Monday: Aug. 31, 2020, (L3) HW: pg. 54: #’s 71, 74, 75, 81

Math 360 pg. 59: #’s 84, 88, 94, 96

Review

Last time we started with counting methods in the use of finding probability of an event.

Def. 2.6 Suppose *S* is a sample space associated with an experiment. To every event *A* in *S*, we assign a number*, P(A),* called the probability of *A*, so that the following hold:

1. 
2. 
3. If form a sequence of pairwise mutually exclusive events in *S* then 

Then using your great ability of reasoning, prove the following intuitive (silly) theorems:

Thm: For each event *A,* 

Thm: 

Thm: Given the events A and B where , then .

Let us start section 2.7 with a couple lf examples.

Section 2.7: Conditional Probability and the Independence of Events

Ex. Given 

Draw the Venn diagram and find:











|  |  |  |  |
| --- | --- | --- | --- |
|  | Early (E) | Late (L) | total |
| Red (R) | 5 | 8 | 13 |
| Yellow (Y) | 3 | 4 | 7 |
| total | 8 | 12 | 20 |

Ex. A package contains 20 tulip bulbs, which will bloom early (E) or late (L) summer either red (R) or yellow (Y) blooms:

Find:









Definition 2.9

The *conditional probability of an event A*, given that an event *B* has occurred, is equal to

 , 

Definition 2.10\*\*\*(know this definition)

Two events *A* and *B* are said to be *independent* if any one of the following holds:



Otherwise, the events are said to be dependent.

Section 2.8: Two Laws of Probability

Theorem 2.5 **The Multiplication Law of Probability**

The probability of the intersection of two events A and B is



If A and B are independent then



The proof follows from the definitions of *conditional probabilities* and *independent* events.

Theorem 2.6 **The Addition Law of Probability**

The probability of the union of two events A and B is



If A and B are mutually exclusive events, then  and



Proof

Notice the following:  and

Then  and 

Rewriting the second equation followed by the substitution of the first give the desired results: .

The proof can easily be shown by drawing the Venn diagram.

Helpful hints:

* When dealing with unions and intersections it is often quite helpful to draw the Venn diagram. Most problems give enough information to complete the diagram.
* From the Addition Law of Probability: 

it would also make sense that .

* Extending the Addition Law of Probability using three events:



Example 2.16

Three brand of coffee, *X, Y ,*and  *Z* are to be ranked according to taste by a judge. Define the following events:

*A*: Brand *X* is preferred to *Y*.

B: Brand *X* is ranked the best.

C: Brand *X* is ranked second best.

D: Brand *X* is ranked third best

If the judge actually has no taste preference and randomly assigns ranks to the brands, is event *A* independent of events *B*, *C*, and *D*?

Example: Suppose that a fair six-sided die is tossed. What is the probability that the number tossed is given that an even number was tossed?

Example: Suppose you are dealt 6 cards from a standard deck of playing cards. What is the probability that the 6th card is your third spade?

Example: Suppose that ,  and . Find .