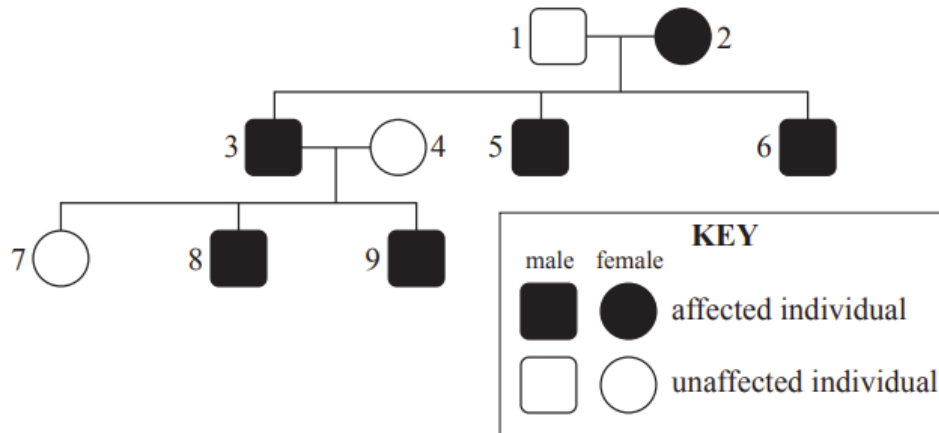


COLLATED QUESTIONS – monohybrid crosses and pedigree charts

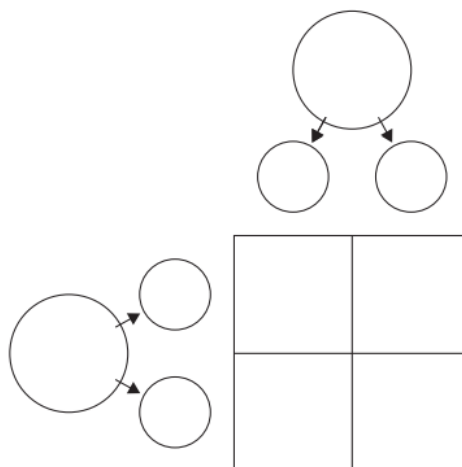
2020:2

Below is a pedigree chart for a family with the genetic disorder, polycystic kidney disease.



Polycystic kidney disease is caused by a dominant allele (D) and the unaffected allele is recessive (d).

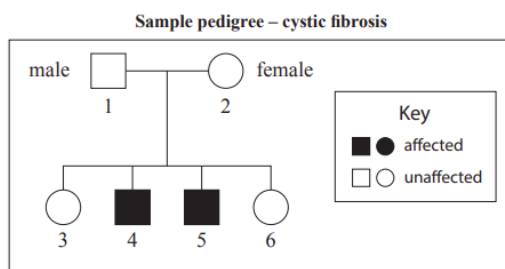
- (a) Complete the Punnett square for the cross between individual 1 homozygous recessive and individual 2 heterozygous for polycystic kidney disease.



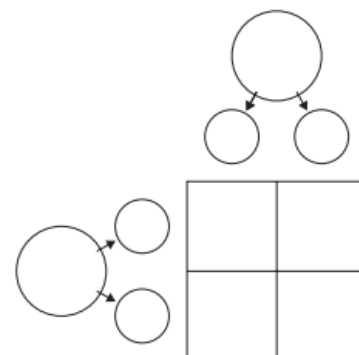
- (b) List the genotypes of the following two individuals: individual 3 individual 4.
 (c) Explain how you worked out the genotype for individual 3. You should support your answer using evidence from BOTH the parents AND children of individual 3.
 (d) One of the family members has kidney failure as a result of an infection. Discuss if this type of kidney failure can be inherited by any future children they have.

2019:2

Cystic fibrosis is a genetically inherited condition. It can be traced through a family, as shown in the pedigree chart. The cystic fibrosis allele (t) is recessive to the unaffected allele (T).



(a) Complete the Punnett square for the cross between individual 1 with individual 2.



(b) Work out the genotypes of the following three individuals.

