NO. 108/3

EDUCATIONAL QUALITY AND ASSESSMENT PROGRAMME

Scoring Rubric 2020

South Pacific Form Seven Certificate

MATHS WITH CALC.

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Strand: 1 ALGEBRA						
Item #	**Skill level**	**Evidence (or expected answer)**	**Level 1**	**Level 2**	**Level 3**	**Level 4**
1.1	1	Simplify 4x – 8 = 5(x + 2) – x ➔ 4x – 8 = 2x + 10 – x ➔ 4x – 8 = x + 10 ➔ 4x – x = 10 + 8 ➔ 3x = 18 ➔ ∴ **x = 6**	Final Answer. Allow for slips.			
1.2	1	<u>Points of intersection</u> y = y y + 3 = x 3x + y = 1 <u>**Method 1**</u> (Substitution) y = x – 3 3x + (x – 3) = 1 y = (1) - 3 4x = 1 + 3 y = -2 4x = 4 x = 1	Final Answer. **(1 , -2)** Allow for slips If student has shown evidence of doing either steps correctly, but made minor algebraic errors to get the answer Compensate their effort, Even though they might Get 1 wrong.	<u>**Method 2**</u> (Elimination) y + 3 = x 3x + y = 1 3x + y = 1 y – x = -3 - (<u>-x + y =</u> <u>-3)</u> y – 1 = -3 4x = 4 y = -3 + 1 = **-2** x = 4/4 = **1**		
1.3	1	$\frac{x+1}{2} \leq \frac{4-x}{-3}$ ➔ $-3(x+1) \geq 2(4-x)$ ➔ $-3x-3 \geq 8-2x$ ➔ $-3x+2x \geq 8+3$ ➔ $-x \geq 11$ ➔ $x \leq \frac{11}{-1}$ ➔ $\boldsymbol{x \leq -11}$	Final Answer. Check to see that the inequality sign has been reversed TWICE, when multiplying/dividing by a negative number.			
1.4	1	$\frac{\sqrt{2-p}}{3} = x+1$ ➔ $\sqrt{2-p} = 3(x+1)$ ➔ $2-p = (3x+3)^2$ ➔ $2 = (3x+3)^2 + p$ $\therefore \boldsymbol{p = 2 - (3x+3)^2}$	Final Answer. Quadratic factor can be accepted in Crude form/ does not need to be expanded, <u>Possible solutions</u>: ➔	$p = 2 - (3x+3)^2$ $p = 2 - (9x^2 + 18x + 9)$ $p = 2 - 9x^2 - 18x - 9$ $p = -9x^2 - 18x - 7$		$2 - p = (3x+3)^2$ $-p = (3x+3)^2 - 2$ $p = \frac{(3x+3)^2 - 2}{-1}$

