



Name: _____ () Class: _____ Date: _____

Topical Revision Worksheet 1

Topic: Algebraic manipulation, Surds and Indices (including Exponential Equations)

Question 1 [2008 EOY, Q1]	marks
Express $\frac{1}{3-2\sqrt{2}}$ in the form $a+b\sqrt{2}$, where a and b are real numbers. Answer: $3+2\sqrt{2}$	[2]
Question 2 [2008 EOY, Q2]	marks
Evaluate $25^{-1.5} \div 32^{0.4}$ without a calculator, leaving your answer as a fraction in its simplest form. Answer: $\frac{1}{500}$	[2]
Question 3 [2009 EOY, Q2]	marks
Express $\frac{2\sqrt{5}-3}{2\sqrt{5}+4} + \frac{2}{\sqrt{3}}$ in the form $a+b\sqrt{3}+c\sqrt{5}$ where a , b and c are rational numbers. Answer: $8+\frac{2}{3}\sqrt{3}-\frac{7}{2}\sqrt{5}$	[3]
Question 4 [2010 EOY, Q1]	marks
(a) Simplify $(\sqrt[3]{3}+\sqrt[3]{2})(\sqrt[3]{9}-\sqrt[3]{6}+\sqrt[3]{4})$. Answer: 5	[2]
(b) A triangle has an area of $(5\sqrt{6}+18)$ units ² and the length of its base is $(2\sqrt{3}-3)$ unit. Find its height in the form $(a\sqrt{2}+b\sqrt{3}+c\sqrt{6}+d)$ units, where a , b , c and d are integers. Answer: $20\sqrt{2}+24\sqrt{3}+10\sqrt{6}+36$ units	[3]
Question 5 [2010 EOY, Q2]	marks
Solve for x when $\frac{1}{2}\sqrt{2x-3} = \sqrt{\frac{3x+5}{2}}$. Answer: No solution	[3]

Question 6 [2010 EOY, Q3]	marks
(a) Make h the subject of the formula $\frac{g}{2r} = \frac{1}{y} \sqrt{\frac{h^2 - 1}{2 - h^2}}$. Answer: $h = \pm \sqrt{\frac{2g^2y^2 + 4r^2}{4r^2 + g^2y^2}}$	[2]
(b) Simplify $\frac{x^2 - 3x + 2}{2x^2 - x - 3} \div \frac{2x^2 + 7x + 6}{8x^2 - 18} \times \frac{x^2 + x - 2}{x^2 - 2x + 1}$. Answer: $\frac{2(x-2)}{x+1}$ or $\frac{2x-4}{x+1}$	[3]
Question 7 [2011 EOY, Q1]	marks
Without using a calculator, simplify $\frac{6}{1-\sqrt{3}} + \frac{9}{\sqrt{3}}$. Answer: -3	[3]
Question 8 [2011 EOY, Q3]	marks
(i) Show that $(2x + y)(4x^2 - 2xy + y^2) = 8x^3 + y^3$.	[1]
(ii) Hence simplify $\frac{8x^3 + y^3}{x^2 - xy - 6y^2} \times \left(\frac{x^2 - 3xy}{2x + y}\right) \div \sqrt{\frac{16x^4}{x^2 + 4xy + 4y^2}}$. Answer: $\frac{4x^2 - 2xy + y^2}{4x}$	[4]
Question 9 [2012 EOY, Q2]	marks
Without using a calculator, simplify $\frac{3}{(2-\sqrt{5})^2} - \frac{2}{(2+\sqrt{5})^2}$. Answer: $9 + 20\sqrt{5}$	[4]
Question 10 [2012 EOY, Q10 a, b]	marks
(a) Factorise $81a^4 - 27a^2b^2 - 4b^4$ completely Answer: $(9a^2 + b^2)(3a + 2b)(3a - 2b)$	[2]
(b) Given that $2x = 3\sqrt{px^2 + q}$, express x in terms of p and q. Answer: $x = \pm \sqrt{\frac{9q}{4-9p}}$	[2]

Question 11 [2013 EOY, Q1 a, b]	marks
(a) Find the product of $(x^{\frac{1}{3}} - y^{\frac{1}{3}})(x^{\frac{1}{3}} + y^{\frac{1}{3}})$ and $(x^{\frac{2}{3}} - x^{\frac{1}{3}}y^{\frac{1}{3}} + y^{\frac{2}{3}})(x^{\frac{2}{3}} + x^{\frac{1}{3}}y^{\frac{1}{3}} + y^{\frac{2}{3}})$ and simplify the answer. Answer: $x^2 - y^2$	[2]
(b) If $y = \frac{\sqrt{x+a} - \sqrt{x-a}}{\sqrt{x+a} + \sqrt{x-a}}$, simplify $y + \frac{1}{y}$. Answer: $\frac{2x}{a}$	[3]
Question 12 [2013 EOY, Q6]	marks
(a) Simplify $\frac{a-b}{(b+c)(a+c)} + \frac{b-c}{(a+c)(a+b)} + \frac{c-a}{(a+b)(b+c)}$. Answer: 0	[3]
(b) Simplify $\frac{2x^2 - 6x + 4}{x^2 - 6x + 5} \times \frac{x^2 - x - 20}{3x^2 + 6x - 24}$. Answer: $\frac{2}{3}$	[3]
Question 13 [2014 EOY, Q1]	marks
(a) Factorise completely $(x-3)^3 + (x-1)^3$. Answer: $2(x-2)(x^2 - 4x + 7)$	[3]
(b) Simplify $\frac{x - \frac{x-1}{2}}{2 - \frac{x-1}{x}}$. Answer: $\frac{x}{2}$	[3]
Question 14 [2014 EOY, Q2]	marks
The area of a rectangle $ABCD$ is given by $(1+3\sqrt{2})\text{ m}^2$, and the length of side AB is $(2+\sqrt{8})\text{ m}$. Find, without using a calculator, the length of side BC in the form of $(a+b\sqrt{2})\text{ m}$, where a and b are real numbers. Answer: $\left(\frac{5}{2} - \sqrt{2}\right)\text{ m}$	[4]

Question 15 [2015 EOY, Q3]	marks
(a) Make p the subject of the formula if $s = \frac{4(2p^2 + 1)}{u^2}$. Answer: $\pm \sqrt{\frac{su^2 - 4}{8}}$	[3]
(b) Simplify into a single fraction $\frac{x^3 + 8y^3}{x^2 - 4y^2} - \frac{16xy^2 - 4x^3}{(4y - 2x)^2}$. Answer: $\frac{2x^2 + 4y^2}{x - 2y}$	[4]
Question 16 [2015 EOY, Q4]	marks
(a) Given that $x^2 - 4x = y^2 - 4y$ and that $x \neq y$, find the value of $\sqrt[3]{x + y}$. Answer: 6	[3]
(b) Using a suitable substitution, or otherwise, solve for x if $2(27^x) = 45(3^x) + \frac{243}{3^x}$ Answer: $x = \frac{3}{2}$	[4]