Solution of question xl-65.2023

Sameer kendal - EE22BTECH11044

Question: The frequencies for autosomal alleles A and a are $p = 0.5$ and $q = 0.5$, respectively, where A is dominant over a. Under the assumption of random mating, the mating frequency among dominant parents is.

Solution: Given: A and a are two alleles where A is dominant one.
Let Y be a random variable depicting the number of dominant alleles in zygote(AA, Aa, aA, aa).

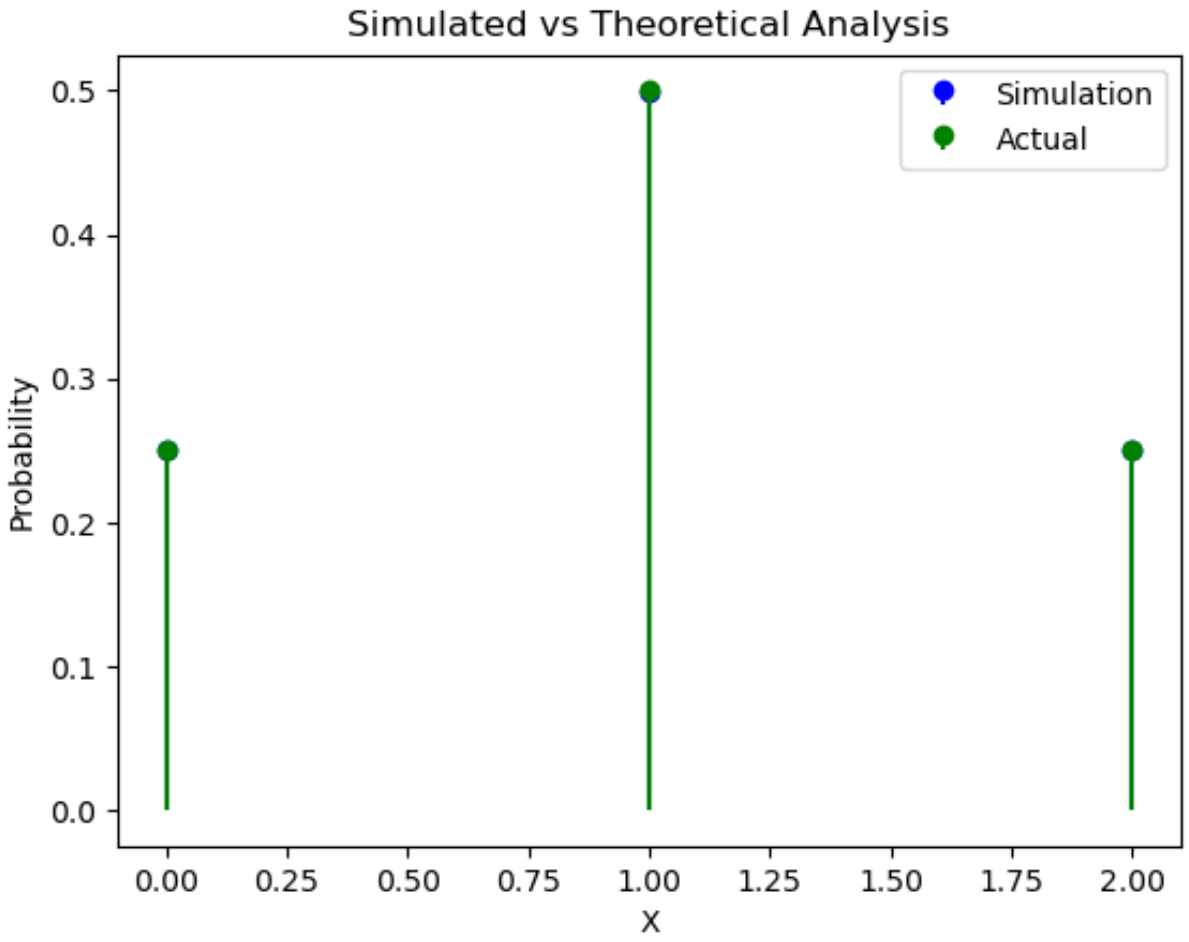
Parameter	Value	Description
A	1	dominant allele
a	0	Recessive allele
n	2	number of Alleles
p	0.5	frequency of dominant one
q	0.5	frquency of recessive one
Y	0,1,2	Number of dominant allele in zygote

