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WJEC Level 2 Additional Mathematics – Question Pack

Simplifying surds, rationalising denominators and giving exact answers in the form $a + b\sqrt{n}$ – all non-calculator.

REVISE
.wales

Surds

Algebra · Level 2 Certificate (9550) · calculator allowed

Simplifying surds, rationalising denominators and giving exact answers in the form $a + b\sqrt{n}$ – all non-calculator.

LEVEL 2 · 9550

Estimated time for entire question pack: ~1 hours 5 minutes

At the Additional Maths pace of ~1.2 min/mark (54 marks across 11 questions).

*You are advised to **not** attempt to complete all of this in one sitting.*

ABOUT THIS QUESTION PACK

This is a **focused single-topic practice pack**, not a single mock paper. It gathers every question on this topic from the 2011–2024 papers.

Questions are ordered by year, newest first.

INSTRUCTIONS

Use black ink or black ball-point pen. Show all working – method marks are awarded for clear setup.

A calculator is allowed throughout this qualification.

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Surds – what's examined

WJEC Level 2 Additional Mathematics (9550) · single written paper, calculator allowed.

Simplifying Number

- Pull out the largest square factor.
- $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$.
- Collect like surds.

Rationalising Number

- Remove surds from a denominator.
- Multiply top and bottom by the surd (or conjugate).
- Leave the answer in exact form.

Exact form Method

- Don't convert to a decimal.
- Give answers as $a + b\sqrt{n}$.
- Show each manipulation step.

Surds in one page

Quick-reference notes – revisit before each question. Don't use during the questions.

Surd laws

$$\begin{aligned}\sqrt{a} \times \sqrt{b} &= \sqrt{ab} \\ \sqrt{a} \div \sqrt{b} &= \sqrt{a/b}\end{aligned}$$

Simplify

$\sqrt{50} = \sqrt{(25 \times 2)} = 5\sqrt{2}$. Always take out the biggest square factor.

Rationalise (single)

$$1/\sqrt{a} = \sqrt{a} / a$$

Rationalise (conjugate)

For $1/(a+\sqrt{b})$, multiply by $(a-\sqrt{b})/(a-\sqrt{b})$ to clear the surd.

4. The diagram below shows a sector of a circle with radius 4.1 cm.

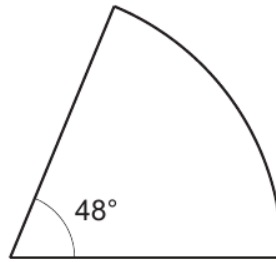


Diagram not drawn to scale

Calculate the area of this sector of a circle.

[2]

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5. (a) Find the remainder when $2x^3 - 3x^2 - 4x + 1$ is divided by $x + 2$.

[2]

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- (b) (i) Show that $x - 3$ is a factor of $x^3 + 4x^2 - 9x - 36$.

[2]

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14. Do **not** use a calculator to answer this question.

$$\text{Solve } \sqrt{2} \sin 60^\circ + \sqrt{3} \sin 45^\circ = \sqrt{x}.$$

[3]

You must show all your working.

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3. Do not use a calculator to answer this question.

(a) Simplify $(4\sqrt{3}+1)^2 - 1$.

Give your answer in the form $a(b + \sqrt{c})$ where a , b and c are integers.

You must show all your working.

[4]

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(b) Rationalise the denominator in the following expression.

$$\frac{1}{6 - \sqrt{7}}$$

You must show all your working.

[2]

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4. Simplify each of the following.

(a) $2x^{\frac{3}{8}} \times 3x^{\frac{1}{4}}$

[1]

(b) $\left(x^{\frac{4}{5}} \times x^{\frac{1}{5}}\right)^3$

[1]

(c) $x^{-\frac{1}{8}} \left(5x^{\frac{1}{8}} + 7x^{\frac{5}{8}}\right)$

[2]



17. Do not use a calculator to answer this question.

All working must be shown.

(a) Find the value of $\left(15^{\frac{1}{3}}\right)^6$.

Show all your working.

[1]

(b) Rationalise the denominator in the following expression.

$$\frac{1}{8 + \sqrt{5}}$$

Show all your working.

[2]

END OF PAPER

9. Do **not** use a calculator to answer any part of this question.
You must show all your working.

(a) Simplify $\frac{\cos 45^\circ}{\sin 45^\circ}$. [1]

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(b) Express $\frac{\sin 30^\circ}{\tan 60^\circ}$ in the form $\frac{\sqrt{a}}{b}$, where a and b are integers to be found. [2]

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(c) $(\sin 60^\circ)^2$ is written $\sin^2 60^\circ$.
Simplify $\sin^2 60^\circ + \tan^2 45^\circ$. [2]

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6. (a) Simplify $\frac{3}{2+\sqrt{5}}$, leaving your answer in surd form.

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[3]

- (b) Simplify $(\sqrt{3} + 2)^2 - (\sqrt{3} - 2)^2$, leaving your answer in surd form.

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[3]

6.

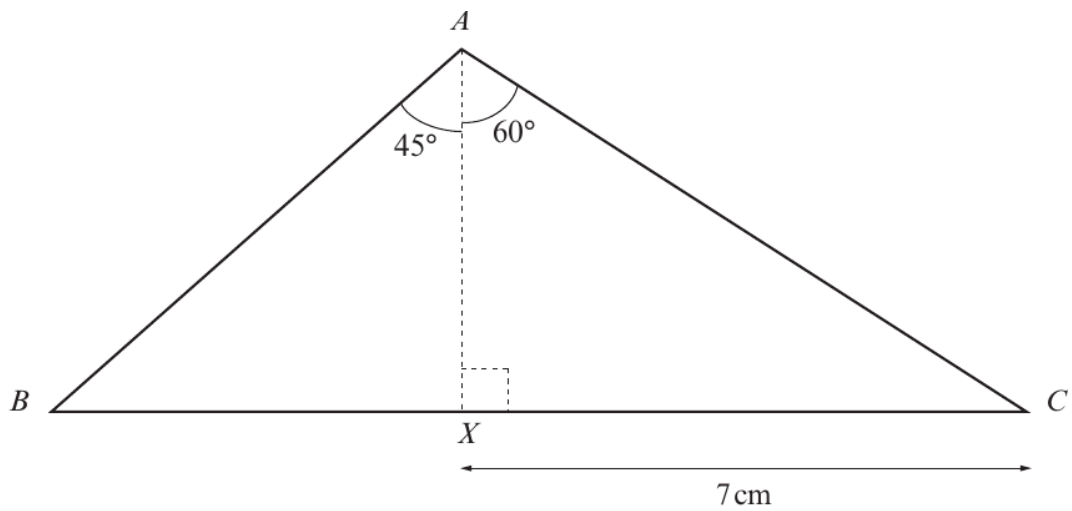


Diagram not drawn to scale

Find the length of AB in surd form.

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[5]

End of question pack