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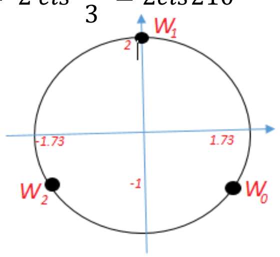
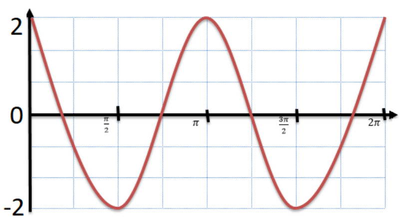
Item #	**Skill level**	**Evidence (or expected answer)**	**Level 1**	**Level 2**	**Level 3**	**Level 4**
1.5	1	Factorise $x^2 - 15x + 26$ ➔ $\boxed{(x-13)(x-2)}$	Final Answer.			
1.6	1	Factorise $2x^2 - 7x + 3 = 0$ ➔ $(2x-1)(x-3) = 0$ ➔ 2x – 1 = 0 x – 3 = 0 ➔ $\boxed{X = \frac{1}{2}}$ $\boxed{X = 3}$	Final Answer. Possible solution is the usage of the Quadratic Formula to solve:	$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(2)(3)}}{2(2)}$ $x = \frac{7 \pm \sqrt{49-24}}{4} = \frac{7 \pm \sqrt{25}}{4}$ $x = \frac{7 \pm 5}{4} \rightarrow x_1 = \frac{12}{4} = 3 \quad x_2 = \frac{1}{2}$		
1.7	1	$\frac{(p^2)^n \times p^{4n} \times p}{p^{5n}}$ $\frac{p^{2n} \times p^{4n} \times p^1}{p^{5n}}$ $\frac{p^{6n} \times p^1}{p^{5n}}$ $\frac{p^{6n+1}}{p^{5n}}$ $p^{6n+1-5n} = \boxed{p^{n+1} \text{ OR } p^n.p}$	Final Answer. Allow for slips. Reward if Laws of Indices used $(p^2)^n = \boldsymbol{p^{2n}}$ $p^{2n}.p^{4n}.p^1 = \boldsymbol{p^{6n+1}}$ $\frac{p^{6n+1}}{p^{5n}} = \boldsymbol{p^{6n+1-5n}}$			
1.8	1	$x^3 - 13x^2 - 50x - 56$ by $(x-7)$ $x - 7 \overline{)\, x^3 - 13x^2 - 50x - 56}$ quotient $x^2 - 6x - 92$ $\underline{-(x^3 - 7x^2)}$ ∴ $-6x^2 - 50x$ $\underline{-(-6x^2 + 42x)}$ ∴ $-92x - 56$ $\underline{-(-92x + 644)}$ ∴ -700 $\boxed{x^2 - 6x - 92 + \frac{-700}{x-7}}$	Final Answer. Alternate answer is to use Synthetic Division.	Synthetic Division only uses coefficients. 7 | 1 -13 -50 -56 7 -42 -644 1 -6 -92 -700→ *Remainder* $x^2 - 6x - 92 + \frac{-700}{x-7}$		
1.9	1	$3x^2 + \boldsymbol{a}x - 4 = 5$ $(x+3) = 0 \rightarrow x = -3$ Substitute x=-3 $3(-3)^2 + a(-3) - 4 = 5$ $3(9) - 3a - 4 = 5$ $27 - 3a - 4 = 5$ $23 - 3a = 5$ $23 - 5 = 3a$ $18 = 3a$ $\boxed{\therefore a = 6}$	Final Answer			

