When Rates Flip

Each fraction shows successes out of attempts.

A1P.DSP.E.36 "Generate a two-way categorical table in order to find and evaluate solutions to real-world problems. a. Aggregate data from several groups to find an overall association between two categorical variables. b..."

NAME _____ DATE _____

REVERSES

One option has the higher success rate in each setting, but the other option has the higher rate when the data are combined.

Museum tours completed: Short tours, guide P 9/10 and guide Q 17/20; long tours, P 6/20 and Q 2/10. Combined, P 15/30 and Q 19/30.

HOLDS

The same option has the higher success rate in each setting and when the data are combined.

Chess puzzles solved: Beginner puzzles, method P 7/10 and method Q 4/10; expert puzzles, P 6/10 and Q 3/10. Combined, P 13/20 and Q 7/20.

1 SORT

8 items

For each item, circle REVERSES or HOLDS; for PROVE IT, pick two items and explain each choice using the rates in both settings and the combined rates.

1.	Tutoring quizzes passed: New students, A 16/20 and B 9/10; returning students, A 1/10 and B 4/20.	REVERSES HOLDS
2.	Seeds sprouted: Sunny spots, A 9/10 and B 16/20; shady spots, A 4/20 and B 1/10.	REVERSES HOLDS
3.	Cafeteria orders correct: Lunch, A 8/10 and B 6/10; dinner, A 4/10 and B 2/10.	REVERSES HOLDS
4.	Flights on time: Clear days, A 27/30 and B 10/10; stormy days, A 1/10 and B 6/30.	REVERSES HOLDS
5.	Bike helmets passed inspection: Small, A 7/10 and B 5/10; large, A 9/10 and B 8/10.	REVERSES HOLDS
6.	Packages delivered on time: Downtown, A 4/10 and B 6/10; outskirts, A 2/10 and B 5/10.	REVERSES HOLDS
7.	Orders packed correctly: Easy orders, A 8/10 and B 14/20; hard orders, A 4/20 and B 1/10.	REVERSES HOLDS
8.	Water samples passed a test: Tap, A 9/10 and B 7/10; well, A 6/10 and B 4/10.	REVERSES HOLDS

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 real-world example of REVERSES and one of HOLDS, each with two settings, four success fractions, and both combined fractions.

REVERSES

HOLDS

CHALLENGE

Make a new example where A has a higher success rate in each setting but B has a higher combined rate, then explain why the result flips.

ANSWER KEY # When Rates Flip

HIGH SCHOOL · A1P.DSP.E.36

PART 1 · SORT

#	ITEM	CATEGORY	WHY
1	Tutoring quizzes passed: New students, A 16/20 and B 9/10; returning students, A 1/10 and B 4/20.	**REVERSES**	B leads in both settings, 90% to 80% and 20% to 10%, but A leads overall, 17/30 to 13/30.
2	Seeds sprouted: Sunny spots, A 9/10 and B 16/20; shady spots, A 4/20 and B 1/10.	**REVERSES**	A leads in both settings, 90% to 80% and 20% to 10%, but B leads overall, 17/30 to 13/30.
3	Cafeteria orders correct: Lunch, A 8/10 and B 6/10; dinner, A 4/10 and B 2/10.	**HOLDS**	A leads at lunch and dinner and overall, 12/20 to 8/20.
4	Flights on time: Clear days, A 27/30 and B 10/10; stormy days, A 1/10 and B 6/30.	**REVERSES**	B leads on both kinds of days, 100% to 90% and 20% to 10%, but A leads overall, 28/40 to 16/40.
5	Bike helmets passed inspection: Small, A 7/10 and B 5/10; large, A 9/10 and B 8/10.	**HOLDS**	A leads for both sizes and overall, 16/20 to 13/20.
6	Packages delivered on time: Downtown, A 4/10 and B 6/10; outskirts, A 2/10 and B 5/10.	**HOLDS**	B leads in both areas and overall, 11/20 to 6/20.
7	Orders packed correctly: Easy orders, A 8/10 and B 14/20; hard orders, A 4/20 and B 1/10.	**REVERSES**	A leads for both kinds of orders, 80% to 70% and 20% to 10%, but B leads overall, 15/30 to 12/30.
8	Water samples passed a test: Tap, A 9/10 and B 7/10; well, A 6/10 and B 4/10.	**HOLDS**	A leads for both water sources and overall, 15/20 to 11/20.

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)

- **REVERSES**: Recycling sorted correctly: Simple loads, A 8/10 and B 15/20; mixed loads, A 3/20 and B 1/10. Combined, A 11/30 and B 16/30.
- **HOLDS**: Study questions answered correctly: Quiet rooms, A 9/10 and B 8/10; noisy rooms, A 2/10 and B 1/10. Combined, A 11/20 and B 9/20.

Challenge: Climbing routes completed: Easy routes, A 9/10 and B 16/20; hard routes, A 4/20 and B 1/10. Combined, A 13/30 and B 17/30. A leads on both kinds of routes, but B attempts more easy routes, where both options have higher success rates.

Students must compare rates, not just numbers of successes. For PROVE IT, accept any two items with correct comparisons for both settings and the combined data.