Individual 1:

Individual 2:

Individual 5:

(c) Explain any difference in the expected phenotypes of the offspring ratio to the actual phenotypes of the offspring ratio between the cross with individual 1 and individual 2. In your answer you should refer to the expected and actual phenotype ratios for the cross.

Expected phenotype ratio:

Actual phenotype ratio:

2018:1

The allele for rose comb (R) is dominant to the allele for single comb (r) in chickens.



Single comb



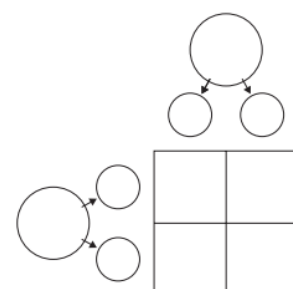
Rose comb

Two rose comb chickens produce a single comb offspring.

(a) Explain how it is possible for two rose comb chickens to produce a single comb offspring.

In your answer you should:

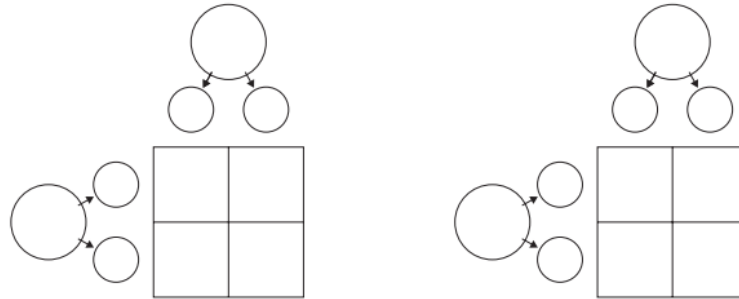
- define dominant allele
- explain the genotypes of the parents and offspring
- use a Punnett square to help your explanation.



- (b) Explain how a breeder could use crosses to find out if a rose comb chicken has a pure breeding genotype for the trait.

In your answer:

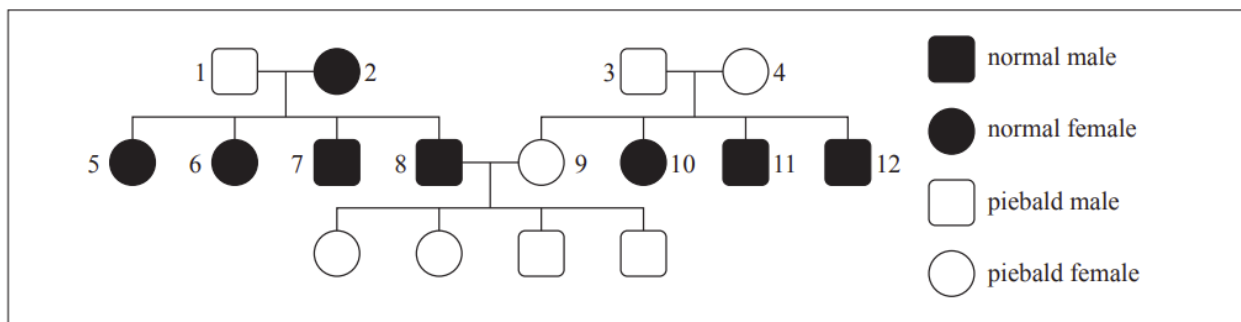
- define pure breeding and genotype
- use Punnett squares to help you explain
- explain when the breeder could be confident of the chicken's genotype.



2017:2

Piebaldism is a genetic condition causing a white patch on the head and body of horses.

In horses piebaldism is a dominant trait (H), and "normal" colour is recessive (h).



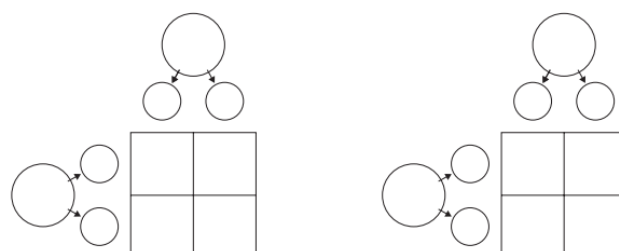
- (a) From the pedigree chart above, list all the possible phenotypes and genotypes of horses 3, 8, and 9. Use the letter H for the dominant trait and h for the recessive.

