1.1 Higher Surds: Simplifying, Multiplying and Dividing: 1-hour Pack

AQA 8365 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Work out each quotient, giving your answer in its simplest form.

(a) $\sqrt{48} \div \sqrt{3}$ **(2)**

(b) $\sqrt{72} \div \sqrt{8}$ **(2)**

(c) $10\sqrt{45} \div (2\sqrt{5})$ **(2)**

(Total for Question 1 is 6 marks)

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2 Simplify each expression fully by collecting like surds.

(a) $3\sqrt{2} + 5\sqrt{2} - \sqrt{2}$ **(2)**

(b) $\sqrt{12} + \sqrt{27}$ **(2)**

(c) $\sqrt{50} - \sqrt{8} + \sqrt{18}$ **(2)**

(Total for Question 2 is 6 marks)

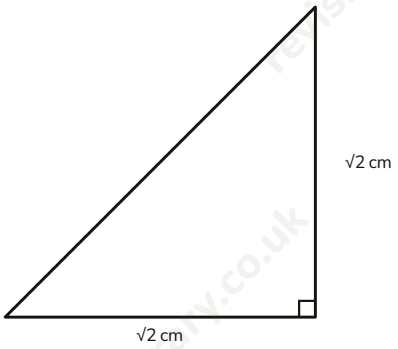
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3 Write $\sqrt{896}$ in the form $a\sqrt{b}$, where a and b are integers and b is as small as possible.

(Total for Question 3 is 2 marks)

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4 A right-angled triangle has shorter sides of length $\sqrt{2}$ cm and $\sqrt{2}$ cm. Find the exact length of the hypotenuse, in the form a $\sqrt{b}$ where b has no square factors (or as an integer).



(Total for Question 4 is 3 marks)

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5 Simplify $\sqrt{6} - \sqrt{150}$, giving your answer in the form a $\sqrt{b}$.

(Total for Question 5 is 3 marks)

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6 Write $\sqrt{162}$ 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 Show that $(3\sqrt{11} - 2\sqrt{5})^2$ can be written in the form $p + q\sqrt{r}$, and find p, q and r. Give your answer as $p + q\sqrt{r}$.

(Total for Question 7 is 3 marks)

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8 Work out $(19\sqrt{42}) / (4\sqrt{6})$. Give your answer in the form $a\sqrt{b}$, where a is a fraction or integer.

(Total for Question 8 is 3 marks)

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9 Work out $3\sqrt{12} \times 3\sqrt{18}$. Give your answer in its simplest surd form.

(Total for Question 9 is 3 marks)

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

(Total for Question 10 is 3 marks)

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11 Simplify $\sqrt{176} + \sqrt{275}$, giving your answer in the form $a\sqrt{b}$.

(Total for Question 11 is 3 marks)

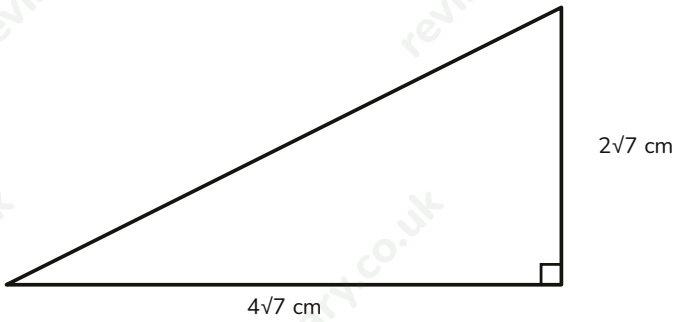
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12 Work out $(10\sqrt{18}) / (6\sqrt{6})$. Give your answer in the form $a\sqrt{b}$, where a is a fraction or integer.

(Total for Question 12 is 3 marks)

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13 A right-angled triangle has shorter sides of length $4\sqrt{7}$ cm and $2\sqrt{7}$ cm. Find the exact length of the hypotenuse, in the form $a\sqrt{b}$ where b has no square factors (or as an integer).



(Total for Question 13 is 3 marks)

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14 Rationalise the denominator of each expression, simplifying fully.

