Half Term 2B (ANSWERS)	Week 1
1	1^{st} *term = 5* 2^{nd} *term = 8* $S_{10} = \frac{10}{2}\left(2 \times 5 + 3(10-1)\right)$ $= 185$
2	$(1+2x)^{-2}$ $= 1 - 2(2x) + \frac{(-2)(-3)}{2!}(2x)^2 + \frac{(-2)(-3)(-4)}{3!}(2x)^3$ $= 1 - 4x + 12x^2 - 32x^3$
3	$sin^2\theta = \frac{3}{4}$ $sin\theta = \pm\frac{\sqrt{3}}{2}$ $\theta = -\frac{2\pi}{3}, -\frac{\pi}{3}, \frac{\pi}{3}, \frac{2\pi}{3}$
4	$A(x+1) + B(x+3) = 2$ $x = -1 \quad 2B = 2 \quad B = 1$ $x = -3 \quad -2A = 2 \quad A = -1$ $\frac{2}{(x+3)(x+1)} = -\frac{1}{x+3} + \frac{1}{x+1}$
5	$\int_{-1}^{3} 3x^2 - 6x + 7\, dx = [x^3 - 3x^2 + 7x]$ $(3^3 - 3 \times 3^2 + 7 \times 3) - ((-1)^3 - 3 \times (-1)^2 + 7 \times (-1))$ $= 32$

Half Term 2B (ANSWERS)	Week 2

1	a = 12 r = 0.2 $S_n = \frac{12(1-0.2^n)}{1-0.2}$ $S_n = 15(1-0.2^n)$
2	$(1-4x)^{\frac{1}{2}}$ $= 1 + \frac{1}{2}(-4x) + \frac{\left(\frac{1}{2}\right)\left(-\frac{1}{2}\right)}{2!}(-4x)^2 + \frac{\left(\frac{1}{2}\right)\left(-\frac{1}{2}\right)\left(-\frac{3}{2}\right)}{3!}(-4x)^3$ $= 1 - 2x - 2x^2 - 4x^3$
3	$Arc\ length = 5 \times \frac{2\pi}{3}$ $= \frac{10\pi}{3}$ $Perimeter = 10 + \frac{10\pi}{3}$
4	$2sinx - 5cosx = R(sinxcos\theta - cosxsin\theta)$ $cos\theta = 2$ $sin\theta = 5$ $tan\theta = \frac{5}{2}$ $\theta = 1.19\ (3\ sf)$ $R = \sqrt{5^2 + 2^2}$ $R = \sqrt{29}$ $2sinx - 5cosx = \sqrt{29}sin(x - 1.19)$
5	$y = 2x^{\frac{5}{2}} + 3x^2$ $\frac{dy}{dx} = 5x^{\frac{3}{2}} + 6x$ $\frac{d^2y}{dx^2} = \frac{15}{2}\sqrt{x} + 6$ $15\sqrt{x} + 12 + a\sqrt{x} = 12$ *a = -15*

Half Term 2B (ANSWERS)	Week 3
1	$a + 9d = 104$ $a + 13d = 152$ $4d = 48$ $d = 12$ $a = -4$ $\quad -4 + 12(n - 1) = 368$ $n = 32$
2	$(1-2x)^{-1} = 1 + 2x + 4x^2 + 8x^3$ $2(1-2x)^{-1} = 2 + 4x + 8x^2 + 16x^3$
3	$4sin\theta = \frac{3cos\theta}{sin\theta}$ $2sin^2\theta - 3cos\theta = 0$ $2 - 2cos^2\theta - 3cos\theta = 0$ $2cos^2\theta + 3cos\theta - 2 = 0$ $cos\theta \neq -2 \quad cos\theta = \frac{1}{2} \qquad \theta = \frac{\pi}{3}, \frac{5\pi}{3}$
4	$3cosx - 7sinx = R(cosxcos\theta - sinxsin\theta)$ $cos\theta = 3 \qquad sin\theta = 7$ $tan\theta = \frac{7}{3} \qquad \theta = 1.17\ (3\ sf)$ $R = \sqrt{7^2 + 3^2} \qquad R = \sqrt{58}$ $3cosx - 7sinx = \sqrt{58}sin(x - 1.17)$
5	$\int_1^3 4x^2 - 4x + 1dx$ $\left[\frac{4x^3}{3} - 2x^2 + x\right]$ $= \left(\frac{4\times27}{3} - 2\times9 + 3\right) - \left(\frac{4\times1}{3} - 2\times1 + 1\right)$ $= 20\frac{2}{3}$

