DE MOIVRE'S THEOREM

A tenth power in a few lines

Multiplying $1 + i$ by itself ten times is tedious and error-prone. In trigonometric form the power is one multiplication of the angle.

01

ALGEBRAIC FORM — BEFORE

$$(1 + i)^{10}$$

↓ Convert to trigonometric form — modulus √2, argument 45° (first quadrant)

02

TRIGONOMETRIC FORM

$$\left(\sqrt{2}\,\mathrm{cis}\,45^\circ\right)^{10}$$

↓ Apply De Moivre's theorem — modulus to the 10th power, angle times 10: $(\sqrt{2})^{10} = 32$, $10 \times 45° = 450°$

03

POWER IN TRIGONOMETRIC FORM

$$32\,\mathrm{cis}\,450^\circ$$

↓ Reduce the angle and convert back — 450° = 360° + 90°, and cis 90° = i

04

ALGEBRAIC FORM — AFTER

$$32i$$