Lesson 6

A-Level Pure Mathematics : Year 1
GCSE (Grades 8 and 9)
Algebra of Surds and Indices I

6.1 Surd arithmetic work-out

Example

Show how to calculate $2\sqrt{15} \times 4\sqrt{10}$ without using a calculator.
Write your answer in the form $a\sqrt{b}$ where a and b are integers and b is $\square$ free.

[2 marks]

6.2 Exercise

Any solution based entirely on graphical
or numerical methods is not acceptable
Marks Available : 50

Do NOT use a calculator

Question 1

Show how to calculate each of the following without using a calculator.
Write your answers in the form $a\sqrt{b}$ where a and b are integers and b is $\square$ free.

(i) $5\sqrt{6} \times 11\sqrt{21}$

(ii) $5\sqrt{14} \times 3\sqrt{10}$

(iii) $10\sqrt{22} \times 4\sqrt{6}$

(iv) $3\sqrt{10} \times 4\sqrt{55}$

[8 marks]

Question 2

Show how to rationalise the denominator of the following without using a calculator. However, check your answer is correct by using a calculator.

(i) $\dfrac{3}{2\sqrt{3}}$ **(ii)** $\dfrac{3}{4\sqrt{5}}$

(iii) $\dfrac{21}{\sqrt{7}}$ **(iv)** $\dfrac{18}{11\sqrt{3}}$

[8 marks]

Question 3

Show how to rationalise the denominator of the following without using a calculator. However, check your answer is correct by using a calculator.

(i) $\dfrac{1}{2-\sqrt{3}}$ **(ii)** $\dfrac{1}{\sqrt{5}+\sqrt{3}}$

[3, 3 marks]

Question 4

(i) Write 252 as a product of primes.
You may use the factorise button on your calculator, marked FACT

[1 mark]

(ii) If $\sqrt{252} = x\sqrt{7}$ deduce the value of the integer x

[2 marks]

Question 5

(i) Write 882 as a product of primes.
You may use the factorise button on your calculator, marked FACT

[1 mark]

(ii) If $\sqrt{882} = y\sqrt{2}$ deduce the value of the integer y

[2 marks]

Question 6

Combine your answers from questions 4 and 5 to determine $\sqrt{252} \times \sqrt{882}$

[2 marks]

Question 7

Show how to rationalise the denominator of the following without using a calculator. However, check your answer is correct by using a calculator.

(i) $\dfrac{3}{2\sqrt{5}+1}$

[4 marks]

(ii) $\dfrac{\sqrt{2}}{3\sqrt{2}-1}$

[4 marks]

Question 8

(i) Write 2541 as a product of primes
You may use the factorise button on your calculator

[1 mark]

(ii) Write 3024 as a product of primes
You may use the factorise button on your calculator

[1 mark]

(iii) Show how to combine your answers to parts **(i)** and **(ii)** to determine the value of $\sqrt{2541} + \sqrt{3024}$

[2 marks]

Question 9

(i) Write 3146 as a product of primes
You may use the factorise button on your calculator

[1 mark]

(ii) Write 936 as a product of primes
You may use the factorise button on your calculator

[1 mark]

(iii) Show how to combine your answers to parts **(i)** and **(ii)** to determine the value of $\sqrt{3146} - \sqrt{936}$

[2 marks]

Question 10

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

Show clear working that demonstrates that you did not use a calculator.

$$\frac{75 + 3\sqrt{6000}}{5}$$

HINT : $\dfrac{a + b}{c} = \dfrac{a}{c} + \dfrac{b}{c}$

[4 marks]