2. Binominial expansion

1	a) $\left(2-\frac{1}{x}\right)^8 = 2^8 - 8.2^7\left(\frac{1}{x}\right) + 28.2^6.\left(\frac{1}{x}\right)^2 - 56.2^5\left(\frac{1}{x}\right)^3 +$ $70.2^4\left(\frac{1}{x}\right)^4 + ...$ $256 - \frac{1024}{x} + \frac{1792}{x^2} - \frac{1792}{x^3} + \frac{1120}{x^4}$ b) $(1.75)^8 = 256 - \frac{1024}{4} + \frac{1792}{16} - \frac{1792}{64} + \frac{1120}{256}$ $= 256 - 256 + 112 - 28 + 4.375$ $= 88.375$	M_1 A_1 M_1 A_1	$2 - 1/x = 1.75$ $0.25 = 1/x \therefore x = 4$
		4	
2.	(2+x)5 25 + 5(2)4x) + 10(2)3x + 10(2)2x3 +… = 32 + 80x + 80x2 + 40x3 + …. (1.970)5 = (2 – 0.03)5 x = -0.03 (1.97)5 = 32 + 80(-0.03) + 80(-0.03)2 + 40(-0.03)3 = 32 – 2.4 + 0.072 – 0.00108 = 29.67092 = 29.67	 M1 A1 M1 A1	
		04	

1. *a) $1^5 + 5(-3x)^1 + 10(-3x)^2 + 10(-3x)^3 + 5(-3x)^4 + (3x)^5$*
   $1 - 15x + 90x^2 - 270x^3 + 405x^4 - 243x^5$
   $1 - 15x + 90x^2 - 270x^3 + 405x^4 - 243x^5$
   b) $3x = 1 - 0.997$
   $x = 0.001$
   $= 1 - 15(0.001) + 90(0.001)^2 - 270(0.001)^3 + 405(0.001)^4$

   $= 1 - 0.015 + 0.00009 - 0.00000027 + \ldots\ldots\ldots\ldots$
   $= 1 + 0.00009 - 0.015 - 0.00000027$
   $= 1.00009 - 0.01500027 = 0.98508973$
   $= -0.9851$ (4 d.p)

2. *(i) $5 + \frac{x}{2}^6 = 15625 + \frac{3125}{3}X + \frac{9375}{4}X^2 + \frac{625}{2}X^3 + \ldots\ldots$*
   (ii) $X = 1$
   $\left(\frac{11}{}\right)^6 = 15625 + \underline{3125} + \underline{9375} + \underline{625}$

$= 15625 + 1041.667 + 2343.75 + 312.5$

3.

$(\sqrt{3} + 2x)^6 = (\sqrt{3})^6 + \sqrt{6}(\sqrt{3})^5\ 2x + 15(3)^4 (2x)^2 + 20\sqrt{3})^3 (2x)^3$

$= 27 + 108x\sqrt{3} + 270x^2 + 480x^3\sqrt{3}$

$\sqrt{3} + 2x = 3\sqrt{3}$

$\sqrt{2x} + 2\ 3$

$x = \sqrt{3}$

$27 + 108\sqrt{3}\ \sqrt{3} + 270\sqrt{3^2} + 480\sqrt{3}(3)^3$

$= 27 + 324 + 810 + 4320 = 5481$

4.

	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

$P(\text{Sum odd}) = {}^{18}/_{36} = ½$

5. $\angle PQR = 180 - (35o + 75)$

$= 70^o$

$PR^2 = 12^2 + 8.4^2 - 2(12)(8.4)\ Cos\ 70^o$

$PR = 145.61 = 12.07$

6. (a) Terms; $2^5, 2^4({}^3/_x), 23({}^s/_x)^2, 2^2({}^3/_x)^3, 2^3({}^3/_x)^4$

Co eff 1, 5, 10, 10, 5

$(2 + {}^3/_x)^5 = 25 + 5(2)^4({}^3/_x) + (2)^3({}^3/_x)^2 + 10(22)\ {}^3/_x)^2 + 5(2)({}^3/_x)$

$= 32 + 2140x\text{-}1 + 720x\text{-}2 + 1080x^3 + 820x\ \text{-}4$

(b) $9.5 = 2 + {}^3/_x$

${}^3/_x = 7.5$

$x = {}^3/_{7.5} = 0.4$

$(9.5)^5 = 32 + \frac{240}{0.4} + \frac{720}{(0.4)^2} + \frac{1086}{(0.4)^3} + \frac{810}{(0.4)^4}$

$= 53647.625(3d.p)$

7. $X^5 - 5x^4(0.2) + 10x3(0.20 - 10x2(0.2)^3 + 5x(0.2)^4 - (0.2)^5$

$X^5 - 5x^4({}^2/10) + 10x^3\ {}^2/10^2 - 10x^2({}^2/10)^3 + 5x({}^2/10)^4 - ({}^2/10)^5 + x^5 - ({}^4/10)x^3 - ({}^8/100)x^2 + 5\ x\ 16 - 2^5/10^5$

$X^5 - x^4x^3 - {}_{8/}100x^2 + 80x - {}_2{}^5/10^5$

90, 392, 079

8. $Log(x + 24) = log(x(9\text{-}2x)$

$X + 24 = 81\text{-}18x$

$X = 3$

9. $1 + \frac{x}{12} = 1 + \frac{x}{2} + \frac{5x^2}{48} + \frac{5x^3}{432}$

$\left(1 + \frac{x}{\ }\right)^6 = 1\ ¼$

$$\frac{12}{x} = \frac{1}{4}$$

$$\frac{12}{x} = 3$$

$$\left(\frac{5}{4}\right)^6 = 1 + \frac{3}{2} + \frac{9}{48} + \frac{27}{432}$$

$$= 2.7500$$

10. (a) $(1 + \frac{1}{2})^8 = 1 + 8(\frac{1}{2}) + 28(\frac{1}{2}x)^2 + 56(\frac{1}{2}x)^3 + 70(\frac{1}{2}x)^4 + 567(\frac{1}{2}x)^5 + 2(\frac{1}{2}x)^6 + 8(\frac{1}{2}x)^7 + (\frac{1}{2}x)^8$

$= 1 + 4x + 7x^2 + 7x^3 + 4.375x^4 + 1.75x^5 + 0.4375x^6 + 0.0625x^7 + {}^1/_{256}x^8$

(b) $(1.05)8 = 1 + 4(0.1) + 7(0.1)2 + 7(0.1)3$

$= 1 + 0.4 + 0.07 + 0.0074\ldots$

$= 1.48$

11. $81 + 27x + 9x^2 + 3x^3 + x^y$

$81 + 108x + 54x^3 + x4$

$81 + 108\,(0.02) + 54\,(0.02)^3$

$= 83.182$