

Lesson 9

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

9.1 TEST

*Any solution based entirely on graphical
or numerical methods is not acceptable*
Marks Available : 71

Do NOT use a calculator

Question 1

GCSE Examination Question from June 2017, Paper 4H, Q10

(a) Simplify, $e^8 \times e^7$ [1 mark]

(b) Simplify fully, $\frac{12g^{10}}{3g^2}$ [2 marks]

(c) Write down the value of m^0 [1 mark]

(d) Simplify fully, $(27x^6)^{\frac{2}{3}}$

[2 marks]

Question 2

Simplify, $(3\sqrt{7})^2$

[1 mark]

Question 3

A-Level Examination Question from January 2009, C1, Q3 (Edexcel)

Showing the non-calculator method used, expand and simplify

$$(\sqrt{7} + 2)(\sqrt{7} - 2)$$

[2 marks]

Question 4

A-Level Examination Question from May 2007, C1, Q1 (Edexcel)

Demonstrate how to simplify without using a calculator,

$$(3 + \sqrt{5})(3 - \sqrt{5})$$

[2 marks]

Question 5

A-Level Examination Question from January 2010, C1, Q2 (Edexcel)

(a) Expand and simplify,

$$(7 + \sqrt{5})(3 - \sqrt{5})$$

[3 marks]

(b) Making your non-calculator method clear, express

$$\frac{7 + \sqrt{5}}{3 + \sqrt{5}}$$

in the form $a + b\sqrt{5}$, where a and b are integers.

[3 marks]

Question 6

Evaluate each of the following without the use of a calculator.

Write your answers in the form $a\sqrt{b}$ where a and b are integers and b is $\square$ free.

(i) $3\sqrt{15} \times 7\sqrt{10}$

(ii) $3\sqrt{5^2 \times 7} \times 2\sqrt{5 \times 7^2}$

[4 marks]

Question 7

(i) Write 980 as a product of primes.

You may use the factorise button on your calculator.

[1 mark]

(ii) If $\sqrt{980} = m\sqrt{5}$ find m

[1 mark]

Question 8

(i) Write 1125 as a product of primes

You may use the factorise button on your calculator

[1 mark]

(ii) If $\sqrt{1125} = n\sqrt{5}$ find n

[1 mark]

Question 9

Using your answers from questions 7 and 8, or otherwise, find $\sqrt{980} + \sqrt{1125}$

[1 mark]

Question 10

A-Level Examination Question from January 2008, C1, Q2 (Edexcel)

(a) Write down the value of

$$16^{\frac{1}{4}}$$

[1 mark]

(b) Simplify

$$(16 \times 12)^{\frac{3}{4}}$$

[2 marks]

Question 11

A-level Examination Question from May 2013, C1, Q1 (Edexcel)

Simplify

$$\frac{7 + \sqrt{5}}{\sqrt{5} - 1}$$

giving your answer in the form $a + b\sqrt{5}$, where a and b are integers.

Show full working.

[4 marks]

Question 12

Making your non-calculator method clear, rationalise the denominator and simplify;

(i) $\frac{12}{\sqrt{6}}$

(ii) $\frac{14\sqrt{3}}{5\sqrt{7}}$

[4 marks]

Question 13

Given that $64\sqrt{2} = 2^a$ find the value of the constant a

[3 marks]

Question 14

Without using a calculator, and making your method clear, find the square root of

$$2^7 \times 3^3 \times 5^2$$

Writing your answer in the form $a\sqrt{b}$ where a and b are integers and b is $\square$ free.

[3 marks]

Question 15

A-Level Examination Question from May 2010, C1, Q1 (edited) (Edexcel)

Making your method clear, write

$$\sqrt{75} - \sqrt{27}$$

in the form $k\sqrt{x}$, where k and x are integers.

[2 marks]

Question 16

A-level C1 Examination Question, May 2012, Q3 (edited)

Giving detail of your reasoning, show that

$$\frac{2}{\sqrt{12} - \sqrt{8}}$$

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

[5 marks]

Question 17

GCSE Examination Question from January 2018, 3H, Q20

(a) $\sqrt{50} + \sqrt{128} - \sqrt{200} = n\sqrt{2}$ where n is an integer

Find the value of n

Show each stage of your working.

[2 marks]

Given that a is a prime number,

(b) simplify

$$\frac{5\sqrt{a} + a}{10\sqrt{a}}$$

Give your answer in the form $x + y\sqrt{a}$ where x and y are fractions.

Show your working clearly.

[2 marks]

Question 18

A-level Examination Question from May 2013, C1, Q3 (Edexcel)

- (a) Find the value of $8^{\frac{5}{3}}$

[2 marks]

- (b) Simplify fully, $\frac{(2x^{\frac{1}{2}})^3}{4x^2}$

[3 marks]

Question 19

A-Level Examination Question from May 2014, Q6

- (a) Write $\sqrt{80}$ in the form $c\sqrt{5}$, where c is a positive constant.

[1 mark]

A rectangle R has a length of $(1 + \sqrt{5})$ cm and an area of $\sqrt{80}$ cm²

- (b) Calculate the width of R in cm.
Express your answer in the form $p + q\sqrt{5}$, where p and q are integers to be found.

[4 marks]

Question 20

A-Level Examination Question from May 2016, C1, Q3 (edited) (Edexcel)

- (a) Showing the reasons why, simplify,

$$\sqrt{50} - \sqrt{18}$$

giving your answer in the form $a\sqrt{2}$ where a is an integer

[2 marks]

- (b) Hence, or otherwise, simplify

$$\frac{12\sqrt{3}}{\sqrt{50} - \sqrt{18}}$$

giving your answer in the form $b\sqrt{c}$, where b and c are integers and $b \neq 1$

Show full working.

[3 marks]

Question 21

A-Level Examination Question from May 2016, C1, Q2 (Edexcel)

Express 9^{3x+1} in the form 3^y giving y in the form $ax + b$
where a and b are constants.

[2 marks]

This document is a part of a **Mathematics Community Outreach Project** initiated by Shrewsbury School

It may be freely duplicated and distributed, unaltered, for non-profit educational use

In October 2020, Shrewsbury School was voted “**Independent School of the Year 2020**”

© 2021 Number Wonder

Teachers may obtain detailed worked solutions to the exercises by email from mhh@shrewsbury.org.uk