

# REVIEW

SCIENTIFIC  
NOTATION

Scientific Notation is a format in which a number is expressed as a number between 1 and 10 multiplied by a power of 10.

EX 1: Put each of these in scientific notation.

a) 3052

$$= 3.052 \times 10^3$$

b) 0.08923

$$= 8.923 \times 10^{-2}$$

c) 0.000032

$$= 3.2 \times 10^{-5}$$

d) 1948.35

$$= 1.94835 \times 10^3$$

EX 2: Write in decimal notation.

a)  $5.7 \times 10^{-3}$

$$= 0.0057$$

b)  $7.55 \times 10^6$

$$= 7,550,000$$

c)  $8 \times 10^2$

$$= 800$$

d)  $0.3 \times 10^{-4}$

$$= 3 \times 10^{-5}$$

$$= 0.00003$$

$$= 0.00003$$

### Multiply/Divide with scientific notation

Multiply or divide the number and deal with the powers of ten separately.

EX 3: Multiply or divide these.

$$\begin{aligned} \text{a) } (4 \times 10^7) \cdot (3.5 \times 10^{-2}) &= (4 \cdot 3.5)(10^7 \cdot 10^{-2}) \\ &= 14 \times 10^{7+(-2)} = 14 \times 10^5 \\ &= 1.4 \times 10^6 \end{aligned}$$

$$\begin{aligned} \text{b) } (3.2 \times 10^5) \div (2.1 \times 10^{-2}) &= \frac{3.2 \times 10^5}{2.1 \times 10^{-2}} = \left(\frac{3.2}{2.1}\right) \left(\frac{10^5}{10^{-2}}\right) \\ &= 1.52380952 \times 10^{5-(-2)} \\ &= 1.52380952 \times 10^7 \end{aligned}$$

### Add/Subtract

If powers match, add the numbers and keep the powers of ten.

If powers do not match, add or subtract in decimal notation.

EX 4: Add or subtract these.

$$\begin{aligned} \text{a) } (2.3 \times 10^{-22}) - (1.5 \times 10^{-22}) \\ &= (2.3 - 1.5) 10^{-22} = 0.8 \times 10^{-22} = 8 \times 10^{-23} \end{aligned}$$

$$\begin{aligned} \text{b) } (3 \times 10^6) + (5 \times 10^4) \\ &= 3,000,000 + 50,000 \\ &= 3,050,000 = 3.05 \times 10^6 \end{aligned}$$

## Scientific Notation

### Advantages

- easy to write large or small numbers (w/ less space)
- convenient when multiplying or dividing

### Disadvantages

- easy to lose track of meaning/size of number
- hard to use for adding or subtracting (if powers are different)

EX 5: Use scientific notation for this computation. In the year 2006, the population of the U.S. hit 300 million. The national debt was \$8.6 trillion. What was the national debt per person that year?

$$\frac{\$8.6 \text{ trillion}}{300 \text{ million people}} = \frac{8.6 \times 10^{12} \text{ (\$)}}{3 \times 10^8 \text{ (person)}}$$

$$\begin{aligned} 300 \text{ million} &= 300 \times 10^6 \\ &= 3 \times 10^8 \end{aligned}$$

on calculator
$3.2 \times 10^6$
$= 3,200,000$
calc: 3.2E6

$$\begin{aligned} &= \left(\frac{8.6}{3}\right) \left(\frac{10^{12}}{10^8}\right) \left(\frac{\$}{\text{person}}\right) \approx 2.867 \times 10^4 \text{ \$/person} \\ &\quad \underline{\$ 28,670} \\ &\quad \text{person} \end{aligned}$$