Further Maths A-Level

# Topic: Imaginary and Complex Numbers

Chapter Reference: Core Pure 1, Chapter 1

**8 minutes**

1. Write $\sqrt{-49}$ in terms of $i$. **(1)**

2. Express each of the following in terms $a + bi$,

a) $(3 + 5i) + (2 + 3i)$, **(1)**

b) $\frac{10-8i}{2}$. **(1)**

3. Solve the equation $z^2 + 16 = 0$. **(2)**

4. The solutions to the quadratic equation,

$$z^2 - 10z + 28 = 0,$$

are $z_1$ and $z_2$.

Find $z_1$ and $z_2$, giving your answers in the form $p \pm i\sqrt{q}$, where $p$ and $q$ are integers. **(3)**

| Topic: Multiplying Complex Numbers<br>Chapter Reference: Core Pure 1, Chapter 1 | 9 minutes |
|---|---|

1. Simplify $(2 + i\sqrt{5})(\sqrt{5} - i)$ in terms $a + bi$, **(2)**

2. If $z = 5 - 3i$, $w = 2 + 2i$, express the following in the form of $a$ + bi, where $a$ and $b$ are real constants,

a. $z^2$, **(2)**

b. $\frac{z}{w}$ **(3)**

3. Given that $z_1 = 3 + 2i$ and $z_2 = \frac{12-5i}{z1}$,

find $z_2$ in the form $a + bi$, where $a$ and $b$ are real. **(2)**

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| Topic: Complex Conjugation<br>Chapter Reference: Core Pure 1, Chapter 1 | 9 minutes |
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1. The complex number $3 - 4i$ is denoted by $z$.

   Giving your answers in the form $x + iy$, find $2z + 5z^*$. **(2)**

2. Solve the following equations, giving each root in the form $a + bi$:

a. $x^2 + 25 = 0$ **(2)**

b. $x^2 - 2x + 17 = 0$ **(2)**

3. If $z = 2 + 3i$ and $w = 4 - i$, express $z^*w$ in the form $x + iy$, clearly showing how you obtained your answer. **(3)**

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Jethwa Maths

| Topic: Roots of Equations with Complex Numbers<br>Chapter Reference: Core Pure 1, Chapter 1 | 8 minutes |
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1. One root of the quadratic equation $x^2 + ax + b = 0$, where $a$ and $b$ are real, is $16 - 30i$.

a) Write down the other root of the quadratic equation. **(1)**

b) Find the values of $a$ and $b$. **(4)**

2. Given that $1 + 3i$ is a root of the equation $z^3 + 6z + 20 = 0$, find the other two roots of the equation. **(3)**



Jethwa Maths

Further Maths A-Level

# Topic: Roots of Equations with Complex Numbers

Chapter Reference: Core Pure 1, Chapter 1

9 minutes

1. $x^3 - 27 = 0$

Show that two of the roots of the above equation satisfy the quadratic equation $x^2 + 3x + 9 = 0$, by using factorisation.

**(2)**

2. $f(z) = z^4 - 12z^3 + 31z^2 + 108z - 360$

Write $f(z)$ in the form $(z^2 - 9)(z^2 + bz + c)$, where $b$ and $c$ are real constants to be found **(2)**

3. $f(x) = (x^2 + 4)(x^2 + 8x + 25)$

Find the four roots of $f(x) = 0$. **(5)**