Index laws: fact sheet

Planner week 10 · Learn these facts

Powers

$2^4 = 2 \times 2 \times 2 \times 2$
$= 16$

The power says how many to multiply

$3^3 = 27$, not 9

Roots

$\sqrt{64} = 8$
$\sqrt[3]{27} = 3$

Square root: what times itself?

Cube root: three times

Multiplying

$n^3 \times n^5 = n^8$

Add the powers

Same base only

Dividing

$x^7 \div x^3 = x^4$

Subtract the powers

$12x^7 \div 6x^3 = 2x^4$

Power of a power

$(p^2)^5 = p^{10}$

Multiply the powers

$(m^{-2})^{-3} = m^6$

Zero and negative

$5^0 = 1$
$5^{-2} = \frac{1}{25}$

Anything to the power 0 is 1

Negative power: 1 over

Numbers and letters

$c^3d^4 \div c^2d$
$= cd^3$

Deal with each letter separately

Numbers: divide normally

Laws

×	add powers
÷	subtract powers
$( )^n$	multiply powers
^{0}	= 1

Which sheet do I need?

Powers and roots ▸
squares, cubes, roots, powers of numbers

Laws of indices ▸
powers with letters: × ÷ brackets

Key words

- **Index / power** the small raised number
- **Base** the number being multiplied
- **Square root** √
- **Reciprocal** 1 ÷ the number

Exam tips

- 2^5 means $2 \times 2 \times 2 \times 2 \times 2$, not 2×5.
- Laws only work with the **same base**.
- Write answers as a power when asked: 2^6.
- Use the x^2 and x^y buttons on a calculator.
- 1 to any power is 1; anything to the power 0 is 1.
- Learn the squares to 15^2 and cubes to 5^3.

Powers and roots: fact sheet

Index laws · Planner week 10 · Learn the method

Worked example

QUESTION

Use your calculator to work out $\sqrt{(6.25)} + 2.1^2$

Write down all the figures on your calculator display.

ANSWER

1. $\sqrt{6.25} = 2.5$
2. $2.1^2 = 2.1 \times 2.1 = 4.41$
3. $2.5 + 4.41$

6.91

Work out the root and the power first, then add.

How to do it

1. A power tells you how many of the number to multiply.
2. A square root undoes squaring; a cube root undoes cubing.
3. On a calculator use x^2, x^3, $\sqrt{}$ and x^y.
4. Reciprocal: 1 ÷ the number.
5. Write all the figures on the display when asked.

Model answer:

$2.5 + 4.41 = 6.91$

Watch out

- $2^4 = 8$ (it is 16).
- Forgetting brackets on the calculator.
- Reciprocal of 0.625 as −0.625 (it is 1.6).

Laws of indices: fact sheet

Index laws · Planner week 10 · Learn the method

Worked example

QUESTION

Write $2^5 \times 2^4 \div 2^3$ as a power of 2.

ANSWER

1. Multiplying: add the powers. 5 + 4 = 9, so 2^9
2. Dividing: subtract the powers. 9 − 3 = 6

2^6

Add when multiplying, subtract when dividing.

How to do it

1. Same base, multiplying: add the powers.
2. Same base, dividing: subtract the powers.
3. Power of a power: multiply the powers.
4. Power 0 = 1. Negative power: 1 over the positive power.
5. Numbers in front: work them out normally.

Model answer:

2^6

Watch out

- Multiplying the powers when multiplying ($n^3 \times n^5 = n^{15}$ ×).
- Dividing the powers when dividing.
- $5^0 = 0$ (it is 1).