## **SL - Binomial Expansion Answers**

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Required term is  $\begin{pmatrix} 8 \\ 5 \\ \hline 1 \end{pmatrix} (3x)^5 (-2)^3$ 1. (A1)(A1)(A1) Therefore the coefficient of  $x^5$  is  $56 \times 243 \times -8$ = -108864(A1)

2. 
$$(5a+b)^7 = \dots + \begin{pmatrix} 7 \\ 4 \end{pmatrix} (5a)^3 (b)^4 + \dots$$
 (M1)

$$= \frac{7 \times 6 \times 5 \times 4}{1 \times 2 \times 3 \times 4} \times 5^3 \times (a^3 b^4) = 35 \times 5^3 \times a^3 b^4$$
So the coefficient is 4375
(A1)

So the coefficient is 4375

= 792

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 $(a+b)^{12}$ 3. 

$$\left( \begin{array}{c} \mathbf{s} \end{array} \right) \left( \begin{array}{c} \mathbf{r} \end{array} \right)$$

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(M1)(A1)

(A2) (C4)

4. The constant term will be the term independent of the variable *x*. (R1)  $(2)^9$   $(-2)^3$   $(-2)^3$ 

$$\left(x - \frac{z}{x^2}\right) = x^9 + 9x^8 \left(\frac{-z}{x^2}\right) + \dots + \left(\frac{y}{3}\right) x^6 \left(\frac{-z}{x^2}\right) + \dots + \left(\frac{-z}{x^2}\right)$$
(M1)

$$\begin{pmatrix} 9 \\ 3 \\ \hline 1 \\ 3 \\ \hline 1 \\ \hline x^6 \\ \hline x^2 \\ \hline x^2 \\ \hline y \\ = 84x^6 \\ \hline \frac{-8}{x^6} \\ \hline y \\ (A1)$$

$$=-672$$
 (A1)

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5. 
$$(3x+2y)^4 = (3x)^4 + \begin{pmatrix} 4 \\ 1 \\ 1 \\ 1 \end{pmatrix} (3x)^2 (2y) + \begin{pmatrix} 4 \\ 2 \\ 1 \\ 2 \end{pmatrix} (3x)^2 (2y)^2 + \begin{pmatrix} 4 \\ 3 \\ 3 \\ 1 \end{pmatrix} (3x)(2y)^3 + (2y)^4$$
 (A1)  
=  $81x^4 + 216x^3y + 216x^2y^2 + 96xy^3 + 16y^4$  (A1)(A1)(A1) (C4)

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6. (a) 
$$(1+1)^4 = 2^4 = 1 + \begin{pmatrix} 4 \\ 1 \\ 1 \end{pmatrix} + \begin{pmatrix} 4 \\ 2 \\ 2 \end{pmatrix} (1^2) + \begin{pmatrix} 4 \\ 3 \\ 3 \\ 1 \end{pmatrix} + 1^4$$
 (M1)  

$$\Rightarrow \begin{pmatrix} 4 \\ 1 \\ 1 \\ 1 \end{pmatrix} + \begin{pmatrix} 4 \\ 2 \\ 1 \\ 2 \\ 1 \end{pmatrix} + \begin{pmatrix} 4 \\ 3 \\ 1 \\ 2 \\ 1 \end{pmatrix} = 16 - 2$$

$$= 14$$
 (A1) (C2)

(b) 
$$(1+1)^9 = 1 + \begin{pmatrix} 9 \\ 1 \\ 1 \\ 1 \end{pmatrix} + \begin{pmatrix} 9 \\ 2 \\ 1 \\ 2 \\ 1 \end{pmatrix} + \begin{pmatrix} 9 \\ 3 \\ 1 \\ 3 \\ 1 \end{pmatrix} + \dots + \begin{pmatrix} 9 \\ 8 \\ 1 \\ 1 \\ 1 \end{pmatrix} + 1$$
 (M1)  

$$\Rightarrow \begin{pmatrix} 9 \\ 1 \\ 1 \\ 1 \\ 1 \end{pmatrix} + \begin{pmatrix} 9 \\ 2 \\ 1 \\ 1 \\ 1 \end{pmatrix} + \dots + \begin{pmatrix} 9 \\ 1 \\ 3 \\ 1 \\ 1 \end{pmatrix} = 2^9 - 2$$

$$= 510$$
 (A1) (C2)

7. (a) 10 (A2) (C2)  
(b) 
$$(3x^2)^3 \left(-\frac{1}{x}\right)^6$$
 [for correct exponents] (M1)(A1)  
 $\begin{pmatrix} 9\\ 6\\ 1\\ 5 \end{pmatrix}^3 x^6 \frac{1}{x^6} \left( \text{or } 84 \times 3^3 x^6 \frac{1}{x^6} \right)$  (A1)  
constant =2268 (A1) (C4)

8. Term involving 
$$x^3$$
 is  $\begin{pmatrix} 5 \\ 3 \\ \hline{3} \\ \hline{1} \end{pmatrix} (2)^2 (-x)^3$  (A1)(A1)(A1)  
 $\begin{pmatrix} 5 \\ 3 \\ \hline{3} \\ \hline{1} \end{pmatrix} = 10$  (A1)  
Therefore, term =  $-40x^3$  (A1)  
 $\Rightarrow$  The coefficient is  $-40$  (A1) (C6)

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$$x^{6} \frac{1}{x^{6}} \left( \text{ or } 84 \times 3^{3} x^{6} \frac{1}{x^{6}} \right)$$

9. Selecting one term (may be implied) (M1)  

$$\left(\frac{7}{2}\right)5^{2}(2x^{2})^{5}$$
(A1)(A1)(A1)  
= 16 800 x<sup>10</sup>
(A1)(A1) (C6)  
Note: Award C5 for 16 800

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**10.** ... 
$$+ 6 \times 2^{2}(ax)^{2} + 4 \times 2(ax)^{3} + (ax)^{4}$$
 (M1)(M1)(M1)  
 $= ... + 24a^{2}x^{2} + 8a^{3}x^{3} + a^{4}x^{4}$  (A1)(A1)(A1) (C6)  
**Notes:** Award C3 if brackets omitted, leading to  $24a^{2}x^{2} + 8$   
 $a^{3}x^{3} + a^{4}x^{4}$ . Award C4 if correct expression with brackets as in  
first line of markscheme is given as final answer.

**11.** (a) 6 terms (A1) (C1)

(b)  $\binom{5}{3} = 10, (-2)^3 = -8, (x^2)^2$  (A1)(A1)(A1)

fourth term is  $-80x^4$ (A1)for extracting the coefficient A = -80(A1) (C5)

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12. 
$$\binom{8}{3}(2)^5 (-3x)^3 \qquad \left(\operatorname{Accept}\binom{8}{5}\right)$$
 (M1)(A1)(A1)(A1)  
Term is  $-48\,384x^3$  (A2) (C6)

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**13.** Area of large sector 
$$\frac{1}{2}r^2\theta = \frac{1}{2}16^2 \times 1.5$$
 (M1)  
= 192 (A1)

Area of small sector 
$$\frac{1}{2}r^2\theta = \frac{1}{2} \times 10^2 \times 1.5$$
 (M1)  
= 75 (A1)

Shaded area = large area - small area = 
$$192 - 75$$
 (M1)  
=  $117$  (A1) (C6)

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