

Chance Connections

Use conditions to find probabilities and test independence.

HIGH SCHOOL • MA.912.DP.4.6

MA.912.DP.4.6 "Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations."

NAME _____

DATE _____

THE BIG IDEA

Conditional probability narrows the group to outcomes that meet a condition. Events are independent when knowing one happened does not change the chance of the other.

WORKED EXAMPLE

At a dance, 27 students wear sneakers. Of them, 9 carry a backpack. Find $P(\text{carries a backpack} \mid \text{wears sneakers})$.

1. Use the 27 students who wear sneakers as the total.
2. Of those students, 9 carry backpacks.
3. $P(\text{backpack} \mid \text{sneakers}) = 9/27 = 1/3$.

Answer: $1/3$

PRACTICE 5 problems

- 1** A jar has 14 black beads, 6 white beads, and 5 gold beads. Given that a bead is not gold, find $P(\text{black})$.

ANSWER _____

- 2** Of 32 students on a team, 20 attend Friday practice, and 8 of those also lift weights. Find $P(\text{lifts weights} \mid \text{attends Friday practice})$.

ANSWER _____

- 3** For events A and B, $P(A) = 4/7$, $P(B) = 5/8$, and $P(A \text{ and } B) = 5/14$. Are A and B independent?

ANSWER _____

- 4** A coin is flipped and a six-sided number cube is rolled. Are getting heads and rolling a 4 independent?

ANSWER _____

- 5** Among 46 students at a library workshop, 14 use a laptop and 8 of those also borrow a charger. Find $P(\text{borrows a charger} \mid \text{uses a laptop})$.

ANSWER _____

APPLY IT Show your work

- 1** At a concert, 50 students buy merchandise. Of these, 22 buy a hoodie, and 10 buy both a hoodie and a poster. Given that a student bought a hoodie, what is the probability that the student also bought a poster?

WORK SPACE

ANSWER _____

- 2** In a survey of 56 students, 14 have a part-time job, 16 play on a school team, and 4 do both. Are having a part-time job and playing on a school team independent?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A report gives $P(A) = 2/7$, $P(B) = 5/6$, and $P(A | B) = 2/7$. Are A and B independent? Explain in a sentence.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A jar has 14 black beads, 6 white beads, and 5 gold beads. Given that a bead is not gold, find $P(\text{black})$.	7/10
2	Of 32 students on a team, 20 attend Friday practice, and 8 of those also lift weights. Find $P(\text{lifts weights} \mid \text{attends Friday practice})$.	2/5
3	For events A and B, $P(A) = 4/7$, $P(B) = 5/8$, and $P(A \text{ and } B) = 5/14$. Are A and B independent?	Yes, independent.
4	A coin is flipped and a six-sided number cube is rolled. Are getting heads and rolling a 4 independent?	Yes, independent.
5	Among 46 students at a library workshop, 14 use a laptop and 8 of those also borrow a charger. Find $P(\text{borrows a charger} \mid \text{uses a laptop})$.	4/7

PART 2 • APPLY IT

- 5/11** Use the 22 hoodie buyers as the conditional total. The probability is $10/22$, which simplifies to $5/11$.
- Yes, independent.** $P(\text{job}) \times P(\text{team}) = (14/56)(16/56) = 4/56$. This equals $P(\text{job and team})$, so the events are independent.

CHALLENGE

Yes, they are independent because learning that B happened leaves the probability of A at 2/7.

Accept equivalent fractions. For independence, accept reasoning that compares a conditional probability to the original probability or compares $P(A \text{ and } B)$ to $P(A) \times P(B)$.