* **2.1: Experiments, Sample Spaces, & Events**
* **2.2: Definition of Probability**
* **2.3: Rules of Probability**
* **2.4: Using Counting Techniques in Probability**
* **2.5: Conditional Probability**
* **2.6: Bayes Theorem**

**2.1:**

**Vocabulary:**

-Experiment: an activity with observable results (outcomes)

-Sample point: an outcome of an experiment

-Sample space: a set of all possible sample points

-Event: a subset of a sample space

-Mutually exclusive: events A and B equal zero (A⋂B=0)

-Complementary events: event B equals the complement of event A (A∁=B)

-Non-discrete: a sample space that is too long to list

**Examples:**

1. S={a,b,c,d,e,f,g,h,i} A={a,b,c} B={a,f,g,h,i} C={d,g,i}

A⋂B=

A⋃B=

B⋃C=

Ac⋂B=

Cc∪A=

1. Rolling a dice

List event A rolling an even number=

List event B rolling a multiple of 3=

A∪B=

A⋂B=

Ac=

**2.2:**

**Vocabulary:**

-Simple event: events that contain one point of an experiment(simple events are always mutually exclusive)

-Probability: a measureof the proportion of the time that the event will occur at a time

* suppose that in N trials an event E occurs M times. The relative frequency is M/N

-Theoretical probability: what you expect to happen, but it isn't always what will actually happen

-Empirical probability: probability determined from the results of the experiment

-Probability distribution table: a table that lists the probability of each event of an experiment

Properties:

1. Probability of each simple event is between 0 and 1 inclusive
2. The sum of all probability events in a sample space is 1
3. The probability of the union of 2 mutually exclusive events is given by the sum of their probabilities

**Examples:**

1. Given the sample space {S1,S2,S3}, list the simple events
2. An opinion poll is conducted with a group of voters (D,R,I) and if they are in university (U) or working (W). Give the sample space and simple events
3. Evan tosses a coin 3 times, and called heads. Find the probability distribution table for P(number of heads)

**2.3:**

**Vocabulary:**

-Additional Rule: If E and F are any two events of an experiment, then p(E ∪ F) = P(E) + P(F) - P(E ∩ U)

* Ex: a card is drawn from a standard deck of cards. What is the probability of a queen or diamond? P(Q ∪ D) = P(Q) + P(D) - P(Q ∩ D)

-Rule of Complements: If E is an event of an experiment and E^c denotes the complement of E, then P(E^c) = 1 - P(E)

* Ex: A card is drawn from a standard deck. What is the probability that it is not a diamond? 1 - P(D^c)

Examples:

1. If a card is drawn from a deck of cards, that is the probability of drawing a Jack, Spade or Ace?
2. A card is drawn from a random deck of cards. What is the probability of not drawing a Jack? Not the Probability of drawing a Spade. Not the probability of drawing an ace?

2.4 Vocabulary: Terms

-Probability = number of favorable outcomes

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 number of possible outcomes

-P(E) = n(E)

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 n(S)

-at most: or, add (+)

-Calculator Rules: MATH, PRB, 3 (nCR)

**Ex 1)** Three marbles are selected at random without replacement from a jar with 3 black, 2 white, and 3 red marbles. Find the probability that…

a) All 3 marbles are black.

b) One is white and two are red.

**Ex 2)** Kennadi is studying for a spelling bee and knows the meanings of 20 words from a list of 30. If the test has 10 words from the list, find the probability that the student will score at least an 80%.

**Ex 3)** Assuming that the probability of a boy being born is the same as the probability of a girl being born, find the probability that a family with four children will have two boys.

**2.5:**

2.5 Vocabulary Terms

-Conditional Probability:the probability of an event occurring given that another event has already occurred.

-Notation:P(B|A) is read as “the probability of B occurring given A has occurred” (Formula: P(B|A) = n(A ∩ B) / n(A)

-Product Rule:P(A ∩ B) = P(B|A) x P(A)

Examples:

1.Three marbles are drawn from a bag without replacement. The bag contains 4 black and 3 grey marbles. Find the probability that:

1. The first marble is black
2. The second marble is black if the first is not grey
3. The second marble is grey

2.In a box of 48 AAA batteries, 24 are Energy Ultimate Lithium Batteries and 24 are Kirkland Signature Alkaline Batteries. 5 of the Energy Ultimate batteries are dead, while 8 of the Kirkland Signature batteries are dead. Find the probability if E = event of drawing an Energy Ultimate Lithium Battery, K= event of drawing a Kirkland Signature Alkaline Battery, and X=event of drawing a dead battery.

1. P(E)
2. P(X|E)
3. P (X ∩ K)
4. P(X)

**2.6:**

2.6 Vocabulary Terms

**Bayes Theorem:** a way of finding a probability when we know certain other probabilities.



**Tree Diagram:**



**KEY:**

* **A, B = events**
* **P(A|B) = probability of A given B is true**
* **P(B|A) = probability of B given A is true**
* **P(A), P(B) = the independent probabilities of A and B**

**Ex 1) A store stocks teddy bears from 3 suppliers. Suppliers A, B, C supply 10%, 30%, and 60% of the stuffed pink bears respectively. 1% of A, 7% of B, and 5% of company C’s bears are defective. If a bear is selected at random and found to be defective, what is the probability that it came from supplier B?**