# If P(A)=35, P(B)=13, And P(AB)=18, Are A And B Independent?Select The Option That Provides Both The Correct

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## Introduction to Probability and Independence

Understanding the concepts of probability and independence is fundamental in statistics. When analyzing events within a probability space, one key question is whether two events are independent. Independence implies that the occurrence or non-occurrence of one event does not influence the probability of the other.

This article explores whether the events A and B are independent given the following probabilities:
- P(A) = 35
- P(B) = 13
- P(AB) = 18

At first glance, these values seem unusual because probability values are traditionally between 0 and 1. This suggests that the numbers provided might be in different units or are scaled differently. We will examine this carefully, interpret the data, and determine whether A and B are independent.

## Understanding the Given Data

### Interpreting the Probabilities

In classical probability theory:
- Probabilities are real numbers between 0 and 1 inclusive.
- P(A) represents the probability of event A occurring.
- P(B) represents the probability of event B occurring.
- P(AB) represents the probability that both A and B occur simultaneously.

Given:
- P(A) = 35
- P(B) = 13
- P(AB) = 18

These values exceed 1, which is not valid for probabilities expressed as decimal fractions.

Possible explanations include:
- The data is scaled or expressed in percentages, but without the percentage sign.
- The values are counts or frequencies rather than probabilities.
- The problem is hypothetical or contains a typo.

Assumption: If these are counts or frequencies, then the total sample space, denoted as N, must be known to convert counts into probabilities:
- P(A) = count of A / N
- P(B) = count of B / N
- P(AB) = count of both A and B / N

Without N, we cannot directly determine the probabilities.

Alternatively, if we interpret these as probabilities scaled by 100, then:
- P(A) = 35/100 = 0.35
- P(B) = 13/100 = 0.13
- P(AB) = 18/100 = 0.18

This makes sense as probabilities between 0 and 1. We'll proceed with this assumption for clarity and further analysis.

# Calculating and Testing for Independence

## Definition of Independence

Two events A and B are independent if and only if:
\[ P(AB) = P(A) \times P(B) \]

This means the joint probability equals the product of individual probabilities.

In our case:
- P(A) = 0.35
- P(B) = 0.13
- P(AB) = 0.18

To test independence:
\[ \text{If } P(AB) = P(A) \times P(B), \text{ then A and B are independent} \]
- Else, they are dependent.

## Calculating the Product of P(A) and P(B)

Compute:
\[ P(A) \times P(B) = 0.35 \times 0.13 = 0.0455 \]

Compare this to P(AB):
\[ P(AB) = 0.18 \]

Since:
\[ 0.18 \neq 0.0455 \]

we see that:
\[ P(AB) \neq P(A) \times P(B) \]

Thus, A and B are not independent based on this data.

## Conclusion on Independence

Given the calculations:
- The joint probability (0.18) is significantly higher than the product of individual probabilities (0.0455).
- This indicates a positive association or dependence between A and B.

Therefore, A and B are not independent under this interpretation.

## Additional Considerations and Validity Checks

### Are the Assumptions Valid?

Our key assumption was interpreting the given numbers as percentages scaled by 100. If, instead, these were raw counts, then the total sample size N would be needed to convert to probabilities, which isn't provided.

Implication:
- Without total N, we cannot definitively compute probabilities.
- If the data is about counts, and N is known, the same logic applies:
$$ P(A) = \frac{\text{count of A}}{N} $$
- The independence test remains the same once probabilities are established.

### Implications of the Data Scale

- If the data is in counts, the interpretation of independence depends on the total N.
- The key point is the comparison of $P(AB)$ with $P(A) \times P(B)$. The actual values matter more than the units.

## Summary of Findings

- Assumption: Probabilities are 0.35, 0.13, and 0.18 based on scaling.
- The joint probability (0.18) is not equal to the product of individual probabilities (0.0455).
- Therefore, A and B are not independent based on the provided data.

## Choosing the Correct Option

Suppose the question provides options like:
1. A and B are independent.
2. A and B are dependent.
3. Cannot determine without additional information.

Based on our analysis:
- The correct choice is that A and B are dependent.

