Surds and Area

Core Worksheet

Worked Examples & Guided Practice

I Do (Teacher Model) A rectangle has side lengths $(3+\sqrt{2})$ cm and $(3-\sqrt{2})$ cm. Calculate its exact area in cm^2.

We Do (Guided Practice) A rectangle has length $(5+\sqrt{3})$ cm and width $\sqrt{3}$ cm. Show that its area can be written in the form $a+b\sqrt{3}$, where a and b are integers.

You Do (Independent Practice) A square has side length $(4+\sqrt{5})$ cm. Find its exact area in the form $a+b\sqrt{5}$.

Challenge (Extension) A right-angled triangle has base $(\sqrt{5}-1)$ cm and height $(\sqrt{5}+3)$ cm. Show that the area of the triangle is $1+\sqrt{5}$ cm^2.

Practice Perfect Questions

Q1. A rectangle has sides of length $\sqrt{8}$ cm and $\sqrt{2}$ cm. Calculate its exact area.

Q2. Calculate the exact area of a rectangle with sides $(6+\sqrt{5})$ cm and $(6-\sqrt{5})$ cm.

Q3. Calculate the exact area of a square with side length $(3+\sqrt{2})$ cm in the form $a+b\sqrt{2}$.

Q4. A rectangle has width $\sqrt{5}$ cm and area $(15+2\sqrt{5})$ cm^2. Find its exact length in the form $a+b\sqrt{5}$.

Q5. A right-angled triangle has base $2\sqrt{3}$ cm and perpendicular height $(4+\sqrt{3})$ cm. Find its area in the form $a+b\sqrt{3}$.

Q6. Calculate the area of a rectangle with length $(4+\sqrt{7})$ cm and width $(2+\sqrt{7})$ cm in the form $a+b\sqrt{7}$.

Answers & Worked Solutions

Model Solutions

- **I Do:** $(3+\sqrt{2})(3-\sqrt{2}) = 9-2 = 7 \text{ cm}^2$
- **We Do:** $\sqrt{3}(5+\sqrt{3}) = 3+5\sqrt{3} \text{ cm}^2 \quad (a=3, b=5)$
- **You Do:** $(4+\sqrt{5})^2 = 16+8\sqrt{5}+5 = 21+8\sqrt{5} \text{ cm}^2$
- **Challenge:** $\text{Area} = \frac{1}{2}(\sqrt{5}-1)(\sqrt{5}+3) = \frac{1}{2}(5+3\sqrt{5}-\sqrt{5}-3) = \frac{1}{2}(2+2\sqrt{5}) = 1+\sqrt{5} \text{ cm}^2$ ■

Practice Perfect Questions Solutions

Q1. $\sqrt{8} \times \sqrt{2} = \sqrt{16} = 4 \text{ cm}^2$

Q2. $(6+\sqrt{5})(6-\sqrt{5}) = 36-5 = 31 \text{ cm}^2$

Q3. $(3+\sqrt{2})^2 = 9+6\sqrt{2}+2 = 11+6\sqrt{2} \text{ cm}^2$

Q4. $\text{Length} = \frac{15+2\sqrt{5}}{\sqrt{5}} = \frac{15\sqrt{5}+10}{5} = 2+3\sqrt{5} \text{ cm}$

Q5. $\text{Area} = \frac{1}{2} \times 2\sqrt{3} \times (4+\sqrt{3}) = 3+4\sqrt{3} \text{ cm}^2$

Q6. $(4+\sqrt{7})(2+\sqrt{7}) = 8+4\sqrt{7}+2\sqrt{7}+7 = 15+6\sqrt{7} \text{ cm}^2$