(a) $1 / (\sqrt{5} + 2)$ **(3)**

(b) $3 / (\sqrt{7} - 2)$ **(3)**

(c) $(\sqrt{2} + 1) / (\sqrt{2} - 1)$ **(3)**

(Total for Question 14 is 9 marks)

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Mark scheme · 1.1 Higher Surds: Simplifying, Multiplying and Dividing: 1-hour Pack

Question 1

(a) $\sqrt{48/3} = \sqrt{16}$ oe	**M1**
(a) 4 cao	**A1**
(a) Answer: 4	
(b) $\sqrt{72/8} = \sqrt{9}$ oe	**M1**
(b) 3 cao	**A1**
(b) Answer: 3	
(c) 5 x $\sqrt{45/5} = 5\sqrt{9}$ oe	**M1**
(c) 15 cao	**A1**
(c) Answer: 15	

Question 2

(a) collects coefficients 3 + 5 - 1	**M1**
(a) $7\sqrt{2}$ cao	**A1**
(a) Answer: $7\sqrt{2}$	
(b) $\sqrt{12} = 2\sqrt{3}$ and $\sqrt{27} = 3\sqrt{3}$ oe	**M1**
(b) $5\sqrt{3}$ cao	**A1**
(b) Answer: $5\sqrt{3}$	
(c) simplifies at least two of the three surds correctly ($5\sqrt{2}$, $2\sqrt{2}$, $3\sqrt{2}$)	**M1**
(c) $6\sqrt{2}$ cao	**A1**
(c) Answer: $6\sqrt{2}$	

Question 3

64 x 14 or a square factor of 896 identified	**M1**
$8\sqrt{14}$ cao	**A1**
Answer: $8\sqrt{14}$	

Question 4

squares the two sides and adds	**M1**
$\sqrt{4}$ or equivalent	**A1**
2 cm cao	**A1**
Answer: 2	

Question 5

at least two surds simplified to a multiple of $\sqrt{6}$	**M1**
all surds expressed as multiples of $\sqrt{6}$	**M1**
$-4\sqrt{6}$ cao	**A1**
Answer: $-4\sqrt{6}$	

Question 6

81 x 2 or a square factor of 162 identified	**M1**
$9\sqrt{2}$ cao	**A1**
Answer: $9\sqrt{2}$	

Question 7

expands with at least 3 terms correct	**M1**
simplifies $\sqrt{ab}$ term	**M1**
$119 - 12\sqrt{55}$ cao	**A1**
Answer: $119 - 12\sqrt{55}$	

Question 8

$\sqrt{42} / \sqrt{6} = \sqrt{7}$ or equivalent	**M1**
19/4 simplified or used as the coefficient	**M1**
$19\sqrt{7}/4$ cao	**A1**
Answer: $19\sqrt{7}/4$	

Question 9

$9\sqrt{216}$ or equivalent	**M1**
$\sqrt{216} = 6\sqrt{6}$ or a square factor extracted	**M1**
$54\sqrt{6}$ cao	**A1**
Answer: $54\sqrt{6}$	

Question 10

at least 3 of the 4 terms correct	**M1**
collects rational and surd parts	**M1**
$-25 - 2\sqrt{5}$ cao	**A1**
Answer: $-25 - 2\sqrt{5}$	

Question 11

at least two surds simplified to a multiple of $\sqrt{11}$	**M1**
all surds expressed as multiples of $\sqrt{11}$	**M1**
$9\sqrt{11}$ cao	**A1**
Answer: $9\sqrt{11}$	

Question 12

$\sqrt{18} / \sqrt{6} = \sqrt{3}$ or equivalent	**M1**
10/6 simplified or used as the coefficient	**M1**
$5\sqrt{3}/3$ cao	**A1**
Answer: $5\sqrt{3}/3$	

Question 13

squares the two sides and adds	**M1**
$\sqrt{140}$ or equivalent	**A1**
$2\sqrt{35}$ cm cao	**A1**
Answer: $2\sqrt{35}$	

Question 14

(a) multiplies numerator and denominator by ($\sqrt{5}$ - 2)	**M1**
(a) denominator simplifies to 5 - 4 = 1	**M1**
(a) $\sqrt{5}$ - 2 cao	**A1**
(a) Answer: $\sqrt{5}$ - 2	
(b) multiplies numerator and denominator by ($\sqrt{7}$ + 2)	**M1**
(b) denominator simplifies to 7 - 4 = 3	**M1**
(b) $\sqrt{7}$ + 2 cao	**A1**
(b) Answer: $\sqrt{7}$ + 2	
(c) multiplies numerator and denominator by ($\sqrt{2}$ + 1)	**M1**
(c) denominator simplifies to 2 - 1 = 1 and numerator expanded to 2 + $2\sqrt{2}$ + 1	**M1**
(c) 3 + $2\sqrt{2}$ cao	**A1**
(c) Answer: 3 + $2\sqrt{2}$	

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