Name & Surname: _____ Class: _____ Date: _____

Powers of 10 in Action

Operate with scientific notation and decimals.

About 45 minutes Level ★★★☆☆



Scientific Notation Basics

Scientific notation writes a number as a **coefficient** times a power of 10.

- Write each number as 1 to less than 10 times 10 to a power: 300,000,000 = 3 × 10^8 and 0.00005 = 5 × 10^-5.
- To multiply, multiply coefficients and add **exponents**.
- To divide, divide coefficients and subtract exponents.
- To add or subtract, first make exponents the **same**, then work with coefficients.

Task A

/3

Fill the chart with each digit. Think about powers of 10.

Number	M	HTh	TTh	Th	H	T	O	t	h	th
6000										
5000000										
0.006										

M = millions · HTh = hundred thousands · TTh = ten thousands · Th = thousands · H = hundreds · T = tens · O = ones · t = tenths · h = hundredths · th = thousandths

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Multiply and Divide

Multiplying and dividing with powers of 10.

Task B /12

Practice operations with scientific notation. Write answers in scientific notation.

WARM UP

1. Work out (3 × 10^2) × (2 × 10^3).

   Answer: _____

2. Work out (5 × 10^4) × (4 × 10^2).

   Answer: _____

3. Work out (8 × 10^6) ÷ (2 × 10^2).

   Answer: _____

4. Work out (6 × 10^5) ÷ (3 × 10^2).

   Answer: _____

PRACTICE

5. Work out (4.5 × 10^-14) × (5.2 × 10^3).

   Answer: _____

6. Work out (9 × 10^7) ÷ (3 × 10^-2).

   Answer: _____

7. Work out (2 × 10^3) × (3 × 10^2) × (2 × 10^1).

   Answer: _____

8. Student A says (2 × 10^3) × (3 × 10^4) = 6 × 10^12 because 3 × 4 = 12. Is Student A correct? Explain how you know.

   Answer: _____

PROBLEM SOLVING

9. Light travels 3 × 10^8 meters per second. How far does it travel in 5 seconds?

   Answer: _____

10. A hair is 7 × 10^-5 meters wide. How wide are 1,000 hairs side by side?

    Answer: _____

11. A diamond has 1.03 × 10^22 carbon atoms. Each atom has mass 2 × 10^-23 grams. Work out the total mass in grams.

    Answer: _____

12. Work out 0.000467 × 32,000,000. Write the answer in scientific notation.

    Answer: _____

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Add and Subtract

Adding and subtracting by matching exponents.

Task C /12

Add and subtract with same exponents. Change decimals when you need to.

WARM UP

1. Work out (5 × 10^3) + (3 × 10^3).

Answer: _____

2. Work out (9 × 10^6) - (4 × 10^6).

Answer: _____

3. Work out 2 × 10^5 + 300,000.

Answer: _____

4. Work out 7 × 10^4 - 20,000.

Answer: _____

PRACTICE

5. Work out 6 × 10^5 + 2.5 × 10^6.

Answer: _____

6. Work out 5 × 10^-3 + 4 × 10^-4.

Answer: _____

7. Work out 0.00005 + 3 × 10^-5.

Answer: _____

8. Student B says 4 × 10^6 + 3 × 10^5 = 7 × 10^6. Is Student B correct? Explain how you know.

Answer: _____

PROBLEM SOLVING

9. The Sun is 1.5 × 10^8 km away. A probe has flown 2,000,000 km toward it. How much farther must it fly?

Answer: _____

10. A lab has 0.000985 grams of salt and adds 1.15 × 10^-4 grams more. How much is there now?

Answer: _____

11. A city had 6,070,000 people. It grows by 3 × 10^5 people. What is the new population?

Answer: _____

12. Which is larger, 2.7 × 10^-15 or 4.54 × 10^9? Explain how you know.

Answer: _____

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Model the Math

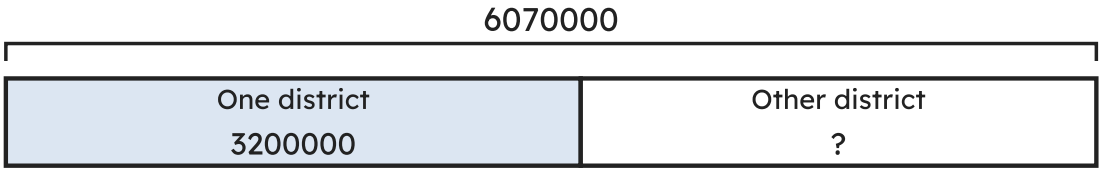
Using bar models and tables with big and small numbers.

