Surds & indices (AS)

B1 Understand and use the laws of indices for all rational exponents.

B2 Use and manipulate surds, including rationalising the denominator.

For a brief commentary on this content go to the MEI outline SoW.

Pre-requisites

- Transition to A level Maths: Essential Skills: In the 'Simplifying' section there are relevant activities called 'Indices' and 'Surds'.
- Expectation that students will have met surds and the laws of indices at GCSE.

Common student errors

- Mixing up rules, making mistakes such as $a^3 \times a^2 = a^6$ and $2x^{-3} = \frac{1}{2x^3}$.
- When rationalising the denominator, failing to divide both terms in the numerator by the result in the denominator, e.g. $\frac{7+4\sqrt{3}}{4} = \frac{7}{4} + 4\sqrt{3}$ or $7 + \sqrt{3}$ instead of $\frac{7}{4} + \sqrt{3}$.
- Cancelling inside the square root by a denominator rather than its square, e.g. $\frac{\sqrt{20x^2}}{2} = \sqrt{10}x$ or even $10x$ instead of $\sqrt{5}x$.

Teaching it!

- A series of six videos designed to support students on this topic.
- Surds True or False: A starter activity designed to expose some common misunderstandings.
- Multiplication & Division of Surds Arithmagon (Solution)
- Sumaze! Powers Maze: A problem-solving puzzle game.
- Underground Mathematics:
  - Ab-surd!: A resource practicing rationalizing the denominator.
  - Index issues: A resource where students work with both surds and indices.

Getting them thinking

- Give me an example of a number between $5\sqrt{6}$ and $6\sqrt{5}$.
- Change one number in $(2 + \sqrt{8})(4 - \sqrt{2})$ so that the product is a rational number.
- Prove that any irrational number can be a root of at most one cubic equation of the form $x^3 + ax = b$, where a and b are rational.
- Give me an example of a number that is equal to $3\sqrt{2}$…and another…and another…and one which no-one else in the class is likely to give me.