

$$i = \sqrt{-1}$$

Write square roots of negative numbers in terms of i In 1 – 24, express each number in terms of i , and simplify.

1. $\sqrt{-36}$

$$\begin{aligned} \sqrt{-1} \cdot \sqrt{36} \\ i \sqrt{36} \\ i \cdot 6 = 6i \end{aligned}$$

2. $\sqrt{-100}$

$$\begin{aligned} i \sqrt{100} \\ 10i \end{aligned}$$

3. $-\sqrt{-81}$

$$\begin{aligned} -\sqrt{-1} \cdot \sqrt{81} \\ -i \cdot 9 \\ -9i \end{aligned}$$

4. $2\sqrt{-49}$

$$\begin{aligned} 2 \cdot \sqrt{-1} \cdot \sqrt{49} \\ 2i \sqrt{49} \\ (2i)(7) = 14i \end{aligned}$$

5. $\frac{1}{8}\sqrt{-64}$

$$\begin{aligned} \frac{1}{8} \sqrt{-1} \cdot \sqrt{64} \\ (\frac{1}{8})(i)(8) = i \end{aligned}$$

6. $-\frac{2}{3}\sqrt{-9}$

$$\begin{aligned} -\frac{2}{3} \cdot \sqrt{-1} \cdot \sqrt{9} \\ (-\frac{2}{3})(i)(3) = -2i \end{aligned}$$

7. $\frac{3}{4}\sqrt{-144}$

$$\begin{aligned} \frac{3}{4} \sqrt{-1} \sqrt{144} \\ (\frac{3}{4})(i)(12) \\ 9i \end{aligned}$$

8. $\frac{1}{3}\sqrt{-25}$

$$\begin{aligned} \frac{1}{3} \sqrt{-1} \sqrt{25} \\ (\frac{1}{3})(i)(5) \\ \frac{5i}{3} \end{aligned}$$

9. $\sqrt{-\frac{1}{4}}$

$$\begin{aligned} \sqrt{-1} \sqrt{\frac{1}{4}} \\ \frac{1}{2}i \end{aligned}$$

10. $\sqrt{-\frac{16}{25}}$

$$\begin{aligned} \sqrt{-1} \sqrt{\frac{16}{25}} \\ \frac{4}{5}i \end{aligned}$$

11. $4\sqrt{-\frac{49}{64}}$

$$\begin{aligned} 4 \sqrt{-1} \sqrt{\frac{49}{64}} \\ (4)(i)(\frac{7}{8}) \\ \frac{7}{2}i \end{aligned}$$

12. $\frac{3}{5}\sqrt{-\frac{100}{9}}$

$$\begin{aligned} \frac{3}{5} \sqrt{-1} \sqrt{\frac{100}{9}} \\ (\frac{3}{5})(i)(\frac{10}{3}) \\ \frac{5i}{2} \end{aligned}$$

13. $\sqrt{-3}$

$$\begin{aligned} \sqrt{-1} \sqrt{3} \\ i\sqrt{3} \end{aligned}$$

14. $\sqrt{-29}$

$$\begin{aligned} \sqrt{-1} \sqrt{29} \\ i\sqrt{29} \end{aligned}$$

15. $3\sqrt{-11}$

$$\begin{aligned} 3 \sqrt{-1} \sqrt{11} \\ 3i\sqrt{11} \end{aligned}$$

16. $-\sqrt{-10}$

$$\begin{aligned} -\sqrt{-1} \sqrt{10} \\ -i\sqrt{10} \end{aligned}$$

17. $\sqrt{-20}$

$$\begin{aligned} \sqrt{-1} \sqrt{20} \\ \sqrt{-1} \sqrt{2 \cdot 2 \cdot 2 \cdot 5} \\ 2i\sqrt{10} \end{aligned}$$

18. $-\sqrt{-28}$

$$\begin{aligned} -\sqrt{-1} \sqrt{28} \\ -\sqrt{-1} \cdot \sqrt{2 \cdot 2 \cdot 7} \\ -2i\sqrt{7} \end{aligned}$$

19. $2\sqrt{-75}$

$$\begin{aligned} 2 \sqrt{-1} \sqrt{75} \\ 2 \sqrt{-1} \sqrt{5 \cdot 5 \cdot 3} \\ 10i\sqrt{3} \end{aligned}$$

20. $5\sqrt{-8}$

$$\begin{aligned} 5 \sqrt{-1} \sqrt{8} \\ 5 \sqrt{-1} \sqrt{2 \cdot 2 \cdot 2} \\ 10i\sqrt{2} \end{aligned}$$

