

BINOMIAL EXPANSIONS 2011-13

①

5) a) $\binom{40}{4} = \frac{40!}{4!b!}$ $b = 36$

b) Coefficient of x^4 in $(1+x)^{40}$ is $\binom{40}{4} = p$

Coefficient of x^5 in $(1+x)^{40}$ is $\binom{40}{5} = q$

$$\frac{q}{p} = \frac{\binom{40}{5}}{\binom{40}{4}} = \frac{658008}{91390} = \frac{36}{5}$$

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2) a) Find first 3 terms of $(3+bx)^5$

$$= 3^5 + \binom{5}{1} 3^4 (bx) + \binom{5}{2} 3^3 (bx)^2$$

$$= 243 + 405bx + 270b^2x^2$$

b)

$$270b^2 = 2 \times 405b$$

$$270b^2 = 810b$$

$$270b = 810$$

$$b = \frac{810}{270}$$

$$b = 3$$

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3) a) Find first 4 terms of $\left(1 + \frac{x}{4}\right)^8$

$$= 1 + 8\left(\frac{x}{4}\right) + \binom{8}{2}\left(\frac{x}{4}\right)^2 + \binom{8}{3}\left(\frac{x}{4}\right)^3$$

$$= 1 + 2x + \frac{28x^2}{16} + \frac{56x^3}{64}$$

$$= 1 + 2x + \frac{7}{4}x^2 + \frac{7}{8}x^3$$

b) $\left(1 + \frac{0.1}{4}\right)^8 \approx 1 + 2(0.1) + \frac{7}{4}(0.01) + \frac{7}{8}(0.001)$

$$\approx 1.218375$$

$$= 1.2184 \quad \text{to 4 d.p.}$$

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④

1) Find first 3 terms of $(2-3x)^5$

$$= 2^5 + \binom{5}{1} 2^4 (-3x) + \binom{5}{2} 2^3 (-3x)^2$$

$$= 32 - 240x + 240x^2$$

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1) Find first 3 terms of $(2-5x)^6$

$$= 2^6 + \binom{6}{1} 2^5 (-5x) + \binom{6}{2} 2^4 (-5x)^2$$

$$= 64 - 960x + 6000x^2$$

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3)

Find first 4 terms of $\left(2 - \frac{1}{2}x\right)^8$

$$= 2^8 + \binom{8}{1} 2^7 \left(-\frac{x}{2}\right) + \binom{8}{2} 2^6 \left(-\frac{x}{2}\right)^2 + \binom{8}{3} 2^5 \left(-\frac{x}{2}\right)^3$$

$$= 256 - 512x + 448x^2 - 224x^3$$
