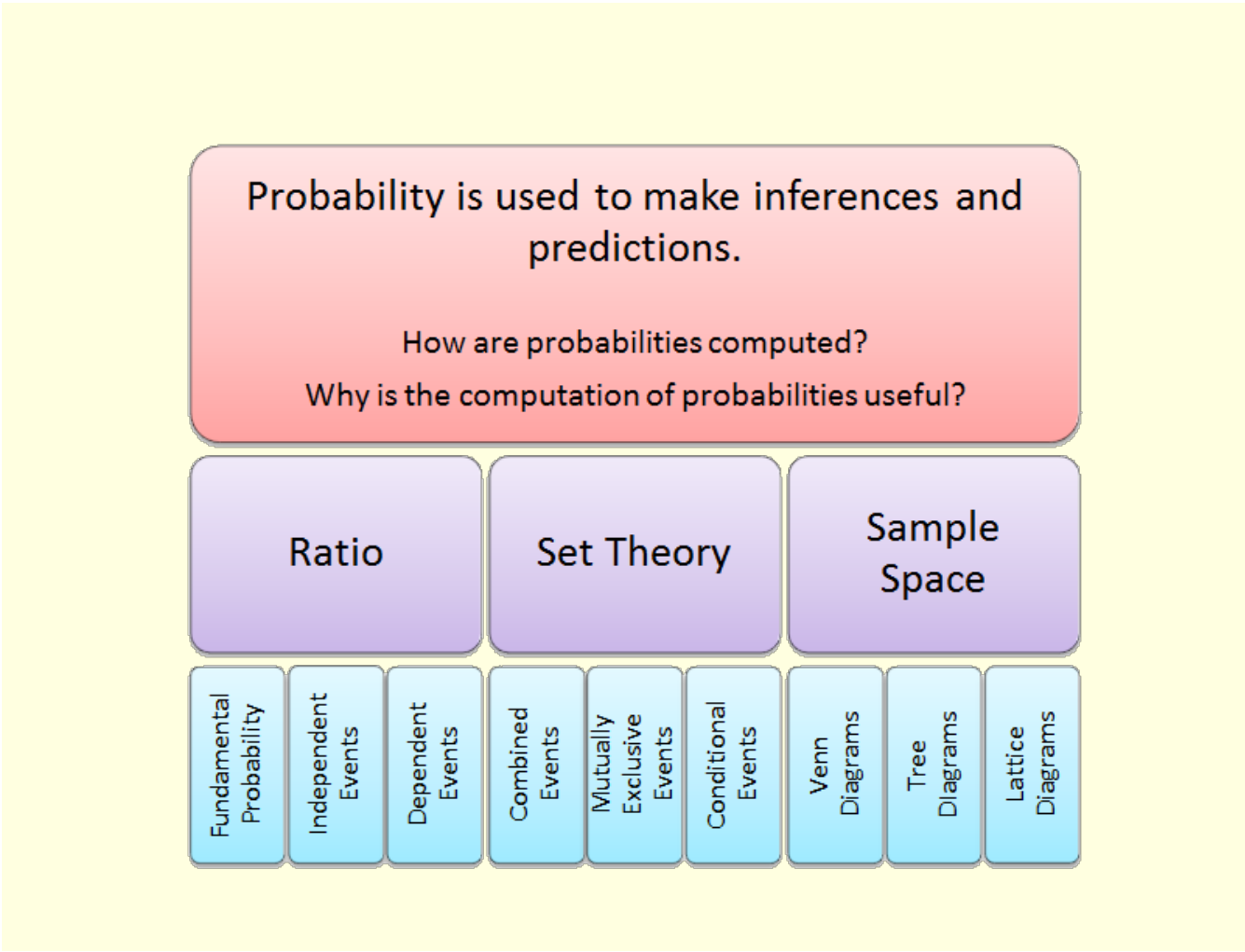
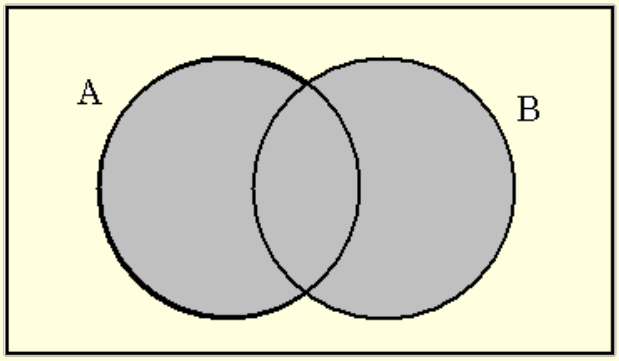
P.4 Combined and Mutually Exclusive Events


Probability is used to make inferences and predictions.
How are probabilities computed?
Why is the computation of probabilities useful?
Ratio
Set Theory
Sample Space
Fundamental Probability
Independent Events
Dependent Events
Combined Events
Mutually Exclusive Events
Conditional Events
Venn Diagrams
Tree Diagrams
Lattice Diagrams



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

When choosing a card, what is the possibility of choosing a king or a diamond?

