Part 2.3: When to Add vs When to Multiply

In probability we are often presented with two events that occur (or could occur). It could be one event followed by another event, or one event happening or another event happening.

When we have:
One event then another event = **multiply**
One event or another event = **add**

For example, I have 10 marbles in a bag,

- 4 labelled A
- 2 labelled B
- 1 labelled C and
- 3 labelled D

We could show this on a probability table:

x	A	B	C	D
P(X=x)	0.4	0.2	0.1	0.3

Whenever I draw a marble out of the bag I always put it back in.

What is the probability I:

a) Pull out marble labelled A then I pull out a marble labelled B?
If we look at the sample space we could have:

		Ball 1			
		A	**B**	**C**	**D**
Ball 2	**A**	AA	**AB**	AC	AD
	B	BA	BB	BC	BD
	C	CA	CB	CC	CD
	D	DA	DB	DC	DD

Looking at that, we can see we just want AB… so P(A then B) = 0.4 x 0.2 = 0.08

b) Pull out one marble and it is labelled A or B?
Looking at the sample space we just have A, B, C and D
We want two of these, so we add them together.
P (A or B) = 0.4 + 0.2 = 0.6