**Sample Spaces with Equally Likely Outcomes** [Ross S2.5]

Say  $S = \{1, 2, \dots N\}.$ 

Then 
$$1 = P[S] = P[1] + P[2] + \dots + P[N].$$
 (4.1)

If each outcome is equally likely:

$$P[1] = P[2] = \dots = P[N]$$
 (4.2)

Combining (4.1) and (4.2):

$$P[1] = P[2] = \dots = P[N] = 1/N$$
 (4.3)

 $P[E] = P\left[\bigcup_{i \in E} \{i\}\right] = \sum_{i \in E} P[i] = \sum_{i \in E} 1/N = |E|/N = |E|/|S|.$ 

Assume equaly likely outcomes.

Then, for any subset  $E \subset S$ :

Solution:

black?

Solution:

Example 4.2: An urn has 7 white balls and 5 black balls.

If we draw 3 balls at random, what is the probability that 1 is white and 2 are

Solution:

Each of n persons throws their hat into the center of a room and picks a hat at random.

What is the probability that no person selects their own hat? [Hard]

These problems all boil down to counting combinations. I'll assume you learned counting in ECE108 and skip the topic, except for the next problem

which is a nice application of the inclusion/exclusion principle.

Example 4.3: Matching Problem