10 discs

How many moves are needed to move all the discs?

$2^{10} - 1 = 1023$ ✓

Probability

$$P(E) = \frac{\text{No. of favorable outcomes}}{\text{Total no. of outcomes}}$$

Sample space → list of all possible outcomes

$P(\text{Head}) = \frac{1}{2} = P(\text{Tail})$

$S = \{H, T\}$

BlackJack

A deck contains 52 cards

4 suits → Clubs, Diamond, Heart, Spade

13 cards in each suit

A → 1 or 11

Cards → A 2 3 4 5 6 7 8 9 10 J Q K

10, J, Q, K → 10

When do we have a blackjack?

10, A	or	A, 10
J, A		J, A
Q, A		Q, A
K, A		K, A

What is the probability of a BlackJack in the first 2 cards drawn from a deck of 52 cards?

$P(\text{Blackjack}) =$ Face card/10 in first draw ✓ and Ace in second draw

OR

✓ Ace is first draw and Face card/10 in second draw

$$\left(\frac{4\times4}{52} \times \left(\frac{4}{52}\right)\right) + \left(\frac{4}{52} \times \frac{5}{52}\right)$$

$$\left(\frac{16}{52} \times \frac{4}{51}\right) + \left(\frac{4}{52} \times \frac{5}{51}\right)$$

$$\frac{64+20}{52\times51} = \frac{84}{52\times51} = \frac{21}{13\times51} = \frac{21}{663} = 3.16\%$$

What is the probability of getting a (20) in first two draws of 52-card deck?

Card 1	Card 2
10	J
10	Q
10	K
K	10
Q	10
J	10
10	10
9	J
K	Q
Q	K
J	J
K	9
A	A
9	

Card 1		Card 2
Facecard or 10	and	Facecard or 10
or A	and	9
or 9	and	A

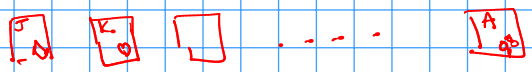
$$\frac{4\times4}{52}\times\frac{15}{51} + \frac{4}{52}\times\frac{4}{51} + \frac{4}{52}\times\frac{4}{51}$$

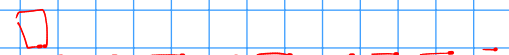
$$= \frac{(16\times15)+16+16}{52\times51}$$

$$= \frac{240+32}{52\times51} = \frac{272}{52\times51} = 10.25\%$$

How many arrangements of a 52-card deck are possible?

$$52! = 52\times51\times50\times\cdots\times1 = 8.067\times10^{67}$$





Pair of Dice (Dice)

Roll a pair of dice. What is the probability of getting an ~~even number~~ odd number as the sum on the dice?

1) 

2) 

e + e = even

o + o = even

1) $\frac{3}{6}\times\frac{3}{6} = \frac{1}{4}$ 2) $\frac{3}{6}\times\frac{3}{6} = \frac{1}{4}$

$$\frac{1}{4}+\frac{1}{4} = \frac{1}{2}$$

$S = \{(1,1),(1,2),(1,3),(1,4),(1,5),(1,6)$

$(2,1)(2,2)(2,3)(2,4)(2,5)(2,6)$

$\vdots$

$(6,1),(6,2)(6,3),(6,4)(6,5)(6,6)\}$

$|S| = 6\times6 = 36$

Even sum = $3\times6 = 18$

$P(\text{Even sum}) = \frac{18}{36} = \frac{1}{2}$.

Prime number → is a number that has exactly two factors.

i) The number itself

ii) 1

4 = 1, 2, 4 (Composite number)

7 = 1, 7 (prime number)

2 = 1, 2

2 is the smallest prime number.

What is the probability of getting a prime number on die?

2, 3, 5

$P(\text{prime}) = \frac{3}{6} = \frac{1}{2} = 50\%$

13

A — Face card - including 10

$\frac{1}{13}$ and $\frac{4}{12}$ $\quad \frac{1}{13} \times \frac{4}{12} = \frac{4}{13 \times 12}$ — (A)

OR

Face card including 10 — A

$\frac{4}{13}$ $\quad \frac{1}{12}$ $\quad \frac{4}{13} \times \frac{1}{12} = \frac{4}{13 \times 12}$ — (B)

$$\frac{2\cancel{8}}{13 \times \cancel{12}_{3}} = \frac{2}{39} = 5.13\%$$