InkMaths

ANSWER BOOK

Indices and surds

Algebra and functions · Year 12–13

7 questions · 20 marks

NAVY EDITION

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SECTION A · Warm-up

A1 $16^{3/4} = (\sqrt[4]{16})^3 = 2^3 = 8$; $5^0 = 1$; $4^{-2} = 1/16$. Root before power keeps the numbers small, and the zero index is 1 for every base. [3]

A2 $\sqrt{72} = \sqrt{(36 \times 2)} = \sqrt{36} \times \sqrt{2} = 6\sqrt{2}$. Pull out the largest square factor in one step; pulling out 4 first works but takes two rounds. [2]

SECTION B · Standard

B1 Outside-in: the minus means reciprocal, the third means cube root. $8^{-2/3} = 1/(\sqrt[3]{8})^2 = 1/4$. And $25^{3/2} = (\sqrt{25})^3 = 5^3 = 125$. [4]

B2 Each surd reduces to a multiple of $\sqrt{2}$: $\sqrt{50} = 5\sqrt{2}$, $\sqrt{32} = 4\sqrt{2}$, $\sqrt{18} = 3\sqrt{2}$. Then $5\sqrt{2} + 4\sqrt{2} - 3\sqrt{2} = 6\sqrt{2}$: like terms in $\sqrt{2}$ collect exactly as terms in x would. [3]

B3 $5/\sqrt{5} = 5\sqrt{5}/5 = \sqrt{5}$: multiplying top and bottom by the surd clears it. $4/\sqrt{6} = 4\sqrt{6}/6 = 2\sqrt{6}/3$, with the final cancellation part of the expected answer. [3]

B4 Multiply top and bottom by the conjugate $\sqrt{6} + 2$: the denominator becomes $6 - 4 = 2$, and the numerator $10(\sqrt{6} + 2)$. So the fraction is $10(\sqrt{6} + 2)/2 = 5\sqrt{6} + 10$. The conjugate is chosen precisely so the cross terms cancel and the denominator turns rational. [4]

SECTION C · Stretch

C1 Write both sides over the base 2: $8^{x-1} = 2^{3(x-1)} = 2^{3x-3}$. Equal bases force equal exponents: $x + 1 = 3x - 3$, so $x = 2$. Matching bases first is the whole method; logs would work but are not needed. [3]