Strand: 1 ALGEBRA

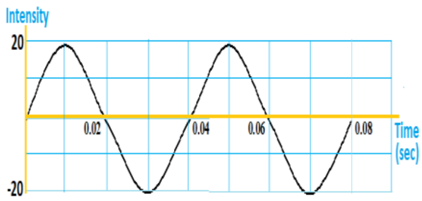
Item #	Skill level	Evidence (or expected answer)	Level 1	Level 2	Level 3	Level 4
1.10	1	$\binom{3}{0}(x)^3\left(-\frac{1}{x}\right)^0 = (1)x^3(1) = x^3$ $\binom{3}{1}(x)^2\left(-\frac{1}{x}\right)^1 = (3)x^2\left(-\frac{1}{x}\right) = -3x$ $\binom{3}{2}(x)^1\left(-\frac{1}{x}\right)^2 = (3)x^1\left(\frac{1}{x}\right)^2 = \frac{3}{x}$ $\binom{3}{3}(x)^0\left(-\frac{1}{x}\right)^3 = (1)(1)\left(-\frac{1}{x}\right)^3 = -\frac{1}{x^3}$ $\boxed{x^3 - 3x + \frac{3}{x} - \frac{1}{x^3}}$	Final Answer. Allow for slips			
1.11	1	$2\sqrt{3} + 4\sqrt{3} - \sqrt{27}$ ➔ $2\sqrt{3} + 4\sqrt{3} - \sqrt{9}\sqrt{3}$ ➔ $2\sqrt{3} + 4\sqrt{3} - 3\sqrt{3}$ ➔ $(2 + 4 - 3)\sqrt{3}$ $\boxed{= 3\sqrt{3}}$	Final Answer. Allow for slips in + or – of surds Reward students who were able: ➔ To break $\sqrt{27} = 3\sqrt{3}$ ➔ To get $7\sqrt{3} - \sqrt{27}$			
1.12	1	$\frac{(1 + 2x)}{3} - \frac{5x}{2} = \frac{(x - 3)}{4}$ ➔ $\frac{2(1+2x)-3(5x)}{6} = \frac{(x-3)}{4}$ ➔ $\frac{2+4x-15x}{6} = \frac{(x-3)}{4}$ ➔ $\frac{2-11x}{6} = \frac{(x-3)}{4}$ ➔ $4(2 - 11x) = 6(x - 3)$ ➔ $8 - 44x = 6x - 18$ ➔ $8 + 18 = 6x + 44x$ ➔ $\boxed{\therefore x = \frac{26}{50} = \frac{13}{25} = 0.52}$	Final Answer. Allow for slips. Check for LCD of "6" Cross-multiplication Alternate Solution is to multiply the whole equation by 24 or 12 – to remove the denominators.	ALTERNATE SOLUTION (multiplying by a factor 12 or 24 $\frac{12\,x(1 + 2x)}{3} - \frac{12x\,5x}{2} = \frac{12\,x(x - 3)}{4}$ $4(1 + 2x) - 6(5x) = 3(x - 3)$ $4 + 8x - 30x = 3x - 9$ $4 + 9 = 3x + 22x$ $\therefore x = \frac{13}{25} \approx 0.52$		
1.13	1	$\left(\frac{(2x)^3 \,.\, y^{-4}}{6x^5 \,.\, y^{-7}}\right)^{-2} = \left(\frac{6x^5 \,.\, y^{-7}}{(2x)^3 \,.\, y^{-4}}\right)^2$ $= \left(\frac{6x^5 \,.\, y^4}{8x^3 \,.\, y^7}\right)^2$ $= \left(\frac{3x^2}{4\,y^3}\right)^2$ $= \boxed{\frac{9x^4}{16y^9}}$	Final Answer. Allow for slips. Check for the inversion/reciprocal Of the fraction that will make exterior power POSITIVE			

Strand: 1 ALGEBRA						
Item #	Skill level	Evidence (or expected answer)	Level 1	Level 2	Level 3	Level 4
1.14	1	$x^2 - 16x + k$ $(x-a)^2 \to \frac{-16}{2} = -8$ $(x-8)^2 = x^2 - 16x + 64$ $\therefore k = 64$	Final Answer			
1.15	2	$\frac{v}{u} = \frac{r_1}{r_2} cis\,(\theta_1 - \theta_2)$ $\frac{v}{u} = \frac{8}{2} cis\left(\frac{\pi}{2} - \frac{\pi}{3}\right)$ $\frac{v}{u} = 4\,cis\,(90 - 60)$ $\frac{v}{u} = 4\,cis\,(30) or\, 4cis\,\frac{\pi}{6}$ $\frac{v}{u} = 4\left(\frac{\sqrt{3}}{2} + \frac{1}{2}i\right) = 2\sqrt{3} + 2i$ $= 3.46 + 2i$	Answer in polar form $4\,cis\,(30)$ or $4cis\,\frac{\pi}{6}$	Final Answer in Rectangular Form $2\sqrt{3} + 2i$ Or 3.46 + 2i		
1.16	4	$W = 8\left(\cos -\frac{\pi}{2} + isin -\frac{\pi}{2}\right)$ $W^3 = -8i = 8cis - 90$ Angles $\theta = \frac{360}{3} = 120^0\ apart.$ $\theta_1 = \frac{-90}{3} = -30^0$ or 330^0 $\theta_2 = -30 + 120 = 90^0$ $\theta_3 = 90 + 120 = 210^0$ $r = \sqrt[3]{8} = 8^{\frac{1}{3}} = 2$ $W_0 = 2\,cis - \frac{\pi}{6} = 2cis - 30^0$ $W_1 = 2\,cis\,\frac{\pi}{2} = 2cis90^0 = 2i$ $W_2 = 2\,cis\,\frac{2\pi}{3} = 2cis210^0$ 	Able to find the "r" value of 2, or the usage of De Moivre's Theorem Correct angle θ $W_k = r^{1/n} cis(\frac{\theta}{n} + \frac{2\pi k}{n})$ $W_k = 2\,cis(\frac{90}{3} + \frac{2\pi k}{3})$	Was able to get at least one or two roots correct. Argand Diagram is incorrect. Or not drawn. Three Roots in Rectangular Form $W_0 = 1.73 - i$ $W_1 = 2i$ $W_2 = -1.73 - i$	Was able to get all three roots correct. Argand Diagram not drawn/incorrect, Allow for slips. If all working is correct and Argand Diagram is drawn – but with only wrong ANGLE/wrong R Value.	All 3 roots correct. Argand Diagram Correct.

