

Stat 100a: Introduction to Probability.

1. Exam 2 back.
2. Independence.
3. Competitions.

NO CLASS or OH Tue Mar 10.

Hw3 is due Mar 12.

Exam 3 is Thu Mar 12.

They are open book, open note.

Bring a calculator and a dark pen or dark pencil.

1. Exam 2 back.

2. Independence.

Events A and B are independent if $P(A|B) = P(A)$, i.e. $P(AB) = P(A)P(B)$.

If A and B are independent, then A^c and B are independent,

and so are A^c and B^c , and so are A and B^c .

2 discrete *random variables* X and Y are independent if for any c and d,
 $P(X = c \text{ and } Y = d) = P(X=c) P(Y=d)$.

For example, let $X =$ your number of 10♦ you have, i.e. $X = 1$ if you have the 10♦ and $X = 0$ otherwise.

Let $Y =$ the number of pairs you have, again 1 or 0.

Are X and Y independent?

$P(X = 1 \text{ and } Y = 1) = P(10♦ \text{ and another } 10) = 3/C(52,2)$.

$P(X = 1) = 51/C(52,2)$. $P(Y = 1) = 3/51$. So $P(X=1)P(Y=1) = 3/C(52,2)$.

2. Independence, continued.

For another example, let X = your number of 10s you have, and Y = the number of pairs you have.

Are X and Y independent?

Now X could be 0, 1, or 2. In principle you have to check all the possibilities, and verify $P(X=c \text{ and } Y=d) = P(X=c) P(Y=d)$.

Sometimes one is easy to check though.

Consider $P(X = 1 \text{ and } Y = 1)$.

$$P(X = 1) = 4 \times 48 / C(52,2).$$

$$P(Y = 1) = 3/51.$$

So if X and Y are ind., then $P(X=1 \text{ and } Y=1)$ needs to be

$$4 \times 48 \times 3 / [C(52,2) \times 51] \sim 1/117.$$

What is $P(X=1 \text{ and } Y=1)$?

3. Competitions.

