

D116 Quiz 1

Name: _____

1. An experiment has outcomes \mathcal{O}_1 , \mathcal{O}_2 , and \mathcal{O}_3 , with $\Pr[\{\mathcal{O}_1, \mathcal{O}_2\}] = 0.9$, $\Pr[\{\mathcal{O}_1, \mathcal{O}_3\}] = 0.8$. What is $\Pr[\mathcal{O}_2]$?

Solution: Note that the sample space is $S = \{\mathcal{O}_1, \mathcal{O}_2, \mathcal{O}_3\}$. Also, recall that we have the following: if E is any event, then

$$\Pr[E] + \Pr[E'] = 1.$$

Let's use this formula with $E = \{\mathcal{O}_2\}$. In this case, $E' = \{\mathcal{O}_1, \mathcal{O}_3\}$, and hence

$$\Pr[\mathcal{O}_2] + \Pr[\{\mathcal{O}_1, \mathcal{O}_3\}] = 1.$$

We are given that $\Pr[\{\mathcal{O}_1, \mathcal{O}_3\}] = 0.8$, which means

$$\Pr[\mathcal{O}_2] + 0.8 = 1,$$

and so $\Pr[\mathcal{O}_2] = 0.2$.

Remark: Similarly, we can also find $\Pr[\mathcal{O}_3] = 1 - 0.9 = 0.1$. We can then use $w_1 + w_2 + w_3 = 1$ to find w_1 , since we knew $w_2 = 0.2$ and $w_3 = 0.1$. $w_1 + 0.2 + 0.1 = 1$, which means $w_1 = 0.7$.

2. A traveler plans to visit three of the cities Amsterdam, Berlin, Copenhagen, and Prague. An itinerary is a list of the three cities to be visited, in order. How many different itineraries are there?

Solution: We are choosing 3 cities from 4 cities in order. So the answer is

$$P(4, 3) = 4 \times 3 \times 2 = 24 \text{ different itineraries.}$$