Strand: 2 TRIGNOMETRY

Item #	Skill level	Evidence (or expected answer)	Level 1	Level 2	Level 3	Level 4
2.1a	1	$\sec x + \tan x = \frac{1 + sinx}{cosx}$ LHS $\frac{1}{cosx} + \frac{sinx}{cosx}$ $\frac{1 + sinx}{cos\, x}$ =RHS	Final Answer. Able to write down reciprocal identities: $secx = \frac{1}{cosx}$ $tanx = \frac{sinx}{cosx}$			
2.1b	2	$(1 + cot^2\theta)(1 - cos^2\theta) \equiv 1$ $cosec^2\theta \; . \; sin^2\theta$ $\frac{1}{sin^2\theta} \; . \; sin^2\theta$ 1 = RHS	Able to use the trig identities to get: $1 + cot^2\theta = csc^2\theta$ $1 - cos^2\theta = sin^2\theta$	Final Answer.		
2.2	2	<u>Pythagoras Theorem</u> Find missing length: $h^2 = a^2 + b^2$ $(2)^2 = (\sqrt{3})^2 + b^2$ $4 = 3 + b^2$ $4 - 3 = b^2$ $\therefore b = 1$ $Sin\ 2x = 2.sinx.cosx$ $= 2.\left(\frac{1}{2}\right).\left(\frac{\sqrt{3}}{2}\right)$ $= 2.\left(\frac{\sqrt{3}}{4}\right)$ $= \boxed{\frac{\sqrt{3}}{2}}$	Final Answer. Was able to use the Pythagoras Theorem, to get the missing length of "1". Or if you see $sinx = \frac{1}{2}$			
2.3	1		Final Answer. Correct shape Correct number of waves y-labels not compulsory			

Strand: 2 TRIGNOMETRY

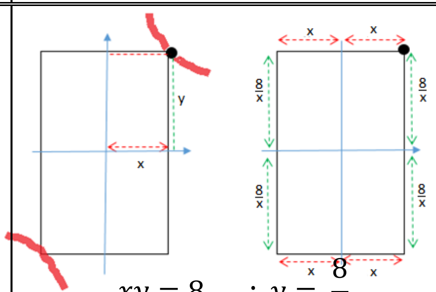
Item #	Skill level	Evidence (or expected answer)	Level 1	Level 2	Level 3	Level 4
2.4	2	$Cos\,(\frac{\pi}{2}+P)$ $= cos\left(\frac{\pi}{2}\right)cos(P) - sin\left(\frac{\pi}{2}\right)sin(P)$ $= (0)cos(P) - (1)sin(P)$ $= \boxed{-sinP}$	Able to employ the Compound Angle Formula: Correct substitution of A=$\frac{\pi}{2}$ or B=P	Final Answer		
2.5	3	 A=20 Type of Graph: sine Graph y=Asin(Bx+C)+D T=0.04 B=$\frac{2\pi}{T} = \frac{2\pi}{0.04} = 50\pi$ C=0 and D=0 Y=20 sin 50π	Was able to identify the: Amplitude=20 Or the graph is a SINE wave.	Was able to identify the value of B: B=50π	Final Answer.	