Individual	Phenotype (normal or piebald)	Genotype (HH, Hh, or hh)
3		
8		
9		

- (b) A breeder wants to produce only dominant (piebald) offspring from a breeding pair of horses. The breeder has piebald and normal horses to breed from.

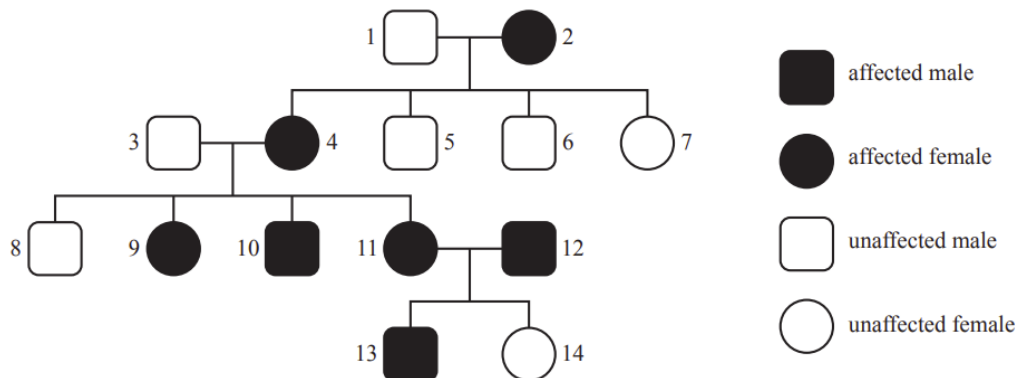
How could the breeder use crosses to make sure that the pair of horses were pure breeding?

Show crosses using Punnett squares to support your answer.



2016: 1

Photic sneezing is a condition which causes affected people to sneeze due to bright light. It can be traced through a family, as shown in the pedigree chart. Photic sneezing (A) is dominant to unaffected (a).



(a) Work out the genotypes of the following four individuals:

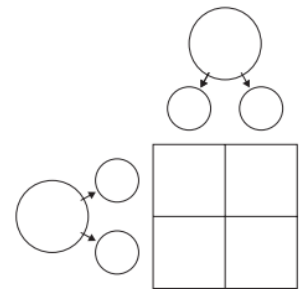
1:

2:

11:

12:

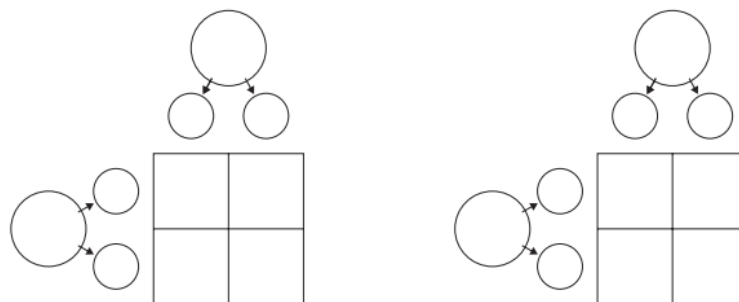
(b) Explain how the pedigree chart can be used to show that Photic sneezing is dominant, but it cannot be used to determine the genotype of individual 13. You may use the Punnett square.



(c) The cross between 1 and 2 in the pedigree chart has one affected sneezing offspring. The cross between 3 and 4 in the pedigree chart has three affected sneezing offspring. Explain the difference in the number of affected offspring (photic sneezers) in these 2 crosses.

