Topic 03 – Surds (From OCR 4751)

Note: A link to the associated YouTube tutorial can be found at ALevelMathsRevision.com/bridging-the-gap/

Q1, (Jan 2006, Q8)

(i) Simplify $5\sqrt{8} + 4\sqrt{50}$. Express your answer in the form $a\sqrt{b}$, where a and b are integers and b is as small as possible. [2]

(ii) Express $\dfrac{\sqrt{3}}{6 - \sqrt{3}}$ in the form $p + q\sqrt{3}$, where p and q are rational. [3]

Q2, (Jun 2006, Q7)

(i) Simplify $6\sqrt{2} \times 5\sqrt{3} - \sqrt{24}$. [2]

(ii) Express $(2 - 3\sqrt{5})^2$ in the form $a + b\sqrt{5}$, where a and b are integers. [3]

Q3, (Jan 2007, Q7)

You are given that $a = \dfrac{3}{2}$, $b = \dfrac{9 - \sqrt{17}}{4}$ and $c = \dfrac{9 + \sqrt{17}}{4}$. Show that $a + b + c = abc$. [4]

Q4, (Jun 2007, Q8)

(i) Simplify $\sqrt{98} - \sqrt{50}$. [2]

(ii) Express $\dfrac{6\sqrt{5}}{2 + \sqrt{5}}$ in the form $a + b\sqrt{5}$, where a and b are integers. [3]

Q5, (Jan 2008, Q8)

(i) Write $\sqrt{48} + \sqrt{3}$ in the form $a\sqrt{b}$, where a and b are integers and b is as small as possible. [2]

(ii) Simplify $\dfrac{1}{5 + \sqrt{2}} + \dfrac{1}{5 - \sqrt{2}}$. [3]

Q6, (Jun 2008, Q7)

(i) Express $\dfrac{1}{5 + \sqrt{3}}$ in the form $\dfrac{a + b\sqrt{3}}{c}$, where a, b and c are integers. [2]

(ii) Expand and simplify $\left(3 - 2\sqrt{7}\right)^2$. [3]

Q7, (Jan 2009, Q10)

(i) Express $\sqrt{75} + \sqrt{48}$ in the form $a\sqrt{3}$. [2]

(ii) Express $\dfrac{14}{3 - \sqrt{2}}$ in the form $b + c\sqrt{d}$. [3]

Q8, (Jun 2009, Q8)

(i) Simplify $\dfrac{\sqrt{48}}{2\sqrt{27}}$. [2]

(ii) Expand and simplify $\left(5 - 3\sqrt{2}\right)^2$. [3]

Q9, (Jun 2010, Q5)

(i) Express $\sqrt{48} + \sqrt{27}$ in the form $a\sqrt{3}$. [2]

(ii) Simplify $\dfrac{5\sqrt{2}}{3 - \sqrt{2}}$. Give your answer in the form $\dfrac{b + c\sqrt{2}}{d}$. [3]

Q10, (Jan 2011, Q7)

(i) Express $\dfrac{81}{\sqrt{3}}$ in the form 3^k. [2]

(ii) Express $\dfrac{5 + \sqrt{3}}{5 - \sqrt{3}}$ in the form $\dfrac{a + b\sqrt{3}}{c}$, where a, b and c are integers. [3]

Q11, (Jan 2012, Q4)

(i) Expand and simplify $(7 + 3\sqrt{2})(5 - 2\sqrt{2})$. [3]

(ii) Simplify $\sqrt{54} + \dfrac{12}{\sqrt{6}}$. [2]

Q12, (Jun 2012, Q5)

(i) Simplify $\dfrac{10(\sqrt{6})^3}{\sqrt{24}}$. [3]

(ii) Simplify $\dfrac{1}{4 - \sqrt{5}} + \dfrac{1}{4 + \sqrt{5}}$. [2]

Q13, (Jan 2013, Q7)

(i) Express $\sqrt{48} + \sqrt{75}$ in the form $a\sqrt{b}$, where a and b are integers. [2]

(ii) Simplify $\dfrac{7 + 2\sqrt{5}}{7 + \sqrt{5}}$, expressing your answer in the form $\dfrac{a + b\sqrt{5}}{c}$, where a, b and c are integers. [3]

Q14, (Jun 2013, Q7)

(i) Express $125\sqrt{5}$ in the form 5^k. [2]

(ii) Simplify $10 + 7\sqrt{5} + \dfrac{38}{1 - 2\sqrt{5}}$, giving your answer in the form $a + b\sqrt{5}$. [3]

Q15, (Jun 2014, Q4)

(i) Expand and simplify $(7 - 2\sqrt{3})^2$. [3]

(ii) Express $\dfrac{20\sqrt{6}}{\sqrt{50}}$ in the form $a\sqrt{b}$, where a and b are integers and b is as small as possible. [2]

Q16, (Jun 2015, Q6)

(i) Expand and simplify $(3 + 4\sqrt{5})(3 - 2\sqrt{5})$. [3]

(ii) Express $\sqrt{72} + \dfrac{32}{\sqrt{2}}$ in the form $a\sqrt{b}$, where a and b are integers and b is as small as possible. [2]