

BINOMIAL EXPERIMENT

1. There are n identical trials.
2. There are only two possible outcomes that we call success and failure.
3. The probability of success remains constant, trial after trial

$$p = P(\text{success}) \quad q = P(\text{failure})$$

$$q = 1 - p$$

4. Trials are independent
5. The binomial random variable, x , is the number of successes in n trials.

Example: Flipping a coin 20 times. Find the probability of getting 5 heads.

$$n = 20 \quad \text{success} = \text{heads} \quad p = .5 \quad q = .5$$

$$x = 5$$

THE BINOMIAL FORMULA

$$P(x) = {}^n C_x \cdot p^x \cdot q^{n-x}$$

= the probability of getting x successes in n trials

$$= {}^{20} C_5 \cdot .5^5 \cdot .5^{20-5}$$

$$= .01478$$

Example: We are throwing a die 10 times.
What is the probability of getting exactly
4 fives?

$$n = 10 \quad \text{success} = 2 \text{ five}$$

$$p = 1/6 \quad q = 5/6 \quad x = \text{number fives} = 4$$

$$P(x) = n C x \cdot p^x \cdot q^{n-x}$$

$$P(4) = 10 C 4 \cdot (1/6)^4 (5/6)^{10-4} = .0543$$