LESSON MAKER PRO

Number Detectives

Sort real numbers by what their forms reveal.

GRADE 7 · 7A.NS.B

7A.NS.B "Understand that the real number system is composed of rational and irrational numbers."

NAME _____ DATE _____

RATIONAL OR IRRATIONAL?

A rational number can be written as a fraction of integers with a nonzero denominator. Its decimal ends or repeats. An irrational number cannot be written as such a fraction, and its decimal goes on forever without repeating. The square root of a perfect square is rational. The square root of a whole number that is not a perfect square is irrational.

WORKED EXAMPLE

Find sqrt(121), then classify it as rational or irrational.

1. 121 = 11 × 11.
2. So sqrt(121) = 11.
3. 11 can be written as 11/1.

Answer: 11; rational

PRACTICE 6 problems

1 Classify -7/8 as rational or irrational.

ANSWER _____

2 Find sqrt(49), then classify it as rational or irrational.

ANSWER _____

3 Classify sqrt(18) as rational or irrational.

ANSWER _____

4 Classify 0.666... as rational or irrational.

ANSWER _____

5 In the decimal 0.101001000100001..., each pair of 1s has one more zero between them than the pair before. Classify the decimal and explain why.

ANSWER _____

6 Find sqrt(36)/sqrt(9), then classify the result.

ANSWER _____

APPLY IT Show your work

1 A player has 0.625 seconds to tap a button in a rhythm game. Is this time rational or irrational? Write it as a fraction to show why.

WORK SPACE

ANSWER _____

2 A video game uses sqrt(20) seconds as a power-up cooldown. Is the cooldown rational or irrational? Explain using perfect squares.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A student claims that adding or multiplying two irrational numbers always gives an irrational result. Test both claims by finding and classifying sqrt(3) + sqrt(3) and sqrt(3) × sqrt(3). Explain what your results show.

WORK SPACE AND ANSWER

ANSWER KEY

Number Detectives

GRADE 7 · 7A.NS.B

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Classify -7/8 as rational or irrational.	**Rational**
2	Find sqrt(49), then classify it as rational or irrational.	**7; rational**
3	Classify sqrt(18) as rational or irrational.	**Irrational**
4	Classify 0.666... as rational or irrational.	**Rational**
5	In the decimal 0.101001000100001..., each pair of 1s has one more zero between them than the pair before. Classify the decimal and explain why.	**Irrational; it goes on forever without repeating a fixed pattern.**
6	Find sqrt(36)/sqrt(9), then classify the result.	**2; rational**

PART 2 · APPLY IT

1. **Rational; 0.625 = 5/8.** Write 0.625 as 625/1000, then simplify to 5/8.
2. **Irrational; 20 is not a perfect square.** The nearby perfect squares are 16 and 25. Since 20 is not a perfect square, sqrt(20) is irrational.

CHALLENGE

sqrt(3) + sqrt(3) = 2sqrt(3), which is irrational. sqrt(3) × sqrt(3) = 3, which is rational. These examples show that adding two irrational numbers can give an irrational result, but multiplying two irrational numbers does not always give one.

Accept equivalent fractions for the rhythm-game time. For the challenge, students need only show that the multiplication claim is false; the sum does not prove what always happens when irrational numbers are added.