Strand: 3 DIFFERENTIATION

Item #	Skill level	Evidence (or expected answer)	Level 1	Level 2	Level 3	Level 4
3.1	1	$\boxed{x = -1}$	Final Answer			
3.2	2	$lim_{x\to 4} \frac{2-\sqrt{x}}{4-x}$ $lim_{x\to 4} \frac{2-\sqrt{x}}{4-x}$ $lim_{x\to 4} \frac{(2-\sqrt{x})}{(2+\sqrt{x})(2-\sqrt{x})}$ $lim_{x\to 4} \frac{1}{2+\sqrt{x}}$ $lim_{x\to 4} \frac{1}{2+\sqrt{4}} = \boxed{\frac{1}{4}}$	Was able to use Difference of Two Squares to factorise the denominator into $(2+\sqrt{x})(2-\sqrt{x})$	Final Answer. <u>L Hopital's Rule (Alternative Solution)</u> Differentiate : $\frac{-\frac{1}{2}x^{\frac{-1}{2}}}{-1} = \frac{1}{2\sqrt{x}} = \frac{1}{2\sqrt{4}} = \frac{1}{2(2)} = \frac{1}{4}$		
3.3	1	$lim_{x\to\infty} = \frac{(x+3)(4-2x)}{(2x-5)^2}$ No need to expand whole eqn: $lim_{x\to\infty} = \frac{-2x^2}{4x^2}$ $lim_{x\to\infty} = \boxed{-\frac{1}{2}}$	Was able to identify the highest term with the HIGHEST POWERS in the numerator OR denominator.	Final Answer		

Strand: 3 DIFFERENTIATION						
Item #	Skill level	Evidence (or expected answer)	Level 1	Level 2	Level 3	Level 4
3.4	2	$Differentiate: \frac{e^{2x}}{x+1}$ $Let\ u = e^{2x}$ $\therefore u' = 2e^{2x}$ $Let\ v = x+1$ $\therefore v' = 1$ $\frac{dy}{dx} = \frac{vu^1 - uv^1}{v^2}$ $\frac{dy}{dx} = \frac{(x+1)(2e^{2x}) - (e^{2x})(1)}{(x+1)^2}$ $\frac{dy}{dx} = \frac{2xe^{2x} + 2e^{2x} - e^{2x}}{(x+1)^2}$ $\frac{dy}{dx} = \frac{2xe^{2x}+e^{2x}}{(x+1)^2}$+ $\frac{dy}{dx} = \frac{e^{2x}(2x+1)}{(x+1)^2}$	If any of the terms in the numerator and denominator were differentiated correctly. $\therefore u' = 2e^{2x}$ $\therefore v' = 1$ If the derivatives were wrong, but was able to recognize this problem employed the Quotient Rule.	Final Answer Allow for slips. If the Quotient Rule was used, correctly with the substitution of the terms. Equation <u>does not</u> necessarily need to be simplified or factorized. Reward students, even if they have given it in its Crude Form		
3.5	4	$s(t) = 6t^3 + 2t - \frac{1}{\sqrt{t}}$ $s(t) = 6t^3 + 2t - t^{-\frac{1}{2}}$ <u>1st Derivative:</u> $s'(t) = v(t) = 18t^2 + 2 + \frac{1}{2}t^{\frac{1}{2}}$ <u>2nd Derivative:</u> $v'(t) = a(t) = 36t + \frac{1}{4}t^{-\frac{1}{2}}$ $a(t) = 36t + \frac{1}{4\sqrt{t}}$ <u>Acceleration at time t=4sec</u> $a(4) = 36(4) + \frac{1}{4\sqrt{4}} = 144 + \frac{1}{8}$ $= 144.125\ or\ \frac{1153}{8}\ m/s^2$	Was able to write $-\frac{1}{\sqrt{t}}\ as\ -t^{-\frac{1}{2}}$ Able to show any signs of differentiation. Substituted t = 4sec into a formula that was differentiated incorrectly.	Was able to differentiate the distance once correctly. <u>1st Derivative</u> $18t^2 + 2 + \frac{1}{2}t^{\frac{1}{2}}$	Was able to differentiate the distance twice correctly. <u>2nd Derivative:</u> $36t + \frac{1}{4}t^{-\frac{1}{2}}$	Final Answer.

