**PARALLEL ALGEBRA ASSESSMENT ANSWERS**

***1.(a) Simplify fully: (x2 – x – 12) = (x – 4)(x + 3) = (x + 3)***

***(x2 – 16) (x – 4)(x + 4) (x + 4)***

***(b) Expand and simplify: (2x – 5)(x + 2)(x – 3)***

***= (2x – 5)( x2 – x – 6)***

***= 2x3 – 2x2 – 12x – 5x2 + 5x + 30***

***= 2x3 – 7x2 – 7x + 30***

***(c) Factorise fully:***

***(i) 3x2 – 3x – 6 = 3(x2 – x – 2) = 3(x – 2)(x + 1)***

***(ii) 3x2 – 11x – 4 = (3x + 1)(x – 4)***

***(d) (i) Change this equation into the form ax2 + bx + c = 0***

***(x – 2)(x + 1) = 2x + 5***

***x2 – x – 2 – 2x – 5 = 0***

***x2 – 3x – 7 = 0***

***(ii) Solve the equation in (i) using the quadratic formula***

***and give your answer to 3 sig fig.***

***a = 1 b = -3 c = -7***

***x = 3 ±√(9 +4.1.7) = 3 ± √37 = 4.54 or – 1.54***

***2 2***

***(e) The equation 2x2 + 3x – (k + 2) = 0 has only one real solution. Find k.***

***Has 1 sol if Δ = 0 so 9 + 4×2×(k + 2) = 0***

***9 + 8k + 16 = 0***

***8k = -25***

***k = -25***

***8***

***(f) (i) Express px2 – 4x + p = x2 – 1 in the form ax2 + bx + c = 0***

***px2 – x2 – 4x + p + 1 = 0***

***(p – 1)x2 – 4x + (p + 1) = 0***

***(ii) Find the possible values of p so that the equation in (i) has real***

***solutions.***

***Has real solutions (ie 2 real or 1 real) if Δ ≥ 0***

***16 – 4(p – 1)(p + 1) ≥ 0***

***16 – 4(p2 – 1 ) ≥ 0***

***16 – 4p2 + 4 ≥ 0***

***20 ≥ 4p2 -√5 √5 p***

***5 ≥ p2***

***-√5 ≤ x ≤√5***

***2.(a) Solve for x: 4(3x – 2) = 6 – x***

***12x – 8 = 6 – x***

***13x = 14***

***x = 14***

***13***

***(b) Solve for x: (x – 1)2 – 2(x + 2) + 7 = 0***

***x2 – 2x + 1 – 2x – 4 + 7 = 0***

***x2 – 4x + 4 = 0***

***(x – 2)2 = 0***

***x = 2***

***(c) Solve for x: 3x2 = x + 2***

***3x2 – x – 2 = 0***

***(3x + 2)(x – 1) = 0***

***x = - 2/3 or 1 or on Graph Calc x = 1 or -0.667***

***(d) The area of the outside of a cone is given by A = πRL***

***where R is the radius of the base and L is the slant height.***

***If L = R – 2 and the area is 24π, find the values of R and L.***

***πRL = 24 π***

***πR(R – 2) = 24 π***

***R(R – 2) = 24***

***R2 – 2R – 24 = 0***

***(R – 6)(R + 4) = 0***

***R = 6 but R=-4 is not valid***

***Hence R = 6, L = 4***

***(e) Solve the equation: 1 + 1 = 13***

***x (x + 3) 40***

***Mult both sides by 40x(x + 3)***

***40(x + 3) + 40x = 13x(x + 3)***

***40x + 120 + 40x = 13x2 + 39x***

***0 = 13x2 – 41x – 120***

***0 = (13x + 24)(x – 5)***

***x = -24/13 or 5***

***on graphic calc x = 5 or – 1.85***

***3. (a) Factorise 7x2 – 4x +3 = (7x + 3)(x – 1)***

***(b) Solve 7x2 – 4x +3 = 0***

***(7x + 3)(x – 1) = 0***

***x = 1 or -7/3***

***(c) Find the EXACT solution of the equation:***

***x2 – 8x = 5 in the form d ± √p using the quadratic formula or by***

***completing the square method***

***x2 – 8x + 16 = 5 + 16 OR x2 – 8x – 5 = 0***

***(x – 4)2 = 21 x = 8 ±√(64 +4×1×5)***

***x – 4 = ±√21 2***

***x = 4 ±√21 x = 8 ±√(84)***

***2***

***(These answers are equal)***

***(d) Find what the value of k must be: x2 – 5x + k = x – 3***

***x2 – 6x + 8 x – 4***

***x2 – 5x + k = x – 3***

***(x – 2)(x – 4) x – 4***

***Clearly (x – 2) must cancel from the left hand side and leave (x – 3) on top.***

***so (x – 2) must be a factor of x2 – 5x + k and other factor is (x – 3)***

***so (x – 2)(x – 3) = x2 – 5x + 6 ie k = 6***

***(e) Bob tries to solve the equation: x2 – 2x – 24 = 3***

***x2 – 6x***

***This is his working:***

***x2 – 2x – 24 = 3x2 – 18x line 1***

***0 = 2x2 – 16x + 24 line 2***

***0 = 2(x2 – 8x + 12) line 3***

***0 = 2(x – 3)(x – 4) line 4***

***x = -3 or -4 line 5***

***(i) Find which lines Bob has made mistakes. LINES 4 and 5***

***(ii) Explain what the mistakes are.***

***He factorised wrongly 2(x2 – 8x + 12) =2 (x – 2)(x – 6)***

***and the solutions from this are x = 2 or 6***

***BUT x = 6 is not valid because of the denominator x2 – 6x = 0***

***and we cant have 0 on the bottom line of a fraction.***

***(iii) Suggest another way he could have solved the equation.***

***Factorising firstly: (x + 4)(x – 6) = 3***

***x(x – 6)***

***x + 4 = 3x***

***4 = 2x***

***2 = x***

***But x ≠ 6 because we cancelled (x – 6)***

***(x – 6)***

***(f)***

***A B This building has a parabolic***

***cross section with the top chopped off.***

***The distance AB is 20 metres.***

***The distance PQ is 40 metres.***

***The height of AB above the ground PQ***

***is 60 metres.***

***P Q***

***Find the equation of this parabolic cross section and find how high it would have been if the top were not chopped off.***

***Equation is of the form y = c – bx2***

***If x = 20, y = 0 so 0 = c – 400b***

***If x = 10, y = 60 so 60 = c – 100b***

***Subtracting 60 = 300b so b = 1/5***

***Subs 0 = c – 400 = 80***

***5***

***The equation is y = 80 – x2***

***5***

***Full height would have been 80 metres.***