When Rates Flip

A third variable can change which choice leads overall.

8A.DSP.D.40.b "Recognize and explore situations where the association between two categorical variables is reversed when a third variable is considered (Simpson's Paradox)."

NAME _____ DATE _____

FLIPS OVERALL

The same choice has the higher success rate in both groups, but the other choice has the higher rate when the groups are combined. Add the successes and attempts for each choice to check the overall rates.

Lanterns that light, dusk: Copper 4/4, Silver 7/8; dawn: Copper 3/8, Silver 1/4. Copper leads in both groups, but Silver leads overall, 8/12 to 7/12.

STAYS THE SAME

The same choice has the higher success rate in both groups and still has the higher rate when the groups are combined.

Marbles found, sand: Jade 3/4, Pearl 2/4; gravel: Jade 6/8, Pearl 5/8. Jade leads in both groups and overall, 9/12 to 7/12.

1 SORT

8 items

For Part 1, circle FLIPS or STAYS for each numbered case, where each fraction shows successes out of attempts; for Part 2, pick one case from each category and explain your choices using the group rates and combined rates.

1.	Poster tests, quick: A 4/5, B 7/10; detailed: A 3/10, B 1/5.	FLIPS STAYS
2.	Puzzle solves, easy: Red 4/5, Blue 3/5; hard: Red 7/10, Blue 6/10.	FLIPS STAYS
3.	Plant sprouts, indoors: X 5/5, Y 8/10; outdoors: X 3/10, Y 1/5.	FLIPS STAYS
4.	Paper bridges that hold, light loads: A 8/10, B 5/5; heavy loads: A 1/5, B 3/10.	FLIPS STAYS
5.	Passes in a game, near: A 4/5, B 6/10; far: A 4/10, B 1/5.	FLIPS STAYS
6.	Shots made, practice: A 3/5, B 4/5; match: A 5/10, B 7/10.	FLIPS STAYS
7.	Packages delivered on time, local: A 5/5, B 9/10; distant: A 3/10, B 1/5.	FLIPS STAYS
8.	Code tasks finished, basic: A 9/10, B 5/5; complex: A 1/5, B 4/10.	FLIPS STAYS

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

For Part 3, write one new FLIPS example and one new STAYS example; give successes out of attempts for two choices in each of two groups.

FLIPS _____

STAYS _____

CHALLENGE

If A and B have the same number of attempts within each group, can A lead in both groups but B lead overall? Explain.

ANSWER KEY

When Rates Flip

GRADE 8 · 8A.DSP.D.40.b

PART 1 · SORT

#	ITEM	CATEGORY	WHY
1	Poster tests, quick: A 4/5, B 7/10; detailed: A 3/10, B 1/5.	**FLIPS**	A leads in each group, but combined rates are A 7/15 and B 8/15.
2	Puzzle solves, easy: Red 4/5, Blue 3/5; hard: Red 7/10, Blue 6/10.	**STAYS**	Red leads in each group and overall, 11/15 to 9/15.
3	Plant sprouts, indoors: X 5/5, Y 8/10; outdoors: X 3/10, Y 1/5.	**FLIPS**	X leads in each group, but combined rates are X 8/15 and Y 9/15.
4	Paper bridges that hold, light loads: A 8/10, B 5/5; heavy loads: A 1/5, B 3/10.	**FLIPS**	B leads in each group, but combined rates are A 9/15 and B 8/15.
5	Passes in a game, near: A 4/5, B 6/10; far: A 4/10, B 1/5.	**STAYS**	A leads in each group and overall, 8/15 to 7/15.
6	Shots made, practice: A 3/5, B 4/5; match: A 5/10, B 7/10.	**STAYS**	B leads in each group and overall, 11/15 to 8/15.
7	Packages delivered on time, local: A 5/5, B 9/10; distant: A 3/10, B 1/5.	**FLIPS**	A leads in each group, but combined rates are A 8/15 and B 10/15.
8	Code tasks finished, basic: A 9/10, B 5/5; complex: A 1/5, B 4/10.	**FLIPS**	B leads in each group, but combined rates are A 10/15 and B 9/15.

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)

- **FLIPS**: Cookie batches, small: A 4/4, B 7/8; large: A 3/8, B 1/4. A leads in both groups, but B leads overall, 8/12 to 7/12.
- **STAYS**: Model boats that float, shallow: A 3/4, B 2/4; deep: A 5/8, B 4/8. A leads in both groups and overall, 8/12 to 6/12.

Challenge: No. With the same number of attempts within each group, A must have more successes than B in each group. Adding the groups gives A more successes out of the same total number of attempts.

For Part 2, look for an explanation that compares both group rates and the combined rates. The examples in Part 3 may vary, but each must have one choice leading in both groups.