

Binomial Expansion Exam Questions MS (from Legacy OCR 4724)

Q1 (Jun 2015, Q4)

(i)	$8^{2/3} = 4$ $(1 - \frac{9x}{8})^{2/3}$ seen $1 + \left(\frac{2}{3}\right)\left(\frac{\pm 9x}{k}\right) + \frac{1}{2!}\left(\frac{2}{3}\right)\left(\frac{2}{3}-1\right)\left(\frac{\pm 9x}{k}\right)^2$ where k is an integer greater than 1 $4 - 3x - \frac{9}{16}x^2$ or $4(1 - \frac{3}{4}x - \frac{9}{64}x^2)$ cao	B1	$8^{2/3} + (\frac{2}{3})8^{-1/3}(\pm 9x) + \frac{2/3 \times (2/3 - 1)}{2!}8^{-2/3}(\pm 9x)^2$
		M1	
		M1	$4 + (\frac{2}{3})(\frac{1}{2})(\pm 9x) + \frac{2/3 \times (2/3 - 1)}{2!}(\frac{1}{16})(\pm 9x)^2$
		A1	
		[4]	
(ii)	$-\frac{8}{9} < x < \frac{8}{9}$ or $ x < \frac{8}{9}$ isw cao	B1	
		[1]	

Q2, (Jun 2016, Q7)

$nk = -6$ soi	B1	allow $nkx = -6x$ and /or
$\frac{n(n-1)k^2}{2!} = 30$ soi	B1	$\frac{n(n-1)k^2}{2!}x^2 = 30x^2$ for first two marks
substitution of $n = \pm \frac{6}{k}$ or $k = \pm \frac{6}{n}$ or $k = \pm \sqrt{\frac{60}{n(n-1)}}$ oe to eliminate one variable from their equations	M1	allow omission of brackets
$n = -1.5$ oe	A1	eg allow $-\frac{6}{4}$
$k = 4$	A1	
expansion is valid for $ x < \frac{1}{4}$ or $-\frac{1}{4} < x < \frac{1}{4}$ isw	B1FT	
	[6]	FT their k

Q5 (Jan 2013, Q2)

<p><u>The first 3 marks refer to the expansion...</u></p>	<p>.....</p>	<p>of $\left(1 - \frac{16x}{9}\right)^{\frac{3}{2}}$ <u>and to no other expansion</u></p>
<p>First 2 terms = $1 - \frac{8}{3}x$</p>	<p>B1</p>	<p>Allow any equiv fraction for the $-\frac{8}{3}$ and ISW</p>
<p>3rd term = $\frac{\frac{3}{2} \cdot \frac{1}{2} \left(-\frac{16x}{9}\right)^2}{1.2}$</p>	<p>M1</p>	<p>Allow clear evidence of intention, e.g. $\frac{\frac{3}{2} \cdot \frac{1}{2} \cdot -16x^2}{1.2 \cdot 9}$</p>
<p>= $\frac{32}{27}x^2$</p>	<p>A1</p>	<p>Allow any equiv fraction for the $\frac{32}{27}$ and ISW</p>
<p>Complete expansion $\approx 27 - 72x + 32x^2$</p>	<p>A1</p>	<p>cao No equivalents. Ignore any further terms</p>
<p>valid for $\frac{-9}{16} < x < \frac{9}{16}$ or $x < \frac{9}{16}$</p>	<p>B1</p>	<p>oe Beware, e.g. $x < \left \frac{9}{16}\right$</p>
		<p>[5]</p>

Q6 (Jun 2012, Q3)

<p>(i)</p>	<p>The first 5 marks are awarded for expansions of either $(1+4x)^{\frac{1}{2}}$ or $(1+4x)^{\frac{1}{2}}$ Expansion of $(1+4x)^{\frac{1}{2}}$; First 2 terms = $1 - 2x$ 3rd term = $\frac{-\frac{1}{2} \cdot (-\frac{1}{2} - 1)}{2} \cdot 16x^2$ [Accept $4x^2$ for $16x^2$] = $+ 6x^2$ 4th term = $\frac{-\frac{1}{2} \cdot (-\frac{1}{2} - 1) \cdot (-\frac{1}{2} - 2)}{2 \cdot 3} \cdot 64x^3$ [Accept $4x^3$ for $64x^3$] = $-20x^3$ $1 - 2x + 7x^2 - 22x^3$; $1 + ax + (b+1)x^2 + (a+c)x^3$</p>	<p>B1 <u>Or</u> $(1+4x)^{\frac{1}{2}} = 1 + 2x \dots$ M1 3rd term = $\frac{\frac{1}{2} \cdot -\frac{1}{2}}{2} \cdot 16x^2$ [ditto] A1 = $-2x^2$ M1 4th tm = $\frac{\frac{1}{2} \cdot -\frac{1}{2} \cdot -\frac{3}{2}}{2 \cdot 3} \cdot 64x^3$ [ditto] A1 = $+ 4x^3$ A1 ft ft only $(1+4x)^{\frac{1}{2}} = 1 + ax + bx^2 + cx^3$ provided a, b and c attempted and at least one @ M1 obtained</p>
		<p>[6]</p>
<p>(ii)</p>	<p>$x < \frac{1}{4}$; $-\frac{1}{4} < x < \frac{1}{4}$; $\{-\frac{1}{4} < x, x < \frac{1}{4}\}$ no equality</p>	<p>B1 But not $\{-\frac{1}{4} < x$ OR $x < \frac{1}{4}\}$ If choice mark what appears to be the final answer.</p>
		<p>[1]</p>

Q7, (Jan 2012, Q4)

<p>(i)</p>	<p>First two terms in expansion = $1 - x$ Third term shown as $\frac{\frac{1}{4} \cdot \frac{-3}{4}}{2} (-4x)^2$ $= -\frac{3}{2}x^2$ Fourth term shown as $\frac{\frac{1}{4} \cdot \frac{-3}{4} \cdot \frac{-7}{4}}{2 \cdot 3} (-4x)^3$ $= -\frac{7}{2}x^3$</p>	<p>B1 M1 A1 M1 A1</p>	<p>(simplify to this, now or later) $-\frac{3}{4}$ can be $\frac{1}{4} - 1$; $(-4x)^2$ can be $-4x^2$ or $-16x^2$ Similar allowances as for first M1 [Complete expansion is $1 - x - \frac{3}{2}x^2 - \frac{7}{2}x^3 \dots$]</p>
<p>(ii)</p>	<p>$(1 + bx^2)^7$ shown (implied) as $1 + 7bx^2 + \dots$ Clear indic that terms involving x and x^2 must cancel $a = -1$ $b = -\frac{3}{14}$</p>	<p>[5] B1 M1 A1 FT A1 FT</p>	<p>If (i) = $1 + \lambda x + \mu x^2$, $a = \lambda$ If (i) = $1 + \lambda x + \mu x^2$, $b = \frac{1}{7}\mu$ FT from wrong (i) only, not wrong $(1 + bx^2)^7$</p>
		<p>[4]</p>	