LESSON MAKER PRO

Connected or Coincidence?

Test whether knowing one event changes the chance of another.

HIGH SCHOOL · MT.CORE.DATA.PROB.2.a

MT.CORE.DATA.PROB.2.a "Understand the concepts of conditional probability and independence in context. This standard should incorporate cultural context relating to Montana Indigenous Peoples and local communities by: Determining whether two events, A and B..."

NAME _____ DATE _____

THE INDEPENDENCE TEST

Events A and B are independent when P(B|A) = P(B), as long as P(A) is not zero. In a table, compare the share of B in row A with the share of B in the whole table.

WORKED EXAMPLE

One student is picked at random. Are joining robotics club (A) and riding the bus (B) independent?

STUDENTS

	Bus	No bus
Robotics	14	7
Not robotics	28	14

1. P(B|A) = 14/21 = 2/3.
2. P(B) = 42/63 = 2/3.
3. The probabilities match.

Answer: Yes. Robotics club membership and riding the bus are independent.

PRACTICE 4 problems

1 P(A) = 1/2, P(B) = 1/4, and P(A and B) = 1/8. Are A and B independent?

ANSWER _____

2 P(A) = 1/3, P(B) = 1/2, and P(A and B) = 1/3. Are A and B independent? Show your comparison.

ANSWER _____

3 A is joining a club, and B is biking to school. P(B|A) = 3/5 and P(B) = 3/5. Are A and B independent?

ANSWER _____

4 A is attending a game, and B is buying a snack after school. P(B|A) = 1/4 and P(B) = 1/2. Are A and B independent? What does the difference mean?

ANSWER _____

APPLY IT Show your work

1 A book is picked at random from a school display featuring Montana Indigenous authors. Are being poetry (A) and being student-recommended (B) independent? Explain.

BOOKS IN THE DISPLAY

	Recommended	Not recommended
Poetry	9	3
Other books	15	5

ANSWER _____

2 One player is picked at random at a Montana community center game night. Are wearing a team shirt (A) and choosing basketball (B) independent? Explain.

GAME NIGHT PLAYERS

	Basketball	Other game
Team shirt	5	5
No team shirt	15	25

ANSWER _____

CHALLENGE One step up

A student is picked at random from a volunteer list. What whole number x makes joining the mural team (A) and helping with setup (B) independent? Explain.

STUDENT VOLUNTEERS

	Setup	No setup
Mural team	4	8
Other volunteers	5	x

WORK SPACE AND ANSWER

ANSWER KEY

Connected or Coincidence?

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	P(A) = 1/2, P(B) = 1/4, and P(A and B) = 1/8. Are A and B independent?	**Yes. (1/2)(1/4) = 1/8.**
2	P(A) = 1/3, P(B) = 1/2, and P(A and B) = 1/3. Are A and B independent? Show your comparison.	**No. (1/3)(1/2) = 1/6, not 1/3.**
3	A is joining a club, and B is biking to school. P(B|A) = 3/5 and P(B) = 3/5. Are A and B independent?	**Yes. Both probabilities are 3/5.**
4	A is attending a game, and B is buying a snack after school. P(B|A) = 1/4 and P(B) = 1/2. Are A and B independent? What does the difference mean?	**No. Students attending the game are less likely to buy a snack after school than students overall.**

PART 2 · APPLY IT

1. **Yes. Being poetry and being student-recommended are independent.** P(B|A) = 9/12 = 3/4, and P(B) = 24/32 = 3/4.
2. **No. Wearing a team shirt and choosing basketball are not independent.** P(B|A) = 5/10 = 1/2, but P(B) = 20/50 = 2/5.

CHALLENGE

x = 10. Then P(B|A) = 4/12 = 1/3 and P(B) = 9/27 = 1/3.

Accept equivalent fractions or a correct comparison using P(A and B) = P(A)P(B). For the challenge, comparing setup rates for mural-team and other volunteers also works.