

- 1 Show that  $\frac{\sqrt{8}}{\sqrt{8}-2}$  can be written in the form  $n + \sqrt{n}$ , where  $n$  is an integer.  
Show your working clearly.

(3)

- (b) Show that  $\frac{\sqrt{20} + \sqrt{80}}{\sqrt{3}}$  can be expressed in the form  $\sqrt{a}$  where  $a$  is an integer.

Show your working clearly.

(3)

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(Total for Question 1 is 6 marks)

- 2 Show that  $\frac{2}{6-3\sqrt{2}}$  can be written in the form  $\frac{a+\sqrt{a}}{b}$   
where  $a$  and  $b$  are integers.  
Show your working clearly.

(3)

Given that  $y$  is a prime number,

- (b) express  $\frac{3}{2-\sqrt{y}}$  in the form  $\frac{a+b\sqrt{y}}{c-y}$  where  $a$ ,  $b$  and  $c$  are integers.

(2)

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(Total for Question 2 is 5 marks)

3

$$a = \sqrt{8} + 4$$

$$b = \sqrt{8} - 4$$

$(a - b)(a + b)$  can be written in the form  $y\sqrt{4y}$

Find the value of  $y$

Show your working clearly.

$y = \dots\dots\dots$

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**(Total for Question 13 is 3 marks)**

- 4 Given that  $(8 - \sqrt{x})(5 + \sqrt{x}) = y\sqrt{x} + 21$  where  $x$  is a prime number and  $y$  is an integer, find the value of  $x$  and the value of  $y$ . Show each stage of your working clearly.

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots$$

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**(Total for Question 4 is 3 marks)**

5

(a) Express  $\sqrt{3} + \sqrt{12}$  in the form  $a\sqrt{3}$  where  $a$  is an integer.

.....  
(2)

(b) Express  $\left(\frac{1}{\sqrt{3}}\right)^7$  in the form  $\frac{\sqrt{b}}{c}$  where  $b$  and  $c$  are integers.

.....  
(3)

(Total for Question 5 is 5 marks)

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- 6 (a) Rationalise the denominator of  $\frac{a + \sqrt{4b}}{a - \sqrt{4b}}$  where  $a$  is an integer and  $b$  is a prime number.

Simplify your answer.

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(Total for Question 6 is 3 marks)

7

(a) Show that  $(6 + 2\sqrt{12})^2 = 12(7 + 4\sqrt{3})$

Show each stage of your working.

(3)

(b) Without using a calculator, rationalise the denominator of  $\frac{6}{3 - \sqrt{7}}$

Simplify your answer.

You must show each stage of your working.

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(Total for Question 7 is 6 marks)

8

Show that  $\frac{4 + \sqrt{8}}{\sqrt{2} - 1}$  can be written in the form  $a + b\sqrt{2}$ , where  $a$  and  $b$  are integers.

Show each stage of your working clearly and give the value of  $a$  and the value of  $b$ .

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(Total for Question 8 is 3 marks)



9

Express  $\frac{8}{\sqrt{5}-1}$  in the form  $\sqrt{a} + b$  where  $a$  and  $b$  are integers.

Show each stage of your working clearly.

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(Total for Question 9 is 3 marks)

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**10** Show that  $\frac{\sqrt{12}}{\sqrt{3} + 2}$

can be written in the form  $a + \sqrt{b}$  where  $a$  and  $b$  are integers.

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(Total for Question 10 is 3 marks)

- 11** Without using a calculator, show that  $\frac{12}{\sqrt{2}-1} - (\sqrt{2})^5 = 2\sqrt{32} + 12$   
Show your working clearly.

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**(Total for Question 11 is 3 marks)**

**12** Express  $\frac{3 + \sqrt{8}}{(\sqrt{2} - 1)^2}$  in the form  $p + \sqrt{q}$  where  $p$  and  $q$  are integers.

Show each stage of your working clearly.

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(Total for Question 12 is 4 marks)

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**13** Show that  $\frac{1}{1 + \frac{1}{\sqrt{2}}}$  can be written as  $2 - \sqrt{2}$

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**(Total for Question 13 is 3 marks)**

**14** Write  $\frac{3\sqrt{3}}{4-\sqrt{3}} - \frac{2}{\sqrt{3}}$  in the form  $\frac{a\sqrt{3}+b}{c}$  where  $a$ ,  $b$  and  $c$  are integers.

.....

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(Total for Question 14 is 4 marks)

- 15** (a) Show that  $\sqrt{45} + \sqrt{20} = 5\sqrt{5}$   
Show your working clearly.

(2)

- (b) Express  $\frac{2}{\sqrt{3}-1}$  in the form  $p + \sqrt{q}$   
where  $p$  and  $q$  are integers.  
Show your working clearly.

.....  
(2)

- (c) Express  $x^2 + 6\sqrt{2}x - 1$  in the form  $(x + a)^2 + b$   
Show your working clearly.

.....  
(2)

(Total for Question 15 is 6 marks)

**16** The area of a rectangle is  $18 \text{ cm}^2$

The length of the rectangle is  $(\sqrt{7} + 1) \text{ cm}$ .

Without using a calculator and showing each stage of your working,

find the width of the rectangle.

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

..... cm

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**(Total for Question 16 is 3 marks)**



17 Solve  $\sqrt{3}(x - 2\sqrt{3}) = x + 2\sqrt{3}$

Give your answer in the form  $a + b\sqrt{3}$  where  $a$  and  $b$  are integers.  
Show your working clearly.

$x = \dots\dots\dots$

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**(Total for Question 17 is 4 marks)**

- 18 The diagram shows a cuboid with a square cross section.

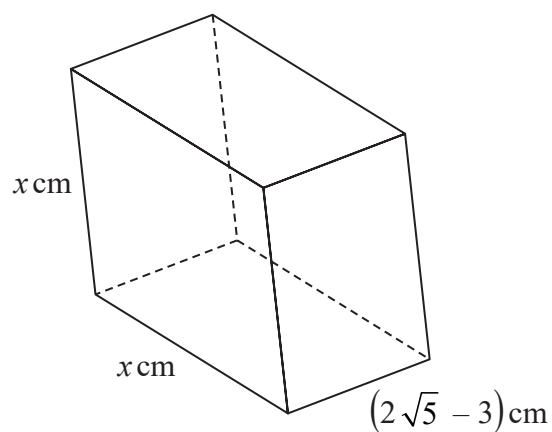


Diagram **NOT**  
accurately drawn

The volume of the cuboid is  $(13 + 6\sqrt{5})\text{cm}^3$

Without using a calculator, find the value of  $x$

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

Show your working clearly.

$$x = \dots\dots\dots$$

**(Total for Question 18 is 4 marks)**

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