

Root Route

Approximate radicals to compare and place numbers.

GRADE 8 • 8.NS.1.b

8.NS.1.b "Use rational approximations (to the nearest hundredth) of irrational numbers to compare, order, and locate values on a number line. Radicals may include both positive and negative square roots of values from 0 to 400 yielding an irrational..."

NAME _____

DATE _____

ROUND, THEN COMPARE

To approximate $\sqrt{n}$, find the perfect squares around n , then test decimal values to the nearest hundredth. For a negative square root, first approximate the positive root, then attach the negative sign. On a number line, numbers farther left are less.

WORKED EXAMPLE

Approximate $\sqrt{30}$ to the nearest hundredth.

- $5^2 = 25$ and $6^2 = 36$, so $\sqrt{30}$ is between 5 and 6.
- The midpoint between 5.47 and 5.48 is 5.475.
- $4.75^2 = 29.975625$, which is less than 30.
- So $\sqrt{30}$ is greater than 5.475 and rounds up to 5.48.

Answer: $\sqrt{30} \approx 5.48$

PRACTICE 6 problems

- 1** Round $\sqrt{7}$ to the nearest hundredth.

ANSWER _____

- 2** Round $-\sqrt{15}$ to the nearest hundredth.

ANSWER _____

- 3** Use hundredth approximations. Is $\sqrt{50}$ greater than or less than 7.05?

ANSWER _____

- 4** Order from least to greatest: $-\sqrt{80}$, -8.90 , $-\sqrt{75}$.

ANSWER _____

- 5** A number line is labeled 10.70, 10.71, 10.72, and 10.73. Which label is closest to $\sqrt{115}$?

ANSWER _____

- 6** Order from least to greatest: $\sqrt{2}$, 1.42, $\sqrt{3}$.

ANSWER _____

APPLY IT Show your work

- 1** A game map shows a straight shortcut of $\sqrt{277}$ meters. A path around the obstacle is 16.60 meters. Which route is shorter, and by about how much?

WORK SPACE

ANSWER _____

- 2** For a school dance, a rectangular photo backdrop is 7 feet wide and 10 feet tall. Its corner-to-corner support rod must be $\sqrt{149}$ feet long. A 12.20-foot rod is available. Is the rod long enough?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Use nearest-hundredth approximations to order from least to greatest: $-\sqrt{199}$, -14.10 , $\sqrt{198}$, 14.08 . Then explain why $-\sqrt{199}$ is placed before -14.10 .

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Round $\sqrt{7}$ to the nearest hundredth.	$\sqrt{7} \approx 2.65$
2	Round $-\sqrt{15}$ to the nearest hundredth.	$-\sqrt{15} \approx -3.87$
3	Use hundredth approximations. Is $\sqrt{50}$ greater than or less than 7.05?	$\sqrt{50}$ is greater than 7.05 because $\sqrt{50} \approx 7.07$.
4	Order from least to greatest: $-\sqrt{80}$, -8.90, $-\sqrt{75}$.	$-\sqrt{80}$, -8.90, $-\sqrt{75}$
5	A number line is labeled 10.70, 10.71, 10.72, and 10.73. Which label is closest to $\sqrt{115}$?	10.72
6	Order from least to greatest: $\sqrt{2}$, 1.42, $\sqrt{3}$.	$\sqrt{2}$, 1.42, $\sqrt{3}$

PART 2 • APPLY IT

- The 16.60-meter path is shorter by about 0.04 meter.** $\sqrt{277} \approx 16.64$. Compare 16.64 and 16.60, then subtract to get about 0.04 meter.
- No. $\sqrt{149} \approx 12.21$ feet, so the rod is about 0.01 foot too short.** Approximate $\sqrt{149}$ as 12.21. Since 12.20 is less than 12.21, the available rod is not long enough.

CHALLENGE

$-\sqrt{199} \approx -14.11 < -14.10 < \sqrt{198} \approx 14.07 < 14.08$. Since -14.11 is farther left than -14.10 on a number line, $-\sqrt{199}$ comes first.

Accept equivalent comparison symbols and correctly rounded decimal approximations. Accept 12.2 in place of 12.20 when the student clearly compares it as 12.20.