LESSON MAKER PRO

Probability Overlap Check

Add probabilities carefully, then account for any overlap.

HIGH SCHOOL · MA.912.DP.4.7

MA.912.DP.4.7 "Apply the addition rule for probability, taking into consideration whether the events are mutually exclusive, and interpret the result in terms of the model and its context."

NAME _____ DATE _____

THE ADDITION RULE

For events A and B, "A or B" includes outcomes in A, in B, or in both. If the events are mutually exclusive, add P(A) + P(B). If they can overlap, use P(A or B) = P(A) + P(B) - P(A and B).

WORKED EXAMPLE

Events M and N are mutually exclusive. P(M) = 13/29 and P(N) = 8/29. Find P(M or N).

1. M and N cannot occur together, so add the probabilities.
2. P(M or N) = 13/29 + 8/29.
3. P(M or N) = 21/29.

Answer: 21/29

PRACTICE 6 problems

1 Events A and B are mutually exclusive. P(A) = 5/12 and P(B) = 1/10. Find P(A or B).

ANSWER _____

2 Events C and D are mutually exclusive. P(C) = 2/9 and P(D) = 5/18. Find P(C or D).

ANSWER _____

3 P(E) = 7/15, P(F) = 4/15, and P(E and F) = 2/15. Find P(E or F).

ANSWER _____

4 A card is drawn from a standard deck. Find P(heart or spade). State whether the events are mutually exclusive.

ANSWER _____

5 P(R) = 3/10, P(S) = 1/2, and P(R and S) = 1/10. Find P(R or S).

ANSWER _____

6 Events C and D are mutually exclusive. P(C) = 9/14 and P(D) = 5/14. Find P(C or D), then interpret the result.

ANSWER _____

APPLY IT Show your work

1 At a school activities fair, 30 students are surveyed. Fourteen follow the school basketball account, 11 follow the robotics account, and 5 follow both accounts. A student is chosen at random from the survey. What is the probability that the student follows the basketball account or the robotics account? Are the events mutually exclusive? Interpret the probability.

WORK SPACE

ANSWER _____

2 A streaming club posts 36 video clips. Fifteen clips feature a game-winning play, 12 feature a player interview, and 4 feature both. One clip is selected at random. What is the probability that it features a game-winning play or a player interview? Interpret the probability.

WORK SPACE

ANSWER _____

CHALLENGE One step up

In a survey of 80 students, 45 have a part-time job, 38 play a school sport, and 12 do neither. One student is chosen at random. Find P(job or sport) and P(job and sport). Explain how you found the overlap.

WORK SPACE AND ANSWER

ANSWER KEY

Probability Overlap Check

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Events A and B are mutually exclusive. P(A) = 5/12 and P(B) = 1/10. Find P(A or B).	**31/60**
2	Events C and D are mutually exclusive. P(C) = 2/9 and P(D) = 5/18. Find P(C or D).	**1/2**
3	P(E) = 7/15, P(F) = 4/15, and P(E and F) = 2/15. Find P(E or F).	**3/5**
4	A card is drawn from a standard deck. Find P(heart or spade). State whether the events are mutually exclusive.	**1/2; mutually exclusive**
5	P(R) = 3/10, P(S) = 1/2, and P(R and S) = 1/10. Find P(R or S).	**7/10**
6	Events C and D are mutually exclusive. P(C) = 9/14 and P(D) = 5/14. Find P(C or D), then interpret the result.	**1; selecting C or D is certain**

PART 2 · APPLY IT

1. **2/3** the events are not mutually exclusive. A randomly selected student has a 2/3 chance of following at least one of the two accounts. Use 14 + 11 - 5 = 20 students who follow at least one account. Then 20/30 = 2/3.
2. **23/36** a randomly selected clip has a 23/36 chance of featuring a game-winning play, a player interview, or both. The categories overlap, so use 15 + 12 - 4 = 23 clips. The probability is 23/36.

CHALLENGE

P(job or sport) = 17/20 and P(job and sport) = 3/16. Since 12 do neither, 68 are in the union. The overlap is 45 + 38 - 68 = 15 students.

Accept equivalent simplified or unsimplified fractions when they have the same value. For overlap problems, students must subtract the intersection once and identify non-mutually-exclusive events when appropriate.