

**Questions**

1. Simplify  $\sqrt{-169}$ .
2. Simplify  $\sqrt{-50}$ .
3. Simplify  $\sqrt{-48}$ .
4. Simplify  $-\frac{3}{2} + \sqrt{-81}$ .
5. Simplify  $\sqrt{-25}\sqrt{-9}$ .
6. Simplify  $\left(\frac{3}{4} - \frac{3}{4}i\right) + \left(\frac{9}{4} + \frac{5}{4}i\right)$ .
7. Simplify  $\left(\frac{1}{2} + i\right)^2$ .
8. Simplify  $(\sqrt{2}i)(\sqrt{6}i)$ .
9. Simplify  $\frac{2+i}{3-i}$ .
10. Simplify  $\frac{4+2i}{2-i}$ .

**Solutions**

1.  $\sqrt{-169} = \sqrt{-1 \cdot 169} = \sqrt{-1}\sqrt{169} = i \cdot 13 = 13i.$

2.  $\sqrt{-50} = \sqrt{-1 \cdot 5^2 \cdot 2} = \sqrt{-1}\sqrt{5^2}\sqrt{2} = 5\sqrt{2}i.$

3.  $\sqrt{-48} = \sqrt{-1 \cdot 4^2 \cdot 3} = \sqrt{-1}\sqrt{4^2}\sqrt{3} = 4\sqrt{3}i.$

4.  $-\frac{3}{2} + \sqrt{-81} = -\frac{3}{2} + \sqrt{-1 \cdot 9^2} = -\frac{3}{2} + \sqrt{-1}\sqrt{9^2} = -\frac{3}{2} + 9i.$

5.  $\sqrt{-25}\sqrt{-9} = (5i)(3i) = 15i^2 = 15(-1) = -15.$

6.  $\left(\frac{3}{4} - \frac{3}{4}i\right) + \left(\frac{9}{4} + \frac{5}{4}i\right) = \left(\frac{3}{4} + \frac{9}{4}\right) + \left(-\frac{3}{4} + \frac{5}{4}\right)i = \left(\frac{3+9}{4}\right) + \left(\frac{-3+5}{4}\right)i = (3) + \left(\frac{1}{2}\right)i = 3 + \frac{i}{2}.$

7.  $\left(\frac{1}{2} + i\right)^2 = \left(\frac{1}{2}\right)^2 + i^2 + 2\frac{1}{2}i = \frac{1}{4} - 1 + i = -\frac{3}{4} + i.$

8.  $(\sqrt{2}i)(\sqrt{6}i) = \sqrt{2 \cdot 6}i^2 = \sqrt{2^2 \cdot 3}(-1) = \sqrt{2^2}\sqrt{3}(-1) = -2\sqrt{3}.$

9. Use the complex conjugate of denominator to divide two complex numbers.

$$\begin{aligned}\frac{2+i}{3-i} &= \frac{(2+i)(3+i)}{(3-i)(3+i)} \\ &= \frac{6+5i+i^2}{9-i^2} \\ &= \frac{6+5i-1}{9-(-1)} \\ &= \frac{5+5i}{10} \\ &= \frac{1+i}{2}\end{aligned}$$

10.

$$\begin{aligned}\frac{4+2i}{2-i} &= \frac{(4+2i)(2+i)}{(2-i)(2+i)} \\ &= \frac{8+4i+4i+2i^2}{4-i^2} \\ &= \frac{8+8i+2(-1)}{4-(-1)} \\ &= \frac{6+8i}{5}\end{aligned}$$