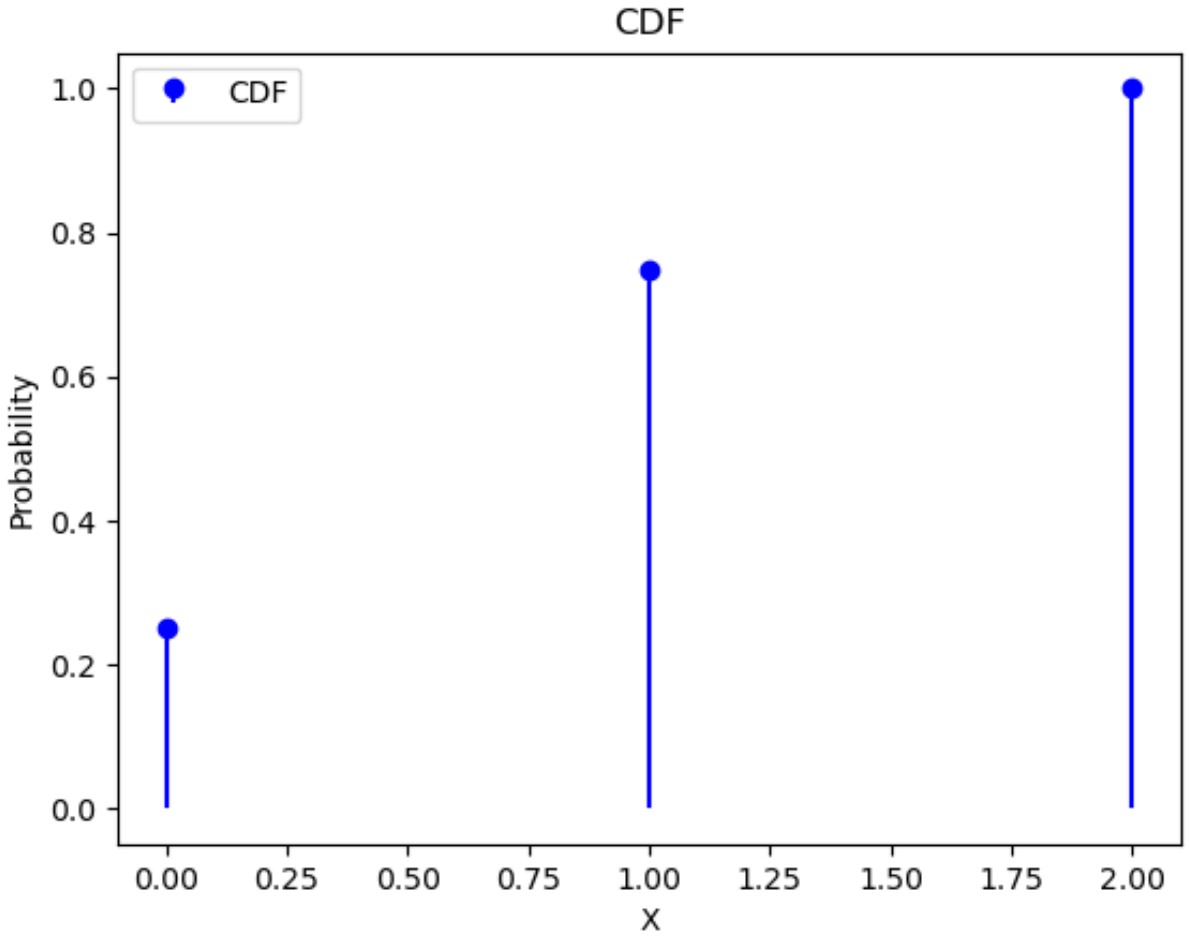
Using binomial which states that

$$\Pr(Y = i) = {}^{n}C_{i}(p)^{i}(q)^{(n-i)} \tag{1}$$

For the mating frquency among the dominant parents, both parents must have atleast one dominant allele. The probability of getting atleast 1 dominant allele in parent zygote :

$$\begin{aligned}
\Pr(Y \geq 1) &= \Pr(Y = 1) + \Pr(Y = 2) && (2)\\
&= {}^{2}C_{1}(p)(q) + {}^{2}C_{2}(p)^{2}(1) && (3)\\
&= 2pq + p^{2} && (4)\\
&= 0.5 + 0.25 && (5)\\
&= 0.75 && (6)
\end{aligned}$$


Simulated vs Theoretical Analysis
Simulation
Actual
Probability
0.0
0.1
0.2
0.3
0.4
0.5
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
X


CDF
CDF
1.0
0.8
0.6
0.4
0.2
0.0
Probability
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
X