

Mutually Exclusive VS. Overlapping

Compound Probability

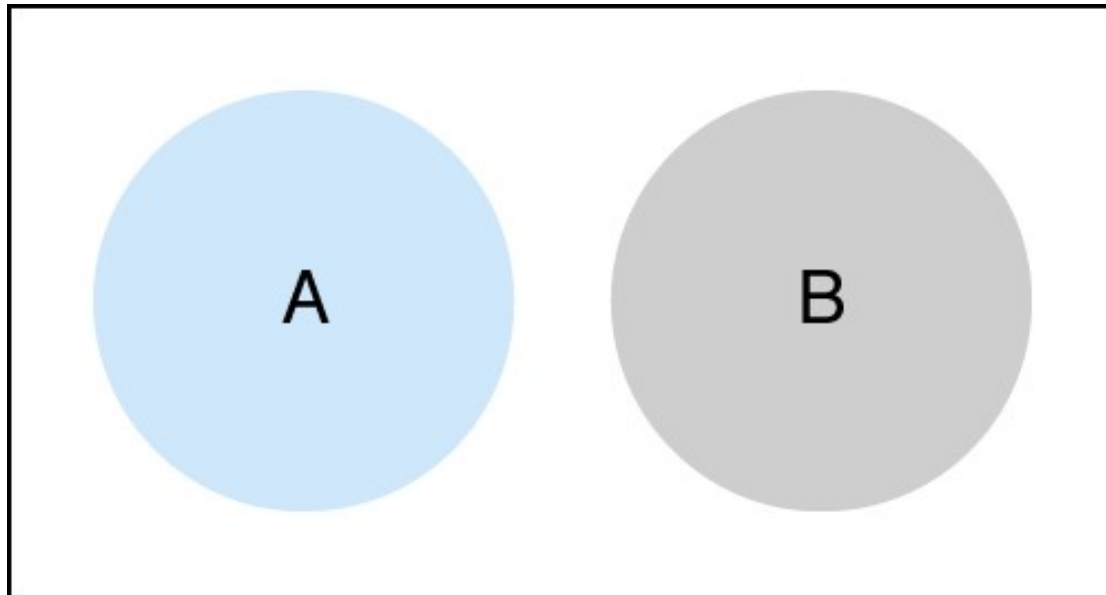
✦ A **compound event** combines two or more events, using the word **and** or the word **or**.

Mutually Exclusive vs. Overlapping

- ✦ If two or more events cannot occur at the same time they are termed **mutually exclusive**.
- ✦ They have **no** common outcomes.
- ✦ **Overlapping** events have **at least one common outcome**.
- ✦ **Also known as inclusive events.**

Mutually Exclusive Formula

$$P(A \text{ or } B) = P(A) + P(B)$$



OR

Means

you ADD

Example 1:

☀ Find the probability that a girl's favorite department store is **Macy's** or **Nordstrom**.

☀ Find the probability that a girl's favorite store is **not** JC Penny's.

$$.25 + .20 = .45$$

| | |
|-----------------------|-------------|
| Macy's | 0.25 |
| Saks | 0.20 |
| Nordstrom | 0.20 |
| JC Penny's | 0.10 |
| Bloomingdale's | 0.25 |

$$.25 + .20 + .20 + .25 = .90$$

Sum of Rolling 2 Dice

| | 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 |

Example 2:

✨ When rolling two dice find

P(sum 4 or sum 5)

$$\frac{3}{36} + \frac{4}{36} = \frac{7}{36}$$

| | 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 |

Standard Deck of 52 Playing Cards

| | <i>Black</i> | <i>Black</i> | <i>Red</i> | <i>Red</i> |
|------------|--------------|--------------|------------|------------|
| | A♠ | A♣ | A♥ | A♦ |
| | 2♠ | 2♣ | 2♥ | 2♦ |
| | 3♠ | 3♣ | 3♥ | 3♦ |
| | 4♠ | 4♣ | 4♥ | 4♦ |
| | 5♠ | 5♣ | 5♥ | 5♦ |
| | 6♠ | 6♣ | 6♥ | 6♦ |
| | 7♠ | 7♣ | 7♥ | 7♦ |
| | 8♠ | 8♣ | 8♥ | 8♦ |
| | 9♠ | 9♣ | 9♥ | 9♦ |
| | 10♠ | 10♣ | 10♥ | 10♦ |
| Face Cards | Jack♠ | Jack♣ | Jack♥ | Jack♦ |
| | Queen♠ | Queen♣ | Queen♥ | Queen♦ |
| | King♠ | King♣ | King♥ | King♦ |

Example 3:

☀ In a deck of cards, find

P(Queen or Ace)

