English Spanish

# 9.6b Scientific Notation

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To add or subtract numbers written in scientific notation with the same power of 10, add or subtract the factors.

## EXAMPLE 1 Adding Numbers Written in Scientific Notation

**Find $(4.6 \times 10^3) + (8.72 \times 10^3)$. Write your answer in scientific notation.**

$(4.6 \times 10^3) + (8.72 \times 10^3)$

$= (4.6 + 8.72) \times 10^3$ Distributive Property

$= 13.32 \times 10^3$ Add.

$= (1.332 \times 10^1) \times 10^3$ Write 13.32 in scientific notation.

$= 1.332 \times 10^4$ Product of Powers Property

To add or subtract numbers written in scientific notation with different powers of 10, first rewrite the numbers so they have the same power of 10.

## EXAMPLE 2 Subtracting Numbers Written in Scientific Notation

**Find $(3.5 \times 10^{-2}) - (6.6 \times 10^{-3})$. Write your answer in scientific notation.**

The numbers do not have the same power of 10. Rewrite $6.6 \times 10^{-3}$ so that it has the same power of 10 as $3.5 \times 10^{-2}$.

$6.6 \times 10^{-3} = 6.6 \times 10^{-1} \times 10^{-2}$ Rewrite $10^{-3}$ as $10^{-1} \times 10^{-2}$.

$= 0.66 \times 10^{-2}$ Rewrite $6.6 \times 10^{-1}$ as 0.66.

Subtract the factors.

$(3.5 \times 10^{-2}) - (0.66 \times 10^{-2})$

$= (3.5 - 0.66) \times 10^{-2}$ Distributive Property

$= 2.84 \times 10^{-2}$ Subtract.

## Practice

**Add or subtract. Write your answer in scientific notation.**

1. $(3 \times 10^7) + (2.4 \times 10^7)$
2. $(7.2 \times 10^{-6}) + (5.44 \times 10^{-6})$
3. $(9.2 \times 10^8) - (4 \times 10^8)$
4. $(7.8 \times 10^{-5}) - (4.5 \times 10^{-5})$
5. $(9.7 \times 10^6) + (6.7 \times 10^5)$
6. $(8.2 \times 10^2) + (3.41 \times 10^{-1})$
7. $(1.1 \times 10^5) - (4.3 \times 10^4)$
8. $(2.4 \times 10^{-1}) - (5.5 \times 10^{-2})$

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To divide numbers written in scientific notation, divide the factors and powers of 10 separately.

## EXAMPLE 3 Dividing Numbers Written in Scientific Notation

**Find $\frac{1.5 \times 10^{-8}}{6 \times 10^{7}}$. Write your answer in scientific notation.**

$$\frac{1.5 \times 10^{-8}}{6 \times 10^{7}} = \frac{1.5}{6} \times \frac{10^{-8}}{10^{7}}$$ Rewrite as a product of fractions.

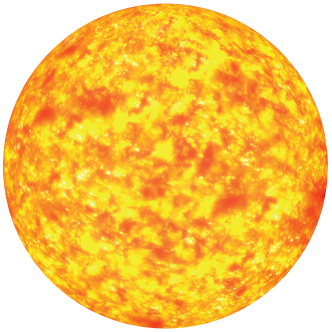
$$= 0.25 \times \frac{10^{-8}}{10^{7}}$$ Divide 1.5 by 6.

$$= 0.25 \times 10^{-15}$$ Quotient of Powers Property

$$= 2.5 \times 10^{-1} \times 10^{-15}$$ Write 0.25 in scientific notation.

$$= 2.5 \times 10^{-16}$$ Product of Powers Property

## EXAMPLE 4 Real-Life Application



Diameter $= 1.4 \times 10^{6}$ km

**How many times greater is the diameter of the Sun than the diameter of Earth?**

Diameter $= 1.28 \times 10^{4}$ km

Divide the diameter of the Sun by the diameter of Earth.

$$\frac{1.4 \times 10^{6}}{1.28 \times 10^{4}} = \frac{1.4}{1.28} \times \frac{10^{6}}{10^{4}}$$ Rewrite as a product of fractions.

$$= 1.09375 \times 10^{2}$$ Divide and use Quotient of Powers Property.

$$= 109.375$$ Write in standard form.

∴ The diameter of the Sun is about 109 times greater than the diameter of Earth.

## Practice

**Divide. Write your answer in scientific notation.**

**9.** $(6 \times 10^{4}) \div (3 \times 10^{4})$

**10.** $(2.3 \times 10^{7}) \div (9.2 \times 10^{7})$

**11.** $(1.5 \times 10^{-3}) \div (7.5 \times 10^{2})$

**12.** $(5.8 \times 10^{-6}) \div (2 \times 10^{-3})$

**13. MONEY** How many times greater is the thickness of a dime than the thickness of a dollar bill?


Thickness $= 1.35 \times 10^{-1}$ cm


Thickness $= 1.0922 \times 10^{-2}$ cm