chapter 2 Algebra 2

Section 2.7 Surds

PROJECT MATHS
Text & Tests 6

68

Surds are non-perfect square roots. They are irrational numbers

Perfect squares :	1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169
Perfect square roots :	$\sqrt{9} = 3$, $\sqrt{169} = 13$, $\sqrt{1600} = 40$ ...
non-perfect square root = surd	$\sqrt{2} \approx 1.414213562...$
Estimate rough value of $\sqrt{73}$	$64 < 73 < 81 \Rightarrow \sqrt{73} \approx 8.??$
write $\sqrt{75}$ in simplest form ie smallest no under square root	$\sqrt{75} = \sqrt{25(3)} = 5\sqrt{3}$ STANDARD SURD FORM
NB $(\sqrt{a})^2 = ?$	$(\sqrt{a})^2 = a$ $(\sqrt{a})(\sqrt{a}) = a$
We like rational denominator	eg.. $\frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}}\left(\frac{\sqrt{2}}{\sqrt{2}}\right) = \frac{\sqrt{2}}{2}$

Example 1

(i) Express $\sqrt{80}$ in the form $a\sqrt{5}$, where a is an integer.

(ii) Express $(4 - \sqrt{5})^2$ in the form $b + c\sqrt{5}$, where b and c are integers.

use calculator

(i) $\sqrt{80} = 4\sqrt{5}$

(ii) $(4 - \sqrt{5})^2$

$(a+b)^2 = a^2 + 2ab + b^2$

$= 16 - 8\sqrt{5} + (\sqrt{5})^2$

$= 21 - 8\sqrt{5}$

Example 2

Simplify (i) $\dfrac{\sqrt{12}}{5\sqrt{3} - \sqrt{27}}$ (ii) $\dfrac{7}{\sqrt{13} - \sqrt{11}}$

Standard form:

$\sqrt{12} = 2\sqrt{3}$

$\sqrt{27} = 3\sqrt{3}$

(i) $\dfrac{\sqrt{12}}{5\sqrt{3} - \sqrt{27}} = \dfrac{2\sqrt{3}}{5\sqrt{3} - 3\sqrt{3}}$

$= \dfrac{2\sqrt{3}}{2\sqrt{3}} = 1$

(ii) $\dfrac{(7)(\sqrt{13} + \sqrt{11})}{(\sqrt{13} - \sqrt{11})(\sqrt{13} + \sqrt{11})}$ ← conjugate of denominator; ← notice: D.O.T.S.

TRICK: MULTIPLY ABOVE & BELOW BY THE CONJUGATE OF THE DENOMINATOR - THIS IS TO RATIONALISE THE DENOMINATOR.

$= \dfrac{7\sqrt{13} + 7\sqrt{11}}{(\sqrt{13})^2 - (\sqrt{11})^2} = \dfrac{7\sqrt{13} + 7\sqrt{11}}{169 - 121}$

$= \dfrac{7\sqrt{13} + 7\sqrt{11}}{48}$