CSI Teacher Solution

What are the observed frequencies in this population?

BB: 164/220 = 0.75 **BW:** 0.15 **WW:** 0.1

What percentage of bears is likely to be coloured white?
10%

Assuming a total coastal black bear population of 4352, how many will likely be coloured white?
435

What are the five assumptions of the Hardy-Weinberg Equilibrium?
Large population, random mating, no migration, no mutation, no selection

What is the allele frequency (p) of B? **p =** (2 X 164 + 34)/440 = **0.823**
What is the allele frequency (q) of W? **q =** (2 X 22 + 34)/440 = **0.177**

Assuming HWE, what are the genotypic frequencies?
p^2 = 0.677 **2pq =** 0.291 **q^2 =** 0.177

Given a population of 220 bears, fill in the following table:

Genotypes	**BB**	**BW**	**WW**	**total**
Observed #s	164	34	22	220
HW genotype frequencies	**p^2 =** 0.677	**2pq =** 0.291	**q^2 =** 0.177	1
HW predicted numbers (frequency x population)	148.94	64.02	6.82	220

Is this population in Hardy-Weinberg Equilibrium? Explain.
No…the observed and predicted numbers are too different. The observed numbers are obviously not in HW frequencies.

If white bears prefer to mate with white bears, which HW assumption is violated?
Random mating – if bears choose their mates by colour, we will not achieve HW equilibrium expectations.

You are the senior wildlife biologist for Spirit Bear Park, which provides critical habitat for both black and white bears. While hunting for white bears is

prohibited, hunting for black bears in this area is still permitted. The Park Manager is reviewing the hunting policy. What do you tell her? Given your knowledge of genetics, how might this affect the white bear gene pool over time?
The white bear gene pool might be compromised, given that 15% of the black bears in this region could be carrying the recessive white gene. Eliminating these bears would reduce the likelihood that future white bears would be born.

A forestry company is proposing to clear-cut an area adjacent to Spirit Bear Park. As a wildlife biologist, you have been called upon to comment on the proposal. You know that black bears prefer forested landscapes and are likely to migrate into neighbouring habitat if they become displaced. How do you think this migration of black (coloured) bears into Spirit Bear Park would affect the Kermode bear gene pool?
This could affect the gene pool in a couple of ways. On one hand, more black bears carrying the recessive gene may enter the park, allowing the white bear genes to continue. On the other, more likely hand, the majority of bears do NOT carry the recessive white gene and more of these bears breeding with Kermode bears could potentially eliminate the white gene all together.

For more information on the Spirit Bear, including traditional knowledge from Tsimshian First Nations, check out: https://www.spiritbear.com/wildlife/spirit-bear.html