Hardy-Weinberg Principle Examples

A population has only 2 alleles, ***R*** and ***r***, for a particular gene. The allele frequency for ***R*** is 30%. What are the frequencies of ***RR***, ***Rr***, and ***rr*** in the population?

$p+q=1$ $p^2+2pq+q^2=1$

Known: R = 30%
R represented by p
∴ p = 30% or 0.3

find q: $p+q=1$
$0.3+q=1$ (−0.3 from both sides)
$q=0.7$

Solve for genotypic frequencies

$RR(p^2)=(0.3)^2$
$=0.09$

$Rr(2pq)=2(0.3)(0.7)$
$=0.42$

$rr(q^2)=(0.7)^2$
$=0.49$

Check
0.09
+ 0.42
0.49
1 ✓

$R=0.3$
$r=0.7$
$RR=0.09$
$Rr=0.42$
$rr=0.49$

In a population of 200 mice, 8 have short tails, which is a recessive trait. The rest have long tails. Determine the frequencies of the genotypes and of the dominant and recessive alleles.

T = long tailed
t = short tailed

$p+q=1$ $p^2+2pq+q^2=1$

Known: $tt = 8/200$
$= 0.04$
tt is q^2

find q:
$q^2=0.04$
$q=\sqrt{0.04}$
$=0.2$

find p:
$p+q=1$
$p+0.2=1$
$p=1-0.2$
$p=0.8$

Solve for genotypic frequencies

$TT(p^2)=(0.8)^2$
$=0.64$

$Tt(2pq)=2(0.8)(0.2)$
$=0.32$

$tt(q^2)=0.04$

Check
$TT=0.64$
$Tt=0.32$
$tt=0.04$
1 ✓

$T=0.8$
$t=0.2$
$TT=0.64$
$Tt=0.32$
$tt=0.04$