MAT 1372 Stat w/ Prob classwk 10 fall 2016

4.5 Conditional Probability and Independence

# The Conditional Probability of B given A

can be found by using the formula



Example: roll 2 dice

Let A = sum is 4

B = doubles



Exercise: A = sum is 8

B = doubles

Find  and , then use these values to calculate .

Similarly calculate  the probability of rolling an 8 given doubles, using the appropriate formula. Of course these probabilities can be calculated directly.

# The multiplication rule:

Example: Suppose that in February, the chance that there is precipitation on a particular day is 1 out of 3. If there is precipitation, the chance that it includes snow is 3 out of 5. What is the chance that it snows on a particular day.

Using the multiplication rule, we see

P(snow)=P(snow ∩ precipitation)=P(precipitation)P(snow|precipitation) 

**14.** A child has 12 socks in a drawer; 5 are red, 4 are blue, and 3 are green.

If 2 socks are chosen at random, find the probability that they are

**(a)** Both red

**(b)** Both blue

**(c)** Both green

**(d)** The same color

**22.** An urn initially contains 4 white and 6 black balls. Each time a ball is

drawn, its color is noted and then it is replaced in the urn along with

another ball of the same color. What is the probability that the first

2 balls drawn are black?

**25.** José and Jim go duck hunting together. Suppose that José hits the

target with probability 0.3 and Jim, independently, with probability

0.1. They both fire one shot at a duck.

**(a)** Given that exactly one shot hits the duck, what is the conditional

probability that it is José’s shot? That it is Jim’s?

**(b)** Given that the duck is hit, what is the conditional probability that

José hit it? That Jim hit it?

# Independent events

A and B are independent if 

Example: A pair of fair dice is rolled. Let *A* be the event that the sum of the dice

is equal to 7. Let *B* be the event that the first die lands on 1.

Are *A and B* independent?



YES! So the chance of a 7 is independent of whether the first die is a one.

Exercise: Let *A* be the event that the sum of the dice

is equal to 6. Let *B* be the event that the first die lands on 1.

Are *A and B* independent?

**42.** Each computer chip produced by machine *A* is defective with probability

0.10, whereas each chip produced by machine *B* is defective

with probability 0.05. If one chip is taken from machine *A* and one from

machine *B*, find the probability (assuming independence) that

**(a)** Both chips are defective.

**(b)** Both are not defective.

**(c)** Exactly one of them is defective.

If it happens that exactly one of the two chips is defective, find the

probability that it was the one from

**(d)** Machine *A*

**(e)** Machine *B*