21. $\frac{2}{3}\sqrt{-72}$

$$\begin{aligned} (\frac{2}{3})(\sqrt{-1})\sqrt{72} \\ (\frac{2}{3})(\sqrt{-1})(\sqrt{3 \cdot 2 \cdot 2 \cdot 2 \cdot 2}) \\ (\frac{2}{3})(i)(6\sqrt{2}) \\ 4i\sqrt{2} \end{aligned}$$

22. $-\frac{1}{2}\sqrt{-300}$

$$\begin{aligned} (-\frac{1}{2})\sqrt{-1}\sqrt{300} \\ (-\frac{1}{2})(\sqrt{-1})\sqrt{3 \cdot 100 \cdot 3} \\ -5i\sqrt{3} \end{aligned}$$

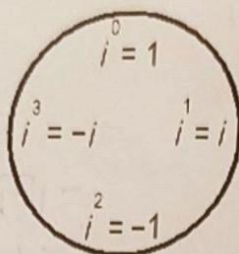
23. $-\sqrt{-\frac{1}{3}}$

$$\begin{aligned} -\sqrt{-1} \sqrt{\frac{1}{3}} \\ -(\sqrt{-1}) \sqrt{\frac{1}{3}} \\ -\frac{i\sqrt{3}}{3} \end{aligned}$$

24. $4\sqrt{-\frac{1}{8}}$

$$\begin{aligned} 4 \sqrt{-1} \sqrt{\frac{1}{8}} \\ 4 \sqrt{-1} \sqrt{\frac{1}{2 \cdot 2 \cdot 2}} \\ \frac{4i}{2\sqrt{2}} \\ \frac{2i\sqrt{2}}{\sqrt{2} \cdot \sqrt{2}} \\ i\sqrt{2} \end{aligned}$$

Simplify powers of i



$$\begin{aligned} r=0 \\ r=1=i \\ r=2=-1 \\ r=3=-i \end{aligned}$$

In 1 – 15, write each given power of i in simplest terms as 1, i , -1 , or $-i$. Show how you arrived at your answer.

1. $i^{12} = 1$ $\begin{array}{r} 3 \\ 4 \overline{)12} \\ \underline{-12} \\ 0=r \end{array}$	2. $i^7 = -i$ $\begin{array}{r} 1 \\ 4 \overline{)7} \\ \underline{4} \\ 3=r \end{array}$	3. $i^{49} = i$ $\begin{array}{r} 12 \\ 4 \overline{)49} \\ \underline{-4} \\ 09 \\ \underline{8} \\ 1=r \end{array}$
4. $i^{72} = 1$ $\begin{array}{r} 18 \\ 4 \overline{)72} \\ \underline{4} \\ 32 \\ \underline{32} \\ 0=r \end{array}$	5. $i^{54} = -1$ $\begin{array}{r} 13 \\ 4 \overline{)54} \\ \underline{4} \\ 14 \\ \underline{12} \\ 2=r \end{array}$	6. $i^{99} = -i$ $\begin{array}{r} 24 \\ 4 \overline{)99} \\ \underline{8} \\ 19 \\ \underline{16} \\ 3=r \end{array}$
7. $i^{300} = 1$ $\begin{array}{r} 75 \\ 4 \overline{)300} \\ \underline{28} \\ 20 \\ \underline{20} \\ 0=r \end{array}$	8. $i^{246} = -1$ $\begin{array}{r} 61 \\ 4 \overline{)246} \\ \underline{24} \\ 06 \\ \underline{-4} \\ 2=r \end{array}$	9. $i^{91} = -i$ $\begin{array}{r} 22 \\ 4 \overline{)91} \\ \underline{8} \\ 11 \\ \underline{8} \\ 3=r \end{array}$
10. $i^{473} = i$ $\begin{array}{r} 118 \\ 4 \overline{)473} \\ \underline{4} \\ 07 \\ \underline{4} \\ 33 \\ \underline{32} \\ 1=r \end{array}$	11. $i^{1331} = i$ $\begin{array}{r} 332 \\ 4 \overline{)1331} \\ \underline{12} \\ 13 \\ \underline{12} \\ 18 \\ \underline{16} \\ 3=r \end{array}$	12. $i^{2001} = i$ $\begin{array}{r} 500 \\ 4 \overline{)2001} \\ \underline{2000} \\ 001=r \end{array}$
13. $i^8 + i^9 + i^{10}$ i^7	14. $i^8 \cdot i^9 \cdot i^{10}$	15. $2i^2 \cdot (3i)^3$