HIGHER

7.1 Surds: 1-hour Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 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 $\sqrt{75}$ fully.

(Total for Question 1 is 1 mark)

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2 Simplify $3\sqrt{2} + 5\sqrt{2}$.

(Total for Question 2 is 1 mark)

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3 Simplify $\sqrt{8} + \sqrt{2}$ fully.

(Total for Question 3 is 2 marks)

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4 Simplify $\sqrt{27} - \sqrt{3}$ fully.

(Total for Question 4 is 2 marks)

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5 Simplify $\sqrt{32}$ fully.

(Total for Question 5 is 1 mark)

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6 Work out $\sqrt{48} / \sqrt{3}$.

(Total for Question 6 is 1 mark)

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7 Simplify each surd fully.

(a) $\sqrt{28}$ **(1)**

(b) $\sqrt{72}$ **(1)**

(c) $\sqrt{200}$ **(1)**

(d) $\sqrt{45}$ **(1)**

(Total for Question 7 is 4 marks)

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8 Simplify fully, showing your working: $3\sqrt{2} + \sqrt{50} - \sqrt{8}$

(Total for Question 8 is 3 marks)

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9 Simplify fully $\sqrt{90} + \sqrt{40} - \sqrt{10}$, showing each step of your working.

(Total for Question 9 is 3 marks)

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10 Using exact trigonometric values, show that $\sin(60°) \times \cos(30°) = 3/4$

(Total for Question 10 is 3 marks)

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11 Simplify fully $\sqrt{48} - \sqrt{12} + \sqrt{3}$

(Total for Question 11 is 3 marks)

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12 Expand and simplify $(5 + \sqrt{7})(2 + 4\sqrt{7})$. Give your answer in the form $p + q\sqrt{7}$.

(Total for Question 12 is 3 marks)

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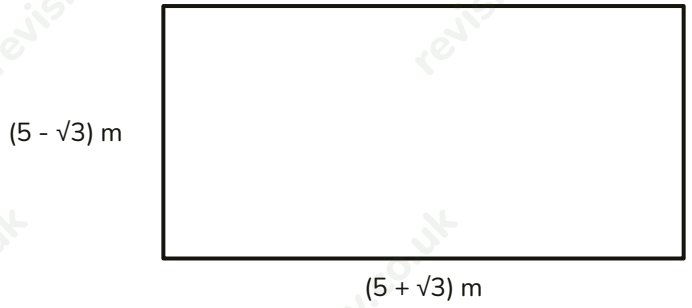
13 Show that $18/(3 + \sqrt{3})$ can be written in the form $p - q\sqrt{3}$, where p and q are integers, and find p and q.

(Total for Question 13 is 3 marks)

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14 A rectangle has length $(5 + \sqrt{3})$ m and width $(5 - \sqrt{3})$ m. Show that the area of the rectangle is an integer and work out its value.

Diagram NOT accurately drawn



(Total for Question 14 is 3 marks)

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15 Expand and simplify $(2 + 5\sqrt{2})(4 - 3\sqrt{2})$. Give your answer in the form $p + q\sqrt{2}$.

(Total for Question 15 is 3 marks)

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16 Write $\sqrt{90}$ in the form $a\sqrt{b}$, where a and b are integers and b is as small as possible.

(Total for Question 16 is 2 marks)

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17 Simplify fully $\sqrt{45} + \sqrt{245} - \sqrt{80}$

(Total for Question 17 is 3 marks)

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18 Rationalise the denominator of $4/\sqrt{2}$. Give your answer in its simplest form.

(Total for Question 18 is 2 marks)

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19 A rectangular garden bed has length $(6 + \sqrt{11})$ m and width $(6 - \sqrt{11})$ m. Find the area of the garden bed, giving your answer as an integer.

(Total for Question 19 is 3 marks)

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Mark scheme · 7.1 Surds: 1-hour Pack

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

Question 1

$5\sqrt{3}$ oe cao **B1**

Answer: $5\sqrt{3}$

Question 2

$8\sqrt{2}$ oe cao **B1**

Answer: $8\sqrt{2}$

Question 3

$\sqrt{8} = 2\sqrt{2}$ identified **M1**

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

Answer: $3\sqrt{2}$

Question 4

$\sqrt{27} = 3\sqrt{3}$ identified **M1**

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

Answer: $2\sqrt{3}$

Question 5

$4\sqrt{2}$ oe cao **B1**

Answer: $4\sqrt{2}$

Question 6

4 cao **B1**

Answer: 4

Question 7

(a) $2\sqrt{7}$ oe cao **B1**

(a) Answer: $2\sqrt{7}$

(b) $6\sqrt{2}$ oe cao **B1**

(b) Answer: $6\sqrt{2}$

(c) $10\sqrt{2}$ oe cao **B1**

(c) Answer: $10\sqrt{2}$

(d) $3\sqrt{5}$ oe cao **B1**

(d) Answer: $3\sqrt{5}$

Question 8

$\sqrt{50} = 5\sqrt{2}$ **M1**

$\sqrt{8} = 2\sqrt{2}$ **M1**

$6\sqrt{2}$ cao **A1**

Answer: $6\sqrt{2}$

Question 9

$\sqrt{90} = 3\sqrt{10}$ **M1**

$\sqrt{40} = 2\sqrt{10}$ **M1**

$4\sqrt{10}$ oe cao **A1**

Answer: $4\sqrt{10}$

Question 10

$\sin(60°) = \sqrt{3}/2$ stated **B1**

$\cos(30°) = \sqrt{3}/2$ stated **B1**

cso - $\sqrt{3}/2 \times \sqrt{3}/2 = 3/4$ shown **A1**

Answer: 3/4 (given)

Question 11

$\sqrt{48} = 4\sqrt{3}$ **M1**

$\sqrt{12} = 2\sqrt{3}$ **M1**

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

Answer: $3\sqrt{3}$

Question 12

at least 3 of the 4 products correct **M1**

$\sqrt{7} \times \sqrt{7} = 7$ used **M1**

$38 + 22\sqrt{7}$ cao **A1**

Answer: $38 + 22\sqrt{7}$

Question 13

multiply numerator and denominator by $(3 - \sqrt{3})$ **M1**

denominator = 6 **M1**

$9 - 3\sqrt{3}$ **A1**

Answer: $9 - 3\sqrt{3}$

Question 14

$(5 + \sqrt{3})(5 - \sqrt{3})$ expanded with at least 3 terms correct **M1**

$\sqrt{3} \times \sqrt{3} = 3$ and cross terms cancel **M1**

22 m² cao **A1**

Answer: 22 m^2

Question 15

at least 3 of the 4 products correct **M1**

$\sqrt{2} \times \sqrt{2} = 2$ used **M1**

$-22 + 14\sqrt{2}$ cao **A1**

Answer: $-22 + 14\sqrt{2}$

Question 16

$90 = 9 \times 10$ or $\sqrt{9} = 3$ seen **M1**

$3\sqrt{10}$ cao **A1**

Answer: $3\sqrt{10}$

Question 17

one surd correctly simplified **M1**

all three terms simplified **M1**

$6\sqrt{5}$ cao **A1**

Answer: $6\sqrt{5}$

Question 18

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

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

Answer: $2\sqrt{2}$

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Question 19

sets up area = $(6 + \sqrt{11})(6 - \sqrt{11})$	**M1**
36 - 11 evaluated (from $36 - 6\sqrt{11} + 6\sqrt{11} - 11$ or difference of two squares)	**M1**
25 m^2 cao	**A1**

Answer: 25 m^2

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