Scientific Notation, Rounding & Significant Figures

Amari Cross & Matthew Williams • Math • May 6, 2026

Estimation, rounding, and scientific notation help you judge whether an answer is sensible. They are not just presentation skills; they help you catch arithmetic mistakes before they cost marks.

CSEC Paper 01 often tests these ideas directly, while Paper 02 expects you to use them inside longer calculations. Keep full accuracy while working, then round only when the question asks or when giving the final answer. If a value is very large or very small, scientific notation makes it easier to read and compare.

Scientific notation is a way to **write extremely large or extremely small numbers** in a compact form.

What Is Scientific Notation?

Any number in scientific notation is written as:

```
a × 10^n
```

Where:

- **a** is a number between 1 and 10 (like 1.5, 2.34, 9.999)
- **[Math: 10^n]** means 10 multiplied by itself n times

Why Do We Use Scientific Notation?

Instead of writing: 43,500,000,000,000 (hard to count the zeros)

We write: [Math: 4.35 × 10^{12}] (much cleaner!)

Converting to Scientific Notation

Conversion is about moving the decimal point until the first number is between 1 and 10. The exponent records how many places the decimal moved and in which direction.

For large numbers: Move the decimal point to the LEFT until there's one digit before the decimal. Count how many places you moved—that's your exponent.

📋 **Example**

Convert 43,500 to scientific notation.

[Math: 43,500 = 43,500.0]

Move the decimal 4 places to the left:

[Math: 4.3500 = 4.35]

So: [Math: 43,500 = 4.35 × 10^4]

(We moved 4 places, so the exponent is 4)

For small numbers: Move the decimal point to the RIGHT until there's one digit before the decimal. Count how many places you moved—that's your negative exponent.

📋 **Example**

Convert 0.00728 to scientific notation.

Move the decimal 3 places to the right:

[Math: 0.00728 = 7.28]

So: [Math: 0.00728 = 7.28 × 10^{-3}]

(We moved 3 places, so the exponent is -3)

🧠 **Remember**

- Large numbers = **positive exponent**
- Small numbers = **negative exponent**

Rounding and Significant Figures

Rounding is used to report an answer at a sensible level of accuracy. In exam working, keep extra digits until the final answer so rounding errors do not build up.

Rounding to Decimal Places

Decimal places count digits after the decimal point. This is useful for money, measurements, and calculator answers where a fixed number of decimal places is requested.

When you round to a certain number of decimal places, look at the next digit:

- If it's 5 or more, round **up**
- If it's less than 5, round **down**

📋 **Example**

Round 37.846 to different decimal places:

- To 2 decimal places: Look at the 3rd digit (6). It's ≥5, so round up: **37.85**
- To 1 decimal place: Look at the 2nd digit (4). It's < 5, so round down: **37.8**
- To the nearest whole number: Look at the 1st digit (8). It's ≥5, so round up: **38**

Significant Figures

Significant figures count meaningful digits from the first non-zero digit. They are useful when numbers are very large, very small, or measured rather than exact.

Significant figures are the **digits that carry meaning** in a number.

Rules:

- 1. All non-zero digits are significant: 123 has **3** sig figs
- 2. Zeros between non-zero digits are significant: 1023 has **4** sig figs
- 3. Leading zeros are NOT significant: 0.00425 has **3** sig figs (only 4, 2, 5)
- 4. Trailing zeros after a decimal are significant: 5.280 has **4** sig figs

📋 **Example**

How many significant figures in each number?

- **5,280:** The last zero doesn't count (no decimal), so **3** sig figs
- **5,280.0:** Now the last zero counts, so **5** sig figs
- **0.00425:** Only 4, 2, 5 count, so **3** sig figs

Unit Conversion

Common Conversions You Must Know

Length:

- 1 km = 1,000 m
- 1 m = 100 cm
- 1 cm = 10 mm

Time:

- 1 hour = 60 minutes
- 1 minute = 60 seconds

- 1 hour = 3,600 seconds

Currency: Always use the given exchange rate in the question.

How to Convert

A conversion factor is a multiplier equal to 1, such as [Math: \frac{100 \text{ cm}}{1 \text{ m}}]. Multiplying by it changes the unit without changing the actual size of the measurement.

Multiply by the conversion factor.

> 📋 **Example**
> **Convert 2.5 km to meters.**
> 1 km = 1,000 m
> [Math: 2.5 \text{ km} × 1,000 = 2,500 \text{ m}]
> **Convert 45 minutes to hours.**
> 1 hour = 60 minutes
> [Math: 45 \text{ minutes} ÷ 60 = 0.75 \text{ hours}]
> (Or: [Math: \frac{45}{60} = \frac{3}{4} = 0.75] hours)

Arithmetic Mean (Average)

The arithmetic mean balances a set of values as if the total were shared equally. In CSEC, it may appear in Computation as a direct calculation and in Statistics as part of data interpretation.

The arithmetic mean is the **average** of a set of numbers.

$$\text{Mean} = \frac{\text{Sum of all values}}{\text{Number of values}}$$

> 📋 **Example**
> **Find the mean of: 12, 15, 18, 20, 25**
> **Step 1:** Add all the numbers.
> [Math: 12 + 15 + 18 + 20 + 25 = 90]
> **Step 2:** Divide by how many numbers there are.
> [Math: \frac{90}{5} = 18]
> The mean is **18**.

Key Takeaways

Know your number types: natural, whole, integers, rational, irrational

Master the four operations with positive and negative numbers

Always follow BODMAS when calculating

Fractions, decimals, and percentages are the same thing — just learn to convert between them

Ratios compare quantities — you must understand how to divide amounts in a ratio

Scientific notation makes large and small numbers manageable

Show all your working in exams — partial credit is better than none

> 📝 **Exam Tip**
> In CSEC Mathematics:
> - **30-40% of marks** come from computation questions
> - **Always show every step** of your calculation
> - **Check your answer** — does it make sense?
> - **Keep track of units** — don't lose marks for forgetting "meters" or "dollars"