LESSON MAKER PRO

Probability Connection Check

Use conditional probability to test independence.

HIGH SCHOOL · MA.912.DP.4.4

MA.912.DP.4.4 "Interpret the independence of two events using conditional probability."

NAME _____ DATE _____

THE INDEPENDENCE TEST

To test whether events A and B are independent, compare P(A|B) with P(A). If they are equal, knowing that B happened does not change the chance of A, so the events are independent. You can also check whether P(A and B) = P(A)P(B).

WORKED EXAMPLE

At a school, 52 students are surveyed. Event A is "the student takes art," and 13 students take art. Event B is "the student rides the bus," and 28 students ride the bus. Of the bus riders, 7 take art. Are A and B independent?

1. Find the overall probability: P(A) = 13/52 = 1/4.
2. Find the conditional probability: P(A|B) = 7/28 = 1/4.
3. Since P(A|B) = P(A), the events are independent.

Answer: Yes, A and B are independent.

PRACTICE 6 problems

1 Events R and S have P(R) = 5/9 and P(R|S) = 5/9. Are R and S independent?

ANSWER _____

2 Events M and N have P(M) = 3/10 and P(M|N) = 6/10. Are M and N independent?

ANSWER _____

3 In a group of 40 students, 24 are in event A, 20 are in event B, and 12 are in both events. Are A and B independent?

ANSWER _____

4 Given P(X) = 5/12, P(Y) = 2/3, and P(X and Y) = 5/18, are X and Y independent?

ANSWER _____

5 If P(J) = 8/17 and events J and K are independent, find P(J|K).

ANSWER _____

6 A random song is marked explicit, E, with P(E) = 9/16. Among songs by artist G, P(E|G) = 3/8. Are E and G independent?

ANSWER _____

APPLY IT Show your work

1 An online music club has 60 members. Of the members, 25 create playlists, 24 post concert reviews, and 10 do both. Are the events "creates a playlist" and "posts a concert review" independent? Show the probabilities you compare.

WORK SPACE

ANSWER _____

2 At a media club, 90 students are surveyed. Of them, 36 share short videos, 45 use a photo-editing app, and 15 do both. Are the events "shares short videos" and "uses a photo-editing app" independent? Show the probabilities you compare.

WORK SPACE

ANSWER _____

CHALLENGE One step up

At esports tryouts, 80 students participate. Of them, 30 choose a strategy workshop, A, and 32 choose a team-communication workshop, B. Assume A and B are independent. How many students chose both workshops, and what is P(A|B)? Explain your reasoning.

WORK SPACE AND ANSWER

ANSWER KEY

Probability Connection Check

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Events R and S have P(R) = 5/9 and P(R|S) = 5/9. Are R and S independent?	**Yes, because P(R|S) = P(R).**
2	Events M and N have P(M) = 3/10 and P(M|N) = 6/10. Are M and N independent?	**No, because P(M|N) does not equal P(M).**
3	In a group of 40 students, 24 are in event A, 20 are in event B, and 12 are in both events. Are A and B independent?	**Yes. P(A) = 24/40 = 3/5 and P(A|B) = 12/20 = 3/5.**
4	Given P(X) = 5/12, P(Y) = 2/3, and P(X and Y) = 5/18, are X and Y independent?	**Yes, because P(X)P(Y) = (5/12)(2/3) = 5/18.**
5	If P(J) = 8/17 and events J and K are independent, find P(J|K).	**8/17**
6	A random song is marked explicit, E, with P(E) = 9/16. Among songs by artist G, P(E|G) = 3/8. Are E and G independent?	**No, because 3/8 does not equal 9/16.**

PART 2 · APPLY IT

1. **Yes.** P(playlist) = 25/60 = 5/12, and P(playlist|review) = 10/24 = 5/12. Compare the overall playlist probability with the playlist probability among members who post reviews. Both probabilities are 5/12, so the events are independent.
2. **No.** P(short videos) = 36/90 = 2/5, and P(short videos|photo app) = 15/45 = 1/3. The conditional probability of sharing short videos among photo-app users is 1/3. Since 1/3 is not equal to 2/5, the events are not independent.

CHALLENGE

12 students chose both workshops, and P(A|B) = 3/8 because independence makes P(A|B) equal to P(A).

Accept equivalent fractions and correct comparison statements. For independence, accept either P(A|B) = P(A) or P(A and B) = P(A)P(B) as valid reasoning.