

Some example R simulations

```
# Simulates rolling two dice
numrolls = 1000000
die1 = sample(6,numrolls,T)
die2 = sample(6,numrolls,T)
mean(die1 > die2) # estimated probability die 1 greater than die 2
mean(die1 + die2) # estimated expected value of sum of rolls
table(die1 + die2)/numrolls # estimated distribution of total of two rolls
```

```
# Alternative with loop (slower)
numrolls = 100000
a = b = NA # initialize vectors a and b
for(i in 1:numrolls){
  dice = sample(6,2,T)
  a[i] = dice[1] > dice[2]
  b[i] = sum(dice)
}
mean(a)
mean(b)
table(b)
```

```
# Simulates rolling 4 dice and determining whether
# at least one 6 has been rolled. Repeats simulation n times
# and computes proportion of time that this event happened.
n = 10000
result = NA # initialize vector of results
for(i in 1:n){
  x = sample(6,4,T) # sample of size 4 from integers 1 to 6 with replacement
  result[i] = any(x==6) # returns T if any of the values in x are 6
}
mean(result) # proportion of T's
```

```
# Card simulations
# Probability first three cards drawn are 2's
nsim = 100000
cards = c(1,1,1,1,rep(0,48))
y = NA
for(i in 1:nsim){
  x = sample(cards,3,F)
  y[i] = sum(x)==3
}
mean(y)
4*3*2/(52*51*50) # theoretical probability
```

```
# Probability that in a random shuffle of a deck of 52 cards,
# no two adjacent cards are same rank
nsim = 100000
cards = rep(1:13,4) # creates deck of 52 cards, 4 of each rank
y = NA
for(i in 1:nsim){
  x = sample(cards) # random permutation of cards
  y[i] = any(diff(x) == 0)
}
1-mean(y) # estimated probability that no two adjacent cards are same rank
```