Strand: 3 DIFFERENTIATION

Item #	Skill level	Evidence (or expected answer)	Level 1	Level 2	Level 3	Level 4
3.6	4	 $xy = 8 \quad \therefore y = \frac{8}{x}$ $Perimeter = 4x + 4.\left(\frac{8}{x}\right)$ $P = 4x + \frac{32}{x}$ <u>Differentiate</u> $P' = 4 - 32x^{-2}$ $Minimum \rightarrow P' = 0$ $0 = 4 - 32x^{-2}$ $32x^{-2} = 4$ $32 = 4x^2$ $8 = x^2$ $\therefore x = \sqrt{8} \; or \; 2\sqrt{2} \; or \; 2.83$ $Perimeter = 4x + \frac{32}{x}$ $= 4(\sqrt{8}) + \frac{32}{\sqrt{8}}$ $= 4(\sqrt{8}) + 4(\sqrt{8})$ $= 8(\sqrt{8}) \; or \; 22.63m$	Was able to write the Perimeter in terms of "X". $Perimeter$ $= 4x + 4.\left(\frac{8}{x}\right)$ $P = 4x + \frac{32}{x}$ Was able to make y the subject of the formula : $\therefore y = \frac{8}{x}$ Evidence of any differentiation, even though the equation is wrong.	Able to differentiate the Perimeter equation correctly. $P' = 4 - 32x^{-2}$	Was able to differentiate correctly and equate to zero. <u>Minimum</u> $P' = 0$ And solve for x: $x = \sqrt{8}$ $or \; 2\sqrt{2}$ $or \; 2.83$	Final Answer Perimeter given. $8(\sqrt{8})$ $or \; 22.63m$ Allow for slips. If they <u>differentiated correctly</u>, but when solving for x, there answer is wrong – and they substituted the wrong x-value into the Perimeter formula – Reward them with FULL scores.

Strand: 4 INTEGRATION						
Item #	Skill level	Evidence (or expected answer)	Level 1	Level 2	Level 3	Level 4
4.1	1	$\int \sqrt{x} + 1\, dx = \int x^{\frac{1}{2}} + 1\, dx$ $= \frac{x^{\frac{3}{2}}}{\frac{3}{2}} + x + c$ $= \frac{2}{3} x^{\frac{3}{2}} + x + c$	Final Answer Allow for slips. Do not penalize anyone, if the coefficient is not reciprocated or C is missing.			
4.2	1	$\int 2e^{2x+2} dx = \frac{2e^{2x+2}}{2} + C$ $= e^{2x+2} + C$	Final Answer. Do not penalize if C is missing.			
4.3	2	Find $\int_1^2 3x^2 + 2x - 1\ dx$ $= \left[\frac{3x^3}{3} + \frac{2x^2}{2} - x\right]_1^2$ $= [x^3 + x^2 - x]_1^2$ $= [(2)^3 + (2)^2 - (2)] - [(1)^3 + (1)^2 - (1)]$ $= [8 + 4 - 2] - [1 + 1 - 1]$ $= [10] - [1]$ $= 9$	Was able to integrate the function into: $\left[\frac{3x^3}{3} + \frac{2x^2}{2} - x\right]_1^2$ And simplified into $[x^3 + x^2 - x]_1^2$	Final Answer Allow for slips. If they messed up in calculating their values in the substitution of the limits, still award marks.		
4.4	2	The function is a cyclic function, so we can find the area of one portion and multiply by 2. $\int_{-2}^{0} x^3 - 4x\, dx = \left[\frac{x^4}{4} - \frac{4x^2}{2}\right]_{-2}^{0}$ $= \left[\frac{x^4}{4} - 2x^2\right]_{-2}^{0}$ $= [0] - [-4] = 4\ units.$ Area of shaded region = 4 x 2 = 8 units^2	Was able to integrate the function correctly. $\frac{x^4}{4} - 2x^2$ Some students will forget to take the absolute value of the negative area – or integrate the function from 2 to -2 – this will give the area of **0 units.**	Final Answer. 8 units.		
4.5a	2	$a = (6 + 2t)\ m/s^2$ Quarter of a minute = ¼ x 60sec = 15 sec. $a(15) = 6 + 2(15)$ $= 6 + 30$ $= 36\ m/s^2$	Able to show that Quarter of a minute is t=15seconds. If they substituted t=¼ or t=0.25 into the acceleration formula.	Final answer.		

