GRADE 12 Biology
Population Genetics – Gene Pool

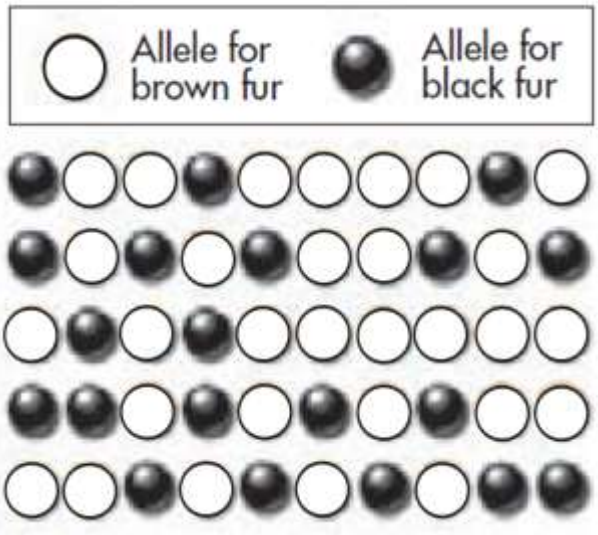
Name:_____
Date: _____

You will need a calculator; some mathematics involved

Here is an example population of mice. It is right after mating season.

Define population:

Here is their 'gene' pool



How many alleles? _____

So how many mice based on the number of alleles ? _____

12 mice are heterozygous
What colour are they?

4 mice are homozygous black.
What colour are they?

How many mice are homozygous brown?

Black is Dominant

PERCENTS

What percentage of the alleles are **black**? (genotypic ratio)

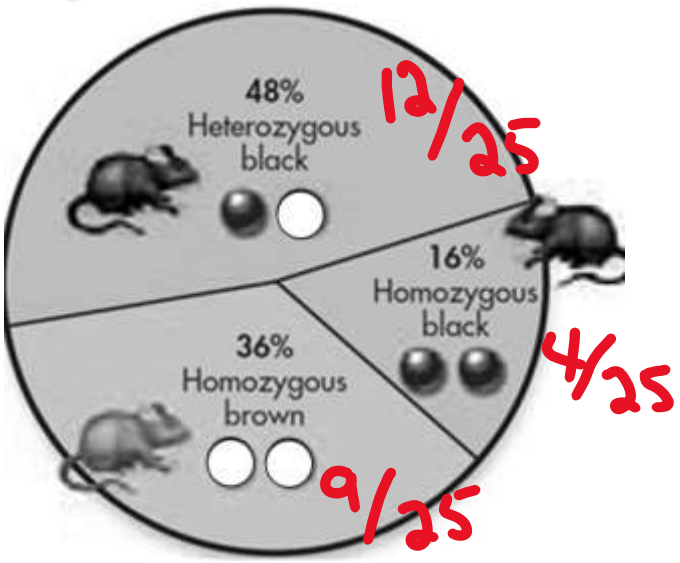
What percentage of the alleles are **brown**? (genotypic ratio)

What percentage of the mice are **black**? (phenotypic ratio)

What percentage of the mice are **brown**? (phenotypic ratio)

Compare the allele ratio and the phenotypic ratio for the **present** population

	Allele Ratio [%]	Phenotypic Ratio [%]
Black		
Brown		



If mother nature kills off 20% of the black mice but only 5% of the brown mice (perhaps the selective pressure is that black mice stand out better on the brown dry ground given that there is recent climate change); how will the numbers and ratios change?

What percentage of mice now are Brown? _____

What percentage of alleles now are Brown? _____

What percentage of mice now are Black? _____

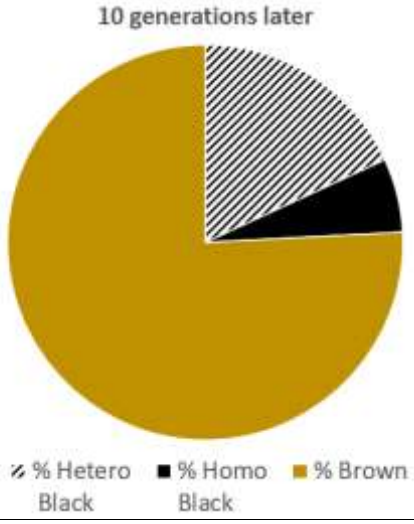
What percentage of alleles now are Black? _____

Changes in the allele frequency (the gene pool) like this are called: _____

Now we have after one season:

	Allele Ratio [%]	Phenotypic Ratio [%]
Black		
Brown		

After 10 seasons:



A new mating season arrives. We will assume random mating. We could double our population but the percentage will not change.
If the climate remains changed and mother nature continues to apply her natural **selection pressure** based on (only) the colour of the mice can you predict what will happen with a further 20% reduction in black and 5% in brown mice?

I did the math: 60% black mice, 40% brown mice. 37% 'B', 63% 'b'.

After 10 seasons it is:
24% black mice, 76% brown mice. 15% 'B', 85% 'b'.

To think about!

What if mating was not random? What if brown mice only mated with brown mice? What if black only mates with black?

What if a new Gold allele for a trait comes along; that is immigrants introduce new alleles into the population? What if a group of four mice get scared away to a whole new location by themselves? (founder effect)

What about the other 1,000 traits that mother nature is also selecting by? For example, mice with longer legs can run faster from predators, …. Etc. **Mother nature does not select by just one trait**, she selects by all the traits of an organism. We would need to look at a 1,000 other traits and see how mother nature favours those too!

What about **co-evolution**? What if the change in climate is also affecting the predators? Maybe there is not enough food now, so hawks get smaller, slower. Maybe the hawks are dying off too! Maybe after a couple seasons there are no hawks left since there are not enough mice left to find?

What if the climate changes again?

You can see that all the organisms are inter-related. The entire ecosystem evolves, not just the one species. This is what we will study in Unit E – Ecology. All our relations.