LESSON MAKER PRO

Does B Matter?

Compare probabilities to test independence.

HIGH SCHOOL · S.P.2.3

S.P.2.3 "Interpret independence of A and B as saying that the conditional probability of A, given B, is the same as the probability of A."

NAME _____ **DATE** _____

THE BIG IDEA

P(A | B) is the chance of A among the outcomes where B happens. When P(B) is greater than 0, A and B are independent if P(A | B) = P(A).

WORKED EXAMPLE

Of 55 students, 22 chose a playlist, 25 brought headphones, and 10 did both. Let A mean choosing a playlist and B mean bringing headphones. Are A and B independent?

1. Find P(A | B) = 10/25 = 2/5.
2. Find P(A) = 22/55 = 2/5.
3. Compare: 2/5 = 2/5.

Answer: Yes, A and B are independent.

PRACTICE 6 problems

1 P(A) = 1/3 and P(A | B) = 1/3. Are A and B independent?

ANSWER _____

2 P(A) = 3/8 and P(A | B) = 1/2. Are A and B independent?

ANSWER _____

3 A and B are independent, P(A) = 3/7, and P(B) is greater than 0. Find P(A | B).

ANSWER _____

4 The table shows counts for events A and B. Find P(A | B) and P(A). Are A and B independent?

COUNTS BY EVENT

	A	Not A	Total
B	4	12	16
Not B	8	8	16
Total	12	20	32

ANSWER _____

5 Of 28 students, 7 did A and 16 did B. If A and B are independent, how many did both?

ANSWER _____

6 P(A) = 3/4, P(B) = 3/8, and P(A and B) = 9/32. Find P(A | B). Are A and B independent?

ANSWER _____

APPLY IT Show your work

1 A school poll asked students whether they follow a band and whether they went to its live show. Let A mean going to the show and B mean following the band. Use the table to decide whether A and B are independent. Show both probabilities you compare.

BAND POLL

	Went to show	Did not go	Total
Follows band	3	6	9
Does not follow	9	18	27
Total	12	24	36

ANSWER _____

2 Students reported whether they use a video-editing app and whether they post videos. Let A mean using the app and B mean posting videos. Use the table to decide whether A and B are independent. Show both probabilities you compare.

VIDEO POLL

	Uses app	Does not use app	Total
Posts videos	8	8	16
Does not post	4	28	32
Total	12	36	48

ANSWER _____

CHALLENGE One step up

In a poll of 72 students, 24 belong to a club and 27 play a school sport. Let A mean belonging to the club and B mean playing a sport. How many students would do both if A and B were independent? If 12 students actually do both, are A and B independent? Explain using P(A | B) and P(A).

WORK SPACE AND ANSWER

Does B Matter?

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	P(A) = 1/3 and P(A | B) = 1/3. Are A and B independent?	**Yes.**
2	P(A) = 3/8 and P(A | B) = 1/2. Are A and B independent?	**No.**
3	A and B are independent, P(A) = 3/7, and P(B) is greater than 0. Find P(A | B).	**3/7**
4	The table shows counts for events A and B. Find P(A | B) and P(A). Are A and B independent?	**P(A | B) = 1/4 and P(A) = 3/8. No, they are not independent.**
5	Of 28 students, 7 did A and 16 did B. If A and B are independent, how many did both?	**4 students**
6	P(A) = 3/4, P(B) = 3/8, and P(A and B) = 9/32. Find P(A | B). Are A and B independent?	**P(A | B) = 3/4. Yes, they are independent.**

PART 2 · APPLY IT

1. **P(A | B) = 3/9 = 1/3 and P(A) = 12/36 = 1/3. The events are independent.** Use the follows-band row for P(A | B) and the total row for P(A). The probabilities are equal.
2. **P(A | B) = 8/16 = 1/2 and P(A) = 12/48 = 1/4. The events are not independent.** Compare the app users among students who post videos with the app users among all students. The probabilities differ.

CHALLENGE

If independent, 9 would do both because P(A) = 24/72 = 1/3 and 1/3 of 27 is 9. If 12 do both, P(A | B) = 12/27 = 4/9, which differs from P(A) = 1/3, so the events are not independent.

Accept equivalent fractions and any clear comparison of P(A | B) with P(A). For problem 5, 7/28 = 1/4, so 1/4 of the 16 students who did B is 4.