

A2.N.9: Multiplication and Division of Complex Numbers 3: Perform arithmetic operations on complex numbers and write the answer in the form $a+bi$

- 1 Express in $a + bi$ form: $2i(i + 3)$
- 2 Express $3i(1 - i)$ in $a + bi$ form.
- 3 Express the product $(3 + 2i)(1 - 3i)$ in $a + bi$ form.
- 4 Express the product $(2 + i)(4 - 3i)$ in the form $a + bi$.
- 5 If x is a real number, express $2xi(i - 4i^2)$ in simplest $a + bi$ form.
- 6 Multiply $x + yi$ by its conjugate, and express the product in simplest form.
- 7 Show that the product of $a + bi$ and its conjugate is a real number.
- 8 In an electrical circuit, the voltage, E , in volts, the current, I , in amps, and the opposition to the flow of current, called impedance, Z , in ohms, are related by the equation $E = IZ$. A circuit has a current of $(3 + i)$ amps and an impedance of $(-2 + i)$ ohms. Determine the voltage in $a + bi$ form.
- 9 Express $(3 - 2i)^2$ in $a + bi$ form.
- 10 The complex number $c + di$ is equal to $(2 + i)^2$. What is the value of c ?
- 11 Express in simplest $a + bi$ form: $(2 + i)^3$
- 12 Express the complex number $(1 + 2i)^4$ in $a + bi$ form.
- 13 Expand and express $(i - 3)^4$ in simplest $a + bi$ form, where i is the imaginary unit.
- 14 Where i is the imaginary unit, expand and simplify completely $(3 - i)^4$.
- 15 Express $\frac{5}{2-i}$ in simplest $a + bi$ form.

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Answer Section

1 ANS:
 $-2 + 6i$

REF: 018714siii

2 ANS:
 $3 + 3i$

REF: 089012siii

3 ANS:
 $9 - 7i$

REF: 088616siii

4 ANS:
 $11 - 2i$

REF: 068911siii

5 ANS:
 $2xi(i - 4i^2) = 2xi^2 - 8xi^3 = 2xi^2 - 8xi^3 = -2x + 8xi$

REF: 011533a2

6 ANS:
 $(x + yi)(x - yi) = x^2 - y^2i^2 = x^2 + y^2$

REF: 061432a2

7 ANS:
 $(a + bi)(a - bi)$ Since a and b are real, their squares are real and the sum of their squares is real.
 $a^2 - abi + abi - b^2i^2$
 $a^2 - b^2(-1)$
 $a^2 + b^2$

REF: 080122b

8 ANS:
 $-7 + i$

REF: 010325b

9 ANS:
 $5 - 12i$

REF: 069014siii

10 ANS:
 3

REF: 080621b

11 ANS:
 $2 + 11i$

REF: 089339siii

12 ANS:
 $-7 - 24i$

REF: 069440siii

13 ANS:
 $28 - 96i$

REF: 069940siii

14 ANS:
 $28 - 96i$

REF: 080141siii

15 ANS:
 $2 + i$

REF: 089612siii