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.	0.474747... (47 repeats forever)	RATIONAL	IRRATIONAL
3.	0.101001000100001... (the groups of 0s keep getting longer)	RATIONAL	IRRATIONAL
4.	2.03333... (3 repeats forever after 2.0)	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.	0.582222... (2 repeats forever after 0.58)	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 0.3272727... (27 repeats forever after 0.3) 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	0.474747... (47 repeats forever)	**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	2.03333... (3 repeats forever after 2.0)	**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	0.582222... (2 repeats forever after 0.58)	**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**: 0.08888... (8 repeats forever after 0.0)
- **IRRATIONAL**: $\sqrt{3}$ = 1.732050807...

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

Accept any explanation that names the deciding feature from the rule box for the chosen item. For Part 2, accept explanations that correctly identify ending, repeating, or nonrepeating decimal behavior.