Which Denominator?

Sort frequencies, explain your choices, and build a two-way table.

S.DA.4.1 "Create two-way tables for bivariate categorical data and analyze for possible associations between the two categories using marginal, joint, and conditional frequencies."

NAME _____ DATE _____

JOINT RELATIVE FREQUENCY

A joint relative frequency describes cases with two traits at once. Its denominator counts everyone or everything in the data set.

Of all 80 lanterns, 12 are red and battery powered: 12/80.

CONDITIONAL RELATIVE FREQUENCY

A conditional relative frequency describes cases within a chosen group. Its denominator counts only the cases in that group.

Among 30 hikers carrying maps, 9 packed a flashlight: 9/30.

1 SORT

8 items

For each statement, circle JOINT or CONDITIONAL based on what its denominator counts.

1.	Of all 50 students, 8 play soccer and sing in choir: 8/50.	JOINT CONDITIONAL
2.	Of all 40 pets, 6 are cats with blue collars: 6/40.	JOINT CONDITIONAL
3.	Among 20 people who bike to work, 5 bring lunch: 5/20.	JOINT CONDITIONAL
4.	Of all 60 orders, 15 include soup and bread: 15/60.	JOINT CONDITIONAL
5.	Among 32 homes with solar panels, 12 have a garden: 12/32.	JOINT CONDITIONAL
6.	Of the 18 swimmers, 6 take morning lessons: 6/18.	JOINT CONDITIONAL
7.	Of all 90 books, 24 are mysteries in paperback: 24/90.	JOINT CONDITIONAL
8.	Of all 72 tickets, 9 are for Friday and cost less than $10: 9/72.	JOINT CONDITIONAL

2 PROVE IT

Explain your thinking

Pick one item from each category and explain how its denominator helped you decide.

ITEM # _____ **HOW I KNEW** _____

ITEM # _____ **HOW I KNEW** _____

3 MAKE YOUR OWN

One of each

Write one new fraction example for each category, stating what the numerator and denominator count.

JOINT _____

CONDITIONAL _____

CHALLENGE

A school asked 40 students whether they take art and whether they play a sport. Eight do both, 12 take only art, 6 play only a sport, and 14 do neither. Create a two-way table with marginal totals (row and column totals). Then compare the conditional frequencies of playing a sport for students who take art and students who do not. Do the data suggest a possible association?

ANSWER KEY # Which Denominator?

PART 1 · SORT

#	ITEM	CATEGORY	WHY
1	Of all 50 students, 8 play soccer and sing in choir: 8/50.	**JOINT**	The denominator counts all 50 students.
2	Of all 40 pets, 6 are cats with blue collars: 6/40.	**JOINT**	The denominator counts all 40 pets.
3	Among 20 people who bike to work, 5 bring lunch: 5/20.	**CONDITIONAL**	The denominator counts only people who bike to work.
4	Of all 60 orders, 15 include soup and bread: 15/60.	**JOINT**	The denominator counts all 60 orders.
5	Among 32 homes with solar panels, 12 have a garden: 12/32.	**CONDITIONAL**	The denominator counts only homes with solar panels.
6	Of the 18 swimmers, 6 take morning lessons: 6/18.	**CONDITIONAL**	The denominator counts only swimmers.
7	Of all 90 books, 24 are mysteries in paperback: 24/90.	**JOINT**	The denominator counts all 90 books.
8	Of all 72 tickets, 9 are for Friday and cost less than $10: 9/72.	**JOINT**	The denominator counts all 72 tickets.

PART 2 · PROVE IT

Task: Pick one item from each category and explain how its denominator helped you decide.
Accept any explanation that names the deciding feature from the rule box for the chosen item.

PART 3 · MAKE YOUR OWN (SAMPLE ANSWERS)

- **JOINT**: Of all 40 campers, 6 have a tent and a backpack: 6/40. The numerator counts campers with both items, and the denominator counts all campers.
- **CONDITIONAL**: Among 15 campers with tents, 6 have backpacks: 6/15. The numerator counts campers with both items, and the denominator counts campers with tents.

Challenge: Table entries: art and sport 8, art and no sport 12, no art and sport 6, neither 14. Marginal totals: art 20, no art 20, sport 14, no sport 26, overall 40. The conditional frequencies are 8/20 = 40% for students who take art and 6/20 = 30% for students who do not. The difference suggests a possible association.

For PROVE IT, item 1 is joint because 50 counts all students; item 3 is conditional because 20 counts only people who bike to work. In the challenge, the association is possible, not proven by the difference in conditional frequencies.