Surds

Question Paper

Course	Edexcel IGCSE Maths
Section	1. Numbers & the Number System
Topic	Surds
Difficulty	Hard

Time allowed: 50

Score: /37

Percentage: /100

Question 1a

Show that $\frac{5}{\sqrt{2}}$ can be written as $\frac{5\sqrt{2}}{2}$

[2 marks]

Question 1b

Show that $(2+\sqrt{3})^2 - (2-\sqrt{3})^2 = 8\sqrt{3}$

[2 marks]

Question 2

Show that $(1+\sqrt{2})(3-\sqrt{2}) = 1+2\sqrt{2}$

[2 marks]

Question 3a

Martin did this question.

Rationalise the denominator of $\dfrac{14}{2+\sqrt{3}}$

Here is how he answered the question.

$$\frac{14}{2+\sqrt{3}} = \frac{14\times(2-\sqrt{3})}{(2+\sqrt{3})(2-\sqrt{3})}$$

$$= \frac{28-14\sqrt{3}}{4+2\sqrt{3}-2\sqrt{3}+3}$$

$$= \frac{28-14\sqrt{3}}{7}$$

$$= 4-2\sqrt{3}$$

Martin's answer is wrong.

Find Martin's mistake.

[1 mark]

Question 3b

Sian did this question.

Rationalise the denominator of $\dfrac{5}{\sqrt{12}}$

Here is how she answered the question.

$$\frac{5}{\sqrt{12}} = \frac{5\sqrt{12}}{\sqrt{12}\times\sqrt{12}}$$

$$= \frac{5\times3\sqrt{2}}{12}$$

$$= \frac{5\sqrt{2}}{4}$$

Sian's answer is wrong.

Find Sian's mistake.

[1 mark]

Question 4

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

You must show your working.

[3 marks]

Question 5

Show that $\sqrt{5}(\sqrt{8}+\sqrt{18})$ can be written in the form $a\sqrt{10}$ and state the value of a. You must show your full working.

[3 marks]

Question 6

Show that $\dfrac{(4-\sqrt{3})(4+\sqrt{3})}{\sqrt{13}}$ simplifies to $\sqrt{13}$.

[2 marks]

Question 7a

Show that $\sqrt{3} + \sqrt{12}$ can be rewritten as $3\sqrt{3}$

[2 marks]

Question 7b

Show that $\left(\frac{1}{\sqrt{3}}\right)^7 = \frac{\sqrt{3}}{81}$

[3 marks]

Question 8

Rationalise the denominator of $\frac{4}{7 - \sqrt{5}}$

Show each stage of your working.

Give your answer in the form $a + b\sqrt{5}$ where a and b are fractions in their simplest forms.

[3 marks]

Question 9

Given that y is a prime number,

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

[2 marks]

Question 10

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

Simplify your answer.
You must show each stage of your working.

[3 marks]

Question 11

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 marks]

Question 12

Express $\frac{2}{\sqrt{3}-1}$ in the form $p+\sqrt{q}$

where p and q are integers.
Show your working clearly.

[2 marks]

Question 13

Show that $\left(5\sqrt{3}-\sqrt{12}\right)^2$ simplifies to an integer.

[3 marks]