

BERNOULLI TRIALS

AN EXPERIMENT WITH TWO OUTCOMES



THE PROBABILITY OF SUCCESS = p

FAILURE = q

$$p+q=1$$

PROBLEM: FIND THE PROBABILITY OF k SUCCESSES WHEN THE EXPERIMENT CONSISTS OF n INDEPENDENT TRIALS.

EXAMPLE FAIR COIN, $n=10$, $k=7$

NUMBER OF 10-TUPLES OF H,T WITH 7 H'S IS $C(10,7)$. EACH TUPLE HAS THE PROBABILITY

$$\frac{1}{2^{10}}. \quad P = C(10,7) \cdot \frac{1}{2^{10}} = \frac{C(10,7)}{2^{10}}$$

EXAMPLE. BIASED COIN $P(H)=\frac{2}{3}$ $P(T)=\frac{1}{3}$
 $n=10$, $k_{\text{HEADS}}=7$.

NUMBER OF 10-TUPLES = $C(10,7)$. SINCE ALL TUPLES ARE INDEPENDENT THE PROBABILITY OF EACH TUPLE WITH 7 HEADS IS $\left(\frac{2}{3}\right)^7 \cdot \left(\frac{1}{3}\right)^3$. $P = C(10,7) \left(\frac{2}{3}\right)^7 \left(\frac{1}{3}\right)^3$

TH. THE PROBABILITY OF k SUCCESSES IN n INDEPENDENT BERNOULLI TRIALS, WITH PROBABILITY OF SUCCESS p , IS

$$C(n,k) \cdot p^k \cdot q^{n-k} \quad (q=1-p)$$

HW. 4, 5, 6, 12, 16, 20a, d, 26a, d

~12.6~