eClassroom

GCSE Mathematics

Powers & Roots

Questions

Pearson Edexcel GCSE & iGCSE Mathematics

Section A — Foundation

Worked Examples

[Fluency]

Work out $\sqrt{169}$.

Think: what number multiplied by itself gives 169?

$13 \times 13 = 169 \rightarrow \sqrt{169} = 13$

[Reasoning]

Between which two consecutive integers does $\sqrt{40}$ lie? Explain your reasoning.

$6^2 = 36$ and $7^2 = 49$

Since $36 < 40 < 49$, we have $6 < \sqrt{40} < 7$

$\sqrt{40}$ is closer to 6 since 40 is closer to 36 than to 49.

[Problem Solving]

A square garden has an area of 72 m². Find the exact side length in its simplest form.

Side $= \sqrt{72} = \sqrt{(36 \times 2)} = 6\sqrt{2}$

Check: $(6\sqrt{2})^2 = 36 \times 2 = 72$ ✓

[Fluency]

1.

Work out

$\sqrt{144}$

(1 mark)

[Fluency]

2.

Work out

$\sqrt[3]{216}$

(1 mark)

[Fluency]

3.

Between which two consecutive integers does $\sqrt{50}$ lie?
Show how you decided.

(2 marks)

[Fluency]

4.

Work out the exact value of:

$$\sqrt{3^2 + 4^2}$$

(2 marks)

[Fluency]

5. Is $\sqrt{2}$ a rational or irrational number?

Explain what this means.

(2 marks)

[Reasoning]

6.

Simplify:

$$\sqrt{72}$$

(2 marks)

[Reasoning]

7.

Simplify:

$$\sqrt{48} + \sqrt{3}$$

(2 marks)

[Reasoning]

8. A square tile has an area of 45 cm².

Find the exact side length of the tile. Give your answer in simplified surd form.

(2 marks)

[Problem Solving]

9. A rectangle has length $5\sqrt{2}$ cm and width $3\sqrt{2}$ cm.

(a) Find the exact area of the rectangle. (2)

(b) Find the exact perimeter. Give your answer in simplified surd form. (2)

(4 marks)

[Problem Solving]

10. A right-angled triangle has legs of length 5 cm and $\sqrt{11}$ cm.

Find the exact length of the hypotenuse.

Show all your working.

(3 marks)

Section B — Higher

Worked Examples

[Fluency]

Simplify $\sqrt{98}$.

Find the largest perfect square factor of 98:

$98 = 49 \times 2$

$\sqrt{98} = \sqrt{(49 \times 2)} = 7\sqrt{2}$

[Reasoning]

Rationalise the denominator of $5 \div \sqrt{2}$. Give your answer in simplest form.

Multiply top and bottom by $\sqrt{2}$:

$$\frac{5}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{5\sqrt{2}}{2}$$

[Problem Solving]

Show that $(1 + \sqrt{3})^2 = 4 + 2\sqrt{3}$.

$(1+\sqrt{3})^2 = 1^2 + 2 \times 1 \times \sqrt{3} + (\sqrt{3})^2 = 1 + 2\sqrt{3} + 3 = 4 + 2\sqrt{3}$ ✓

[Fluency]

1.

Simplify:

$$\sqrt{200}$$

(2 marks)

[Fluency]

2.

Expand and simplify:

$$(3\sqrt{5})^2$$

(2 marks)

[Fluency]

3.

Rationalise the denominator and simplify:

$$\frac{6}{\sqrt{3}}$$

(2 marks)

[Reasoning]

4.

Expand and simplify:

$$(2+\sqrt{3})(2-\sqrt{3})$$

(2 marks)

[Reasoning]

5.

Expand and simplify:

$$(3+\sqrt{5})^2$$

(3 marks)

[Reasoning]

6.

Rationalise the denominator and simplify fully:

$$\frac{8}{3-\sqrt{5}}$$

(3 marks)

[Reasoning]

7.

Show that:

$$\sqrt{75}-\sqrt{12}=3\sqrt{3}$$

(3 marks)

[Problem Solving]

8. A rectangle has length $(3+\sqrt{2})$ cm and width $(3-\sqrt{2})$ cm.

(a) Show that the area is a rational number. (2)

(b) Find the exact perimeter of the rectangle. (2)

(4 marks)

[Problem Solving]

9.

Solve, giving your answers in simplified surd form:

$$x^2=75$$

(3 marks)

[Problem Solving]

10. An isosceles right-angled triangle has a hypotenuse of length 10 cm.

(a) Show that the length of each leg is $5\sqrt{2}$ cm. (3)

(b) Find the exact area of the triangle. (2)

(5 marks)