**Topic 03 – Surds (From OCR 4751)**

Note: A link to the associated YouTube tutorial can be found at [ALevelMathsRevision.com/bridging-the-gap/](https://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 \(\frac{\sqrt{3}}{6 - \sqrt{3}}\) 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 \(a = \frac{3}{2}\), \(b = \frac{9 - \sqrt{17}}{4}\) and \(c = \frac{9 + \sqrt{17}}{4}\). Show that \(a + b + c = abc\). [4]

Q4, (Jun 2007, Q8)

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

(ii) Express \(\frac{6\sqrt{5}}{2 + \sqrt{5}}\) 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 \(\frac{1}{5 + \sqrt{2}} + \frac{1}{5 - \sqrt{2}}\). [3]

Q6, (Jun 2008, Q7)

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

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

Q7, (Jan 2009, Q10)

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

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

Q8, (Jun 2009, Q8)

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

(ii) Expand and simplify \((5 - 3\sqrt{2})^2\). [3]
Q9, (Jun 2010, Q5)
(i) Express \( \sqrt{48} + \sqrt{27} \) in the form \( a\sqrt{3} \). [2]

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

Q10, (Jan 2011, Q7)
(i) Express \( \frac{81}{\sqrt{3}} \) in the form \( 3^k \). [2]

(ii) Express \( \frac{5 + \sqrt{3}}{5 - \sqrt{3}} \) in the form \( \frac{a + b\sqrt{3}}{c} \), 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 \( \sqrt{54} + \frac{12}{\sqrt{6}} \). [2]

Q12, (Jun 2012, Q5)
(i) Simplify \( \frac{10(\sqrt{6})^3}{\sqrt{24}} \). [3]

(ii) Simplify \( \frac{1}{4 - \sqrt{5}} + \frac{1}{4 + \sqrt{5}} \). [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 \( \frac{7 + 2\sqrt{5}}{7 + \sqrt{5}} \), expressing your answer in the form \( \frac{a + b\sqrt{5}}{c} \), 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 \( 10 + 7\sqrt{5} + \frac{38}{1 - 2\sqrt{5}} \), 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 \( \frac{20\sqrt{6}}{\sqrt{50}} \) 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 \( \sqrt{72} + \frac{32}{\sqrt{2}} \) in the form \( a\sqrt{b} \), where \( a \) and \( b \) are integers and \( b \) is as small as possible. [2]