

Surds

Exam questions

Higher tier

Please write clearly in block capitals.

Name

Class

Teacher

Time allowed: 55 minutes

Materials

For this booklet you need a black pen, a pencil, a ruler and a rubber.

Instructions

- Use black ink or black ballpoint pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer all questions in the spaces provided.
- You must not use a calculator.
- Do all rough work in this booklet. Cross through any work you do not want marked.

Information

- The marks for each question are shown in brackets.
- The maximum mark for this booklet is 48.

Advice

- Read each question carefully.
- In all calculations, show clearly how you work out your answer.

For teacher’s use

Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
TOTAL	

- 1** (a) Simplify $\sqrt{72}$

Answer _____

[1 mark]

- (b) Write $3\sqrt{5}$ in the form $\sqrt{n}$.

Answer _____

[1 mark]

- 2** (a) Circle the irrational number.

$\sqrt{0.25}$ $\sqrt{\frac{4}{9}}$ $\sqrt{8}$ $\sqrt[3]{27}$

[1 mark]

- (b) Write down two different surds that multiply to give 6

Answer _____

[1 mark]

- 3** Work out $\sqrt{50} + \sqrt{18}$
Give your answer in its simplest form.

Answer _____

[2 marks]

- 4** Write these numbers in order of size. Start with the smallest.

$2\sqrt{7}$ $3\sqrt{3}$ $4\sqrt{2}$ $\sqrt{30}$

Answer _____

[2 marks]

- 5** Rationalise the denominator of $\frac{12}{\sqrt{3}}$
Give your answer in its simplest form.

Answer _____
[2 marks]

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

Answer _____
[2 marks]

- 7** Sam says,
“ $(\sqrt{3} + \sqrt{2})^2 = 5$ ”

Is Sam correct?
You must show your working.

[2 marks]

- 8** Show that $\frac{\sqrt{27} + \sqrt{12}}{\sqrt{75} - \sqrt{48}} = 5$

[3 marks]

9 $8\sqrt{2} = 2^k$

Work out the value of k .

Do not
write
outside
the box

$k =$ _____

[2 marks]

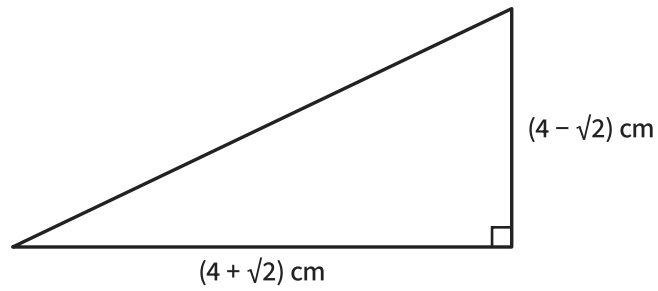
10 $(\sqrt{a} + \sqrt{3})^2 = 19 + 8\sqrt{3}$
 a is a positive integer.

Work out the value of a .

$a =$ _____

[3 marks]

- 11** The diagram shows a right-angled triangle.



Not drawn accurately

- (a)** Show that the area of the triangle is 7 cm^2

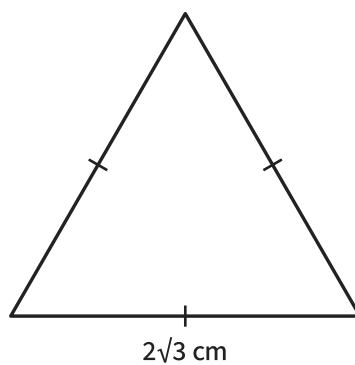
[2 marks]

- (b)** Show that the length of the hypotenuse is 6 cm

[3 marks]

Do not
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outside
the box

- 12** The diagram shows an equilateral triangle.



Not drawn accurately

Work out the area of the triangle.
Give your answer as a surd in its simplest form.

Answer _____ cm^2
[3 marks]

Do not
write
outside
the box

13

The area of this rectangle is 20 cm^2



$(5 + \sqrt{5}) \text{ cm}$

Not drawn accurately

- (a) Work out the width of the rectangle.
Give your answer in the form $a + b\sqrt{5}$ where a and b are integers.

Answer _____ cm

[3 marks]

- (b) Show that the perimeter of the rectangle is 20 cm

[1 mark]

14

Solve $x\sqrt{3} + 4 = x + 2\sqrt{3}$

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

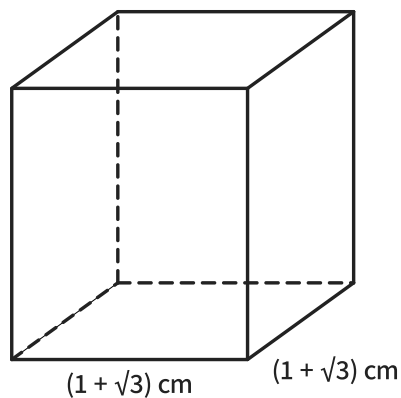
$x =$ _____

[4 marks]

Do not
write
outside
the box

- 15** A cuboid has a square base with sides of length $(1 + \sqrt{3})$ cm.
The volume of the cuboid is $(10 + 6\sqrt{3})$ cm³

(a) Show that the cuboid is a cube.



Not drawn accurately

[4 marks]

- (b)** Work out the length of a diagonal of the cube that joins opposite corners through the inside of the cube.
Give your answer in the form $a + \sqrt{b}$ where a and b are integers.

Answer _____ cm

[2 marks]

16

$$p = \frac{1}{2+\sqrt{3}} \quad \text{and} \quad q = \frac{1}{2-\sqrt{3}}$$

Work out the value of $p^3 + q^3$
You must show your working.

Do not
write
outside
the box

Answer _____

[4 marks]

END OF QUESTIONS