

# Artificial selection

You are a farmer who is trying to selectively breed prize-winning sheep which you can sell for lots of money at market. Your sheep are used for two things:

1. Wool, to make clothing;
2. Meat, which is really delicious.

However, the traits which make sheep good at these things are recessive. This means that you need two copies of the recessive gene (homozygous recessive), one from each parent, for it to show up in the phenotype.

Your aim is to breed sheep over many generations to make the 'perfect' sheep – one that is homozygous recessive for both wool and meat production.

How to play:

Each pair of farmers will be given a flock of six sheep (three female sheep and three male). Each card shows the genotype and the phenotype of the sheep. E.g.

	1-3	4-6	
Trait	Genotype		Phenotype
Sex	X	Y	Male
Wool	w	w	Good
Meat	T	T	Bad

In this example, we have a male sheep who is good at producing wool (he is homozygous recessive for this trait) but does not produce much meat (he is homozygous dominant for this trait).

Your task as the farmer is to select which two sheep should breed together. Remember that when they breed, the offspring will get one gene from the mother and one gene from the father in each homologous pair of chromosomes. Exactly which gene they inherit from each parent is completely random so you will need to roll a die to decide.

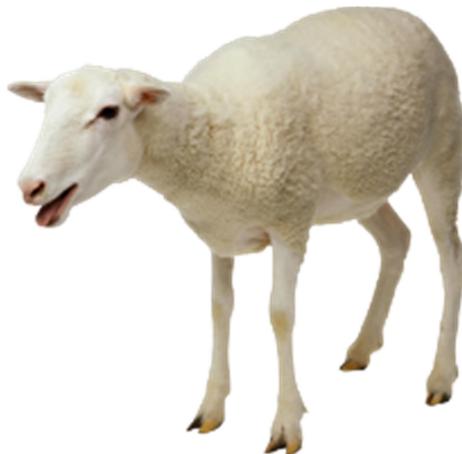
1. Choose a male and female sheep from your original flock and breed them together by rolling the die for each trait that their lamb will inherit (i.e. sex, wool, and meat).

2. Roll to determine the gene that is inherited from the mother first and then roll for the gene from the father. Record the genotype and phenotype for that particular trait in a blank table. Then roll again for the next trait.

3. Each female sheep gives birth to two lambs so will need to roll for each baby on its own.

4. Whatever you roll stays. If you roll for a gene you don't want, bad luck. However, you can always breed more babies from the same parents or select different sheep (male and female) from your growing flock to breed together.

5. If you get a sheep with all homozygous dominant traits then you have reached a 'dead-end' and you will need to choose another sheep to breed from!



	1-3	4-6	
Trait	Gene from Mum	Gene from Dad	Phenotype
Sex			
Wool			
Meat			

	1-3	4-6	
Trait	Gene from Mum	Gene from Dad	Phenotype
Sex			
Wool			
Meat			

	1-3	4-6	
Trait	Gene from Mum	Gene from Dad	Phenotype
Sex			
Wool			
Meat			

	1-3	4-6	
Trait	Gene from Mum	Gene from Dad	Phenotype
Sex			
Wool			
Meat			

	1-3	4-6	
Trait	Gene from Mum	Gene from Dad	Phenotype
Sex			
Wool			
Meat			

	1-3	4-6	
Trait	Gene from Mum	Gene from Dad	Phenotype
Sex			
Wool			
Meat			

## Male Sheep 1 – 'Billy'



	Roll 1-3	Roll 4-6	
Trait	Genotype		Phenotype
Sex	X	Y	Male
Wool	w	w	Good
Meat	t	T	Bad

Male Sheep 2 – 'Boris'



	Roll 1-3	Roll 4-6	
Trait	Genotype		Phenotype
Sex	X	Y	Male
Wool	w	W	Bad
Meat	t	t	Good

*Male Sheep 3 – ‘Rambo’*



	<i>Roll 1-3</i>	<i>Roll 4-6</i>	
<i>Trait</i>	<i>Genotype</i>		<i>Phenotype</i>
<i>Sex</i>	<i>X</i>	<i>Y</i>	<i>Male</i>
<i>Wool</i>	<i>W</i>	<i>W</i>	<i>Bad</i>
<i>Meat</i>	<i>t</i>	<i>t</i>	<i>Good</i>

Female sheep 1 – ‘Daisy’



	Roll 1-3	Roll 4-6	
Trait	Genotype		Phenotype
Sex	X	X	Female
Wool	w	w	Good
Meat	t	T	Bad

*Female sheep 2 – 'Kerry'*



	<i>Roll 1-3</i>	<i>Roll 4-6</i>	
<i>Trait</i>	<i>Genotype</i>		<i>Phenotype</i>
<i>Sex</i>	X	X	<i>Female</i>
<i>Wool</i>	w	w	<i>Good</i>
<i>Meat</i>	T	t	<i>Bad</i>

Female sheep 3 – 'Ethel'



	Roll 1-3	Roll 4-6	
Trait	Genotype		Phenotype
Sex	X	X	Female
Wool	W	W	Bad
Meat	T	t	Bad