AFM Name Key

Unit 7 Day 4 Notes – Mutually Inclusive and Exclusive Date _____

Two events are mutually exclusive if they have no outcomes in common.

Ex: In drawing a card form a standard deck

E: the card is an ace

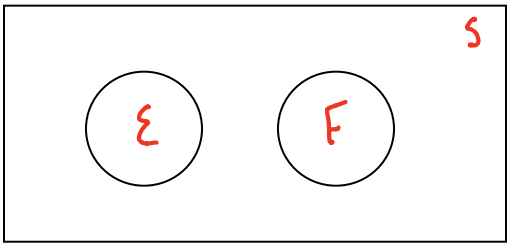
F: the card is a queen

*NOT possible to be an ace and a queen at the same time!

Probability of the union of mutually exclusive event:

If E and F are mutually exclusive events in the same sample space S, the probability of E or F is:

$P(E) + P(F)$

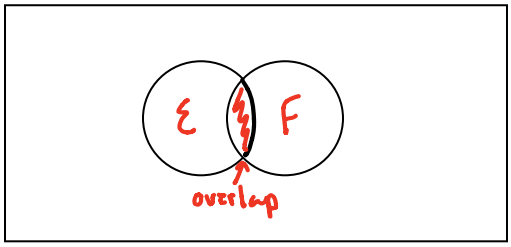


** They cannot happen at the same time!

Example: A marble is selected from a bag containing 5 blue, 2 red, and 3 white marbles. What is the probability that it is a blue or a white marble? (a marble cannot be blue and white so mutually exclusive)

Probability of the union of two events (NOT mutually exclusive)

If E and F are in the sample space S, then the probability of E or F is



$P(E \text{ or } F) = P(E) + P(F) - P(E \cap F)$, overlap

*Think about a venn diagram

Example: When drawing a card from a deck of 52 playing cards, what is the probability of getting a red card or a King? (a card can be red and a king at the same time so NOT mutually exclusive)

$P(Red \text{ or } King) = P(Red) + P(King) - P(Red \cap King)$

$\left(\frac{26}{52}\right) + \left(\frac{4}{52}\right) - \left(\frac{2}{52}\right) = \frac{28}{52} = \frac{5}{13}$ or .385

When the occurrence of one event does not affect the probability of another event, we say the events are Independent (replacing).

Ex: If a balanced coin is tossed, the probability of showing heads on the 2nd toss is ½ regardless of the outcome of the 1st toss. So any 2 tosses of a coin are independent.

$\left(\frac{1}{2}\right) \cdot \left(\frac{1}{2}\right) = \frac{1}{4}$ or .25

Probability of the intersection of independent events:

If E and F are independent events in a sample space S, then:

(Probability of E times probability of F) = $P(E) \cdot P(F)$

Example: When tossing a fair coin twice, what is the probability of getting a 'Head' on the first toss and then getting a 'Tail' on the second toss?

$P(H \text{ and } T) = P(H) \times P(T)$

H T

$\left(\frac{1}{2}\right) \cdot \left(\frac{1}{2}\right) = \frac{1}{4}$ or .25

When the occurrence of one event does affect the probability of another event we say that the events are dependent. (replacing)

*We use $P(E \cap F) = P(E) * P(F)$ for dependent events also, but we need to consider the effect on the first event on the second event when considering the sample space.

Example: Paul draws a red marble from a bag of 3 red marbles and 2 blue marbles. Then Nadia draws a blue marble from those remaining in the bag. What is the probability of this happening?

P N

$\left(\frac{3}{5}\right) \cdot \left(\frac{2}{4}\right) = \frac{3}{10}$ or .3

How to identify Probability Problems: mutually

-If there is an OR then it is exclusive/inclusive problem and we must use addition (+ sometimes subtraction)

- You must determine if the two events are mutually exclusive to determine which addition formula.

YES: $P(E) + P(F)$ (ME)

NO: $P(E) + P(F) - P(E \text{ and } F)$ (MI)

-If there is an AND then we are dealing with independent / dependent and we will use the multiplication formula.

Replace= Independent

No replacement= Dependent and you must account for a smaller sample space in the second event.

Example: A card is chosen at random from a standard deck of 52 playing cards. Without replacing it, a second card is chosen. What is the probability that the first card chosen is a queen and the second card chosen is a jack?

Q J

$\left(\frac{4}{52}\right) \cdot \left(\frac{4}{51}\right) = \frac{4}{663}$ or .006

Unit 7 Day 4 HW

1. If a committee of three is to be chosen randomly from five males and nine females, what is the probability that the committee is either all male or all female?

2. A box contains a nickel, a penny, and a dime. Find the probability of choosing first a dime and then, without replacing the dime, choosing a penny.

3. There are 3 literature books, 4 algebra books, and 2 biology books on a shelf. If a book is randomly selected, what is the probability of selecting a literature books or an algebra book?

4. A die is rolled. What is the probability of rolling a 5 or a number greater than 3?

5. Find the probability of tossing two number cubes and getting a 3 on each one.

6. Each of the numbers from 1 to 30 is written on a card and placed in a bag. If one card is drawn at random, what is the probability that the number is a multiple of 2 or a multiple of 3?

7. Joe's wallet contains three $1 bills, four $5 bills, and two $10 bills. If he selects three bills in succession, find the probability of selecting a $10 bill, then a $5 bill, and then a $1 bill if the bills are not replaced.

8. A bag contains 5 red, 3 green, 4 blue, and 8 yellow marbles. Find the probability of randomly selecting a green marble, and then a yellow marble if the first marble is replaced

9. In Jerry's Boy Scout group of 24 scouts, 6 scouts are studying for the swimming merit badge and 10 scouts are studying for the life saving merit badge. Two scouts are studying for both merit badges. Find the probability that a scout is studying for:
    a. Swimming merit badge

    b. Life saving merit badge

    c. Swimming and life saving merit badges

    d. Swimming or life saving merit badge