

Estimating Square Roots (Pages 362–365)

Numbers like $\sqrt{3}$ and $\sqrt{11}$ are not integers or rational numbers because their decimal values do not terminate or repeat. They are **irrational numbers**. You can estimate irrational square roots by using perfect squares.

EXAMPLE

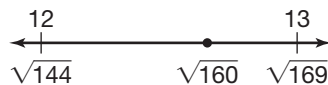
Estimate $\sqrt{160}$.

Find the two perfect squares closest to 160. List some perfect squares.

... 100, 121, 144, 169, 196, 225, ...

↑ 160 is between 144 and 169.

$$\begin{aligned} 144 &< 160 < 169 \\ \sqrt{144} &< \sqrt{160} < \sqrt{169} \\ 12 &< \sqrt{160} < 13 \end{aligned}$$



Since 160 is closer to 169 than to 144, the best whole number estimate for $\sqrt{160}$ is 13.

Try These Together

Estimate each square root to the nearest whole number.

1. $\sqrt{21}$

2. $\sqrt{56}$

HINT: Use a number line to help determine the nearest whole number.

PRACTICE

Estimate each square root to the nearest whole number.

3. $\sqrt{12}$

4. $\sqrt{32}$

5. $\sqrt{43}$

6. $\sqrt{113}$

7. $\sqrt{276}$

8. $\sqrt{420}$

9. $\sqrt{740}$

10. $\sqrt{1050}$

11. $\sqrt{31.4}$

12. $\sqrt{91.2}$

13. $\sqrt{132.8}$

14. $\sqrt{11.11}$



15. **Standardized Test Practice** The area of a square is 75 square feet. Estimate the length of one side to the nearest whole number.

A 8 ft

B 9 ft

C 16 ft

D 18 ft