

Converting to and from Standard Form

Starter

1. (Review of last lesson)

Find the value of: (a) 7^{-2} (b) $\left(3\frac{2}{5}\right)^{-2}$

2. (Review of last lesson) Simplify: (a) $y^{17} \div \frac{1}{y^3}$ (b) $p^{-5} \times \frac{1}{p^{-11}}$

3. (Review of previous material)
Write down the value of: (a) 10^3 (b) 10^{-2}

4. (Review of previous material)
Express these numbers as a power of 10: (a) 1000000 (b) 0.001

Notes

Standard form is a way of writing very large and very small numbers in a concise way. These are especially useful in science when you deal with very large (e.g. distances in outer space) and very small (e.g. size of an atom) quantities.

Standard form numbers are as: $A \times 10^n$ where $1 \leq A < 10$ and n is an integer.

E.g. 3×10^5 7.2×10^4 4.98×10^{-2}

This is what they mean:

$$3 \times 10^5 = 3 \times 100000 = 300000$$

$$7.2 \times 10^4 = 7.2 \times 10000 = 72000$$

$$4.98 \times 10^{-2} = 4.98 \times \frac{1}{10^2} = 4.98 \times \frac{1}{100} = \frac{4.98}{100} = 0.0498$$

E.g. 1 Decide whether the following are written in standard form. For those that are not, give a reason for your answer.

(a) 7956×10^2 (b) 6.4×10^5 (c) $4 \times 10^{-8.5}$ (d) 0.05×10^6

Working: (a) 7956×10^2 Incorrect because 7956 is not greater than or equal to 1 and less than 10.

E.g. 2 Write these standard form numbers as ordinary numbers:

(a) 8×10^5 (b) 6×10^3 (c) 5.9×10^3 (d) 4.21×10^6

Working: (a) $8 \times 10^5 = 8 \times 100000 = 800000$

E.g. 3 Write these standard form numbers as ordinary numbers:

- (a) 7×10^{-5} (b) 2×10^{-4} (c) 2.3×10^{-4} (d) 1.80×10^{-6}

Working: (a) $7 \times 10^{-5} = 7 \times \frac{1}{100000} = \frac{7}{100000} = 0.00007$

E.g. 4 Change these ordinary numbers to standard form:

- (a) 900 (b) 40000 (c) 45000 (d) 10600000

Remember: $A \times 10^n$ where $1 \leq A < 10$ and n is an integer.

Working: (a) $900 = 9 \times 100 = 9 \times 10^2$

N.B. When the number is smaller than 1, the power of 10 is negative.

E.g. 5 Rewrite these decimals in standard form:

- (a) 0.00006 (b) 0.008 (c) 0.0087 (d) 0.000713

Remember: $A \times 10^n$ where $1 \leq A < 10$ and n is an integer.

Working: (a) $0.00006 = 6 \div 100000 = 7.83 \div 10^5 = 7.83 \times 10^{-5}$

E.g. 6 Rewrite these numbers in standard form.

- (a) 572×10^{18} (b) 0.0061×10^{-4}
(c) 8923×10^{11} (d) $0.000001324 \times 10^{-7}$

Working: (a) $572 \times 10^{18} = 5.72 \times 100 \times 10^{18}$
 $= 5.72 \times 10^2 \times 10^{18}$
 $= 5.72 \times 10^{2+18}$
 $= 5.72 \times 10^{20}$

E.g. 7* If the number 8.36×10^{11} is written out in full, how many zeros follow the 6?

Video: [Standard form](#)

[Solutions to Starter and E.g.s](#)

Exercise

9-1 class textbook:	p129 M5.3 Qu 1ace..., 2ace..., 3-9, 10ace, 11ace, 12ace
A*-G class textbook:	p121 M5.3 Qu 1ace..., 2ace..., 3-9, 10ace, 11ace, 12ace
9-1 homework book:	p45 M5.3 Qu 1-6
A*-G homework book:	p33 M5.3 Qu 1-6

Summary

Standard form numbers are as: $A \times 10^n$ where $1 \leq A < 10$ and n is an integer.
When the number is smaller than 1, the power of 10 is negative.