

Square Root Bounds

Bracket each root, then choose the closer whole number.

GRADE 8 • 8.NS.1.a

8.NS.1.a "Estimate and identify the two consecutive natural numbers between which the positive square root of a given number lies and justify which natural number is the better approximation. Numbers are limited to natural numbers from 1 to 400."

NAME _____

DATE _____

FIND THE BETTER ESTIMATE

Find consecutive natural numbers whose squares are on either side of the given number. To choose the better estimate, compare the number with the square of the midpoint between those two numbers.

WORKED EXAMPLE

Estimate $\sqrt{50}$.

- $7^2 = 49$ and $8^2 = 64$.
- So $\sqrt{50}$ is between 7 and 8.
- $5^2 = 56.25$, and 50 is less than 56.25.

Answer: $\sqrt{50}$ is between 7 and 8. The better approximation is 7.

PRACTICE 5 problems

1 Estimate $\sqrt{18}$.

ANSWER _____

2 Estimate $\sqrt{70}$.

ANSWER _____

3 Estimate $\sqrt{145}$.

ANSWER _____

4 Estimate $\sqrt{250}$.

ANSWER _____

5 Estimate $\sqrt{399}$.

ANSWER _____

APPLY IT Show your work

- 1** A square poster has an area of 96 square inches. Between which two natural numbers is its side length? Which is the better estimate?

WORK SPACE

ANSWER _____

- 2** A square zone in a video game has an area of 288 square units. Between which two natural numbers is its side length? Which is the better estimate?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Without a calculator, explain why 14 is a better approximation of $\sqrt{210}$ than 15.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Estimate $\sqrt{18}$.	Between 4 and 5; 4 is better.
2	Estimate $\sqrt{70}$.	Between 8 and 9; 8 is better.
3	Estimate $\sqrt{145}$.	Between 12 and 13; 12 is better.
4	Estimate $\sqrt{250}$.	Between 15 and 16; 16 is better.
5	Estimate $\sqrt{399}$.	Between 19 and 20; 20 is better.

PART 2 • APPLY IT

- Between 9 and 10 inches; 10 inches is better.** $9^2 = 81$ and $10^2 = 100$. Since 96 is greater than $9.5^2 = 90.25$, the side length is closer to 10.
- Between 16 and 17 units; 17 units is better.** $16^2 = 256$ and $17^2 = 289$. Since 288 is greater than $16.5^2 = 272.25$, the side length is closer to 17.

CHALLENGE

$14^2 = 196$ and $15^2 = 225$, so $\sqrt{210}$ is between 14 and 15. Because 210 is less than $14.5^2 = 210.25$, $\sqrt{210}$ is closer to 14.

Accept correct bounds and the closer natural number. Accept midpoint-square reasoning or an accurate decimal estimate as justification.