$P(K) = \frac{4}{52}$

$P(D) = \frac{13}{52}$

$P(K \cap D) = \frac{1}{52}$

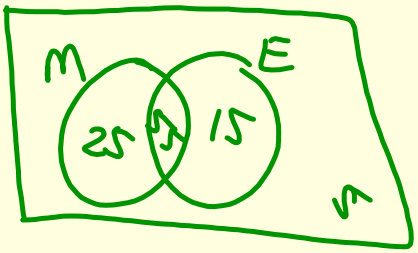
$P(K \cup D) = \frac{4}{52} + \frac{13}{52} - \frac{1}{52}$

$= \frac{16}{52}$

Professor Jackson is in charge of a program to prepare people for a high school equivalency exam. Records show that 80% of the students need work in math, 70% need work in English, and 55% need work in both areas. Compute the probability that a student selected at random needs help in math or English.

$$P(M \cup E) = 80\% + 70\% - 55\%$$

$$= 95\%$$



In a bag are 100 discs numbered 1 to 100. A disc is selected at random from the bag. Find the probability that the number on the selected disc is even or a multiple of 5.

$P(\text{even}) = \frac{50}{100}$

$P(\text{mult. 5}) = \frac{20}{100}$

$P(\text{even} \cap 5) = \frac{10}{100}$

$P(\text{even} \cup 5) = \frac{50}{100} + \frac{20}{100} - \frac{10}{100}$

$= \frac{60}{100}$

A garage knows that when a person calls to report that their car won't start, th probability that the engine is flooded is 0.5 and the probability that the battery is dead is 0.4, and the probability of both is 0.1. What is the probability that th next person who calls will have either a flooded engine or a dead battery? Are these events dependent or independent? Why?

$$P(F \cup D) = 0.5 + 0.4 - 0.1$$
$$= 0.8$$

Independent?

$$P(F \cap D) = P(F) \times P(D)$$
$$0.1 = (0.5)(0.4)$$
$$0.1 \neq 0.2$$

Dependent!

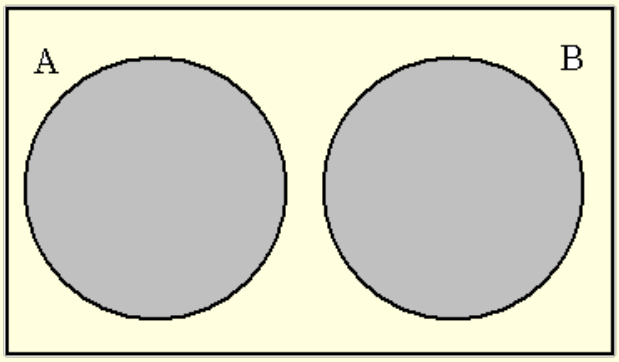
In a class, half the pupils study Mathematics, a third study English, and a quarter study both Mathematics and English. Find the probability that a student selected at random studies either Mathematics or English.

$$P(M \cup E) = P(M) + P(E) - P(M \cap E)$$

$$= \frac{1}{2} + \frac{1}{3} - \frac{1}{4}$$

$$= \frac{6}{12} + \frac{4}{12} - \frac{3}{12}$$

$$= \frac{7}{12}$$



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

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

$P(A \cap B) = 0$

When tossing a die, what is the probability of tossing a 3 or a 4?

$$P(3 \cup 4) = P(3) + P(4)$$

$$= \frac{1}{6} + \frac{1}{6}$$

$$= \frac{2}{6} = \frac{1}{3}$$

When choosing a card, what is the probability of choosing a jack or a king?

$$P(J \cup K) = \frac{4}{52} + \frac{4}{52}$$

$$= \frac{8}{52}$$

The Cost Less Clothing Store carries "seconds" in slacks that don't quite fit. If you buy a pair of slacks in your regular waist size without trying them on, the probability that the waist will be too tight is 0.30 and the probability that it will be too loose is 0.10. What is the probability that the waist won't fit?

$P(\text{won't fit}) = 0.3 + 0.1$

$= 0.4$

Given that events A and B are mutually exclusive with $P(A) = \frac{3}{10}$ and $P(B) = \frac{2}{5}$, find the value of $P(A \cup B)$.

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

$$= \frac{3}{10} + \frac{2}{5}$$

$$= \frac{7}{10}$$