

Example: Suppose that  $X$  is the number of clubs that appear in 5 cards that are drawn from a deck, with replacement and with shuffling in between draws.

Then  $X$  is a Binomial  $(5, 1/4)$  random variable.

Think  $X = X_1 + X_2 + X_3 + X_4 + X_5$  where each  $X_i$  is an indicator (i.e. Bernoulli) random variable with probability of success  $p = 1/4$ .

What is the mass of  $X$ ?

$$P_X(0) = \binom{5}{0} (1/4)^0 (3/4)^5 = \frac{243}{1024}$$

$$P_X(1) = \binom{5}{1} (1/4)^1 (3/4)^4 = \frac{405}{1024}$$

$$P_X(2) = \binom{5}{2} (1/4)^2 (3/4)^3 = \frac{270}{1024}$$

$$P_X(3) = \binom{5}{3} (1/4)^3 (3/4)^2 = \frac{90}{1024}$$

$$P_X(4) = \binom{5}{4} (1/4)^4 (3/4)^1 = \frac{15}{1024}$$

$$P_X(5) = \binom{5}{5} (1/4)^5 (3/4)^0 = \frac{1}{1024}$$

