

Perform the indicated operation. Express in standard form.

1. $(4 - 3i) + (12 - 9i)$

$$16 - 12i$$

2. $(15 + 7i) + (4 + 3i)$

$$19 + 10i$$

3. $5i + (6 - 8i)$

$$6 - 3i$$

4. $4i(5 - 3i)$

$$20i - 12i^2$$

$$20i - 12(-1)$$

$$20i + 12$$

$$12 + 20i$$

5. $(3 - 4i)(5 + 6i)$

$$15 + 18i - 20i - 24i^2$$

$$15 - 2i - 24(-1)$$

$$15 - 2i + 24$$

$$39 - 2i$$

6. $(8 - 4i)(5 - 3i)$

$$40 - 24i - 20i + 12i^2$$

$$40 - 44i + 12(-1)$$

$$40 - 44i - 12$$

$$28 - 44i$$

7. $\frac{9 - 5i}{3}$

$$\frac{9}{3} - \frac{5}{3}i$$

$$3 - \frac{5}{3}i$$

8. $\frac{5 + 7i}{2}$

$$\frac{5}{2} + \frac{7}{2}i$$

9. $4(3 - 2i) + (2 + 3i)^2$

$$12 - 8i + (2 + 3i)(2 + 3i)$$

$$12 - 8i + 4 + 6i + 6i + 9i^2$$

$$16 + 4i + 9i^2$$

$$16 + 4i + 9(-1)$$

$$16 + 4i - 9$$

$$7 + 4i$$

10. $\frac{(2 - 4i)(3i)}{3i(3i)} = \frac{6i - 12i^2}{9i^2}$

$$= \frac{6i - 12(-1)}{9(-1)} = \frac{6i + 12}{-9}$$

$$= \frac{12 + 6i}{-9}$$

$$= -\frac{12}{9} - \frac{6}{9}i$$

$$= -\frac{4}{3} - \frac{2}{3}i$$

11. $\frac{(3 + 5i)(6 + 2i)}{(6 - 2i)(6 + 2i)}$

$$= \frac{18 + 6i + 30i + 10i^2}{36 + 12i - 12i - 4i^2}$$

$$= \frac{18 + 36i + 10i^2}{36 - 4i^2}$$

$$= \frac{18 + 36i + 10(-1)}{36 - 4(-1)}$$

$$= \frac{8 + 36i}{40} = \frac{8}{40} + \frac{36i}{40}$$

$$= \frac{1}{5} + \frac{9}{10}i$$

12. $\frac{(2 - 7i)(4 - 5i)}{(4 + 5i)(4 - 5i)}$

$$= \frac{8 - 10i - 28i + 35i^2}{16 - 20i + 20i - 25i^2}$$

$$= \frac{8 - 38i + 35(-1)}{16 - 25(-1)}$$

$$= \frac{-27 - 38i}{41}$$

$$= -\frac{27}{41} - \frac{38}{41}i$$

Solve. Express your radical solutions in the simplest form.

13. $(4m+3)^2 + 33 = 3$

$$\begin{aligned} \sqrt{(4m+3)^2} &= \sqrt{-30} \\ 4m+3 &= \pm i\sqrt{30} \\ \frac{4m}{4} &= \frac{-3 \pm i\sqrt{30}}{4} \\ m &= -\frac{3}{4} \pm \frac{\sqrt{30}}{4}i \end{aligned}$$

14. $\sqrt{(3y)^2} = \sqrt{-18}$

$$\begin{aligned} \frac{3y}{3} &= \frac{\pm i\sqrt{18}}{3} \\ y &= \pm \frac{\sqrt{18}}{3}i \\ y &= \pm \frac{\sqrt{9 \cdot 2}}{3}i \\ y &= \pm \frac{3\sqrt{2}}{3}i \\ y &= \pm i\sqrt{2} \end{aligned}$$

15. $77 = 5 - 2(2h-4)^2$

$$\begin{aligned} \frac{72}{-2} &= \frac{-2(2h-4)^2}{-2} \\ \sqrt{-36} &= \sqrt{(2h-4)^2} \\ \pm 6i &= 2h-4 \\ \frac{\pm 6i}{2} &= \frac{2h-4}{2} \\ \frac{4 \pm 6i}{2} &= \frac{2h}{2} \\ \frac{4}{2} \pm \frac{6i}{2} &= h \\ 2 \pm 3i &= h \end{aligned}$$

16. $\sqrt{(2x-4)^2} = \sqrt{-20}$

$$\begin{aligned} 2x-4 &= \pm i\sqrt{20} \\ \frac{2x}{2} &= \frac{4 \pm i\sqrt{20}}{2} \\ x &= \frac{4}{2} \pm \frac{\sqrt{20}}{2}i \\ x &= 2 \pm \frac{\sqrt{4 \cdot 5}}{2}i \\ x &= 2 \pm \frac{2\sqrt{5}}{2}i \\ x &= 2 \pm i\sqrt{5} \end{aligned}$$

17. $(5p-2)^2 - 48 = 0$

$$\begin{aligned} \sqrt{(5p-2)^2} &= \sqrt{48} \\ 5p-2 &= \pm \sqrt{48} \\ \frac{5p}{5} &= \frac{2 \pm \sqrt{48}}{5} \\ p &= \frac{2}{5} \pm \frac{\sqrt{48}}{5} \\ p &= \frac{2}{5} \pm \frac{\sqrt{16 \cdot 3}}{5} \\ p &= \frac{2}{5} \pm \frac{4\sqrt{3}}{5} \end{aligned}$$

18. $12 = 100 + (7d-14)^2$

$$\begin{aligned} \sqrt{-88} &= \sqrt{(7d-14)^2} \\ \pm i\sqrt{88} &= 7d-14 \\ \frac{\pm i\sqrt{88}}{7} &= \frac{7d-14}{7} \\ 2 \pm \frac{\sqrt{88}}{7}i &= d \\ 2 \pm \frac{\sqrt{4 \cdot 22}}{7}i &= d \\ 2 \pm \frac{2\sqrt{22}}{7}i &= d \end{aligned}$$