**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.***