HIGHER

7.1 Surds: 30-minute Pack

EDEXCEL 1MA1 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

Surds: Fluency and Exam Drill

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This is a non-calculator practice set on surds. Work through the fluency questions first to secure the core skills of simplifying, combining and rationalising surds, then attempt the exam-style questions, finishing with two grade 9 stretch questions. Show all your working clearly, since method marks are available even when a final answer is not fully correct. Give all answers in their simplest surd form unless told otherwise.

1 Simplify $\sqrt{50}$ fully.

(Total for Question 1 is 1 mark)

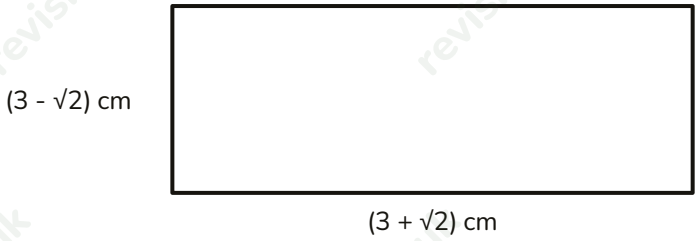
2 Work out $\sqrt{20} * \sqrt{5}$.

(Total for Question 2 is 1 mark)

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3 A rectangle has length $(3 + \sqrt{2})$ cm and width $(3 - \sqrt{2})$ cm. Show that the area of the rectangle is 7 cm².

Diagram NOT accurately drawn



(Total for Question 3 is 3 marks)

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

(Total for Question 4 is 4 marks)

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5 Rationalise the denominator of $70/\sqrt{10}$. Give your answer in its simplest form.

(Total for Question 5 is 2 marks)

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6 Write $\sqrt{147}$ in the form $a\sqrt{b}$, where a and b are integers and b is as small as possible.

(Total for Question 6 is 2 marks)

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7 Simplify fully $\sqrt{18} + \sqrt{50} - \sqrt{50}$

(Total for Question 7 is 3 marks)

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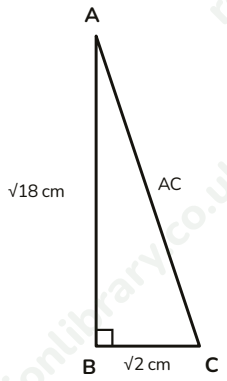
8 Rationalise the denominator: $5/\sqrt{2}$, giving your answer in its simplest form.

(Total for Question 8 is 2 marks)

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9 The diagram shows right-angled triangle ABC, with the right angle at B. AB = $\sqrt{18}$ cm and BC = $\sqrt{2}$ cm. Find the length of AC, giving your answer in the form $k\sqrt{n}$ cm, where k and n are integers.

Diagram NOT accurately drawn



(Total for Question 9 is 3 marks)

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10 A student writes down the statement $\sqrt{16} + \sqrt{9} = \sqrt{16 + 9}$.

(a) Show, by evaluating both sides, that the statement above is not correct. **(2)**

(b) By simplifying $\sqrt{20} + \sqrt{5}$ and $\sqrt{20 + 5}$ separately, show that $\sqrt{a} + \sqrt{b}$ is not equal to $\sqrt{a + b}$ in general. **(3)**

(Total for Question 10 is 5 marks)

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Mark scheme · 7.1 Surds: 30-minute Pack

A correct answer earns full marks unless the question asks for working, a method, proof or explanation.

Question 1

$5\sqrt{2}$ oe cao **B1**

Answer: $5\sqrt{2}$

Question 2

10 cao **B1**

Answer: 10

Question 3

$(3+\sqrt{2})(3-\sqrt{2}) = 9 - 3\sqrt{2} + 3\sqrt{2} - 2$ (or equivalent expansion) **M1**

the $3\sqrt{2}$ terms are recognised to cancel to zero **M1**

cso - 9 - 2 = 7 cm² shown **A1**

Answer: 7 cm^2 (given)

Question 4

correct expansion: $5 - 3\sqrt{5} + 2\sqrt{5} - 6$ (or equivalent four terms) **M1**

surd terms combined to $-\sqrt{5}$ **M1**

constant terms combined to -1 **A1**

$-1 - \sqrt{5}$ oe cao **A1**

Answer: $-1 - \sqrt{5}$

Question 5

multiply numerator and denominator by $\sqrt{10}$ **M1**

$7\sqrt{10}$ cao **A1**

Answer: $7\sqrt{10}$

Question 6

$147 = 49 \times 3$ or $\sqrt{49} = 7$ seen **M1**

$7\sqrt{3}$ cao **A1**

Answer: $7\sqrt{3}$

Question 7

one surd correctly simplified **M1**

all three terms simplified **M1**

$3\sqrt{2}$ cao **A1**

Answer: $3\sqrt{2}$

Question 8

multiplies numerator and denominator by $\sqrt{2}$ **M1**

$5\sqrt{2}/2$ oe cao **A1**

Answer: $5\sqrt{2}/2$

Question 9

$AC^2 = 18 + 2$ (= 20) **M1**

$AC = \sqrt{20}$ oe **M1**

$AC = 2\sqrt{5}$ cm cao **A1**

Answer: AC = $2\sqrt{5}$ cm

Question 10

(a) left-hand side evaluated: $\sqrt{16} + \sqrt{9} = 4 + 3 = 7$ **B1**

(a) right-hand side evaluated: $\sqrt{16 + 9} = \sqrt{25} = 5$, and 7 is not equal to 5 so the statement is incorrect **B1**

(a) Answer: 7 is not equal to 5, so the statement is false

(b) $\sqrt{20} = 2\sqrt{5}$, so $\sqrt{20} + \sqrt{5} = 3\sqrt{5}$ **M1**

(b) $\sqrt{20 + 5} = \sqrt{25} = 5$ evaluated **A1**

(b) cso - since $3\sqrt{5}$ is not equal to 5, confirms $\sqrt{a} + \sqrt{b}$ is not equal to $\sqrt{a + b}$ in general **A1**

(b) Answer: $3\sqrt{5}$ is not equal to 5, confirming the general result

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