

**1 a**  $\operatorname{Re}(z) = a = 2$   
 $\operatorname{Im}(z) = b = 3$

**b**  $\operatorname{Re}(z) = a = 4$   
 $\operatorname{Im}(z) = b = 5$

**c**  $\operatorname{Re}(z) = a = \frac{1}{2}$   
 $\operatorname{Im}(z) = b = -\frac{3}{2}$

**d**  $\operatorname{Re}(z) = a = -4$   
 $\operatorname{Im}(z) = b = 0$

**e**  $\operatorname{Re}(z) = a = 0$   
 $\operatorname{Im}(z) = b = 3$

**f**  $\operatorname{Re}(z) = a = \sqrt{2}$   
 $\operatorname{Im}(z) = b = -2\sqrt{2}$

**2 a**  $2a - 3bi = 4 + 6i$   
 $2a = 4$   
 $a = 2$   
 $-3bi = 6i$   
 $b = -2$

**b**  $a + b = 5$   
 $b = 5 - a$   
 $-2ab = -12$   
 $ab = 6$   
 $a(5 - a) = 6$   
 $5a - a^2 = 6$   
 $a^2 - 5a + 6 = 0$   
 $(a - 2)(a - 3) = 0$   
When  $a = 2$   
 $b = 5 - 2 = 3$   
When  $a = 3$   
 $b = 5 - 3 = 2$

**c**  $2a + bi = 10$   
 $= 10 + 0i$   
 $2a = 10$   
 $a = 5$   
 $b = 0$

**d**  $3a = 2$   
 $a = \frac{2}{3}$   
 $a - b = 1$   
 $\frac{2}{3} - b = 1$   
 $b = \frac{2}{3} - 1 = -\frac{1}{3}$

**3 a**  $(2 - 3i) + (4 - 5i) = 2 + 4 - 3i - 5i$   
 $= 6 - 8i$

$$\begin{aligned} \mathbf{b} \quad (4+i) + (2-2i) &= 4+2+i-2i \\ &= 6-i \end{aligned}$$

$$\begin{aligned} \mathbf{c} \quad (-3-i) - (3+i) &= -3-3-i-i \\ &= -6-2i \end{aligned}$$

$$\begin{aligned} \mathbf{d} \quad (2-\sqrt{2}i) + (5-\sqrt{8}i) &= 2+5-\sqrt{2}i-\sqrt{8}i \\ &= 7-\sqrt{2}i-2\sqrt{2}i \\ &= 7-3\sqrt{2}i \end{aligned}$$

$$\begin{aligned} \mathbf{e} \quad (1-i) - (2i+3) &= 1-3-i-2i \\ &= -2-3i \end{aligned}$$

$$\begin{aligned} \mathbf{f} \quad (2+i) - (-2-i) &= 2+2+i+i \\ &= 4+2i \end{aligned}$$

$$\begin{aligned} \mathbf{g} \quad 4(2-3i) - (2-8i) &= 8-2-12i+8i \\ &= 6-4i \end{aligned}$$

$$\begin{aligned} \mathbf{h} \quad -(5-4i) + (1+2i) &= -5+1+4i+2i \\ &= -4+6i \end{aligned}$$

$$\begin{aligned} \mathbf{i} \quad 5(i+4) + 3(2i-7) &= 20-21+5i+6i \\ &= -1+11i \end{aligned}$$

$$\begin{aligned} \mathbf{j} \quad \frac{1}{2}(4-3i) - \frac{3}{2}(2-i) &= 2-3-\frac{3}{2}i+\frac{3}{2}i \\ &= -1 \end{aligned}$$

$$\begin{aligned} \mathbf{4 a} \quad \sqrt{-16} &= \sqrt{16 \times -1} \\ &= 4i \end{aligned}$$

$$\begin{aligned} \mathbf{b} \quad 2\sqrt{-9} &= 2\sqrt{9 \times -1} \\ &= 6i \end{aligned}$$

$$\begin{aligned} \mathbf{c} \quad \sqrt{-2} &= \sqrt{2 \times -1} \\ &= \sqrt{2}i \end{aligned}$$

$$\begin{aligned} \mathbf{d} \quad i^3 &= i^2 \times i \\ &= -i \end{aligned}$$

$$\begin{aligned} \mathbf{e} \quad i^{14} &= i^{4 \times 3 + 2} \\ &= -1 \end{aligned}$$

$$\begin{aligned} \mathbf{f} \quad i^{20} &= i^{4 \times 5} \\ &= 1 \end{aligned}$$

$$\begin{aligned} \mathbf{g} \quad -2i \times i^3 &= -2i^4 \\ &= -2 \end{aligned}$$

$$\begin{aligned} \mathbf{h} \quad 4i^4 \times 3i^2 &= 4 \times 3 \times i^4 \times i^2 \\ &= 12i^6 \\ &= -12 \end{aligned}$$

$$\begin{aligned} \mathbf{i} \quad \sqrt{8}i^5 \times \sqrt{-2} &= \sqrt{8}i^4 \times i \times \sqrt{2}i \\ &= \sqrt{16} \times 1 \times -1 \\ &= -4 \end{aligned}$$

**5 a**  $i(2 - i) = 2i - i^2$   
 $= 2i - (-1)$   
 $= 1 + 2i$

**b**  $i^2(3 - 4i) = -1(3 - 4i)$   
 $= -3 + 4i$

**c**  $\sqrt{2}i(i - \sqrt{2}) = \sqrt{2}i^2 - 2i$   
 $= -\sqrt{2} - 2i$

**d**  $-\sqrt{3}(\sqrt{-3} + \sqrt{2}) = -\sqrt{3}(\sqrt{3}i + \sqrt{2})$   
 $= -3i - \sqrt{6}$   
 $= -\sqrt{6} - 3i$