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QUESTION WORKBOOK

# Roots of polynomials

Further algebra and series · Year FM

6 questions · 20 marks

NAVY SCREEN EDITION

**SECTION A** · Warm-up

**A1** The equation  $2z^3 + 6z^2 - 4z + 10 = 0$  has roots  $\alpha, \beta, \gamma$ . Write down  $\alpha + \beta + \gamma$  and  $\alpha\beta\gamma$ . [2]

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**A2** The quadratic  $z^2 - 6z + 4 = 0$  has roots  $\alpha$  and  $\beta$ . Without solving, find  $\alpha + \beta$ ,  $\alpha\beta$  and  $1/\alpha + 1/\beta$ . [3]

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**SECTION B** · Standard

**B1** For the same quadratic  $z^2 - 6z + 4 = 0$ , find  $\alpha^2 + \beta^2$ , and hence write down a quadratic equation with roots  $\alpha^2$  and  $\beta^2$ . [4]

- B2** Verify that  $z = 2$  is a root of  $z^3 - 4z^2 + z + 6 = 0$ , find the other two roots, and check the sum and product against the coefficients. [4]

- B3** The equation  $z^2 - 6z + 4 = 0$  has roots  $\alpha, \beta$ . Find a quadratic equation with integer coefficients whose roots are  $\alpha + 1$  and  $\beta + 1$ . [4]

## SECTION C · Stretch

- C1** A cubic with real coefficients has roots that sum to 0 and multiply to  $-8$ , and the sum of its pairwise products is  $-2$ . Write down the cubic, taking the leading coefficient as 1. [3]