

Complex Numbers: worked examples

HSC Mathematics Extension 2

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: ext2_pem_2025_q15a_roots_of_unity_perimeter | seed 41001 | mapping ext2-complex-1

Perimeter from roots of unity

Find the perimeter of the regular 5-gon formed by the solutions of $z^5=1$.

(a) Give an exact expression. [2 marks]

Answer: $10 \sin(\pi/5)$

Unit Circle Chord: Adjacent roots are separated by chord length $2\sin(\pi/5)$.

Regular Polygon: $5 \times 2\sin(\pi/5)$.

Worked example 2 | 3 marks

Catalog reference: ext2_pem_2025_q14a_cube_root_simplification | seed 41001 | mapping ext2-complex-1

Cube root of unity

Let ω be a non-real solution of $z^3=1$. Simplify $2((1+\omega)^2+(1+\omega^2)^2)+0$.

(a) Simplify the expression. [3 marks]

Answer: -2

Roots Of Unity: $1+\omega+\omega^2=0$.

Power Reduction: $\omega^4=\omega$.

Collect Terms: $0-2$.

Worked example 3 | 2 marks

Catalog reference: ext2_nor25_argument_of_complex_factor | seed 41001 | mapping ext2-complex-1

Argument of a complex factor

Given $w=6-(2\sqrt{3})3i$ and $\text{Arg}(z w)=\pi/3$, find the exact principal value of $\text{Arg}(z)$.

(a) Give the exact argument. [2 marks]

Answer: $(2\pi)/3$

Principal Argument: $0 - (\pi/3)$

Argument Product Rule: $(2\pi)/3$

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-2-11-12-2024/overview/course>

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