LESSON MAKER PRO

Probability Pair Check

Use products to test whether two events are independent.

HIGH SCHOOL · MA.912.DP.4.2

MA.912.DP.4.2 "Determine if events A and B are independent by calculating the product of their probabilities."

NAME _____ DATE _____

TEST WITH A PRODUCT

Events A and B are independent when P(A and B) = P(A) × P(B). Multiply the probabilities of the two events, then compare the product to the given probability that both events happen. If the values match, the events are independent.

WORKED EXAMPLE

Determine whether events A and B are independent if P(A) = 2/7, P(B) = 3/8, and P(A and B) = 3/28.

1. Multiply: P(A) × P(B) = 2/7 × 3/8 = 6/56.
2. Simplify the product: 6/56 = 3/28.
3. Compare: P(A and B) = 3/28, which matches the product.

Answer: The events are independent.

PRACTICE 6 problems

1 Determine whether events A and B are independent if P(A) = 1/4, P(B) = 2/3, and P(A and B) = 1/6.

ANSWER _____

2 Determine whether events A and B are independent if P(A) = 5/6, P(B) = 3/5, and P(A and B) = 1/2.

ANSWER _____

3 Determine whether events A and B are independent if P(A) = 3/10, P(B) = 1/2, and P(A and B) = 1/10.

ANSWER _____

4 Determine whether events A and B are independent if P(A) = 2/5, P(B) = 1/4, and P(A and B) = 1/10.

ANSWER _____

5 Determine whether events A and B are independent if P(A) = 7/9, P(B) = 3/7, and P(A and B) = 1/3.

ANSWER _____

6 Determine whether events A and B are independent if P(A) = 4/5, P(B) = 1/3, and P(A and B) = 1/4.

ANSWER _____

APPLY IT Show your work

1 A music app chooses a song at random from a playlist. Let A be the event that the song is hip-hop, and let B be the event that the song has explicit lyrics. The app reports P(A) = 3/10, P(B) = 2/5, and P(A and B) = 3/25. Are A and B independent?

WORK SPACE

ANSWER _____

2 At a school, let A be the event that a randomly selected student plays a strategy video game, and let B be the event that the student joins the esports tournament. The school finds P(A) = 4/9, P(B) = 1/2, and P(A and B) = 1/3. Are A and B independent?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Events A and B have P(A) = 5/8 and P(B) = 4/9. What must P(A and B) equal for the events to be independent? A report states that P(A and B) = 7/24. Is the report consistent with independence? Explain.

WORK SPACE AND ANSWER

ANSWER KEY

Probability Pair Check

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Determine whether events A and B are independent if P(A) = 1/4, P(B) = 2/3, and P(A and B) = 1/6.	**Independent, because 1/4 × 2/3 = 1/6.**
2	Determine whether events A and B are independent if P(A) = 5/6, P(B) = 3/5, and P(A and B) = 1/2.	**Independent, because 5/6 × 3/5 = 1/2.**
3	Determine whether events A and B are independent if P(A) = 3/10, P(B) = 1/2, and P(A and B) = 1/10.	**Dependent, because 3/10 × 1/2 = 3/20, not 1/10.**
4	Determine whether events A and B are independent if P(A) = 2/5, P(B) = 1/4, and P(A and B) = 1/10.	**Independent, because 2/5 × 1/4 = 1/10.**
5	Determine whether events A and B are independent if P(A) = 7/9, P(B) = 3/7, and P(A and B) = 1/3.	**Independent, because 7/9 × 3/7 = 1/3.**
6	Determine whether events A and B are independent if P(A) = 4/5, P(B) = 1/3, and P(A and B) = 1/4.	**Dependent, because 4/5 × 1/3 = 4/15, not 1/4.**

PART 2 · APPLY IT

1. **Independent.** Calculate 3/10 × 2/5 = 6/50 = 3/25. This matches P(A and B), so the events are independent.
2. **Dependent.** Calculate 4/9 × 1/2 = 2/9. Since 2/9 does not equal 1/3, the events are dependent.

CHALLENGE

For independence, P(A and B) must equal 5/18 because 5/8 × 4/9 = 20/72 = 5/18. No, the report is not consistent with independence because 7/24 = 21/72, not 20/72.

Accept equivalent fraction forms and correct unsimplified products when they are accurately compared. Students should identify events as independent only when P(A and B) equals P(A) × P(B).