Half Term 2B (ANSWERS)	Week 4
1	$5 = 5k + 3$ $5k = 2$ $k = 0.4$
2	$(2-x)^{-1} = 1 + \frac{1}{4}x + \frac{1}{8}x^2 + \frac{1}{16}x^3$ $(x+1)(\frac{1}{2} + \frac{1}{4}x + \frac{1}{8}x^2 + \frac{1}{16}x^3)$ $= \frac{1}{2} + \frac{3}{4}x^2 + \frac{3}{8}x^2 + \frac{3}{16}x^3$
3	$8sin^2 2\theta cos2\theta = \frac{sin^2 2\theta}{cos^2 2\theta}$ $8cos^3 2\theta = 1$ $cos2\theta = \frac{1}{2}$ $2\theta = \frac{\pi}{3}, \frac{5\pi}{3}$ $\theta = \frac{\pi}{6}, \frac{5\pi}{6}$
4	$\frac{cosec\theta}{cosec\theta - sin\theta} = sec^2\theta$ $cosec\theta - sin\theta$ $= \frac{1-sin^2\theta}{sin\theta}$ $= \frac{cos^2\theta}{sin\theta}$ $\quad\quad \frac{1}{sin\theta} \times \frac{sin\theta}{cos^2\theta} = \frac{1}{cos^2\theta} = sec^2\theta$
5	$\frac{dy}{dx} = 8x + \frac{5}{x^2}$ *x = -1 gradient of the tangent = -3* *Gradient of the normal =* $\frac{1}{3}$ *x = -1 y = 10* *(y – 10) =* $\frac{1}{3}$*(x + 1) 3y – x = 31*

Half Term 2B (ANSWERS)	Week 5

1	$ar = 10$ $ar^3 = 62.5$ $r^2 = 6.25$ $r = 2.5$ $\quad S_5 = \frac{4(2.5^5-1)}{2.5-1}$ $a = 4$ $= 257.75$
2	$(1+3x)^{-1} = 1 - 3x + 9x^2 - 27x^3$ $3(3+x)^{-1} = 1 - \frac{1}{3}x + \frac{1}{9}x^2 - \frac{1}{27}x^3$ $1 - 3x + 9x^2 - 27x^3 \ldots\ldots + 1 - \frac{1}{3}x + \frac{1}{9}x^2 - \frac{1}{27}x^3$ $= 2 - \frac{10}{3}x + \frac{82}{9}x^2 - \frac{730}{27}x^3$
3	$r \times \frac{\pi}{6} = 8$ $r = \frac{48}{\pi}$ *Area of triangle* $= \frac{1}{2} \times \frac{48}{\pi} \times \frac{48}{\pi} \times \sin\frac{\pi}{6}$ $= 58.4\ cm^2$
4	$5 \times 2sin2\theta cos2\theta = 3sin2\theta$ $sin2\theta(10cos2\theta - 3) = 0$ $sin2\theta = 0 \quad 2\theta = 0, \pi$ $cos2\theta = \frac{3}{10} \quad 2\theta = 1.27,\ 5.02$ $\theta = 0.635,\ \frac{\pi}{2},\ 2.51$
5	$y = 48x^{-1} + x^3$ $\frac{dy}{dx} = -\frac{48}{x^2} + 3x^2$ $\quad \frac{d^2y}{dx^2} = \frac{144}{x^3} + 6x \quad x = 2 \quad \frac{d^2y}{dx^2} > 0$ *(min)* $-\frac{48}{x^2} + 3x^2 = 0$ $\quad x = -2 \quad \frac{d^2y}{dx^2} < 0$ *(max)* $3x^4 = 48 \quad x = \pm 2$ $\quad$ *Max point at (-2, -32)*