			Or acceleration = 6.5m/s[2]			
4.5b	3	$a = (6+2t)\ m/s^2$ First Integration: $\int a = v(t) = \int (6+2t)\,dt$ $= 6t + 2\frac{t^2}{2} + C$ $v(t) = 6t + t^2 + C$ Using initial conditions to find C v=0 t=12 $0 = 6(12) + (12)^2 + C$ $\therefore C = 432$ $v(t) = 6t + t^2 + 432$ Find velocity at t=2 sec $v(2) = 6(2) + (2)^2 + 432$ $= 12 + 4 + 432$ $= 448\ m/s$	Was able to integrate acceleration to get the velocity $v(t) = 6t + t^2 + C$ Any sign or evidence of integration shown: reward the student – even if it's wrong.	The initial conditions were used to find the constant: C = 432, Hence the complete Velocity expression: $v(t) = 6t + t^2 + 432$	Final Answer.	

Strand: 4 INTEGRATION

Item #	Skill level	Evidence (or expected answer)	Level 1	Level 2	Level 3	Level 4
4.6	4	$\frac{dN}{dt} \alpha \ n$ $\frac{dN}{dt} = k\,n$ $\frac{dN}{n} = k\,.dt$ $\int \frac{dN}{n} = k\,.\int dt$ $lnN = kt + C$ $e^{lnN} = e^{kt+C}$ $N = e^{C}.e^{kt}$ $N = A_0 e^{kt}$ Because radioactive DECAYS, k is NEGATIVE $N = A_0 e^{-kt}$ Because initial weight is 150 $\therefore A_0 = 150$ $N = 150e^{-kt}$ Half-life is the time where original breaks into half. $T_{1/2}$ = 435yrs into 75g $75 = 150e^{-k(435)}$ $\frac{1}{2} = e^{-435k}$ $ln\left(\frac{1}{2}\right) = -435k$ $\therefore k = \frac{ln0.5}{-435} = 0.001593$ $N = 150e^{-0.001593t}$ After 200 years: t = 200 $N = 150e^{-0.001593(200)}$ $N = 150e^{-0.3186883589}$ $N = 150(0.72710211)$ $N = 109.065\ g$	Showed evidence of separating differential equations Removing the proportional sign meant adding an "equal sign and K" Getting a general format for the Exponential Eqn: $N = A_0 e^{kt}$ Some will not derive, but write the general format straight away.	Was able to link the word DECAY: which means "K" is NEGATIVE $N = A_0 e^{-kt}$ Or $N = 150e^{-kt}$	Used initial conditions of half-life to get value of k $k = \frac{ln0.5}{-435}$ $= 0.001593$	Final Answer Be on the lookout if k has been rounded up to a particular decimal place. This will give several answers.

Possible Solutions (depending on value of "k")

If k = 0.002	then N = 100.548g
If k = 0.0016	then N = 108.922g
If k = 0.00159	then N = 109.140g

THE END