

1MA1 Higher themed papers: Surds

| | | | |
|---|-------------|------------------|--------------------------------|
| Write your name here | | | |
| Surname | Other names | | |
| Centre Number | | Candidate Number | |
| Pearson Edexcel Level 1/Level 2 GCSE (9–1) | | | |
| Mathematics Surds | | | |
| | | | Paper Reference 1MA1 |
| You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used. | | | Total Marks |

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- You must **show all your working**.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

Information

- The total mark for this paper is **39**. There are **11** questions.
- Questions have been arranged in an ascending order of mean difficulty, as found by all students in the June 2017–November 2019 examinations.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

1MA1 Higher themed papers: Surds



1 (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 1 is 5 marks)

1MA1 Higher themed papers: Surds



2 $\sqrt{5}(\sqrt{8} + \sqrt{18})$ can be written in the form $a\sqrt{10}$ where a is an integer.

Find the value of a .

$a = \dots\dots\dots$

(Total for Question 2 is 3 marks)

1MA1 Higher themed papers: Surds

3 Martin did this question.

| |
|--|
| Rationalise the denominator of $\frac{14}{2+\sqrt{3}}$ |
|--|

Here is how he answered the question.

$$\begin{aligned}\frac{14}{2+\sqrt{3}} &= \frac{14 \cdot (2-\sqrt{3})}{(2+\sqrt{3})(2-\sqrt{3})} \\ &= \frac{28-14\sqrt{3}}{4+2\sqrt{3}-2\sqrt{3}+3} \\ &= \frac{28-14\sqrt{3}}{7} \\ &= 4-2\sqrt{3}\end{aligned}$$

Martin's answer is wrong.

(a) Find Martin's mistake.

.....
.....

(1)

Sian did this question.

| |
|--|
| Rationalise the denominator of $\frac{5}{\sqrt{12}}$ |
|--|

Here is how she answered the question.

$$\begin{aligned}\frac{5}{\sqrt{12}} &= \frac{5\sqrt{12}}{\sqrt{12} \cdot \sqrt{12}} \\ &= \frac{5 \cdot 3\sqrt{2}}{12} \\ &= \frac{5\sqrt{2}}{4}\end{aligned}$$

Sian's answer is wrong.

(b) Find Sian's mistake.

.....
.....

(1)

(Total for Question 3 is 2 marks)

1MA1 Higher themed papers: Surds



4

(a) Rationalise the denominator of $\frac{22}{\sqrt{11}}$

Give your answer in its simplest form.

.....


(2)

(b) Show that $\frac{\sqrt{3}}{2\sqrt{3}-1}$ can be written in the form $\frac{a+\sqrt{3}}{b}$ where a and b are integers.

(3)

(Total for Question 4 is 5 marks)

1MA1 Higher themed papers: Surds

 **5** Show that $\frac{(\sqrt{18} + \sqrt{2})^2}{\sqrt{8} - 2}$ can be written in the form $a(b + \sqrt{2})$ where a and b are integers.

(Total for Question 5 is 3 marks)

1MA1 Higher themed papers: Surds



- 6** Show that $\frac{6-\sqrt{8}}{\sqrt{2}-1}$ can be written in the form $a + b\sqrt{2}$ where a and b are integers.

(Total for Question 6 is 3 marks)



- 7** Show that $\frac{3+\sqrt{2}}{5+\sqrt{8}}$ can be written $\frac{11-\sqrt{2}}{17}$

(Total for Question 7 is 3 marks)

1MA1 Higher themed papers: Surds



8 Simplify fully $\frac{(6-\sqrt{5})(6+\sqrt{5})}{\sqrt{31}}$

You must show your working.

.....
(Total for Question 8 is 3 marks)



9 Show that $\frac{4}{\frac{1}{\sqrt{3}} + \sqrt{3}}$ can be written as $\sqrt{3}$

(Total for Question 9 is 3 marks)

1MA1 Higher themed papers: Surds



10 $\frac{1 + \sqrt{2}}{(3 - \sqrt{2})^2}$ can be written in the form $a + b\sqrt{2}$

Find the value of a and the value of b .

$a = \dots\dots\dots$

$b = \dots\dots\dots$

(Total for Question 10 is 5 marks)

1MA1 Higher themed papers: Surds



- 11** Show that $\frac{12 + \sqrt{128}}{1 - \sqrt{2}}$ can be written in the form $a + b\sqrt{2}$, where a and b are integers.

(Total for Question 11 is 4 marks)

TOTAL MARKS FOR PAPER: 39