## Final Remarks

Understanding whether two events are independent is vital for probability modeling and inference. The key step involves comparing the joint probability with the product of individual probabilities. When the values differ, as in this case, it indicates dependence.

In real-world applications, ensure that probabilities are within the [0,1] range, and interpret data carefully, considering whether numbers are counts, percentages, or probabilities.

In conclusion:
- Given the plausible assumption that $P(A)=0.35$, $P(B)=0.13$, and $P(AB)=0.18$,
- A and B are not independent because $P(AB) \neq P(A) \times P(B)$.

Understanding these principles helps clarify the relationships between events and informs decision-making in probabilistic contexts.

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Note: Always verify data units and context before applying probability formulas to avoid misinterpretations.

## Frequently Asked Questions

### Given P(A) = 0.35, P(B) = 0.13, and P(AB) = 0.18, are events A and B independent?

No, A and B are not independent because $P(AB) \neq P(A)\ P(B)$.

### How do you determine if two events are independent using their probabilities?

Two events are independent if $P(AB) = P(A)\ P(B)$.

### Calculate P(A) P(B) with P(A) = 0.35 and P(B) = 0.13. Is it equal to P(AB)?

$P(A)\ P(B) = 0.35\ 0.13 = 0.0455$. Since $P(AB) = 0.18$, they are not equal, so A and B are not independent.

### What does it mean if P(AB) is greater than P(A) P(B)?

It suggests that A and B are positively dependent, meaning they are more likely to occur together than if they were independent.

### Are the probabilities P(A) = 0.35, P(B) = 0.13, and P(AB) = 0.18 consistent with independence?

No, because $P(AB)$ (0.18) $\neq$ $P(A)\ P(B)$ (0.0455), so the events are not independent.

### If given P(A) = 0.35, P(B) = 0.13, and P(AB) = 0.0455, would A and B be independent?

Yes, because P(AB) equals P(A) P(B).

### Why is the value P(AB) = 0.18 significant in determining independence?

Because it differs from the product P(A) P(B), indicating that A and B are dependent.

### What is the correct conclusion about A and B's independence based on P(AB) = 0.18?

A and B are not independent since P(AB) does not equal P(A) P(B).

### Select the option that correctly states whether A and B are independent given the probabilities.

They are not independent because P(AB) ≠ P(A) P(B).

## Additional Resources

If P(A)=35, P(B)=13, And P(AB)=18, Are A And B Independent? Select The Option That Provides Both The Correct

In the realm of probability theory, understanding the relationship between two events—namely whether they are independent or dependent—is fundamental. Given the probabilities P(A)=35, P(B)=13, and P(AB)=18, many might wonder: are events A and B independent? This question is not just academic; it has practical implications across fields like statistics, data science, and decision-making processes. To answer it thoroughly, we need to explore the concepts of probability, independence, and how to interpret these specific values.

In this article, we will dissect what these probabilities imply, walk through the criteria for independence, and clarify the correct interpretation based on the provided data. By the end, readers will have a clear understanding of whether events A and B are independent and the reasoning behind that conclusion.

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Understanding Basic Probability: Clarifying the Given Data

Before analyzing the independence of events A and B, it’s crucial to interpret the given probabilities properly.

The Numerical Values and Their Context

- P(A) = 35
- P(B) = 13
- P(AB) = 18

Typically, probabilities are expressed as values between 0 and 1, representing the likelihood of an event occurring. However, in the data provided, the probabilities are given as whole numbers exceeding 1, suggesting these are likely percentage values.

Assumption: The probabilities are percentages, meaning:

- P(A) = 35% = 0.35
- P(B) = 13% = 0.13
- P(AB) = 18% = 0.18

This interpretation aligns with standard probability notation and makes sense in the context of the question.

Validity of Probabilities

- Probabilities must be between 0 and 1.
- The provided values (35, 13, 18) as percentages are valid, since they fall within 0-100%.

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Defining Independence in Probability

What Does It Mean for Two Events to Be Independent?