In your answer you should:

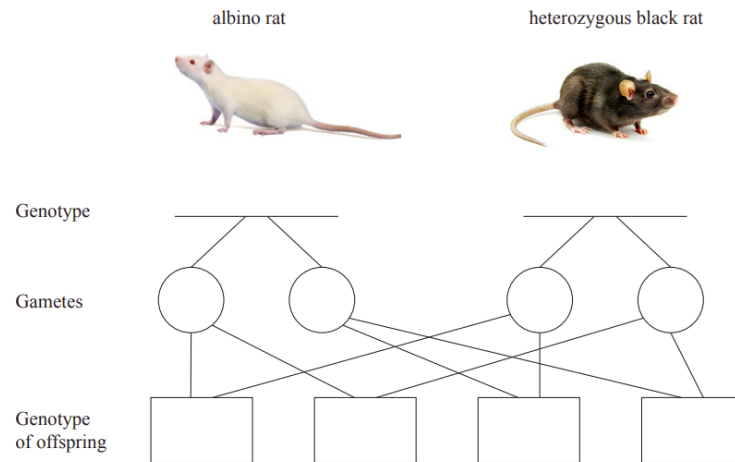
- complete Punnett squares
- give the expected phenotype ratio for each cross
- account for any difference between the expected ratio and the actual phenotype ratio for each of the crosses.



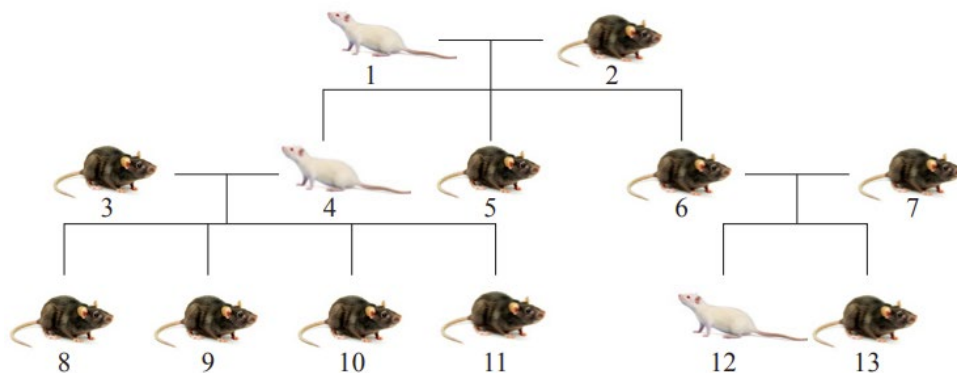
2015:1

Albinism in rats results in white fur and pink eyes. Albinism is caused by a recessive allele *a*.

(a) Complete the following diagram.



(b) The albino rat and the heterozygous black rat produced the following two generations of offspring, as shown in the pedigree chart below.



What are the genotypes of the following rats?

Rat 4:

Rat 6:

Rat 10:

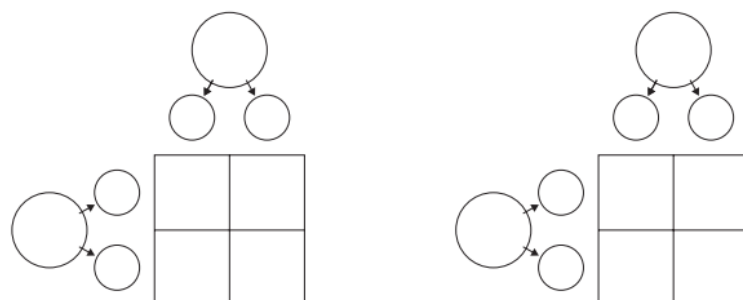
(c) Rat 3 was not an offspring of Rat 1 and Rat 2 in the family tree.

Give the possible genotypes for Rat 3 and explain which is the most likely genotype for Rat 3.

In your answer you should:

- state the possible genotypes for Rat 3
- explain why both genotypes are possible but one is more likely
- explain what you could do to be more certain about the genotype of Rat 3.

Punnett squares will be useful.



2015:2 (part question)

