


Rationalise the Denominator

To **rationalise the denominator** we convert the denominator of a fraction from a surd to a rational number.

Denominator is a single surd

 **Example** Rationalise the denominator: $\frac{8}{\sqrt{2}}$

- 1** Multiply the numerator and denominator by the **surd in the denominator**.


$$\frac{8}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$$

We use the law $\sqrt{m} \times \sqrt{m} = m$ to change the denominator to a rational number.
 $\sqrt{2} \times \sqrt{2} = 2$

- 2** Simplify the expression fully: $\frac{8\sqrt{2}}{2} = 4\sqrt{2}$

We **only** cancel factors from coefficients and not from inside square root symbols.

Denominator is a surd expression

 **Example** Rationalise the denominator: $\frac{4}{5 + \sqrt{2}}$

- 1** Change the sign of the expression in the denominator. $5 - \sqrt{2}$

- 2** Multiply numerator and denominator by **this expression**.

$$\frac{4}{5 + \sqrt{2}} \times \frac{5 - \sqrt{2}}{5 - \sqrt{2}}$$

We use the difference of two squares to eliminate all surds from the denominator.

- 3** Simplify: $\frac{20 - 4\sqrt{2}}{25 + 5\sqrt{2} - 5\sqrt{2} - 2} = \frac{20 - 4\sqrt{2}}{23}$

Surd expressions in denominator cancel out.



THIRD SPACE
LEARNING