Logarithms – Made Easy!

Class 9 · Chapter 2 · Exercise 2.1 · Slow & Simple Notes

Welcome to Chapter 2 – it starts with a friendly game

Before logarithms arrive, the chapter teaches a shortcut for writing HUGE and TINY numbers: scientific notation. The speed of light is 300000000 m/s — who wants to write all those zeros? Scientists write 3 × 10. Same number, tiny costume.

THE SHAPE TO MEMORIZE: $a \times 10^n$

- *'a' is a small number: at least 1, less than 10 — ONE digit before the decimal point, never more.*
- *'10' carries the zeros. n counts how far the decimal point travels.*
- *Big number n is positive. Small number (less than 1) n is negative.*

THE POINT-HOPPING GAME (the whole exercise!)

- *Point hops LEFT the power goes UP (+). Think: the number was big.*
- *Point hops RIGHT the power goes DOWN (–). Think: the number was tiny.*
- *Count every hop. The count IS the power. That is all of Exercise 2.1!*

One digit before the point,
and let 10 carry the zeros!

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Q.1 Into Scientific Notation (i–iv)

Hop the point until ONE digit stands before it. Count the hops.

(i) 2000000

The point starts at the end: 2000000. It must land after the 2: 2.000000. It hopped LEFT 6 times.

Answer: 2×10

(ii) 48900

Land the point after the 4: 4.8900 write 4.89 (trailing zeros after the point can go). Hops left: 4.

Answer: 4.89×10 (Check: $4.89 \times 10000 = 48900$)

(iii) 0.0042 — a tiny number, point hops RIGHT

The first real digit is 4. Hop right until the point sits after it: 0.0042 4.2. Hops: 3, and rightward hops make the power NEGATIVE.

Answer: 4.2×10^{3}

(iv) 0.0000009

Only one real digit here: 9. Hop right, past every zero, until you reach it: 7 hops.

Answer: 9×10

Memory picture: for tiny numbers, count the zeros BEFORE the digit, then add 1 — that total is the minus power. (iv): 6 zeros + 1 = 7 10.

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Q.1 Fix-Ups (v–vi) + Q.2 Back to Ordinary (i–iii)

Two parts already wear the ×10 costume — but the first number has the wrong size.

(v) 73×10^3 — 73 is too big (two digits before the point)

Shrink 73 into 7.3: the point hops LEFT 1, so the power grows by 1: $7.3 \times 10^1 \times 10^3 = 7.3 \times 10$.

Answer: 7.3×10 (Same value: $73 \times 1000 = 73000$, and $7.3 \times 10000 = 73000$)

(vi) 0.65×10^2 — 0.65 is too small (less than 1)

Grow 0.65 into 6.5: the point hops RIGHT 1, so the power drops by 1: $6.5 \times 10^1 \times 10^2 = 6.5 \times 10^1$.

Answer: 6.5×10^1 (Check: $0.65 \times 100 = 65$, and $6.5 \times 10 = 65$)

Q.2 Back to ordinary notation — the game in reverse

(i) 8.04×10^2: power +2 point hops RIGHT 2: 8.04 804. Answer: 804

(ii) 3×10: point hops right 5, filling with zeros: 3 300000. Answer: 300000

(iii) 1.5×10^{-2}: power −2 point hops LEFT 2: 1.5 0.015. Answer: 0.015

Rule for Q.2: the power's SIGN tells the direction — plus means 'grow the number', minus means 'shrink it'.

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Q.2 (iv–vi) + The Two Names Trap

Three more reverse journeys — then one warning about words.

(iv) 1.77 × 10: hop right 7: 1.77 17700000. Answer: 17700000

(v) 5.5 × 10: hop left 6: 5.5 0.0000055. Answer: 0.0000055

(vi) 4 × 10: hop left 5: 4 0.00004. Answer: 0.00004

Self-check for tiny answers: for 10 your answer must have the first real digit in the 6th place after the point. Count the places in (v): 0.000005 — the 5 sits at place 6 .

THE TWO NAMES TRAP

In THIS book's questions: 'scientific notation' means the a × 10 costume (Q.1, Q.4), and 'standard form' means the full ordinary number written out (Q.3, Q.5, Q.6). Do not swap them — read what the question starts from: costume write it out; long number dress it up.

ZERO-COUNTING SHORTCUT FOR POWERS OF 10

10^2 = 100 (2 zeros). $10^$ = 1000000 (6 zeros). $10^$ = 100000000 (8 zeros). The power IS the zero count — use it to check big answers in seconds.

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Q.3 + Q.4 — Light and Earth

Real-life giants. One direction each — the game is the same.

Q.3 Speed of light: 3×10^8 m/s standard form

Power +8: write 3 and give it 8 zeros (or hop the point right 8 times).

Answer: 300000000 m/s Read it: 300 million metres every single second!

Q.4 Earth's circumference: 40075000 m scientific notation

The distance around the Earth at the equator is 40,075,000 metres — about 40 thousand kilometres!

Hop the point left until one digit (4) stands before it: 4.0075000 keep the meaningful digits: 4.0075. Hops: 7.

Answer: 4.0075 × 10 m

Which digits to keep? After the first digit, keep every digit until the zeros take over: 4.0075 keeps 0, 0, 7, 5 — the two middle zeros are REAL digits here, they hold places. Never drop zeros that sit between real digits!

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Q.5 + Q.6 — Two Planets in Standard Form

Costume off, full numbers out. Then compare the two planets.

Q.5 Diameter of Mars: 6.779×10^3 km

Power +3: hop the point right 3: 6.779 → 6779. The $\times 10^3$ disappears into the number.

Answer: 6779 km

Q.6 Diameter of Earth: 1.2756×10^4 km

Power +4: hop the point right 4: 1.2756 → 12756.

Answer: 12756 km

SENSE-CHECK THE TWO ANSWERS TOGETHER

Earth: 12,756 km across. Mars: 6,779 km. Is Earth about double Mars? 6779 × 2 = 13,558 — a bit more than 12,756, so Earth is ALMOST double. True in real life too — your answers are sensible .

Exam habit: whenever two answers can be compared, compare them. A swapped power (10^3 for 10) would have screamed here.

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1-Page Revision — Scientific Notation

Read this before the test — the whole exercise is one game.

1. Scientific notation = $a \times 10$, with $1 \le a < 10$: exactly ONE digit before the decimal point.
2. Into notation: hop the point until one digit leads. Left hops power +, right hops power −. Count the hops = the power.
3. Out of notation (ordinary / standard form): the sign commands — + power: hop right and grow; − power: hop left and shrink, filling zeros.
4. Fix-ups: if 'a' is too big (73×10^3) shrink it and RAISE the power; if too small (0.65×10^2) grow it and LOWER the power.
5. The power of 10 = its zero count: 10 has 8 zeros. For a tiny number, zeros before the digit + 1 = the minus power.
6. Book's words: 'scientific notation' = the $a \times 10$ form; 'standard form' in Q.3/Q.5/Q.6 = the full ordinary number.
7. Real giants to remember: light 3×10 m/s; around Earth 4.0075×10 m; Earth across 1.2756×10 km; Mars 6.779×10^3 km.

TRY YOURSELF

A) Write 5600000 in scientific notation.

B) Write 0.00031 in scientific notation.

C) Write 2.5×10 in ordinary notation.

D) Write 9.1×10^3 in ordinary notation.

Answers: A) 5.6×10 B) 3.1×10 C) 25000 D) 0.0091

Exercise 2.1 — done! Next stop:
what a logarithm actually is. It is friendlier than its name.

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