

Combinatorics: worked examples

HSC Mathematics Extension 1

These examples show assessable skills, not an official HSC topic weighting or prediction. The 2024 NSW syllabuses have their first HSC examination in 2027; students sitting the 2026 HSC continue under the applicable 2017 syllabus.

Worked example 1 | 2 marks

Catalog reference: ext1_jr25_binomial_fifth_power_expansion | seed 41001 | mapping ext1-a1-2

A fifth-power binomial

Expand and simplify $(4-x)^5$.

(a) Give the fully simplified polynomial. [2 marks]

Answer: $((1024 - (1280x) + (640x^2) - (160x^3) + (20x^4) - x^5)$

Binomial Coefficients: Use coefficients 1,5,10,10,5,1 with alternating signs.

Collect Polynomial: $((1024 - (1280x) + (640x^2) - (160x^3) + (20x^4) - x^5)$

Worked example 2 | 2 marks

Catalog reference: ext1_jr25_composite_binomial_y3_coefficient | seed 41001 | mapping ext1-a1-2

A coefficient after substitution

Find the coefficient of y^3 in $(2-2y+y^2)^5$.

(a) Find the coefficient. [2 marks]

Answer: -640

Coefficient From Square: $-20^2 \cdot 32$.

Coefficient From Cube: $-102 \cdot 2^2 \cdot 3$; add the two contributions.

Worked example 3 | 1 marks

Catalog reference: ext1_pem_2025_q11c_i_repeated_letter_arrangements | seed 41001 | mapping ext1-a1-1

Repeated-letter arrangements

A word contains 7 identical A's, two identical B's, two identical R's, one C and one D. How many distinct linear arrangements are possible?

(a) Find the number of arrangements of all 13 letters. [1 mark]

Answer: 308880

Multiset Permutation: $(13!)/(7!2!2!)$.

Source and methodology

Examples are deterministic curriq catalog generations from existing QDSL archetypes at the published fixed seed. The generator copies only student-facing prompts, mark allocations, topic mappings, display tables or options, checked answers and marking-path results into this resource.

Official syllabus source:

<https://curriculum.nsw.edu.au/learning-areas/mathematics/mathematics-extension-1-11-12-2024/overview/course>

Teacher verification note: check the mathematics, notation, permitted technology and syllabus fit for your cohort before classroom or assessment use.