LESSON MAKER PRO

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 sqrt70 to the nearest tenth.

1. $8^2 = 64$ and $9^2 = 81$, so sqrt70 is between 8 and 9.
2. $8.3^2 = 68.89$ and $8.4^2 = 70.56$.
3. The halfway value is 8.35, and $8.35^2 = 69.7225$.
4. Since 70 is greater than 69.7225, sqrt70 is greater than 8.35 and rounds to 8.4.

Answer: sqrt70 is about 8.4.

PRACTICE 6 problems

1 Between which two consecutive whole numbers is sqrt18?

ANSWER _____

2 Estimate sqrt45 to the nearest tenth.

ANSWER _____

3 Is sqrt121 rational or irrational? Write its value.

ANSWER _____

4 Order these numbers from least to greatest: sqrt10, 3.2, sqrt11.

ANSWER _____

5 Which number is closer to sqrt27, 5.1 or 5.2?

ANSWER _____

6 Estimate sqrt95 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

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.

WORK SPACE AND ANSWER

ANSWER KEY

Root Reality Check

GRADE 8 · 8.NR.1

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Between which two consecutive whole numbers is sqrt18?	**4 and 5**
2	Estimate sqrt45 to the nearest tenth.	**6.7**
3	Is sqrt121 rational or irrational? Write its value.	**Rational, 11**
4	Order these numbers from least to greatest: sqrt10, 3.2, sqrt11.	**sqrt10, 3.2, sqrt11**
5	Which number is closer to sqrt27, 5.1 or 5.2?	**5.2**
6	Estimate sqrt95 to the nearest whole number.	**10**

PART 2 · APPLY IT

1. **sqrt50 ft, about 7.1 ft** The side length is sqrt50. Since $7.05^2 = 49.7025$ and $7.1^2 = 50.41$, sqrt50 is between 7.05 and 7.1, so it rounds to 7.1.
2. **sqrt157 cm, about 12.5 cm** Use the Pythagorean theorem: $6^2 + 11^2 = 157$, so the diagonal is sqrt157. Since $12.5^2 = 156.25$ and $12.55^2 = 157.5025$, sqrt157 rounds to 12.5.

CHALLENGE

The perimeter is 4sqrt200 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.