

## Year 4 Math Assignment 1: Binomial Theorem

Q1 Draw the Pascal's triangle for the first 6 rows and use it to write down the expansions of

(a)  $(x+y)^3$                       (b)  $(a-2b)^4$                       (c)  $(4-3x)^5$

Q2 Find the coefficient of  $x^2$  in the following expansions.

(a)  $(2-x)^5$                       (b)  $(3+2x)^4$                       (c)  $(2-2x)^3$

Q3 The coefficient of  $x^2$  in the expansion of  $(x+2y)^3$  is 24. Find the value of  $y$ .

Q4 Expand completely

(a)  $(3x-2y)^4$                       (b)  $(2+x)(1-x)^4$

Q5 Given that  $x$  is small such that terms of  $x^3$  and higher can be ignored, expand  $(2x+3)(7-2x)^5$ .

sol<sup>ns</sup>

Q1a)  $(x+y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$  #

b)  $(a-2b)^4 = a^4 - 4a^3(2b) + 6a^2(2b)^2 - 4a(2b)^3 + (2b)^4$   
 $= a^4 - 8a^3b + 24a^2b^2 - 32ab^3 + 16b^4$  #

c)  $(4-3x)^5 = 4^5 - 5(4)^4(3x) + 10(4)^3(3x)^2 - 10(4)^2(3x)^3 + 5(4)(3x)^4 - (3x)^5$   
 $= 1024 - 3840x + 5760x^2 - 4320x^3 + 1620x^4 - 243x^5$  #

Q2a)  $T_3 = \binom{5}{2} 2^3 (-x)^2$

∴ coefficient of  $x^2$  is 80 #

b)  $T_3 = \binom{4}{2} 3^2 (2x)^2$

coefficient of  $x^2$  is 216 #

c)  $T_3 = \binom{3}{2} (2)^1 (-2x)^2$

∴ coefficient of  $x^2$  is 24 #

Q5)  $(7-2x)^5 = 7^5 - 5(7)^4(2x) + 10(7)^3(2x)^2 + \dots$

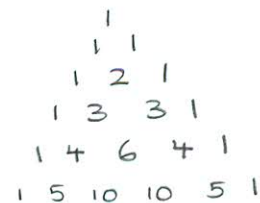
∴  $(2x+3)(7-2x)^5$

$= (2x+3)(16807 - 24010x + 13720x^2 + \dots)$

$= 33614x - 48020x^2 + 50421 - 72030x$

$+ 41160x^2 + \dots$

$= 50421 - 38416x - 6860x^2 + \dots$  #



Q3)  $T_2 = \binom{3}{1} x^2 (2y)$

$6y = 24$

$y = 4$  #

Q4a)  $(3x-2y)^4 = (3x)^4 - 4(3x)^3(2y) + 6(3x)^2(2y)^2 - 4(3x)(2y)^3 + (2y)^4$

$= 81x^4 - 216x^3y + 216x^2y^2 - 96xy^3 + 16y^4$

Q4b)  $(1-x)^4 = 1 - 4x + 6x^2 - 4x^3 + x^4$

∴  $(2+x)(1-x)^4 = (2+x)(1 - 4x + 6x^2 - 4x^3 + x^4)$

$= 2 - 8x + 12x^2 - 8x^3 + 2x^4 + x - 4x^2 + 6x^3 - 4x^4 + x^5$

$= 2 - 7x + 8x^2 - 2x^3 - 2x^4 + x^5$  #