

STAT 2011

Q1 two dice

$$A_i: \text{get double 6 on } i^{\text{th}} \text{ roll} \quad \underline{P(A_i) = \frac{1}{36}} \quad P(\bar{A}_i) = \frac{35}{36}$$

throw n times

$$P(A) = P(\text{get at least one double 6 in } n \text{ trials})$$

$$= 1 - P(\text{no double 6 in all } n \text{ trials})$$

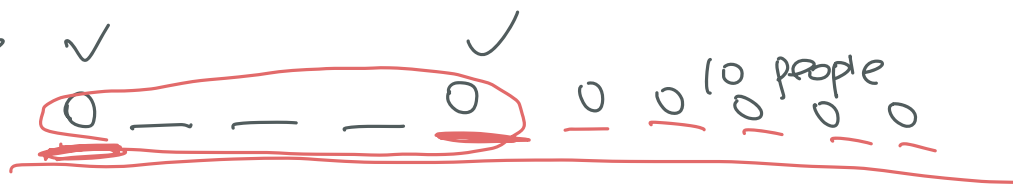
$$= \underline{1 - \left(\frac{35}{36}\right)^n} \geq 0.5$$

$$0.5 \geq \left(\frac{35}{36}\right)^n$$

$$n \geq 24.6$$

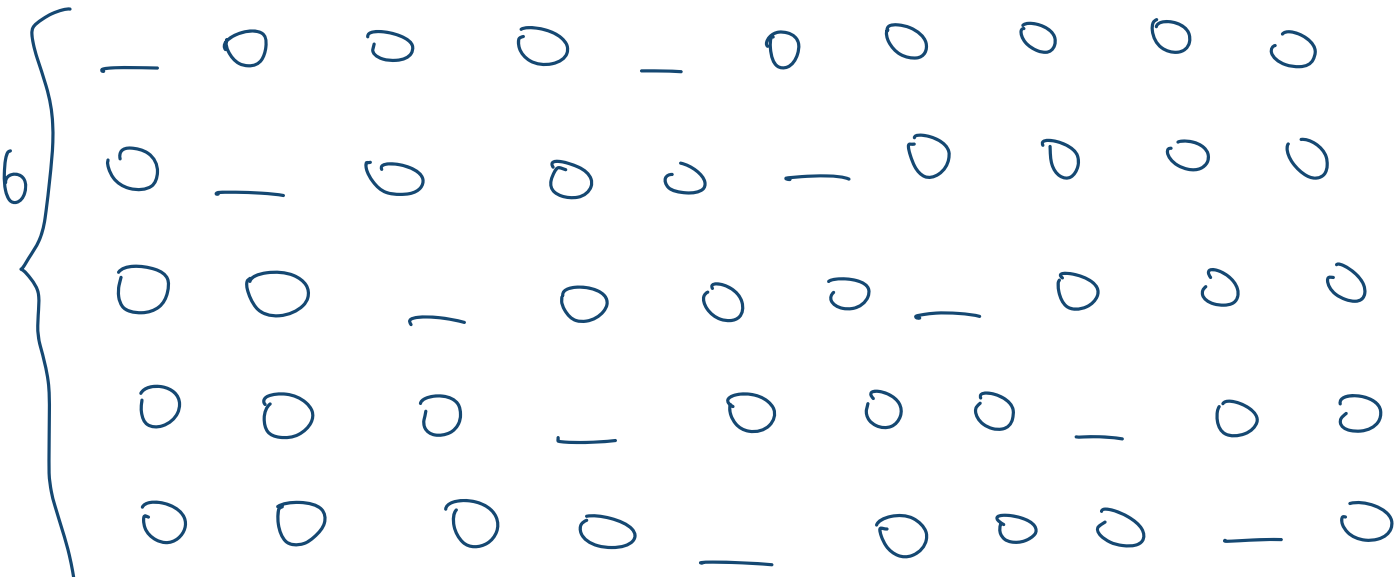
$$\Rightarrow n = 25$$

Q3 ✓



$$\underline{\binom{8}{3} \times 3! \times 6! \times 2}$$

$$= 483840$$



$$\underbrace{000000}_{6 \times 2 \times 8!} - \underbrace{0000}_{0000}$$

$$6 \times 2 \times 8!$$

$$= 483840$$

Q5

$$\binom{n}{0}^2 + \binom{n}{1}^2 + \dots + \binom{n}{n}^2 = \binom{2n}{n}$$

$$\begin{aligned} & \binom{n}{0} \binom{n}{0} + \binom{n}{1} \binom{n}{1} + \dots + \binom{n}{n} \binom{n}{n} \\ &= \binom{n}{0} \binom{n}{n} + \binom{n}{1} \binom{n}{n-1} + \binom{n}{2} \binom{n}{n-2} + \dots + \binom{n}{n} \binom{n}{0} \end{aligned}$$

$$\binom{n}{k} = \frac{n!}{k!(n-k)!}$$

$$\frac{n!}{(n-k)!k!} = \binom{n}{n-k}$$

$$\underbrace{000 \dots 0}_n \quad \underbrace{000 \dots 0}_n$$

$$= \binom{2n}{n}$$

Q7

A: all three chips are white.

B: urn sampled B tenth.

$$P(A|B) = \frac{5}{6} \times \frac{4}{5} \times \frac{3}{4} = \frac{1}{2} \quad P(B) = \frac{1}{10}$$

$$P(A|\bar{B}) = \frac{3}{6} \times \frac{2}{5} \times \frac{1}{4} = \frac{1}{20}$$

$$P(B|A) = \frac{P(BA)}{P(A)}$$

$$= \frac{P(A|B) \cdot P(B)}{P(A|B) \cdot P(B) + P(A|\bar{B}) \cdot P(\bar{B})}$$

$$= \frac{\frac{1}{2} \times \frac{1}{10}}{\frac{1}{2} \times \frac{1}{10} + \frac{1}{20} \times \frac{9}{10}}$$

$$= \frac{10}{19}$$

Q10

n antennas $\begin{cases} n-m \text{ functional} \\ m \text{ defective.} \end{cases}$



$$\binom{n-m+1}{m}$$