

Decimal Detectives

Use decimal patterns to identify rational and irrational numbers.

GRADE 8 • NY-8.NS.1

NY-8.NS.1 "Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion eventually repeats. Know that other numbers that are not rational are called irrational."

NAME _____

DATE _____

DECIMAL PATTERNS

Every number has a decimal expansion. A rational number has a decimal that terminates or eventually repeats. A decimal that never terminates and never repeats represents an irrational number.

WORKED EXAMPLE

Write $7/12$ as a decimal. Then decide whether it is rational or irrational.

1. Divide 7 by 12. Write 7.000... so you can continue dividing.
2. 12 goes into 70 five times, so the first decimal digit is 5.
3. 12 goes into 100 eight times, leaving 4. Then 12 goes into 40 three times, leaving 4 again.
4. Because the remainder repeats, the digit 3 repeats forever.

Answer: $7/12 = 0.58333...$; rational

PRACTICE 6 problems

- 1** Write $3/8$ as a decimal. Then state whether it is rational or irrational.

ANSWER _____

- 2** Write $5/6$ as a decimal. Then state whether it is rational or irrational.

ANSWER _____

- 3** Is 0.121212... rational or irrational? State why.

ANSWER _____

- 4** Is 0.407407407... rational or irrational? State why.

ANSWER _____

- 5** Is $\sqrt{18}$ rational or irrational?

ANSWER _____

- 6** Is π rational or irrational?

ANSWER _____

APPLY IT Show your work

- 1** A gamer has downloaded $\frac{13}{16}$ of a new game. Write $\frac{13}{16}$ as a decimal, then classify the decimal as rational or irrational.

WORK SPACE

ANSWER _____

- 2** A student trims a music clip to $\frac{11}{9}$ seconds. Write $\frac{11}{9}$ as a decimal, then classify the decimal as rational or irrational.

WORK SPACE

ANSWER _____

CHALLENGE One step up

The decimal $0.101001000100001\dots$ has groups of zeros that get longer each time. Is this number rational or irrational? Explain your reasoning.

WORK SPACE AND ANSWER

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Write $\frac{3}{8}$ as a decimal. Then state whether it is rational or irrational.	$\frac{3}{8} = 0.375$; rational
2	Write $\frac{5}{6}$ as a decimal. Then state whether it is rational or irrational.	$\frac{5}{6} = 0.8333...$; rational
3	Is 0.121212... rational or irrational? State why.	Rational; the block 12 repeats.
4	Is 0.407407407... rational or irrational? State why.	Rational; the block 407 repeats.
5	Is $\sqrt{18}$ rational or irrational?	irrational
6	Is pi rational or irrational?	irrational

PART 2 • APPLY IT

- $\frac{13}{16} = 0.8125$; rational** Divide 13 by 16 to get 0.8125. The decimal terminates, so it is rational.
- $\frac{11}{9} = 1.222...$; rational** Divide 11 by 9 to get 1.222.... The digit 2 repeats, so the number is rational.

CHALLENGE

Irrational; the decimal does not terminate, and its digits do not eventually repeat because the groups of zeros keep getting longer.

Accept equivalent repeating-decimal notation, such as 0.58 with 3 repeating for the worked example. For rational classifications, accept an explanation that the decimal terminates or repeats.