LESSON MAKER PRO

Chance or Connection?

Use two-way tables to test whether events are independent.

HIGH SCHOOL · A1P.DSP.F.38

A1P.DSP.F.38 "Explain whether two events, A and B, are independent, using two-way tables or tree diagrams."

NAME _____ DATE _____

THE INDEPENDENCE TEST

Events A and B are independent when knowing that A happened does not change the chance of B. Use the table to compare P(B|A) with P(B). If the probabilities are equal, the events are independent.

WORKED EXAMPLE

Let A = walks to school and B = buys a snack. Are A and B independent?

SCHOOL TRAVEL AND SNACKS

	Buys a snack	Does not buy a snack	Total
Walks to school	28	42	70
Does not walk	56	84	140
Total	84	126	210

1. Among students who walk, P(B|A) = 28/70 = 2/5.
2. Among all students, P(B) = 84/210 = 2/5.
3. The probabilities are equal.

Answer: Yes. A and B are independent because P(B|A) = P(B) = 2/5.

PRACTICE 6 problems

1 Let A = plays a sport and B = streams music. Are A and B independent? Compare P(B|A) with P(B).

SPORTS AND MUSIC

	Streams music	Does not stream music	Total
Plays a sport	6	6	12
Does not play a sport	4	4	8
Total	10	10	20

ANSWER _____

2 Let A = has a job and B = takes the bus. Are A and B independent? Compare P(B|A) with P(B).

JOBS AND BUS RIDES

	Takes the bus	Does not take the bus	Total
Has a job	9	3	12
Does not have a job	3	9	12
Total	12	12	24

ANSWER _____

3 Let A = uses a reusable bottle and B = bikes to school. Are A and B independent? Show a probability comparison.

BOTTLES AND BIKES

	Bikes to school	Does not bike	Total
Uses a reusable bottle	2	8	10
Does not use one	3	12	15
Total	5	20	25

ANSWER _____

4 Let A = plays an instrument and B = attended a concert. Are A and B independent? Compare P(B|A) with P(B).

INSTRUMENTS AND CONCERTS

	Attended	Did not attend	Total
Plays an instrument	5	5	10
Does not play one	4	6	10
Total	9	11	20

ANSWER _____

5 Let A = uses a transit app and B = travels by train. Are A and B independent? Compare P(A|B) with P(A).

TRANSIT APPS AND TRAINS

	Travels by train	Does not travel by train	Total
Uses a transit app	12	18	30
Does not use one	8	12	20
Total	20	30	50

ANSWER _____

6 Let A = joins the art club and B = owns a sketchbook. Are A and B independent? Compare the chance of B for students in each row.

ART CLUB AND SKETCHBOOKS

	Owns a sketchbook	Does not own one	Total
Joins the art club	7	13	20
Does not join	14	6	20
Total	21	19	40

ANSWER _____

APPLY IT Show your work

1 A student council surveys people at a school festival. Let A = bought a ticket online and B = visited the music stage. Does buying a ticket online appear independent of visiting the music stage? Use the table to explain.

FESTIVAL TICKETS AND MUSIC STAGE

	Visited music stage	Did not visit	Total
Bought online	12	8	20
Did not buy online	18	12	30
Total	30	20	50

ANSWER _____

2 A student-run pop-up shop tracks who saw its social media post. Let A = saw the post and B = bought an item. Are A and B independent? Use the table to explain.

POP-UP SHOP

	Bought an item	Did not buy	Total
Saw the post	15	5	20
Did not see the post	10	20	30
Total	25	25	50

ANSWER _____

CHALLENGE One step up

Let A = is a club member and B = attended the game. What value of x makes A and B independent? Explain by comparing the fraction who attended in each row.

CLUB MEMBERS AT A GAME

	Attended	Did not attend
Club member	12	8
Not a member	9	x

WORK SPACE AND ANSWER

Chance or Connection?

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Let A = plays a sport and B = streams music. Are A and B independent? Compare P(B|A) with P(B).	**Yes. P(B|A) = 6/12 = 1/2 and P(B) = 10/20 = 1/2.**
2	Let A = has a job and B = takes the bus. Are A and B independent? Compare P(B|A) with P(B).	**No. P(B|A) = 9/12 = 3/4, but P(B) = 12/24 = 1/2.**
3	Let A = uses a reusable bottle and B = bikes to school. Are A and B independent? Show a probability comparison.	**Yes. P(B|A) = 2/10 = 1/5 and P(B) = 5/25 = 1/5.**
4	Let A = plays an instrument and B = attended a concert. Are A and B independent? Compare P(B|A) with P(B).	**No. P(B|A) = 5/10 = 1/2, but P(B) = 9/20.**
5	Let A = uses a transit app and B = travels by train. Are A and B independent? Compare P(A|B) with P(A).	**Yes. P(A|B) = 12/20 = 3/5 and P(A) = 30/50 = 3/5.**
6	Let A = joins the art club and B = owns a sketchbook. Are A and B independent? Compare the chance of B for students in each row.	**No. P(B|A) = 7/20, while P(B|not A) = 14/20.**

PART 2 · APPLY IT

1. **Yes. P(B|A) = 12/20 = 3/5 and P(B) = 30/50 = 3/5.** Find the fraction of online buyers who visited the music stage, then compare it with the fraction of all surveyed people who visited. The fractions are equal.
2. **No. P(B|A) = 15/20 = 3/4, but P(B) = 25/50 = 1/2.** Compare the fraction who bought an item among those who saw the post with the fraction who bought an item overall. The fractions differ.

CHALLENGE

x = 6. The club-member attendance fraction is 12/20 = 3/5. When x = 6, the nonmember fraction is 9/15 = 3/5, so the events are independent.

Accept equivalent fractions and any correct probability comparison that supports the independence decision. In the challenge, comparing the attendance fractions for the two rows is sufficient.