PARALLEL QUESTIONS FROM THE 2013 NCEA EXAMINATIONS
ALGEBRA
ACHIEVEMENT

1a Factorise $$8x^2 + 10x - 3$$ $$(4x - 1)(2x + 3)$$	1b Solve $$8x^2 + 10x - 3 = 0$$ $$(4x - 1)(2x + 3) = 0$$ $$4x - 1 = 0 \quad \mid \quad 2x + 3 = 0$$ $$4x = 1 \quad \mid \quad 2x = -3$$ $$x = \frac{1}{4} \quad \mid \quad x = -\frac{3}{2}$$ OR on calculator $$x = 0.25, \; -1.5$$
2a Simplify $$\frac{(5b^3)^2}{(2b^5)^4}$$ $$= \frac{25 b^6}{16 b^{20}}$$ $$= \frac{25}{16 b^{14}}$$	2b Simplify $$\left(\frac{81c^8}{16d^{12}}\right)^{\frac{1}{4}}$$ $$= \frac{3 c^2}{2 d^3}$$
3a Solve $$\text{Log}_x (32) = 5$$ $$x^5 = 32$$ $$x = 2$$	3b If $2000 is invested at 8% interest, then the final amount A in n years is given by A = 2000×(1.08)^n Find A if n= 6 years $$A = 2000 \times (1.08)^6$$ $$= \$3173.75$$

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MERIT

1c Simplify FULLY $\dfrac{5x^2 - 45}{x^2 + x - 12}$	1d Solve $(x+1) - 2\sqrt{(x+1)} - 8 = 0$ HINT let $b^2 = (x+1)$
$= \dfrac{5(x^2 - 9)}{(x-3)(x+4)}$ $= \dfrac{5(x+3)(x-3)}{(x-3)(x+4)}$ $= \dfrac{5(x+3)}{(x+4)}$	$b^2 - 2b - 8 = 0$ $(b+2)(b-4) = 0$ $b = -2$ or $b = 4$ so $b^2 = 4$ or $b^2 = 16$ $4 = x+1$ $\quad$ $16 = x+1$ $3 = x$ $\quad\quad$ $15 = x$ This one does not work $\quad$ This is valid
2c Simplify $\left(c^6\right)^{\frac{1}{2}} \times \left(c^{12}\right)^{\frac{1}{3}}$ $= c^3 \times c^4$ $= c^7$	2d Phil thinks of a number $\quad x$ He squares it $\quad x^2$ Then adds 5 times the original number $+5x$ The answer is 66 Form an equation and solve it to find his number. $x^2 + 5x = 66$ $x^2 + 5x - 66 = 0$ $(x-6)(x+11) = 0$ $x = 6$ or -11
3c Solve $5^{(x+4)} = 6 \times 3^x$ $\log_{10} 5^{x+4} = \log 6 + \log 3^x$ $(x+4)\log 5 = \log 6 + x\log 3$ $x\log 5 + 4\log 5 = \log 6 + x\log 3$ $x\log 5 - x\log 3 = \log 6 - 4\log 5$ $x(\log 5 - \log 3) = \log 6 - 4\log 5$ $x = \dfrac{\log 6 - 4\log 5}{\log 5 - \log 3} \approx -9 \cdot 1$	3d If \$2000 is invested at 8% interest, then the final amount A in n years is given by $A = 2000 \times (1.08)^n$ When will the amount A be greater than \$6000? $6000 = 2000(1.08)^n$ $3 = (1.08)^n$ $\log 3 = n\log 1.08$ $\dfrac{\log 3}{\log 1.08} = n$ Amount is > 6000 when $n > 14 \cdot 27$ years