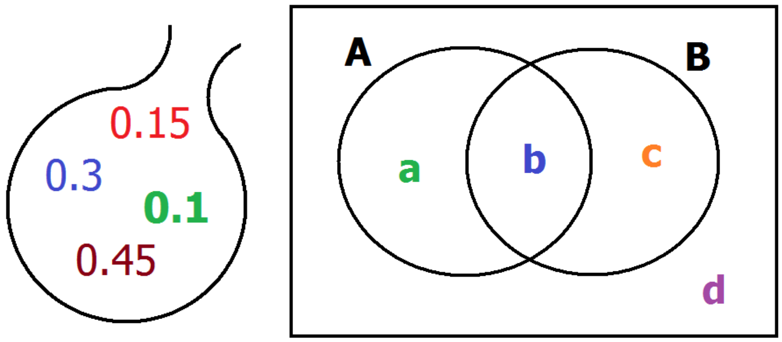
MSV 27: Answers



A and B are independent events if and only if P(A | B) = P(A).
So from the diagram, A and B are independent events if and only if

$$\frac{b}{b+c} = a+b = \frac{a+b}{a+b+c+d}.$$

This is true (multiplying out) if and only if **ac = bd.**

We can now note that **0.45 × 0.1 = 0.3 × 0.15.**

So we can assign the four numbers to a, b, c and d

in eight different ways that make sense.

a	**c**	**b**	**d**
0.45	0.1	0.3	0.15
0.45	0.1	0.15	0.3
0.1	0.45	0.3	0.15
0.1	0.45	0.15	0.3
0.3	0.15	0.45	0.1
0.3	0.15	0.1	0.45
0.15	0.3	0.45	0.1
0.15	0.3	0.1	0.45

There are 24 ways to allocate the four numbers altogether,

So P(A and B are independent) is **1/3.**

We could look at this problem this way:

If A and B are independent, then so are A’ and B, and A and B’, and A’ and B’.

The Venn diagram for each of these eight pairs of events is below.