GRADE 7 ACCELERATED · UNIT 4 · LESSONS 2–3

# Multiplying and Dividing in Scientific Notation

**MA.8.NSO.1.5**

I can multiply and divide two numbers written in scientific notation, and write the answer in scientific notation.

# Warm-Up

1. $(3.4 \times 10^6) + (2.8 \times 10^6)$
2. Write as one power: $\frac{10^9}{10^4}$
3. Find the value: $\sqrt{169}$
4. Find the quotient: $\frac{4.8}{1.6}$

# Warm-Up

1. $(3.4 \times 10^6) + (2.8 \times 10^6)$ **$6.2 \times 10^6$**
2. Write as one power: $\frac{10^9}{10^4}$ **$10^5$**
3. Find the value: $\sqrt{169}$ **13**
4. Find the quotient: $\frac{4.8}{1.6}$ **3**

# Vocabulary

## product of powers law

$10^m \cdot 10^n = 10^{m+n}$ — the law from 3.01,

now doing the work on the powers of ten

## quotient of powers law

$\frac{10^m}{10^n} = 10^{m-n}$ — top minus bottom, from 3.02

## regrouping a product

using the commutative and associative properties to write $(2 \times 10^4)(3 \times 10^5)$

as $(2 \cdot 3)(10^4 \cdot 10^5)$

# Notes

## I. Multiplying: regroup, then use the laws

$$(2 \times 10^4)(3 \times 10^5) = (2 \cdot 3)(10^4 \cdot 10^5) = 6 \times 10^9$$

$6 \times 10^9$, never $6 \times 10^{20}$

**Multiply the coefficients. Add the exponents — that is the product of powers law, not a new rule.**

# Notes

## II. Dividing: the same move with the quotient law

$$\frac{8.4 \times 10^{9}}{2.1 \times 10^{4}} = \frac{8.4}{2.1} \times 10^{9-4} = 4 \times 10^{5}$$

$$\frac{3 \times 10^{8}}{3 \times 10^{-4}} = 1 \times 10^{8-(-4)} = 1 \times 10^{12}$$

**Divide the coefficients. Subtract the exponents, top minus bottom.**

# Notes

## III. Finish the answer — both directions

$$(8 \times 10^{2})(7.5 \times 10^{4}) = 60 \times 10^{6} = 6 \times 10^{7}$$

$$\frac{2.65 \times 10^{11}}{5 \times 10^{13}} = 0.53 \times 10^{-2} = 5.3 \times 10^{-3}$$

**Every answer ends with a coefficient at least 1 and less than 10.**

# Example 1

$$(4.5 \times 10^{-3})(6 \times 10^{7})$$

**Multiply. Write the answer in scientific notation.**

# Example 1

$$(4.5 \times 10^{-3})(6 \times 10^{7}) = (4.5 \cdot 6)(10^{-3} \cdot 10^{7})$$

$$= 27 \times 10^{4}$$

$$27 \times 10^{4} = 2.7 \times 10^{5}$$

**Answer: $2.7 \times 10^{5}$**

# Your Turn

$$(2.5 \times 10^{6})(8 \times 10^{-2})$$

**Multiply. Write the answer in scientific notation.**

# Your Turn

$$(2.5 \times 10^{6})(8 \times 10^{-2})$$

**Multiply. Write the answer in scientific notation.**

Multiply the fronts: $2.5 \times 8 = 20$

Add the exponents: $10^{6} \times 10^{-2} = 10^{4}$

$20 \times 10^{4} = 2 \times 10^{5}$

**Answer: $2 \times 10^{5}$**

# Example 2

$$\frac{(8 \times 10^2)(7.5 \times 10^4)}{5 \times 10^2}$$

**Evaluate. Write the answer in scientific notation.**

# Example 2

$$(8 \times 10^{2})(7.5 \times 10^{4}) = 60 \times 10^{6}$$

$$\frac{60 \times 10^{6}}{5 \times 10^{2}} = 12 \times 10^{4}$$

$$12 \times 10^{4} = 1.2 \times 10^{5}$$

**Answer: $1.2 \times 10^{5}$**

# Your Turn

$$\frac{(6 \times 10^{5})(4 \times 10^{-3})}{8 \times 10^{4}}$$

**Evaluate. Write the answer in scientific notation.**

# Your Turn

$$\frac{(6 \times 10^{5})(4 \times 10^{-3})}{8 \times 10^{4}}$$

**Evaluate. Write the answer in scientific notation.**

Top: $6 \times 4 = 24$ and $10^{5} \times 10^{-3} = 10^{2}$

Divide: $24 \div 8 = 3$ and $10^{2} \div 10^{4} = 10^{-2}$

$3 \times 10^{-2}$

**Answer: $3 \times 10^{-2}$**

# Whiteboards · Question 1 of 9

$$(3 \times 10^5)(3 \times 10^6)$$

**Answer it.**

# Whiteboards · Question 1 of 9

$$(3 \times 10^5)(3 \times 10^6)$$

Multiply the fronts: $3 \times 3 = 9$

Add the exponents: $10^5 \times 10^6 = 10^{11}$

$9 \times 10^{11}$

**Answer: $9 \times 10^{11}$**

# Whiteboards · Question 2 of 9

A printer makes $4 \times 10^3$ copies per hour.

It runs for $2.5 \times 10^2$ hours. Paper costs 3 cents a sheet.

**How many copies does it make?**

**Answer it.**

# Whiteboards · Question 2 of 9

A printer makes $4 \times 10^3$ copies per hour.

It runs for $2.5 \times 10^2$ hours. Paper costs 3 cents a sheet.