Task D

/4

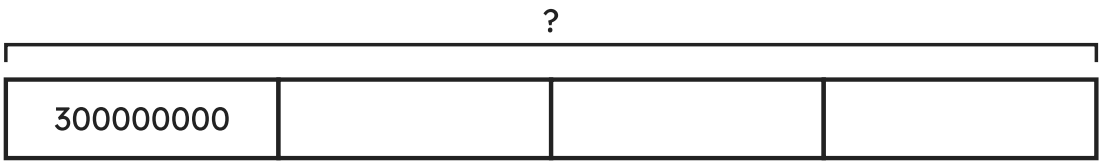
Read each story. Use the bar model to find the missing number.

1. In 1990 a city had 6,070,000 people. 3,200,000 lived in one district and the rest lived in the other district. How many lived in the other district?



Answer: _____ **people**

2. Light travels 300,000,000 meters in one second. How far does it travel in 4 seconds?



Answer: _____ **meters**

Task E

/4

Complete the table. Fill each missing form of the number.

Decimal number	Scientific notation
6000	
0.006	
300000000	
0.00005	

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Show the Steps

Worked methods and function machines for practice.

Task F

/2

Follow the steps in each example, then try the matching question.

WORKED EXAMPLE

Work out (2 × 10^3) × (3 × 10^5)

1. Multiply coefficients: 2 × 3 = 6
2. Add exponents: 3 + 5 = 8
3. Answer is 6 × 10^8

Answer: 6 × 10^8

YOUR TURN

Work out (4 × 10^2) × (2 × 10^6)

Answer: _____

WORKED EXAMPLE

Work out 4 × 10^5 + 30,000

1. Change 30,000 to 0.3 × 10^5 so exponents match
2. Add coefficients: 4 + 0.3 = 4.3
3. Answer is 4.3 × 10^5

Answer: 4.3 × 10^5

YOUR TURN

Work out 3 × 10^6 + 500,000

Answer: _____

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Powers of 10 in Action

Task G /8

Find the missing outputs and inputs. Then write one output in scientific notation.

1 IN → × 1000 → OUT

In	Out
2.500000	
0.000467	
	32000000
	6070000

2 IN → ÷ 1000 → OUT

In	Out
6000	
5000000	
	0.00600
	0.00005

How did I do?

Circle a face for each line.

I can multiply and divide numbers in scientific notation. ☹ 😐 ☺

I can add and subtract by making exponents the same. ☹ 😐 ☺

I can solve problems that mix decimal and scientific notation. ☹ 😐 ☺

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Answer sheet: Powers of 10 in Action

Task A

1. 6000: – | – | – | 6 | 0 | 0 | 0 | – | – | –
2. 5000000: 5 | 0 | 0 | 0 | 0 | 0 | 0 | – | – | –
3. 0.006: – | – | – | – | – | – | 0 | 0 | 0 | 6

Task B

1. 6 × 10^5
2. 2 × 10^7
3. 4 × 10^4
4. 2 × 10^3
5. 2.34 × 10^-10
6. 3 × 10^9
7. 1.2 × 10^7
8. No. Multiply coefficients but add exponents, not multiply them. 3 + 4 = 7, so the answer is 6 × 10^7.
9. 1.5 × 10^9 meters
10. 7 × 10^-2 meters
11. 2.06 × 10^-1 grams
12. 1.4944 × 10^4

Task C

1. 8 × 10^3
2. 5 × 10^6
3. 5 × 10^5
4. 5 × 10^4
5. 3.1 × 10^6
6. 5.4 × 10^-3
7. 8 × 10^-5
8. No. The exponents are different. Change 3 × 10^5 to 0.3 × 10^6. The sum is 4.3 × 10^6.
9. 1.48 × 10^8 km
10. 1.1 × 10^-3 grams
11. 6.37 × 10^6 people
12. 4.54 × 10^9 is larger. A positive exponent means a large number, while a negative exponent means a number less than 1.

Task D

1. 2870000 people
2. 1200000000 meters

Task E

6000 | 6 × 10^3
0.006 | 6 × 10^-3
300000000 | 3 × 10^8
0.00005 | 5 × 10^-5

Task F

1. 8 × 10^8
2. 3.5 × 10^6

Task G

1. 2.500000 → 2500; 0.000467 → 0.467000; 32000 → 32000000; 6070 → 6070000
2. 6000 → 6; 5000000 → 5000; 6 → 0.00600; 0.05000 → 0.00005

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