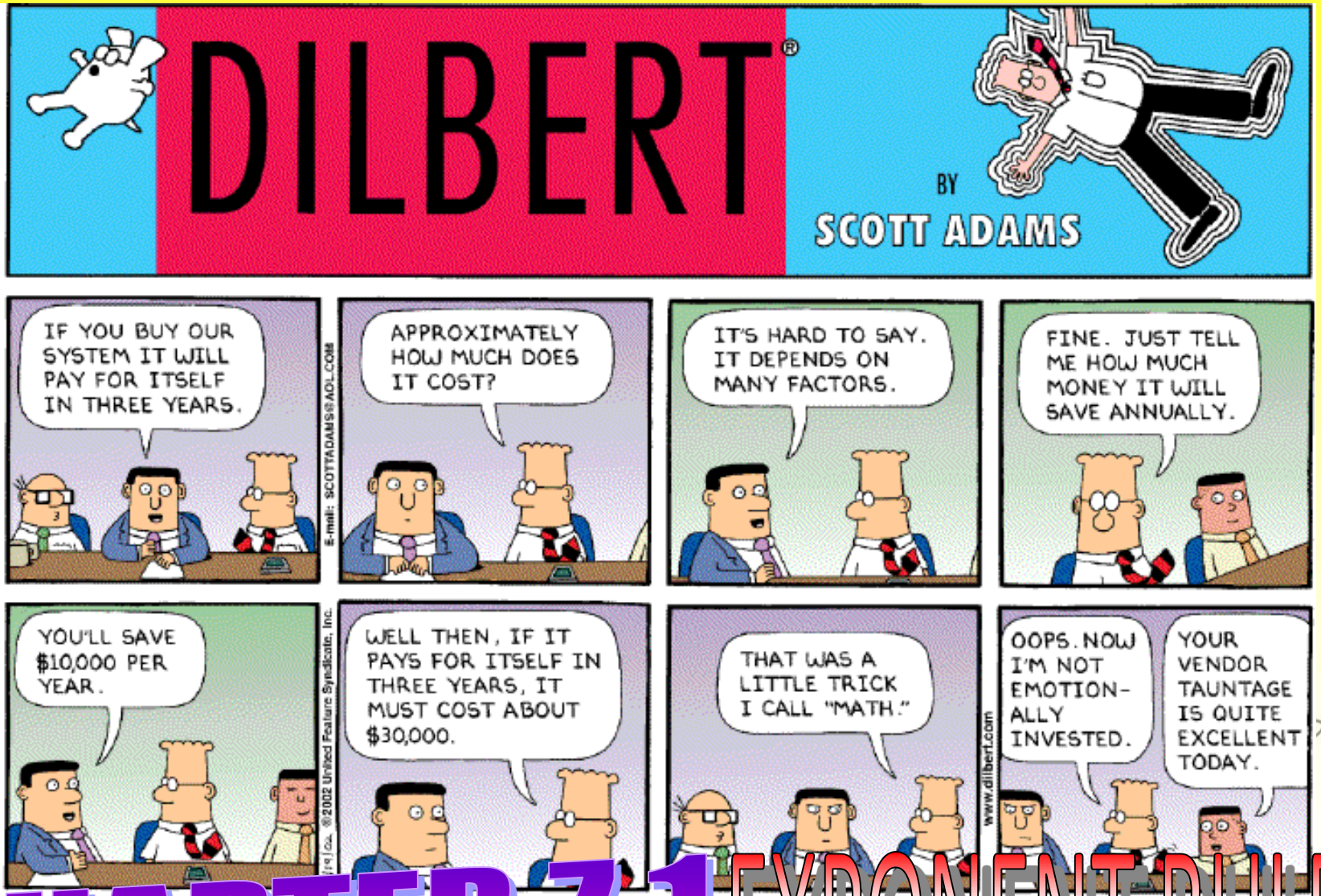
ST. JEAN DE BREBEUF MATHEMATICS



CHAPTER 7.1 EXPONENT RULES

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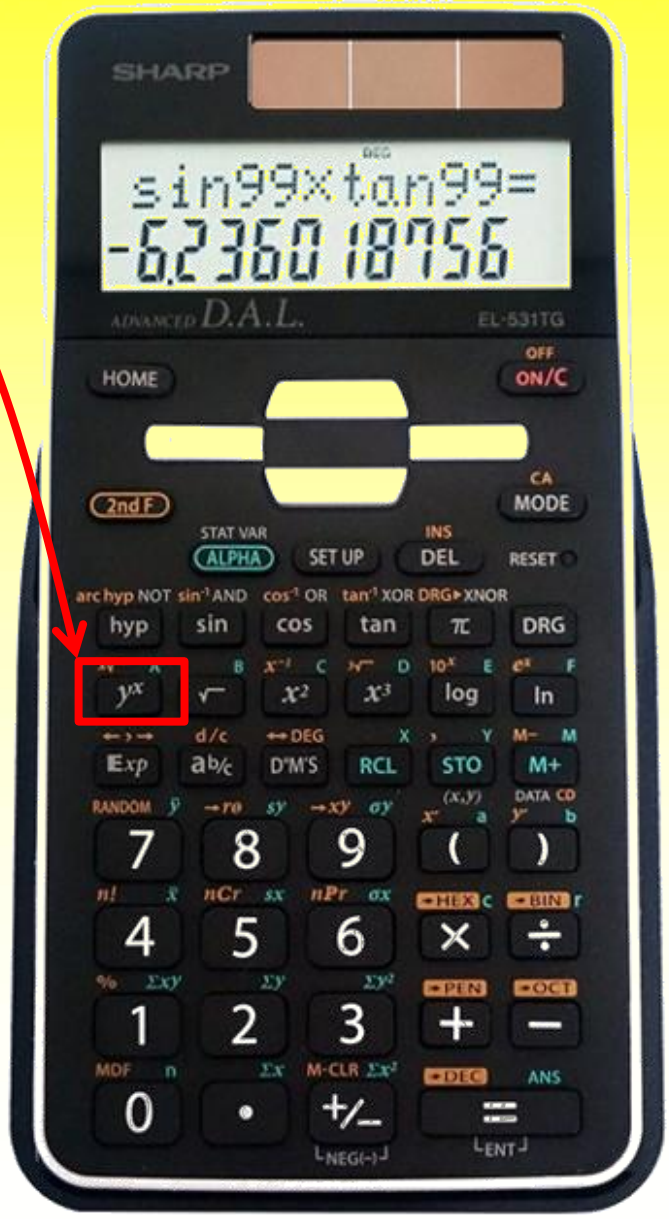
GETTING TO KNOW YOUR CALCULATOR

