

**PARALLEL QUESTIONS FROM THE 2013 NCEA EXAMINATIONS**

**ALGEBRA**

**ACHIEVEMENT**

<p>1a Factorise</p> $8x^2 - 2x - 3$ $(4x - 3)(2x + 1)$	<p>1b Solve</p> $8x^2 - 2x - 3 = 0$ $(4x - 3)(2x + 1) = 0$ $x = \frac{3}{4}, -\frac{1}{2}$
<p>2a Simplify</p> $\frac{(2b^3)^5}{(4b^5)^2}$ $= \frac{32 b^{15}}{16 b^{10}}$ $= 2 b^5$	<p>2b Simplify</p> $\left(\frac{8c^6}{27d^9}\right)^{\frac{1}{3}}$ $= \frac{2c^2}{3d^3}$
<p>3a Solve</p> $\log_x(64) = 2$ $x^2 = 64$ $x = 8$	<p>3b Ann borrows \$4000 at the beginning of her UNI course. If she passes all her exams, she is told her loan will reduce by 30% each year. Write an expression for the amount she owes after n years.</p> $4000 \times (0.7)^n$

ALGEBRA  
MERIT

1c Simplify FULLY

$$\frac{3x^2 - 48}{x^2 + x - 20}$$

$$= \frac{3(x^2 - 16)}{(x-4)(x+5)}$$

$$= \frac{3(\cancel{x-4})(x+4)}{(\cancel{x-4})(x+5)}$$

$$= \frac{3(x+4)}{(x+5)}$$

1d

Solve  $(x+4) - 2\sqrt{x+4} - 3 = 0$

HINT let  $b = x+4$

$$b - 2\sqrt{b} - 3 = 0$$

$$b - 3 = 2\sqrt{b}$$

$$b^2 - 6b + 9 = 4b$$

$$b^2 - 10b + 9 = 0$$

$$(b-9)(b-1) = 0$$

$$b = 9, 1$$

$$x = 5, -3$$

not valid in original eqn

2c Simplify

$$(x^2)^{\frac{1}{6}} \times (x^5)^{\frac{1}{3}}$$

$$x^{\frac{1}{3}} \times x^{\frac{5}{3}}$$

$$= x^{\frac{6}{3}}$$

$$= x^2$$

2d

Bill thinks of a number  $x$   
He squares it  $x^2$   
Then multiplies by 4  $4x^2$   
Then adds 4 times the original number  $x^2 + 4x$   
The answer is 24  
Find his number.

$$4x^2 + 4x = 24$$

$$4x^2 + 4x - 24 = 0$$

$$4(x^2 + x - 6) = 0$$

$$4(x-2)(x+3) = 0$$

$$x = 2 \text{ or } -3$$

3c Solve

$$2^{(x+4)} = 32 \times 8^x$$

OR

$$2^{x+4} = 2^5 \times 2^{3x}$$

$$x+4 = 3x+5$$

$$-1 = 2x$$

$$-\frac{1}{2} = x$$

$$(x+4) \log 2 = \log 32 + x \log 8$$

$$x \log 2 + 4 \log 2 = \log 32 + x \log 8$$

$$4 \log 2 - \log 32 = x \log 8 - x \log 2$$

$$4 \log 2 - \log 32 = x(\log 8 - \log 2)$$

$$\frac{4 \log 2 - \log 32}{\log 8 - \log 2} = x$$

$$x = -0.5$$

3d Ann borrows \$4000 at the beginning of her UNI course.

If she passes all her exams, she is told her loan will reduce by 30% each year. How long will she study for if she owes less than \$500

$$4000 \times (0.7)^n < 500$$

$$(0.7)^n < 0.125$$

$$n \log 0.7 < \log 0.125$$

$$-0.1549n < -0.903$$

$$n > 5.83$$