



QUESTION WORKBOOK

Roots of unity and complex roots

Complex numbers · Year FM

7 questions · 31 marks

PRINT EDITION

SECTION A · Warm-up

- A1** State how many solutions $z^5 = 32$ has over the complex numbers, and give the modulus of each. [2]

- A2** List the arguments of the sixth roots of unity, describe the shape they make on an Argand diagram, and state their sum. [3]

SECTION B · Standard

- B1** Solve $z^3 = -27$, giving all roots exactly. [5]

- B2** Solve $z^4 = -16$, giving all roots in the form $a + bi$ with exact values, and describe their arrangement. [5]

- B3** By considering the factorisation of $z^5 - 1$, show that the five fifth roots of unity sum to zero. [3]

- B4** Solve $z^3 = 64i$, giving all roots exactly. [5]

SECTION C · Stretch

- c1** $w = \cos(2\pi/5) + i \sin(2\pi/5)$. Show that $1 + w + w^2 + w^3 + w^4 = 0$, and hence show that $\cos(2\pi/5) + \cos(4\pi/5) = -1/2$. [8]