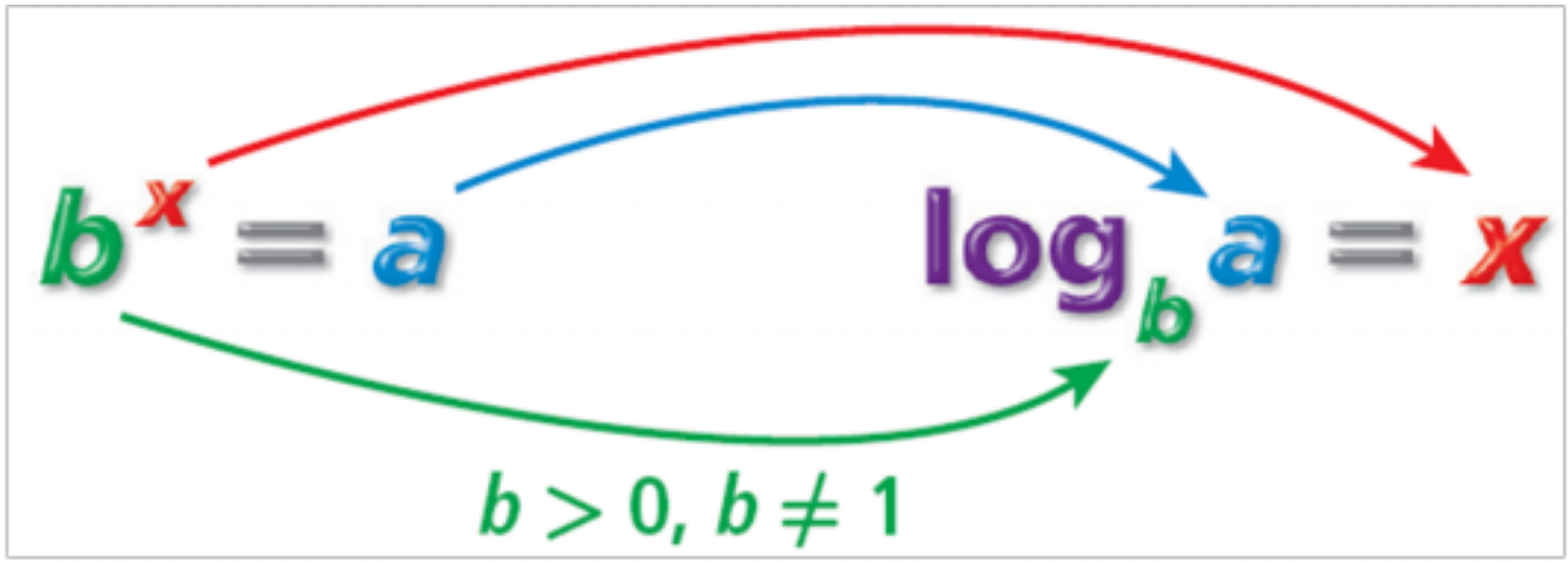
IT'S AN EXPONENT

What does it do?

How does it look? $\log_3 9 = 2$

$3^2 = 9$

Notes 2.2 - Logarithms



Reading Math

Read $\log_b a = x$, as "the log base b of a is x."
Notice that the log is the exponent.

Notes 2.2 - Logarithms

Write the following in logarithmic form.

$3^5 = 243$

$\log_3 243 = 5$

$\left(\frac{1}{2}\right)^0 = 1$

$\log_{\frac{1}{2}} 1 = 0$

$4^{-2} = \frac{1}{16}$

$\log_4 \frac{1}{16} = -2$

$b^a = x$

$\log_b x = a$

Notes 2.2 - Logarithms

Write the following in exponential form.

$\log_2 8 = 3$

$2^3 = 8$

$\log_4\left(\frac{1}{16}\right) = -2$

$4^{-2} = \frac{1}{16}$

$\log_8(2) = \frac{1}{3}$

$8^{1/3} = 2$

$\log 100 = 2$

$10^2 = 100$

Notes 2.2 - Logarithms

Evaluate without a calculator.

$\log_3 27 = 3$

$\log_6\left(\frac{1}{36}\right) = -2$

$\log_5 5 = 1$

$\log 1000 = 3$

$\log_6\left(\frac{1}{36}\right) = -2$

$\log_{49}(7) = \frac{1}{2}$

Notes 2.2 - Logarithms

Special Logarithms.

The common logarithm.

$10^x = a \qquad \log a = x$

The Natural Logarithm.

$e^x = a \qquad \ln a = x$

Notes 2.2 - Logarithms

Inverse Properties of Logarithms and Exponents

For any base b such that $b > 0$ and $b \neq 1$,

ALGEBRA	EXAMPLE
$\log_b b^x = x$	$\log_{10} 10^7 = 7$
$b^{\log_b x} = x$	$10^{\log_{10} 2} = 2$

$5^{\log_5 729} = 729$

Notes 2.2 - Logarithms

Inverse and Special Logarithms Practice

Rewrite in other form.

$10^2 = 100$

$\log 100 = 2$

$\ln b = a$

$e^a = b$

$e^x = t$

$\ln t = x$

$\log x = y$

$10^y = x$

Evaluate without a calculator

$\log \frac{1}{100} = -2$

$\log_7 7^{82} = 82$

$\ln e^{245}$

$\log_e e^{245}$

245

$4^{\log_4 25} = 25$