

Root Road Map

Classify square roots and place them between benchmarks.

GRADE 8 • MA.8.NSO.1.1

MA.8.NSO.1.1 "Extend previous understanding of rational numbers to define irrational numbers within the real number system. Locate an approximate value of a numerical expression involving irrational numbers on a number line."

NAME _____

DATE _____

SQUARE ROOT BENCHMARKS

A rational number can be written as a fraction of integers, and an irrational number cannot. For a whole-number radicand that is not a perfect square, its square root is irrational. To place a square root on a number line, find the perfect squares on either side of the radicand.

WORKED EXAMPLE

Locate $\sqrt{45}$ on a number line.
Round it to the nearest tenth.

- $6^2 = 36$ and $7^2 = 49$.
- Since $36 < 45 < 49$, $\sqrt{45}$ is between 6 and 7.
- $7^2 = 44.89$ and $6.8^2 = 46.24$.
- Because 45 is closer to 44.89, $\sqrt{45}$ rounds to 6.7.

Answer: $\sqrt{45}$ is between 6 and 7, and $\sqrt{45}$ is about 6.7.

PRACTICE 6 problems

- 1** Is $\sqrt{64}$ rational or irrational? Give its value.

ANSWER _____

- 2** Is $\sqrt{28}$ rational or irrational?

ANSWER _____

- 3** Which number is irrational: $\frac{5}{12}$, $\sqrt{25}$, $\sqrt{11}$, or 0.4?

ANSWER _____

- 4** Between which two consecutive whole numbers is $\sqrt{17}$?

ANSWER _____

- 5** Between which two consecutive whole numbers is $1 + \sqrt{10}$?

ANSWER _____

- 6** Estimate $\sqrt{24}$ to the nearest tenth.

ANSWER _____

APPLY IT Show your work

- 1** An esports club is ordering a square floor mat with an area of 72 square feet. Its side length is $\sqrt{72}$ feet. Between which two consecutive whole numbers should the side length be placed on a number line?

WORK SPACE

ANSWER _____

- 2** A fitness app gives a route a score of $2 + \sqrt{50}$ points. Between which two consecutive whole numbers should this score be placed on a number line?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Estimate $\sqrt{13} + \sqrt{12}$ to the nearest tenth. Is the value closer to 7 or 8? Explain your reasoning.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Is $\sqrt{64}$ rational or irrational? Give its value.	Rational, 8.
2	Is $\sqrt{28}$ rational or irrational?	Irrational.
3	Which number is irrational: $5/12$, $\sqrt{25}$, $\sqrt{11}$, or 0.4?	$\sqrt{11}$
4	Between which two consecutive whole numbers is $\sqrt{17}$?	Between 4 and 5.
5	Between which two consecutive whole numbers is $1 + \sqrt{10}$?	Between 4 and 5.
6	Estimate $\sqrt{24}$ to the nearest tenth.	4.9

PART 2 • APPLY IT

1. **Between 8 and 9 feet.** $8^2 = 64$ and $9^2 = 81$. Since 72 is between 64 and 81, $\sqrt{72}$ is between 8 and 9.
2. **Between 9 and 10 points.** $\sqrt{50}$ is between 7 and 8 because $49 < 50 < 64$. Adding 2 places the score between 9 and 10.

CHALLENGE

About 7.1, so it is closer to 7. $\sqrt{13}$ is about 3.6 and $\sqrt{12}$ is about 3.5, and $3.6 + 3.5 = 7.1$.

Accept equivalent wording such as "nonterminating, nonrepeating" for irrational numbers. For interval answers, accept the correct pair of consecutive whole numbers in either sentence form or inequality form.