LESSON MAKER PRO

Square Root Detective

Use perfect squares to decide when a square root is irrational.

GRADE 8 · 8.AF.A.4.b

8.AF.A.4.b "Explain that the square root of a non-perfect square is irrational."

NAME _____ DATE _____

THE BIG IDEA

A perfect square is a whole number made by multiplying a whole number by itself. The square root of a whole number that is not a perfect square is irrational, which means it cannot be written as a fraction of integers. Nearby perfect squares help you check whether a number is a perfect square.

WORKED EXAMPLE

Is sqrt(10) rational or irrational?

1. $9 < 10 < 16$, and 9 and 16 are perfect squares.
2. So $3 < \text{sqrt}(10) < 4$.
3. Because 10 is not a perfect square, sqrt(10) is irrational.

Answer: sqrt(10) is irrational.

PRACTICE 6 problems

1 Is sqrt(2) rational or irrational? Explain using perfect squares.

ANSWER _____

2 Find sqrt(49). Is it rational or irrational?

ANSWER _____

3 Is sqrt(20) rational or irrational? Name the perfect squares on either side of 20.

ANSWER _____

4 Find the smallest whole number greater than 36 whose square root is irrational. Explain your choice.

ANSWER _____

5 A student says sqrt(45) is rational because 45 is a whole number. Is the student correct? Explain.

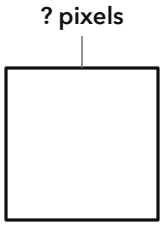
ANSWER _____

6 Which is irrational, sqrt(64) or sqrt(63)? Explain.

ANSWER _____

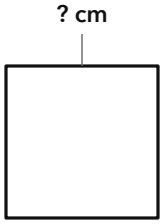
APPLY IT Show your work

1 A square game icon has an area of 72 square pixels. Give its exact side length in pixels. Is that length rational or irrational, and which two whole numbers is it between?



ANSWER _____

2 A square laptop sticker has an area of 100 square centimeters. Its designer increases the area by 1 square centimeter. What was the original side length? Is the new side length rational or irrational? Explain.



ANSWER _____

CHALLENGE One step up

A student says, "Because 18 is not a perfect square, sqrt(18)/sqrt(2) must be irrational." Is the student correct? Simplify the expression and explain.

WORK SPACE AND ANSWER

ANSWER KEY

Square Root Detective

GRADE 8 · 8.AF.A.4.b

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Is sqrt(2) rational or irrational? Explain using perfect squares.	**Irrational. Since 1 < 2 < 4, 2 is not a perfect square.**
2	Find sqrt(49). Is it rational or irrational?	**sqrt(49) = 7. It is rational because 7 can be written as 7/1.**
3	Is sqrt(20) rational or irrational? Name the perfect squares on either side of 20.	**Irrational. The perfect squares are 16 and 25.**
4	Find the smallest whole number greater than 36 whose square root is irrational. Explain your choice.	**37. It is the next whole number after 36, and it is not a perfect square.**
5	A student says sqrt(45) is rational because 45 is a whole number. Is the student correct? Explain.	**No. The number under the square root, 45, is not a perfect square, so sqrt(45) is irrational.**
6	Which is irrational, sqrt(64) or sqrt(63)? Explain.	**sqrt(63) is irrational because 63 is not a perfect square. sqrt(64) = 8 is rational.**

PART 2 · APPLY IT

1. **The side length is sqrt(72) pixels. It is irrational and lies between 8 and 9 pixels.** The side length is the square root of the area. Since 64 < 72 < 81 and 72 is not a perfect square, sqrt(72) is irrational and lies between 8 and 9.
2. **The original side length was 10 cm. The new side length is sqrt(101) cm, which is irrational because 101 is not a perfect square.** sqrt(100) = 10. The new area is 101 square centimeters, so its side length is sqrt(101) cm; 101 is not a perfect square.

CHALLENGE

No. sqrt(18)/sqrt(2) = sqrt(9) = 3, which is rational. Dividing one irrational square root by another can give a rational number.

Accept equivalent explanations that identify a non-perfect-square whole number under the square root. For the icon, also accept 6sqrt(2) pixels as the exact side length.