

1. How many total ways with two dice?

$$|S| =$$

2. How many ways do two dice sum to 3

$$|E| =$$

3. $p(E) = \frac{|E|}{|S|} =$

How many ways to deal:

4. 5 cards? $|S| =$

5. the Ace and King of clubs? $|E| =$

6. $p(E) = \frac{|E|}{|S|} =$

7. an Ace and King? $|E| =$

Conditional Probability

8. $E = 4$ heads appear when coin flipped 5 times
 $F = 1^{\text{st}}$ flip a heads

$$S = \{HHHHH, HHHHT, \dots, TTTTT\}$$

$$F = \{HHHHH, HHHHT, HHHTT, \dots, HTTTT\}$$

$$|S| =$$

$$|F| =$$

$$p(F) =$$

$$E \cap F =$$

$$p(E \cap F) =$$

$$p(E|F) = p(E \cap F) / p(F) =$$

Bernoulli Trials

Probability of k successes in n independent Bernoulli trials, with probability success p and failure $q = 1-p$ is $C(n,k) p^k q^{n-k}$

10. Probability of having 5 children and 3 girls?

$$|E| =$$

$$p(E) =$$

Random Variables

$X(t)$ is random variable that assigns the *number of heads* that occur for outcome t .

$$11. X(\text{HHTTH}) =$$

$$12. p(X=5) =$$

Conditional Probability

1. How many total ways with two dice? $|S| = 6^2$
2. How many ways do two dice sum to 3? $|E| = \{ (1,2), (2,1) \}$
3. $p(E) = 2/36$

How many ways to deal:

4. 5 cards? $|S| = C(52,5)$
5. the Ace and King of clubs? $|E| = 1*1*C(50,3)$
6. $p(E) = C(50,3) / C(52,5)$
7. an Ace and King? $|E| = C(4,1)*C(4,1)*C(50,3)$ 1 of 4 Aces*1 of 4 Kings * Other 3 cards
8. $E = 4$ heads appear when coin flipped 5 times
 $F = 1^{\text{st}}$ flip a heads

$$S = \{ \text{HHHHH, HHHHT, ..., TTTTT} \}$$

$$F = \{ \text{HHHHH, HHHHT, HHHHTT, ..., HTTTT} \}$$

$$|S| = 2^5$$

$$|F| = 2^4$$

$$p(F) = 2^4/2^5 = 1/2$$

$$E \cap F = \{ \text{HHHHT, HHHHTH, HHTHH, HTHHH} \}$$

$$p(E \cap F) = 4 / 32 = 1/8$$

$$p(E|F) = p(E \cap F) / p(F) = 1/8 / 1/2 = 1/4$$

Bernoulli Trials

Probability of k successes in n independent Bernoulli trials, with probability success p and failure $q = 1-p$ is $C(n,k) p^k q^{n-k}$

9. Probability of having 5 children and 5 girls?

$$|E| = C(5,5) = 5!/5!(5-5)! = 1$$

$$p(E) = 1*1/2^5*1/2^0 = 1/32$$

10. Probability of having 5 children and 3 girls?

$$|E| = C(5,3) = 5!/3!(5-3)! = 5*4/2 = 10$$

$$p(E) = 10*1/2^3*1/2^2 = 10*1/2^5 = 10/32$$

Random Variables

$X(t)$ is random variable that assigns the *number of heads* that occur for outcome t .

11. $X(\text{HHTTH}) = 3$

12. $p(X=5) = 1/2^5 = 1/32$