Decimal Detectives

Use decimal patterns to classify each number.

8.NR.1.1 "Distinguish between rational and irrational numbers using decimal expansion. Convert a decimal expansion which repeats eventually into a rational number."

NAME _____ DATE _____

RATIONAL NUMBER

A rational number has a decimal that ends or repeats forever. The repeating part can begin after other digits.

4.125

IRRATIONAL NUMBER

An irrational number has a decimal that never ends and never repeats a fixed digit or block of digits.

$\sqrt{2}$ = 1.414213562...

1 SORT

8 items

Circle RATIONAL or IRRATIONAL for each decimal, then choose two items and explain whether the decimal ends, repeats, or goes on without repeating.

1.	6.25	RATIONAL	IRRATIONAL
2.	0.\overline{47}	RATIONAL	IRRATIONAL
3.	0.101001000100001... (the groups of 0s keep getting longer)	RATIONAL	IRRATIONAL
4.	2.0\overline{3}	RATIONAL	IRRATIONAL
5.	0.121122111222... (the groups of 2s keep getting longer)	RATIONAL	IRRATIONAL
6.	π = 3.141592653589793...	RATIONAL	IRRATIONAL
7.	-1.75	RATIONAL	IRRATIONAL
8.	0.58\overline{2}	RATIONAL	IRRATIONAL

2 PROVE IT

Explain your thinking

Pick two items from Part 1. For each one, tell how you knew where it belonged.

ITEM # _____ **HOW I KNEW** _____

ITEM # _____ **HOW I KNEW** _____

3 MAKE YOUR OWN

One of each

Write one new RATIONAL example and one new IRRATIONAL example.

RATIONAL _____

IRRATIONAL _____

CHALLENGE

Convert $0.3\overline{27}$ to a fraction in simplest form. Show the equation or subtraction you used.

ANSWER KEY # Decimal Detectives

GRADE 8 · 8.NR.1.1

PART 1 · SORT

#	ITEM	CATEGORY	WHY
1	6.25	**RATIONAL**	The decimal ends.
2	0.\overline{47}	**RATIONAL**	The block 47 repeats forever.
3	0.101001000100001... (the groups of 0s keep getting longer)	**IRRATIONAL**	The growing groups of zeros prevent a fixed repeating block.
4	2.0\overline{3}	**RATIONAL**	The digit 3 repeats forever after 2.0.
5	0.121122111222... (the groups of 2s keep getting longer)	**IRRATIONAL**	The growing groups of 2s prevent a fixed repeating block.
6	π = 3.141592653589793...	**IRRATIONAL**	The decimal expansion of pi never ends or repeats.
7	-1.75	**RATIONAL**	The decimal ends.
8	0.58\overline{2}	**RATIONAL**	The digit 2 repeats forever after 0.58.

PART 2 · PROVE IT

Accept any explanation that names the deciding feature from the rule box for the chosen item.

PART 3 · MAKE YOUR OWN (SAMPLE ANSWERS)

- **RATIONAL**: 0.0\overline{8}
- **IRRATIONAL**: √3 = 1.732050807...

Challenge: Let x = 0.3272727... Then 1000x - 10x = 324, so 990x = 324 and x = 18/55.

Sort answers: 1 RATIONAL, 2 RATIONAL, 3 IRRATIONAL, 4 RATIONAL, 5 IRRATIONAL, 6 IRRATIONAL, 7 RATIONAL, 8 RATIONAL. For Part 2, accept explanations that correctly identify ending, repeating, or nonrepeating decimal behavior.