EXPONENT KEY

→Raises a number to the exponent

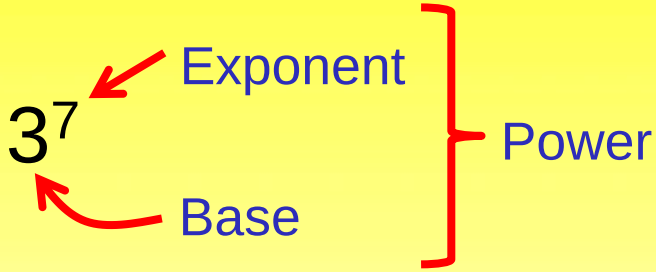
EXAMPLE: Evaluate $\mathbf{4^2}$

Press “4” → “y^x” → “2” → “=“



CHAPTER 7.1 EXPONENT RULES

KEY CONCEPTS



EXAMPLE 1 *Multiplying Powers*

Express each as a *single power* then evaluate

(a) $5^2 \times 5^4$

$= 5^{2+4}$

$= 5^6$

$= \mathbf{15625}$

(b) $(3^7)(3^{-3})$

$= 3^{7+(-3)}$

$= 3^{7-3}$

$= 3^4$

$= \mathbf{81}$

(c) $(-4)^3 \times (-4)^2$

$= (-4)^{3+2}$

$= (-4)^5$

$= \mathbf{-1024}$

To multiply powers with the same base, keep the base the same and **add the exponents**.

$$a^p \times a^q = a^{p+q}$$

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CHAPTER 7.1 EXPONENT RULES

EXAMPLE 2 *Dividing Powers*

Express each as a *single power* then evaluate.

(a) $3^7 \div 3^2$

$= 3^{7-2}$

$= 3^5$

$= \mathbf{243}$

(b) $\dfrac{5^6}{5^{-1}}$

$= 5^{6-(-1)}$

$= 5^{6+1}$

$= 5^7$

$= \mathbf{78\ 125}$

(c) $4^{-2} \div 4^{-5}$

$= 4^{-2-(-5)}$

$= 4^{-2+5}$

$= 4^3$

$= \mathbf{64}$

To divide powers with the same base, keep the base the same and **subtract the exponents**.

$$a^p \div a^q = a^{p-q}$$

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CHAPTER 7.1 EXPONENT RULES

EXAMPLE 3 *Power of a Power*

Express each as a *single power* then evaluate.

(a) $(2^3)^4$

$= 2^{3 \times 4}$

$= 2^{12}$

$= \mathbf{4096}$

(b) $(3^{-3})^{-2}$

$= 3^{-3 \times (-2)}$

$= 3^6$

$= \mathbf{729}$

To simplify a power of a power, keep the base the same and **multiply the exponents**.

$$(a^p)^q = a^{p \times q}$$

(c) $\left(\frac{1}{2^3}\right)^4$

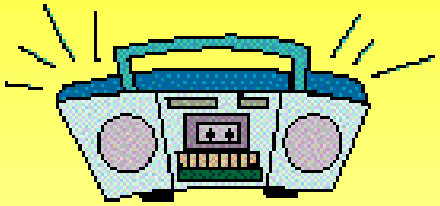
* Need to raise both the *top* and *bottom* by the exponent!

$= \frac{(1)^4}{(2^3)^4}$ $= \frac{1}{2^{12}}$

$= \frac{1}{2^{3 \times 4}}$ $= \frac{1}{4096}$

CHAPTER 7.1 EXPONENT RULES

EXAMPLE 4 *Application: Sound intensities*



The sound produced in the first row of a rock concert is 110 dB and is expressed as $\mathbf{10^{11}}$. The sound produced from a CD player is 60 dB and is expressed as $\mathbf{10^{6}}$.

How many times louder is the sound produced from a rock concert compared to the sound produced from a CD player?

$$\frac{Sound\ from rock concert}{Sound\ from CD\ player} = \frac{10^{11}}{10^{6}}$$

$$= 10^{11-6}$$

$$= 10^{5}$$

$$= 100000$$

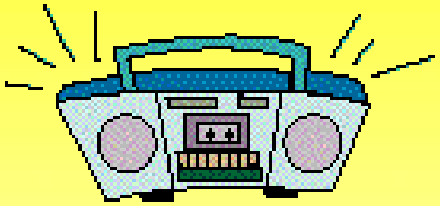
We need to <u>divide like bases</u>!

→**<u>Subtract</u>** the exponents

The rock concert is **100 000 times** louder than the CD player

CHAPTER 7.1 EXPONENT RULES

Homework



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