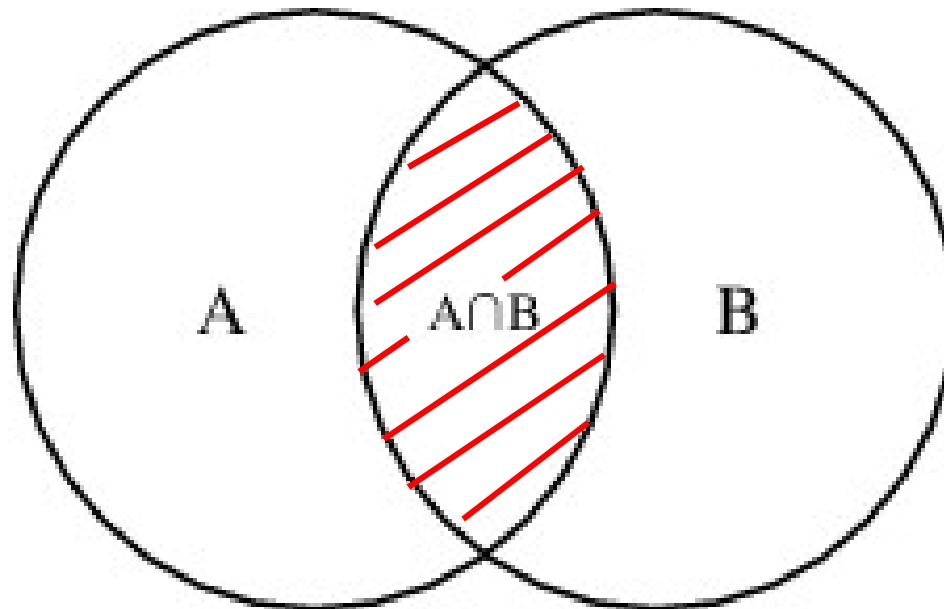
$$\frac{4}{52} + \frac{4}{52} = \frac{2}{13}$$

| Standard Deck of 52 Playing Cards | | | | |
|-----------------------------------|--------------|--------------|------------|------------|
| | <i>Black</i> | <i>Black</i> | <i>Red</i> | <i>Red</i> |
| | A♠ | A♣ | A♥ | A♦ |
| | 2♠ | 2♣ | 2♥ | 2♦ |
| | 3♠ | 3♣ | 3♥ | 3♦ |
| | 4♠ | 4♣ | 4♥ | 4♦ |
| | 5♠ | 5♣ | 5♥ | 5♦ |
| | 6♠ | 6♣ | 6♥ | 6♦ |
| | 7♠ | 7♣ | 7♥ | 7♦ |
| | 8♠ | 8♣ | 8♥ | 8♦ |
| | 9♠ | 9♣ | 9♥ | 9♦ |
| | 10♠ | 10♣ | 10♥ | 10♦ |
| Face Cards | Jack♠ | Jack♣ | Jack♥ | Jack♦ |
| | Queen♠ | Queen♣ | Queen♥ | Queen♦ |
| | King♠ | King♣ | King♥ | King♦ |

Overlapping Events Formula

$P(A \text{ or } B)$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$



Example 6:

☀ In a deck of cards find

P(King or Club)

$$\frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{4}{13}$$

| Standard Deck of 52 Playing Cards | | | | |
|-----------------------------------|--------------|--------------|------------|------------|
| | <i>Black</i> | <i>Black</i> | <i>Red</i> | <i>Red</i> |
| | A♠ | A♣ | A♥ | A♦ |
| | 2♠ | 2♣ | 2♥ | 2♦ |
| | 3♠ | 3♣ | 3♥ | 3♦ |
| | 4♠ | 4♣ | 4♥ | 4♦ |
| | 5♠ | 5♣ | 5♥ | 5♦ |
| | 6♠ | 6♣ | 6♥ | 6♦ |
| | 7♠ | 7♣ | 7♥ | 7♦ |
| | 8♠ | 8♣ | 8♥ | 8♦ |
| | 9♠ | 9♣ | 9♥ | 9♦ |
| | 10♠ | 10♣ | 10♥ | 10♦ |
| Face Cards | Jack♠ | Jack♣ | Jack♥ | Jack♦ |
| | Queen♠ | Queen♣ | Queen♥ | Queen♦ |
| | King♠ | King♣ | King♥ | King♦ |

Example 7:

☀ Find the P(picking a **female** or a person from **Florida**).

| | Female | Male |
|----|--------|------|
| FL | 8 | 4 |
| AL | 6 | 3 |
| GA | 7 | 3 |

$$\frac{21}{31} + \frac{12}{31} - \frac{8}{31} = \frac{25}{31}$$

Example 8:

☀ When rolling 2 dice, find P(an **even sum** or a number **greater than 10**).

$$\frac{18}{36} + \frac{3}{36} - \frac{1}{36} = \frac{5}{9}$$

| | 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 |