CAMBRIDGE IGCSE MATHS (0580) · TOPIC 1: NUMBER

Surds questions and answers

11 questions · Extended · 11 non-calculator · worked answers

Name _____ Date _____ Score _____

- Original questions in the style of the Cambridge 0580 papers, each labelled Core or Extended and calculator or non-calculator. Try every question before you look at the answers.
- Worked answers start after the questions. Questions with marks come from our 0580 practice bank (M method, A accuracy, B independent marks).
- Online, with more practice: igcsemathrevision.com/igcse-frontend/0580/surds-questions

Extended: for Papers 2 and 4

1. **Extended · non-calculator · easy**

Simplify

(a) $\sqrt{50}$

(b) $\sqrt{48}$

2. **Extended · non-calculator · easy**

Write $\sqrt{20} + \sqrt{45}$ as a single surd in its simplest form.

3. **Extended · non-calculator · easy · 2 marks**

Simplify $\sqrt{8} + \sqrt{50}$.

4. **Extended · non-calculator · medium**

Simplify $\sqrt{98} - \sqrt{32}$.

5. **Extended · non-calculator · medium**

Multiply out $(5 + \sqrt{3})(5 - \sqrt{3})$ and simplify your answer.

6. **Extended · non-calculator · medium**

Expand and simplify $(2 + \sqrt{5})^2$.

7. **Extended · non-calculator · medium**

Rationalise the denominator of $\frac{6}{\sqrt{3}}$. Simplify your answer.

8. **Extended · non-calculator · medium · 2 marks**

Expand and simplify $(3 + \sqrt{2})(5 - \sqrt{2})$.

9. **Extended · non-calculator · hard**

Rationalise the denominator of $\frac{4}{3-\sqrt{5}}$. Simplify your answer.

10. **Extended · non-calculator · hard**

A rectangle has sides of length $(\sqrt{8}+1)$ cm and $(\sqrt{2}-1)$ cm.
Find its area in the form $a+b\sqrt{2}$, where a and b are integers.

11. **Extended · non-calculator · hard · 4 marks**

A rectangle has sides of length $(4+\sqrt{3})$ cm and $(4-\sqrt{3})$ cm.

(a) Work out its area.

(b) Work out the length of its diagonal. Give your answer as a surd.

Answers and worked solutions

Question 1

Answer: (a) $5\sqrt{2}$ (b) $4\sqrt{3}$

1. (a) $\sqrt{50} = \sqrt{25 \times 2} = 5\sqrt{2}$
2. (b) $\sqrt{48} = \sqrt{16 \times 3} = 4\sqrt{3}$

Question 2

Answer: $5\sqrt{5}$

1. $\sqrt{20} = \sqrt{4 \times 5} = 2\sqrt{5}$ and $\sqrt{45} = \sqrt{9 \times 5} = 3\sqrt{5}$.
2. $2\sqrt{5} + 3\sqrt{5} = 5\sqrt{5}$

Question 3

2 marks

Answer: $7\sqrt{2}$

M1 $2\sqrt{2}$ or $5\sqrt{2}$ seen

A1 $7\sqrt{2}$

Question 4

Answer: $3\sqrt{2}$

1. $\sqrt{98} = \sqrt{49 \times 2} = 7\sqrt{2}$ and $\sqrt{32} = \sqrt{16 \times 2} = 4\sqrt{2}$.
2. $7\sqrt{2} - 4\sqrt{2} = 3\sqrt{2}$

Question 5

Answer: 22

1. $25 - 5\sqrt{3} + 5\sqrt{3} - 3$
2. $= 22$

Question 6

Answer: $9 + 4\sqrt{5}$

1. $(2 + \sqrt{5})(2 + \sqrt{5}) = 4 + 2\sqrt{5} + 2\sqrt{5} + 5$
2. $= 9 + 4\sqrt{5}$

Question 7

Answer: $2\sqrt{3}$

1. Multiply top and bottom by $\sqrt{3}$: $\frac{6\sqrt{3}}{3}$.
2. $= 2\sqrt{3}$

Question 8

2 marks

Answer: $13 + 2\sqrt{2}$

M1 $15 - 3\sqrt{2} + 5\sqrt{2} - 2$

A1 $13 + 2\sqrt{2}$

Question 9

Answer: $3 + \sqrt{5}$

1. Multiply top and bottom by $3 + \sqrt{5}$.
2. Bottom: $(3 - \sqrt{5})(3 + \sqrt{5}) = 9 - 5 = 4$.
3. $\frac{4(3+\sqrt{5})}{4} = 3 + \sqrt{5}$

Question 10

Answer: $3 - \sqrt{2}\,\text{cm}^2$

1. $(\sqrt{8} + 1)(\sqrt{2} - 1) = \sqrt{16} - \sqrt{8} + \sqrt{2} - 1$
2. $= 4 - 2\sqrt{2} + \sqrt{2} - 1 = 3 - \sqrt{2}$

Question 11

4 marks

Answer: (a) $13\ \text{cm}^2$ (b) $\sqrt{38}$ cm

M1 (a) $16 - 3$

A1 $13\,\text{cm}^2$

M1 (b)

$(4 + \sqrt{3})^2 + (4 - \sqrt{3})^2 = 19 + 8\sqrt{3} + 19 - 8\sqrt{3}$

A1 $\sqrt{38}$ cm

More surds practice with instant marking, notes and common mistakes: igcsemathrevision.com/igcse-frontend/0580/surds-questions

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