Lesson 3

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

3.1 Rationalising the Denominator #1

Mathematicians' dislike fractions which have a square root in the denominator. There are standard techniques for manipulating such fractions to remove the offending square root from the denominator.

This may well result in a square root in the numerator, but this is considered fine !

Example:

Rationalise the denominator of $\frac{4\sqrt{3}}{\sqrt{5}}$

[1 mark]

3.2 Exercise

Any solution based entirely on graphical or numerical methods is not acceptable Marks Available : 35

Do NOT use a calculator

Question 1

Rationalise the denominators of the following fractions;

(i)
$$\frac{20}{\sqrt{5}}$$
 (ii) $\frac{28}{\sqrt{7}}$ (iii) $\frac{24\sqrt{3}}{\sqrt{2}}$

(iv)
$$\frac{12}{\sqrt{3}}$$
 (v) $\frac{5}{\sqrt{13}}$ (vi) $\frac{14\sqrt{3}}{\sqrt{2}}$

(vii)
$$\frac{55}{\sqrt{11}}$$
 (viii) $\frac{1}{\sqrt{2}}$ (ix) $\frac{15\sqrt{2}}{\sqrt{15}}$

[9 marks]

Question 2

By multiplying both numerator and denominator by $\sqrt{2}$ rationalise the denominator

of
$$\frac{5}{8\sqrt{2}}$$

[1 mark]

Question 3

Rationalise the denominators of the following fractions, simplifying the result.

(i)
$$\frac{52}{3\sqrt{13}}$$
 (ii) $\frac{48}{5\sqrt{6}}$ (iii) $\frac{7}{3\sqrt{15}}$

$$(iv) \frac{11}{12\sqrt{3}}$$
 $(v) \frac{6\sqrt{3}}{7\sqrt{2}}$ $(vi) \frac{3}{\sqrt{7}}$

(vii)
$$\frac{44}{5\sqrt{11}}$$
 (viii) $\frac{14}{\sqrt{2}}$ (ix) $\frac{28}{3\sqrt{14}}$

Question 4

Show that,
$$\frac{3}{\sqrt{2}} + \frac{5}{\sqrt{3}} = \frac{9\sqrt{2} + 10\sqrt{3}}{6}$$

[2 marks]



Simplify,
$$\frac{1}{\sqrt{5}} + \frac{4\sqrt{5}}{5}$$

[2 marks]

Question 6 Simplify, $\frac{7}{\sqrt{6}} + \frac{\sqrt{3}}{\sqrt{2}} + \frac{\sqrt{2}}{\sqrt{3}}$

[3 marks]

Question 7

A-Level Examination Question from January 2019, C12, Q2 (Edexcel) Given $y = 2^x$, express each of the following in terms of y. Write each expression in its simplest form. (a) 2^{2x}

$$(\mathbf{b}) \quad 2^{x+3}$$

$$(c) \frac{1}{4^{2x-3}}$$

[2 marks]

[1 mark]

[1 mark]

Question 8

A-Level Examination Question from June 2018, C12, Q4 (Edexcel) Given that,

$$y = \frac{64 x^6}{25}, \ x > 0$$

express each of the following in the form $k x^n$ where k and n are constants.

(a) $y^{-\frac{1}{2}}$

[3 marks]

(b) $(25y)^{\frac{2}{3}}$

[2 marks]

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