Half Term 2B (ANSWERS)	Week 6

1	$S_1 = 25 \quad S_2 = 54 \quad S_3 = 87$ *1st term = 25* *2nd term = 29* *3rd term = 33* $\quad u_n = 25 + 4(n-1)$
2	$(1-x)^{\frac{1}{2}} = 1 - \frac{1}{2}x - \frac{1}{8}x^2$ $(1+x)^{-\frac{1}{2}} = 1 - \frac{1}{2}x + \frac{3}{8}x^2$ $(1 - \frac{1}{2}x - \frac{1}{8}x^2)(1 - \frac{1}{2}x + \frac{3}{8}x^2)$ $= 1 - \frac{1}{2}x - \frac{1}{2}x^2$
3	$A_1 = \frac{1}{2} \times 4 \times \theta \qquad A_2 = 10\theta$ $10\theta = \frac{1}{2} \times 81\theta - \frac{1}{2} \times (OX)^2\theta$ $(OX)^2 = 61$ $OX = \sqrt{61}$
4	$1 + tan^2\theta = \frac{cos^2\theta + sin^2\theta}{cos^2\theta} \qquad 1 - tan^2\theta = \frac{cos^2\theta - sin^2\theta}{cos^2\theta}$ $\frac{1 - tan^2\theta}{1 + tan^2\theta} = \frac{cos^2\theta - sin^2\theta}{cos^2\theta} \times \frac{cos^2\theta}{cos^2\theta + sin^2\theta}$ $= cos^2\theta - sin^2\theta$ $= (1 - sin^2\theta) - sin^2\theta$ $= 1 - 2sin^2\theta$
5	$x^2 - 4x + 4 = 9$ $x^2 - 4x - 5 = 0$ $(x-5)(x+1) = 0 \qquad x = -1 \text{ and } x = 5$ $\int_{-1}^{5} 9 - x^2 + 4x - 4\,dx$ $= \left[5x - \frac{x^3}{3} + 2x^2\right]$ $= \left(25 - \frac{125}{3} + 50\right) - \left(-5 + \frac{1}{3} + 2\right) = 36$

Half Term 2B (ANSWERS)	Week 7
1	$a = 2 \;\; r = 3$ $\frac{2(3^n-1)}{3-1} > 200000$ $3^n > 200001$ $n > \frac{ln(200001)}{ln\,3}$ $\quad n > 11.11 \quad$ *12 terms needed*
2	$(4+x)^{\frac{1}{2}} = 2 + \frac{1}{4}x - \frac{1}{64}x^2$ $(1-x)^{-\frac{1}{2}} = 1 + \frac{1}{2}x + \frac{3}{8}x^2$ $(2 + \frac{1}{4}x - \frac{1}{64}x^2)(1 + \frac{1}{2}x + \frac{3}{8}x^2)$ $= \; 2 + \frac{5}{4}x + \frac{55}{64}x^2$
3	$12^2 = 10^2 + 10^2 - 2 \times 10 \times 10 \times \cos\theta$ $\theta = 1.287$ *radians* *Perimeter* $= 10 \times 1.287 + 12$ $= 24.9$ *cm (3 s.f)*
4	$2cosec^2\theta - 2 + cosec\theta + 1 = 0$ $2cosec^2\theta + cosec\theta - 1 = 0$ $(2cosec\,\theta - 1)(cosec\theta + 1) = 0$ $cosec\,\theta = \frac{1}{2}$ *(no solutions)* $cosec\,\theta = -1 \qquad \theta = -\frac{\pi}{2}, \; \frac{3\pi}{2}$
5	$\frac{dy}{dx} = 4 - 10x^{-2}$ $y = 4x + 10x^{-1} + c$ *When* $x = 5 \quad y = 16$ $16 = 20 + 2 + c$ $c = -6 \qquad\qquad y = 4x + \frac{10}{x} - 6$