

Root Reality Check

Use square roots to make useful estimates.

GRADE 8 • 8.NR.1

8.NR.1 "Solve problems involving irrational numbers and rational approximations of irrational numbers to explain realistic applications."

NAME _____

DATE _____

BOUND, THEN ROUND

Square roots of perfect squares are rational. For a nonperfect square, use nearby perfect squares to bound its irrational square root, then test tenths and use the halfway value to round.

WORKED EXAMPLE

Estimate $\sqrt{70}$ to the nearest tenth.

- $8^2 = 64$ and $9^2 = 81$, so $\sqrt{70}$ is between 8 and 9.
- $3^2 = 68.89$ and $8.4^2 = 70.56$.
- The halfway value is 8.35, and $8.35^2 = 69.7225$.
- Since 70 is greater than 69.7225, $\sqrt{70}$ is greater than 8.35 and rounds to 8.4.

Answer: $\sqrt{70}$ is about 8.4.

PRACTICE 6 problems

- 1** Between which two consecutive whole numbers is $\sqrt{18}$?

ANSWER _____

- 2** Estimate $\sqrt{45}$ to the nearest tenth.

ANSWER _____

- 3** Is $\sqrt{121}$ rational or irrational? Write its value.

ANSWER _____

- 4** Order these numbers from least to greatest: $\sqrt{10}$, 3.2, $\sqrt{11}$.

ANSWER _____

- 5** Which number is closer to $\sqrt{27}$, 5.1 or 5.2?

ANSWER _____

- 6** Estimate $\sqrt{95}$ to the nearest whole number.

ANSWER _____

APPLY IT Show your work

- 1** A school gaming club plans a square floor mat with an area of 50 square feet. About how long is each side, to the nearest tenth of a foot?

WORK SPACE

ANSWER _____

- 2** A student is designing a phone-case graphic that is 6 cm wide and 11 cm tall. What is the diagonal length, to the nearest tenth of a centimeter?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A square dance floor has an area of 200 square meters. Fencing must go around all four sides and can be bought only in whole meters. What is the least whole number of meters of fencing needed? Explain your reasoning.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Between which two consecutive whole numbers is $\sqrt{18}$?	4 and 5
2	Estimate $\sqrt{45}$ to the nearest tenth.	6.7
3	Is $\sqrt{121}$ rational or irrational? Write its value.	Rational, 11
4	Order these numbers from least to greatest: $\sqrt{10}$, 3.2, $\sqrt{11}$.	$\sqrt{10}$, 3.2, $\sqrt{11}$
5	Which number is closer to $\sqrt{27}$, 5.1 or 5.2?	5.2
6	Estimate $\sqrt{95}$ to the nearest whole number.	10

PART 2 • APPLY IT

- $\sqrt{50}$ ft, about 7.1 ft** The side length is $\sqrt{50}$. Since $7.05^2 = 49.7025$ and $7.1^2 = 50.41$, $\sqrt{50}$ is between 7.05 and 7.1, so it rounds to 7.1.
- $\sqrt{157}$ cm, about 12.5 cm** Use the Pythagorean theorem: $6^2 + 11^2 = 157$, so the diagonal is $\sqrt{157}$. Since $12.5^2 = 156.25$ and $12.55^2 = 157.5025$, $\sqrt{157}$ rounds to 12.5.

CHALLENGE

The perimeter is $4\sqrt{200}$ m, which is about 56.57 m. The least whole number of meters needed is 57 m.

Accept equivalent radical forms and decimal estimates that round correctly to the requested place value. For the challenge, students should use the unrounded side length or enough precision before rounding the total perimeter.