Learning Goal: Probabilities Simulations

Textbook Page 322 Example#2:

A group of 3 members is to be randomly selected from 5 doctors and 7 technicians.

a) What is the probability that the group will be comprised of doctors only?

order does not matter (combination)

$$P(\text{doctors only}) = \frac{n\left(\begin{array}{c}\text{selecting 3 members}\\\text{with only doctors}\end{array}\right)}{n\left(\begin{array}{c}\text{selecting 3 members}\\\text{without restrictions}\end{array}\right)} = \frac{\binom{5}{3}\binom{7}{0}}{\binom{12}{3}} = \frac{1}{22} \checkmark$$

b) What is the probability that the group will not be comprised of doctors only?

Indirect method
$$1 - P(\text{doctors only})$$
$$= 1 - \frac{1}{22} = \frac{21}{22}$$

OR

Direct Method
$$\frac{\binom{5}{0}\binom{7}{3} + \binom{5}{1}\binom{7}{2} + \binom{5}{2}\binom{7}{1}}{\binom{12}{3}} = \frac{21}{22}$$

Textbook Page 322 Example#1:

Two brothers enter a race with 5 other friends. The racers draw lots to determine their starting positions. What is the probability of having the elder brother in lane 1 and his brother is beside him in lane 2?

$$P(\text{older in \#1, younger in \#2}) = \frac{1 \times 1 \times 5 \times 4 \times 3 \times 2 \times 1}{7!}$$

older bro   younger bro

$$= \frac{1}{42}$$

Textbook Page 323 Example#3:

What is the probability that two or more students out of a class of 19 will have the same birthday? (Assume no students were born in February 29)

$$P(A) = 1 - P(A') = 1 - \frac{_{365}P_{19}}{365^{19}}$$

2 or more people having the same birthday   no one is having the same birthday $= 0.379$

$$P(A') = \frac{365}{365}\left(\frac{364}{365}\right)\left(\frac{363}{365}\right)\left(\frac{362}{365}\right) \quad \left(\frac{347}{365}\right)\left(365-19\atop +1\right)$$

$$= \frac{_{365}P_{19}}{365^{19}}$$

Homework Question:

Page 324 #1: Four friends, two females and two males, are playing contract bridge. Partners are randomly assigned for each game. What is the probability that the two females will be partners for the first game?

F F M M

order doesn't matter

$$P(A) = \frac{\binom{2}{2}\binom{2}{0}}{\binom{4}{2}} = \frac{1}{6}$$

female →   ← male

Page 325 #11: Suki is enrolled in one data-management class at her school and Leo is in another. A school quiz team will have four volunteers, two randomly selected from each of the two classes. Suki is one of five volunteers from her class, and Leo is one of four volunteers from his. Calculate the probability of the two being on the team.

Suki →   ← Leo

$$P(\text{both on the team}) = \frac{\binom{1}{1}\binom{4}{1}\binom{1}{1}\binom{3}{1}}{\binom{5}{2}\binom{4}{2}}$$

$$= \frac{1}{5}$$