Name	Date started	Target end date

GCE A LEVEL — PURE MATHEMATICS B QUESTION PACK

0976-01 (Legacy C4) · New spec Unit 3 Topic 14 · A2 unit, 35% of A-level, 120 marks, 2h 30min paper

REVISE
.wales

MATHEMATICS — PURE B · BINOMIAL EXPANSION - RATIONAL & NEGATIVE

Binomial Expansion (Rational & Negative powers)

Every binomial expansion (rational / negative powers) question from the legacy WJEC C4 papers (June 2011 – June 2017) for new-spec A2 Unit 3 sequences & series

LEGACY 2008 SPECIFICATION

Estimated time for entire question pack: ~0 hours 50 minutes

*Derived from the legacy C3/C4 paper's pace of **~1.25 min/mark** (40 marks over 7 questions).*

*You are advised to **not** attempt to complete all of this in one sitting.*

ABOUT THIS QUESTION PACK

This is a **comprehensive practice question pack**, not a single mock paper. It contains questions from the legacy WJEC C3 and C4 papers (2008 modular spec) that maps onto new-spec A2 Unit 3 Topic 14 (2.3.4).

Questions are ordered chronologically.

INSTRUCTIONS

Use black ink or black ball-point pen. Show all working — method marks are awarded for clear setup.

A calculator is allowed (except where specified by individual questions). The WJEC Formula Booklet may be referred to.

For Examiner's use only

Q	Source	Max	Mark
1	Jun 11 Q6	7	
2	Jun 12 Q5	5	
3	Jun 13 Q5	5	
4	Jun 14 Q5	7	

Q	Source	Max	Mark
5	Jun 15 Q5	5	
6	Jun 16 Q2	5	
7	Jun 17 Q5	6	
Total		**40**	

Binomial Expansion (Rational & Negative powers) — what the new spec asks

WJEC GCE A Level Mathematics (from 2017) · Unit 3: Pure Mathematics B · Topic 2.3.4.

Binomial expansion (general) 2.3.4

- For rational n: $(1+x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \frac{n(n-1)(n-2)}{3!}x^3 + \ldots$.
- Valid for $|x| < 1$.
- For $(a+bx)^n$, factor out a^n first.

Approximations 2.3.4

- Substitute a small x into the expansion to approximate a surd.
- State range of validity clearly: e.g. $|2x| < 1$ means $|x| < \frac{1}{2}$.
- Check the question for required accuracy.

Crib sheet »

Binomial Expansion - Rational & Negative in one page

Quick-reference notes — revisit before each section. Don't use during questions.

Binomial series

$(1+x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \frac{n(n-1)(n-2)}{3!}x^3 + \dots$

Valid for $|x| < 1$ when n is not a non-negative integer.

General $(a+bx)^n$

Factor out a^n: $(a+bx)^n = a^n(1+bx/a)^n$.

Apply binomial to $(1+bx/a)^n$.

Valid for $|bx/a| < 1$, i.e. $|x| < |a/b|$.

Approximations

Substitute a small x to estimate surds.

$\sqrt{1+x} \approx 1 + \frac{1}{2}x - \frac{1}{8}x^2$ for small x.

Range of validity

Always state: e.g. "$|2x| < 1 \Rightarrow |x| < \frac{1}{2}$".

Tricky derivatives

For $(1+ax^k)^n$, treat ax^k as the "x" in the formula.

Cross-check

Differentiate or expand to verify a few coefficients.

SECTION T14

Binomial Expansion (Rational & Negative powers)

Questions 1–7 · 40 marks

6. Expand $4(1+2x)^{\frac{1}{2}} - \dfrac{1}{(1+3x)^2}$ in ascending powers of x up to and including the term in x^2.

State the range of values of x for which your expansion is valid. [7]

5. Expand $\left(1+\frac{x}{3}\right)^{-\frac{1}{2}}$ in ascending powers of x up to and including the term in x^2.

State the range of values of x for which your expansion is valid.

Hence, by writing $x = \frac{1}{5}$ in your expansion, find an approximate value for $\sqrt{15}$ in the form $\frac{a}{b}$, where a and b are integers whose values are to be found. [5]

5. *(a)* (i) Expand $(1 + 6x)^{\frac{1}{3}}$ in ascending powers of x up to and including the term in x^2.

(ii) State the range of values of x for which your expansion is valid. [3]

(b) Use your expansion in part *(a)* to find an approximate value for one root of the equation

$$2(1 + 6x)^{\frac{1}{3}} = 2x^2 - 15x.$$ [2]

5. Expand

$$6\sqrt{1-2x}-\frac{1}{1+4x}$$

in ascending powers of x up to and including the term in x^2.
State the range of values of x for which your expansion is valid. [7]

5. Expand $\left(1+\frac{x}{8}\right)^{-\frac{1}{2}}$ in ascending powers of x up to and including the term in x^2.

State the range of values of x for which your expansion is valid.
Hence, by writing $x = 1$ in your expansion, find an approximate value for $\sqrt{2}$ in the form $\frac{a}{b}$, where a and b are integers whose values are to be found. [5]

2. *(a)* (i) Expand $\frac{1}{\sqrt{1+2x}}$ in ascending powers of x up to and including the term in x^2.

(ii) State the range of values of x for which your expansion is valid. [3]

(b) Use your expansion in part *(a)* to find an approximate value for one root of the equation

$$\frac{6}{\sqrt{1+2x}} = 4+15x-x^2. \quad [2]$$

5. *(a)* Expand $(1+4x)^{-\frac{1}{2}}$ in ascending powers of x up to and including the term in x^2. State the range of values of x for which your expansion is valid. [3]

(b) Use your answer to part *(a)* to expand $(1+4y+8y^2)^{-\frac{1}{2}}$ in ascending powers of y up to and including the term in y^2. [3]

END OF BINOMIAL EXPANSION - RATIONAL & NEGATIVE PACK

Source: WJEC C3 + C4 (2008 modular spec) · 2011–2017
Curated for WJEC Maths 2017 spec A2 Unit 3 — Topic 14 (2.3.4)