Two events A and B are independent if the occurrence of one does not affect the probability of the other. Formally:

$$
\text{Events A and B are independent} \iff P(AB) = P(A) \times P(B)
$$

This means that if knowing whether A occurred doesn't change the likelihood of B, then their joint probability equals the product of their individual probabilities.

Applying the Independence Criterion

Using the assumption that probabilities are in decimal form:

$$
P(A) = 0.35, \quad P(B) = 0.13, \quad P(AB) = 0.18
$$

Calculate the product:

$$
P(A) \times P(B) = 0.35 \times 0.13 = 0.0455
$$

Compare this to the joint probability:

$$
P(AB) = 0.18
$$

Since:

$$
0.18 \neq 0.0455
$$

we can immediately infer that A and B are not independent — because the joint probability does not equal the product of the individual probabilities.

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Detailed Analysis: Is There Any Ambiguity?

While the initial calculation suggests dependence, it’s essential to consider potential sources of confusion or misinterpretation.

Could the Data Be Misread?

- If the probabilities are given as raw counts or frequencies rather than percentages, the analysis would differ.
- If the total sample space is not specified, the percentages might not be directly comparable.

However, given the standard practice in probability calculations, the percentage interpretation is the most plausible.

Rechecking the Calculations

- Under the assumption of percentages, the product is 0.0455, but the joint probability is 0.18.
- Since 0.18 > 0.0455, the joint probability exceeds what would be expected if the events were independent, indicating dependence.

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Implications of the Results

Dependence or Independence?

Based on the calculation:

- Events A and B are dependent because:

$$
P(AB) \neq P(A) \times P(B)
$$

- The joint probability is significantly higher than the product of individual probabilities, indicating some form of positive dependence—meaning the occurrence of one event increases the likelihood of the other.

Real-World Interpretation

In practical scenarios, this could mean:

- The occurrence of event A makes event B more likely.
- For instance, if these were events related to health outcomes, such as "having symptom A" and "having disease B," a high joint probability might suggest a correlation.

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Selecting the Correct Option: Both the Reasoning and the Conclusion

Suppose the question provides multiple-choice options regarding the independence of A and B, with some options claiming they are independent, others claiming dependence. Based on our analysis:

- The correct choice is the one asserting that A and B are dependent.

Note: If the options include a statement like "A and B are independent because $P(AB) = P(A) \times P(B)$," that is incorrect given the calculations. The correct reasoning is that since $P(AB) \neq P(A) \times P(B)$, the events are not independent.

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Additional Considerations: How to Confirm Independence Practically

In real-world data analysis, confirming independence involves:

- Statistical tests: such as Chi-square tests for independence.
- Data collection: ensuring data is representative and free from bias.
- Calculating expected frequencies: and comparing with observed frequencies.

These methods complement theoretical calculations and provide empirical validation.

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Summary: Final Verdict on Independence

Given the probability values:

- $P(A) = 0.35$
- $P(B) = 0.13$
- $P(AB) = 0.18$

and the independence criterion:

$$
P(AB) \stackrel{?}{=} P(A) \times P(B)
$$

we find:

$$
0.18 \neq 0.0455
$$

which confirms that A and B are dependent events. The joint probability is higher than expected under independence, indicating some positive correlation between the two events.

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Conclusion

In the intricate world of probability, understanding the relationship between two events hinges on precise calculations and clear interpretations. The case with P(A)=35, P(B)=13, and P(AB)=18 demonstrates that, despite initial assumptions, the events are dependent because their joint probability exceeds what would be anticipated if they were independent.

This analysis underscores the importance of carefully interpreting probability data, applying the fundamental independence criterion, and recognizing how such concepts influence broader decision-making and statistical analysis. Whether in academic research, data-driven industries, or everyday reasoning, grasping the nuances of event relationships is essential for accurate conclusions.

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In summary:
- Are A and B independent? No.
- Why? Because $P(AB) \neq P(A) \times P(B)$.
- Correct choice: The one indicating dependence based on the given probabilities.

Understanding these principles equips analysts, statisticians, and decision-makers to interpret data correctly and make informed conclusions about the interconnectedness of events in their respective domains.

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