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A LEVEL MATHS

(44) Binomial Expansion (Estimations and Approximations)

WORKING AT D/E

(1) (a) Find the terms up to an and including the term in x^2 in the expansion of $(1+x)^7$

(b) By choosing a suitable value of x, use your answer to part (a) show that a quadratic approximation to 1.01^7 is 1.0721

(2) (a) Find the first 4 terms in the expansion of $(1-2x)^{12}$ is ascending powers of x.

(b) Use your answer to part (a) to find an approximation to the expansion of 0.96^{12}

WORKING AT B/C

(1) (a) Find the first 3 terms in the expansion of $(2-\frac{x}{4})^8$ in ascending powers of x, simplifying each term.
(b) Using your answer to part (a), find a quadratic approximation for 1.99^8

(c) Show that the percentage error for the approximation is less than 1%.

(2) (a) Find the first 3 terms in the expansion of $\left(5-\frac{x}{3}\right)^9$ in ascending powers of x. Simplify each coefficient fully.
(b) If x is small and terms in x^2 and higher can be ignored, show that
$\left(\frac{1}{5}+x\right)\left(5-\frac{x}{3}\right)^9 \approx 390625 + 1718750x$

WORKING AT A*/A

(1) If x is small and terms in x^2 and higher can be ignored, show that $(a+x)^n(a-x)^n \approx a^{2n}$ when a and n are positive integers.

(2) Use the binomial expansion of $(5-4x)^8$ to find a cubic approximation for 4.92^8 giving your answer to 1 decimal place.