Mutually Exclusive and Inclusive Events

CCM2 Unit 1: Probability

Mutually Exclusive Events

- Suppose you are rolling a six-sided die. What is the probability that you roll an odd number or you roll a 2?
    - Can these both occur at the same time? Why or why not?
- **Mutually Exclusive Events (or Disjoint Events):** Two or more events that cannot occur at the same time.

Probability of the Union of Two Events: The Addition Rule

Addition Formula:

$$\mathbf{P(A \text{ or } B) = P(A \cup B) = P(A) + P(B) - P(A \cap B)}$$

If you randomly chose one of the integers 1 – 10, what is the probability of choosing either an odd number or an even number?

2. Are these mutually exclusive events? Why or why not?

3. P(odd)?

½

4. P(even)?

½

5. P(odd and even)?

0

6. Calculator P(odd or even) using the formula

P(Odd or Even) = P(Odd) + P(Even) – P(O∩E)

=½ + ½ - 0

= 2/2 = 1 = 100%

7. Does this answer make sense?

YES!! 100% chance of getting even or odd #

Two fair dice are rolled. What is the probability of getting a sum less than 7 or a sum equal to 10?

8. Are these events mutually exclusive?

9. Complete the following table using the sums of two dice:

Die	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4				
3	4					
4						
5						
6						

Die	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

10. P(getting a sum less than 7 OR sum of 10)

= P(sum <7) + P(sum = 10) – P(sum <7 and sum=10)

= 15/36 + 3/36 - 0

= 18/36

= ½

11. The probability of rolling a sum less than 7 or a sum of 10 is ½ or 0.5 or 50%.

Mutually Inclusive Events

Suppose you are rolling a six-sided die. What is the probability that you roll an odd number or a number less than 4?

12. Can these both occur at the same time? If so, when?

Mutually Inclusive Events: Two events that can occur at the same time.

13. What is the probability of choosing a card from a deck of cards that is a club or a ten?

P(choosing a club or a ten)

= P(club) + P(ten) – P(10 of clubs)

= 13/52 + 4/52 – 1/52

= 16/52

= 4/13 or .308 or 30.8%

14. What is the probability of choosing a number from 1 to 10 that is less than 5 or odd?

$$P(<5 \text{ or odd})$$

$$= P(<5) + P(\text{odd}) - P(<5 \text{ and odd})$$

$$<5 = \{1,2,3,4\} \quad \text{odd} = \{1,3,5,7,9\}$$

$$= 4/10 + 5/10 - 2/10$$

$$= 7/10 \text{ or } 0.7 \text{ or } 70\%$$

15. A bag contains 26 tiles with a letter on each, one tile for each letter of the alphabet. What is the probability of reaching into the bag and randomly choosing a tile with one of the first 10 letters of the alphabet on it or randomly choosing a tile with a vowel on it?

15. continued

First 10 letters: A, B, C, D, E, F, G, H, I, J,

Vowels: A, E, I, O, U

P(one of the first 10 letters or vowel)

P(first 10 letters) + P(vowel) – P(first 10 and vowel)

10/26 + 5/26 – 3/26

12/26 or 6/13 or .462 or 46.2%

4. A bag contains 26 tiles with a letter on each, one tile for each letter of the alphabet. What is the probability of reaching into the bag and randomly choosing a tile with one of the last 5 letters of the alphabet on it or randomly choosing a tile with a vowel on it?

P(one of the last 5 letters or vowel)

P(one of the last 5 letters) + P(vowel) – P(last 5 and vowel)

= 5/26 + 5/26 – 0

= 10/26 or 5/13 or .385 or 38.5%

Check Your Understanding (CYU)

Given the situation of drawing a card from a standard deck or cards, calculate the probability of the following:

1. **Drawing a red card or a king**
2. **Drawing a ten or a spade**
3. **Drawing a four or a queen**
4. **In a math class of 32 students, 18 boys and 14 are girls. On a unit test, 5 boys and 7 girls made an A. What is the probability of choosing a girl or an A student?**