

# Algebra

## Miscellaneous topics

### Surd Equations

#### P5 - Algebra

Solve the following surd equation:  $\sqrt{5x + 6} = \sqrt{2x} + 2$

#### Solution

There are two surds in the algebraic equation, so move one to each side of the equation, square both sides, isolate the remaining surd, square both side again and solve.

$$\Rightarrow (\sqrt{5x + 6})^2 = (\sqrt{2x} + 2)^2 \quad \dots \text{squaring both sides}$$

$$\Rightarrow 5x + 6 = 2x + 4\sqrt{2x} + 4$$

$$\Rightarrow 3x + 2 = 4\sqrt{2x} \quad \dots \text{isolate the remaining surd}$$

$$\Rightarrow (3x + 2)^2 = (4\sqrt{2x})^2 \quad \dots \text{squaring both sides again}$$

$$\Rightarrow 9x^2 + 12x + 4 = 16(2x) \quad \dots \text{solving for } x$$

$$\Rightarrow 9x^2 - 20x + 4 = 0$$

$$\Rightarrow (9x - 2)(x - 2) = 0$$

$$\therefore x = \frac{2}{9} \quad \text{or} \quad x = 2$$

Checking .....  $\sqrt{5(2) + 6} - \sqrt{2(2)} = 2$

$$\sqrt{5\left(\frac{2}{9}\right) + 6} - \sqrt{2\left(\frac{2}{9}\right)} = 2$$