**How many copies does it make?**

Multiply the fronts: $4 \times 2.5 = 10$

Add the exponents: $10^3 \times 10^2 = 10^5$

$10 \times 10^5 = 1 \times 10^6$

**Answer: $1 \times 10^6$**

# Whiteboards · Question 3 of 9

$$\frac{9.6 \times 10^{8}}{1.2 \times 10^{3}}$$

**Answer it.**

# Whiteboards · Question 3 of 9

$$\frac{9.6 \times 10^{8}}{1.2 \times 10^{3}}$$

Divide the fronts: $9.6 \div 1.2 = 8$

Subtract the exponents: $10^{8} \div 10^{3} = 10^{5}$

$8 \times 10^{5}$

**Answer: $8 \times 10^{5}$**

# Whiteboards · Question 4 of 9

$$\frac{3.28 \times 10^{7}}{4 \times 10^{10}}$$

**Answer it.**

# Whiteboards · Question 4 of 9

$$\frac{3.28 \times 10^{7}}{4 \times 10^{10}}$$

Divide the fronts: $3.28 \div 4 = 0.82$

Subtract the exponents: $10^{7} \div 10^{10} = 10^{-3}$

$0.82 \times 10^{-3} = 8.2 \times 10^{-4}$

**Answer: $8.2 \times 10^{-4}$**

# Whiteboards · Question 5 of 9

$$(4 \times 10^{7})(2 \times 10^{9})$$

Which is the product?

**A.** $8 \times 10^{-2}$

**B.** $8 \times 10^{63}$

**C.** $8 \times 10^{16}$

**D.** $6 \times 10^{16}$

**Answer it.**

# Whiteboards · Question 5 of 9

$$(4 \times 10^{7})(2 \times 10^{9})$$

Which is the product?

Multiply the fronts: $4 \times 2 = 8$

Add the exponents: $10^{7} \times 10^{9} = 10^{16}$

$8 \times 10^{16}$

**Answer: C — $8 \times 10^{16}$**

# Whiteboards · Question 6 of 9

$$(5 \times 10^6)(4 \times 10^3)$$

Which is the product, written in scientific notation?

**A.** $2 \times 10^9$

**B.** $20 \times 10^9$

**C.** $20 \times 10^{18}$

**D.** $2 \times 10^{10}$

**Answer it.**

# Whiteboards · Question 6 of 9

$$(5 \times 10^{6})(4 \times 10^{3})$$

Which is the product, written in scientific notation?

Multiply the fronts: $5 \times 4 = 20$

Add the exponents: $10^{6} \times 10^{3} = 10^{9}$

$20 \times 10^{9} = 2 \times 10^{10}$

**Answer: D — $2 \times 10^{10}$**

# Whiteboards · Question 7 of 9

$$\frac{7 \times 10^{9}}{7 \times 10^{-6}}$$

**Answer it.**

# Whiteboards · Question 7 of 9

$$\frac{7 \times 10^{9}}{7 \times 10^{-6}}$$

Divide the fronts: $7 \div 7 = 1$

Subtract the exponents: $10^{9} \div 10^{-6} = 10^{9-(-6)} = 10^{15}$

$1 \times 10^{15}$

**Answer: $1 \times 10^{15}$**

# Whiteboards · Question 8 of 9

$$\frac{8.4 \times 10^{7}}{n \times 10^{2}} = 4.2 \times 10^{5}$$

What is the value of $n$ ?

**Answer it.**

# Whiteboards · Question 8 of 9

$$\frac{8.4 \times 10^{7}}{n \times 10^{2}} = 4.2 \times 10^{5}$$

What is the value of $n$ ?

Fronts: $8.4 \div n = 4.2$, so $n = 8.4 \div 4.2 = 2$

Check: $\frac{8.4 \times 10^{7}}{2 \times 10^{2}} = 4.2 \times 10^{5}$

**Answer: $n = 2$**

# Whiteboards · Question 9 of 9

For $\frac{7.2 \times 10^{11}}{2.4 \times 10^{3}}$ Marcus writes $4.8 \times 10^{8}$

and Sara writes $3 \times 10^{14}$

Name what each one did wrong, and give the correct quotient.

**Write your answer in sentences.**

# Whiteboards · Question 9 of 9

For $\frac{7.2 \times 10^{11}}{2.4 \times 10^{3}}$ Marcus writes $4.8 \times 10^{8}$

and Sara writes $3 \times 10^{14}$

Name what each one did wrong, and give the correct quotient.

Marcus subtracted the fronts. Sara added the exponents.

$7.2 \div 2.4 = 3$ and $10^{11} \div 10^{3} = 10^{8}$

$3 \times 10^{8}$

**Answer: $3 \times 10^{8}$**

# Independent Set

1. $(2 \times 10^5)(4 \times 10^3)$
2. $\dfrac{9.9 \times 10^7}{3.3 \times 10^2}$
3. $(5 \times 10^6)(6 \times 10^{-2})$
4. $\dfrac{1.8 \times 10^3}{6 \times 10^7}$
5. $\dfrac{4 \times 10^9}{8 \times 10^{-2}}$
6. Find $n$. $(2 \times 10^n)(3 \times 10^4) = 6 \times 10^{10}$

# IXL

1. Open IXL and start today's skills.
2. Work on paper where the question needs work. The answer box does not show it.
3. Every skill listed is required, to a SmartScore of 67. Due by the Unit 4 test.

**Today's skills — all required**

Multiply numbers written in scientific notation — YZU
Divide numbers written in scientific notation — SGT