Getting Ready for the Midterm – Chapter 5

Practice Problems – Answer Key

1) In how many different ways could the Today Show select 3 jurors from a 12 person jury to interview?

3 out of 12, no repetition, order of selection does not matter since each person selected will be interviewed: $_{12}C_3 = 220$

2) An employer decides to randomly give out 4 gift cards - $500, $250, $100, and $50. If there are 13 employees, in how many different ways can the gift cards be given out?

4 out of 13, no repetition, order of selection matters since each person will win a different amount: $_{13}P_4 = 17{,}160$

3) A school PTA has 25 members. In how many ways can they elect a president, vice-president, treasurer, and a 3-person committee?

This is a mixture of permutations and combinations, since the order matters for some jobs (president, VP) but not for the others (3 person committee): $_{25}P_2 \cdot {}_{23}C_3 = 1{,}062{,}600$

4) In a radio contest you have a 5% chance of winning first place and a 10% chance of winning second place.
a) What is the probability that you win a prize?
"OR" tells us to add. Since you cannot win both prizes we do not subtract.

$$P(\text{1st or 2nd}) = P(1st) + P(2nd) = 0.05 + 0.10 = 0.15$$

b) What is the probability that you do not win a prize?

Not winning a prize is the complement of winning a prize, which we figured out in part a).

P(No Prize) = 1 – P(Win Prize) = 1 – 0.15 = 0.85

5) 60% of COS students are female, 45% like football, and 22% are female and like football. Find the probability that a COS student is female or likes football.

"OR" tells us to add, but since a person can be female AND like football we have to subtract the probability of their intersection:

$$\begin{aligned} &P(\text{Female or Football}) \\ &= P(Female) + P(Football) - P(\text{Female AND Football}) \\ &= 0.60 + 0.45 - 0.22 \\ &= 0.83 \end{aligned}$$

6) Three cards are drawn from a standard 52-card deck. Find the probability they are all Jacks.

For the probability of "ALL" we multiply the probability of the first outcome by the probability of the second outcome …

There are 4 Jacks in a 52 card deck. After the first Jack is selected, that leaves 3 Jacks in the 51 card deck. After that, there are 2 Jacks left in the 50 card deck.

$$
\begin{aligned}
&P(\text{All 3 Jacks}) \\
&= P(Jack_1) \cdot P(Jack_2) \cdot P(Jack_3) \\
&= \frac{4}{52} \cdot \frac{3}{51} \cdot \frac{2}{50} \\
&= \frac{1}{5525} \\
&\approx 0.000181
\end{aligned}
$$

7) An elementary school class has 14 girls and 11 boys. If the teacher randomly picks a new helper for the next 3 days, find the probability that all 3 students are girls.

Similar to number 6, but we are working with 16 girls out of 25 students instead of 4 Jacks in a 52 card deck: $\frac{14}{25} \cdot \frac{13}{24} \cdot \frac{12}{23} = \frac{91}{575} \approx 0.158261$

150 students at the College of the Sequoias were asked their preference of burgers. Their responses were categorized as Burger King, McDonald's, In-N-Out and Wendy's. Here are the results.

	Burger King	McDonald's	In-N-Out	Wendy's
Male	15	18	35	15
Female	35	12	10	10

8) Find the probability that a student is female.

There are a total of 67 females, so P(F) = 67/150 = 0.446667

9) Find the probability that a student is male or prefers McDonald's.

Add all of the students who are male or like McD's or both (83 males + 12 more females who like McD's = 95): P(Male OR McD's) = 95/150 = 19/30 = 0.633333

10) Find the probability that a student is male and prefers In-N-Out.

Find the intersection of Male and In-N-Out, which is 35 students:
P(Male AND In-N-Out) = 35/150 = 7/30 = 0.233333