Simplify the expression.

1. \(\sqrt{54}\)
2. \(\sqrt{112}\)
3. \(\sqrt{176}\)
4. \(\sqrt{180}\)
5. \(\sqrt{117f}\)
6. \(\sqrt{432y^2}\)
7. \(\frac{\sqrt{120}}{\sqrt{121}}\)
8. \(\sqrt{\frac{75}{225}}\)
9. \(\sqrt{\frac{202}{256}}\)
10. \(\frac{\sqrt{320}}{\sqrt{441}}\)
11. \(\sqrt{\frac{21v^2}{324}}\)
12. \(\frac{\sqrt{94t}}{\sqrt{196}}\)

13. A square has an area of 700 square units. Find the length of a side of the square as a radical expression in simplest form.

Simplify the expression.

14. \(\sqrt{171cd^2}\)
15. \(\sqrt{152m^2n}\)
16. \(\sqrt{126x^2y^2}\)
17. \(\frac{\sqrt{23w^2}}{\sqrt{49}}\)
18. \(\frac{\sqrt{45rt^2}}{\sqrt{144}}\)
19. \(\frac{\sqrt{76p^2q^2}}{\sqrt{81}}\)

20. After a car accident on a dry asphalt road, an investigator measures the length \(l\) (in feet) of a car’s skid marks. The expression \(\sqrt{18l}\) gives the car’s speed in miles per hour at the time the brakes were applied.

a. Write the expression in simplest form.

b. The skid marks are 140 feet long. Use the simplified expression to approximate the car’s speed when the brakes were applied.

21. You drop a stick from the top of a building that is 245 feet high. You can use the expression \(\sqrt{\frac{245}{16}}\) to find the time in seconds that it takes the stick to hit the ground. Write the expression in simplest form. Then approximate the value of the expression to the nearest second.
Simplify the expression.

1. $\sqrt{14} \cdot \sqrt{8}$
2. $\sqrt{20} \cdot \sqrt{10}$
3. $\sqrt{18} \cdot \sqrt{7}$
4. $\sqrt{6} \cdot \sqrt{18}$
5. $\frac{\sqrt{7}}{\sqrt{3}}$
6. $\frac{\sqrt{4}}{\sqrt{5}}$
7. $\frac{\sqrt{8}}{\sqrt{4}}$
8. $\frac{\sqrt{28}}{\sqrt{21}}$
9. $5\sqrt{3} - 2\sqrt{3}$
10. $7\sqrt{5} - \sqrt{125}$
11. $6\sqrt{6} - \sqrt{6}$
12. $6\sqrt{50} + 3\sqrt{50}$
13. $7\sqrt{5} + 4\sqrt{45}$
14. $4\sqrt{7} + 2\sqrt{28}$
15. $4\sqrt{6} - \sqrt{3} + 5\sqrt{6}$
16. $7\sqrt{3} - \sqrt{8} - 2\sqrt{3}$

17. **Tidal Wave** The expression $\sqrt{15d}$ gives the approximate velocity (in feet per second) of a tidal wave in water of depth $d$ (in feet). If one tidal wave is in water with a depth of 52 feet and another tidal wave is in water with a depth of 30 feet, what is the difference in velocity between the two tidal waves? Round your answer to the nearest tenth.

18. **Sailing** The crow's nest on a ship allows sailors to see land. The expression $\frac{\sqrt{3h}}{2}$ represents the distance $d$ (in miles) a sailor can see from a height $h$ (in feet) above the water. If the deck is 8 feet above the water and the crow's nest is 10 feet above the deck, about how much farther can a sailor in the crow's nest see than a sailor on the deck? Round your answer to the nearest tenth.

19. **Challenge** The minimum speed (in miles per hour) at which a car was traveling when it began to skid can be approximated using the expression $\sqrt{30df}$ where $d$ is the length of the skid marks (in feet) and $f$ is the coefficient of friction for the road. Approximately how much faster was a car going if it leaves a skid mark 42 feet long on a concrete road with a coefficient of friction $f = 0.75$ than a car that leaves a skid mark 30 feet long on a dirt road with a coefficient of friction $f = 0.35$?