A#3b BINOMIAL APPROXIMATIONS

AEM questions are taken from past exam papers - they have been carefully chosen to represent a typical exam question at each level of difficulty. If you can do these questions, you’re ready to move onto past papers for this topic.

APPRENTICE

a. Use \( x = \frac{1}{15} \) in the first three terms of the expansion \( (1 + 6x)^{-1} \approx 1 - 6x + 36x^2 + \ldots \) to find an approximate value for \( \frac{5}{7} \).

b. Find the percentage error in this approximation.

EXPERT

If \( x = 1.6 \) is used in the first three terms of the expansion \( (1 + x)^{10} \approx 1 + 10x + 45x^2 + \ldots \), this will not produce a good approximation of \( 2.6^{10} \).

Explain why and suggest an alternative way to use this expansion to find an approximation for \( 2.6^{10} \).

MASTER

Choosing a suitable value for \( x \), use the first two terms of the expansion of \( \sqrt{3 - 4x} \) to find an approximation for \( \sqrt{10} \) in the form \( k\sqrt{3} \) where \( k \in \mathbb{Q} \).