



Scientific notation

Mana Maths

Te reo Māori terms



taupū

exponent

Open in Te Aka

pūtake

base number

Open in Te Aka

tau tōrunga

positive number

Open in Te Aka

tau tōraro

negative number

Open in Te Aka

Notes & Steps



Key idea

Scientific notation writes very large or very small numbers compactly as $a \times 10^n$, where $1 \leq a < 10$ and n is an integer.

Steps — large numbers

1. Move the decimal point left until only one digit remains before it.
2. Count how many places you moved — that is the exponent n .
3. Write the result as $a \times 10^n$.

Steps — small numbers

1. Move the decimal point right until only one non-zero digit is before it.
2. Count the places moved — that is $-n$.
3. Write as $a \times 10^{-n}$.

Examples

- ▶ $2000 = 2 \times 10^3$ (move 3 left)
- ▶ $0.00037 = 3.7 \times 10^{-4}$ (move 4 right)
- ▶ $5 \times 10^3 = 5000$ (move 3 right)
- ▶ $7.5 \times 10^{-2} = 0.075$ (move 2 left)

Common mistake

Writing 30×10^2 instead of 3×10^3 . The coefficient must be between 1 and 10. 30 is too large. Adjust: $30 \times 10^2 = 3 \times 10^3$.

Try these

1. Write 2000 in scientific notation.
2. Write 0.00037 in scientific notation.
3. Express 5×10^3 as an ordinary number.

Notes & Steps



Example 1: large number

Write 9,500,000 in scientific notation.

9 500 000

Move the decimal point 6 places left: 9.5.

Answer: 9.5×10^6 .

Example 2: small number

Write 0.00012 in scientific notation.

0.00012

Move the decimal point 4 places right:

1.2. Answer: 1.2×10^{-4} .

Try these

1. Convert 3.84×10^5 to a normal number.
2. Write 0.02 in scientific notation.
3. Write 7.5×10^{-2} as a decimal.

Notes & Steps



Example 3: multiplying in sci. not.

Calculate $(3 \times 10^4) \times (2 \times 10^3)$.

$$3 \times 2 = 6$$

$$10^4 \times 10^3 = 10^7$$

Answer: 6×10^7 .

Example 4: dividing in sci. not.

Calculate $(6 \times 10^5) \div (2 \times 10^2)$.

$$6 \div 2 = 3$$

$$10^5 \div 10^2 = 10^3$$

Answer: 3×10^3 .

Common mistake

Adding exponents instead of subtracting during division. Remember: divide coefficients, subtract exponents.

Start Tasks



1. Write 2000 in scientific notation.

2. Write 0.00037 in scientific notation.

3. Express 5×10^3 as an ordinary number.

4. Convert 3.84×10^5 to a normal number.

5. Which is larger:
 4×10^2 or 3×10^3 ?
Explain briefly.

6. Write 0.02 in scientific notation.

7. Write 7.5×10^{-2} as a decimal.

8. Put these in order from smallest to largest:

2×10^{-1} , 1.5×10^0 , 3×10^1

9. Round 3.84×10^5 to 2 significant figures in scientific notation.

Start Tasks



1. Express 9,500,000 in scientific notation.

2. Convert 6×10^{-4} to a decimal.

3. Fill the blank:
 $0.00045 = \underline{\hspace{2cm}} \times 10^{\underline{\hspace{1cm}}}$.

4.

5.

6.

7.

8.

9.

Build Tasks



1. Convert 4.2×10^6 into an ordinary number.

2. Write 0.00012 in scientific notation and state the exponent.

3. Multiply:
 $(3 \times 10^4) \times (2 \times 10^3)$
and give the answer in scientific notation.

4. Divide:
 $(6 \times 10^5) \div (2 \times 10^2)$
and give the answer in scientific notation.

5. Express 0.0036 as $a \times 10^n$ with $1 \leq a < 10$.

6. A distance is 1.2×10^4 m. Give this in kilometres in scientific notation.

7. Explain why 3.0×10^3 and 30×10^2 represent the same number.

8. Write 9.81×10^0 as an ordinary number.

9. Convert 2.5×10^{-3} to a decimal and to a percentage.

Build Tasks



1. Fill in the blank:

$$(a \times 10^m) \times (b \times 10^n) = (\quad)$$

for

$$a = 3, b = 4, m = 2, n = 3.$$

2. Find the order of magnitude of 7.2×10^8 .

3. A star is 3.5×10^{16} metres away. Express this distance in scientific notation to 2 significant figures.

4.

5.

6.

7.

8.

9.

Push Tasks



1. A number is written as $a \times 10^n$ where a has 3 significant figures. Explain how to convert it to 2 significant

2. A calculation gives 4.356×10^7 . Round this to 3 significant figures and explain the rounding step.

3. Compare 9.99×10^2 and 1.01×10^3 . Which is larger and by how much?

4. If $5 \times 10^x = 0.005$, find x and show working.

5. Multiply $(7.2 \times 10^{-4}) \times (8.3 \times 10^5)$ and give the answer in scientific notation, simplified.

6. A measurement is 6.02×10^{23} . Explain in one sentence what this means (student-facing).

7. Write 0.00000000045 in scientific notation and state the exponent and

8. A spacecraft travels 2.5×10^8 m in one hour. What is its speed in m/s in scientific

9. Simplify: $(3 \times 10^4) \div (9 \times 10^1)$ and express as scientific notation.

Push Tasks



1. A value is given as 4.00×10^{-2} and another as 4×10^{-2} . Discuss any difference in significance.

2. Convert 1.2345×10^3 to standard form and then to scientific notation with 2 sig figs.

3. Prove that multiplying by 10^n shifts the decimal point by n places and give two examples.

4.

5.

6.

7.

8.

9.