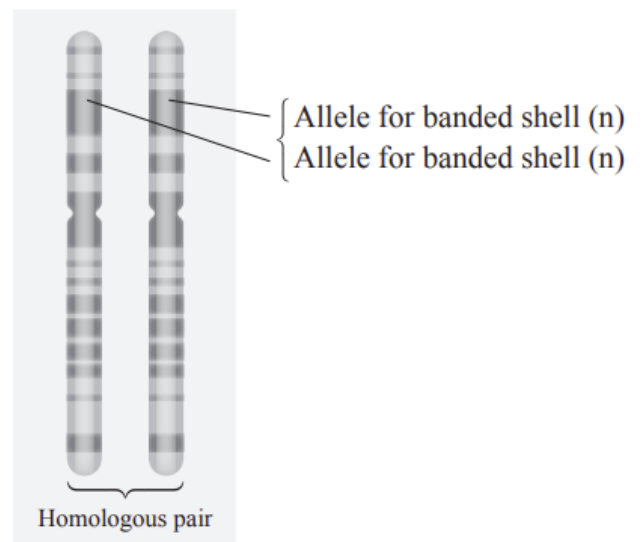
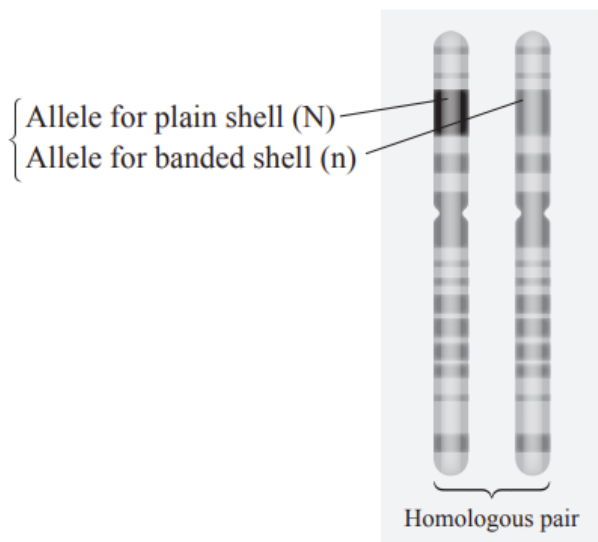
A snail known as *Cepaea nemoralis* can have either a plain shell or a banded shell.



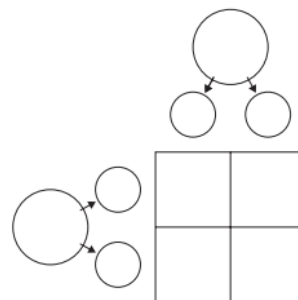
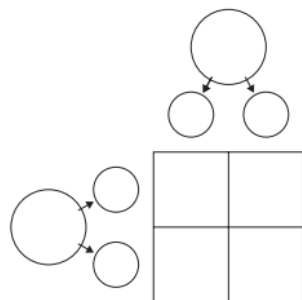
The diagrams below show the homologous chromosomes that contain the gene for shell pattern for each of the snails in the photographs above. Assume the allele for plain shell (N) is dominant over the allele for banded shell (n).

Plain shell snail

Banded shell snail



- (a) In the diagram above, which snail is heterozygous for shell pattern? Explain why you chose this snail.
- (c) These two snails were produced by sexual reproduction from the same male and female.
- give the possible genotypes of both parents and explain how you determined these possible genotypes.



2014:3

An animal breeder wanted to produce sheep with white wool, but some white sheep produce lambs that have black wool. Animal breeders often use one male sheep to mate with all their female sheep.



- (a) Give all possible genotypes for each phenotype. Use **A** to represent the dominant allele for common white wool, and **a** to represent the recessive allele for black wool.

White wool:

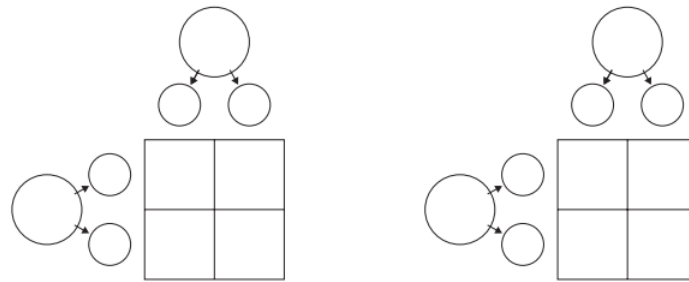
Black wool:

- (b) Discuss how a farmer could develop a group of sheep that are pure breeding for white wool. In your answer you should:

- state the genotypes of the male and female sheep the farmer should use to breed from
- explain how the animal breeder can determine the genotypes of the male and female to produce sheep that all have white wool.

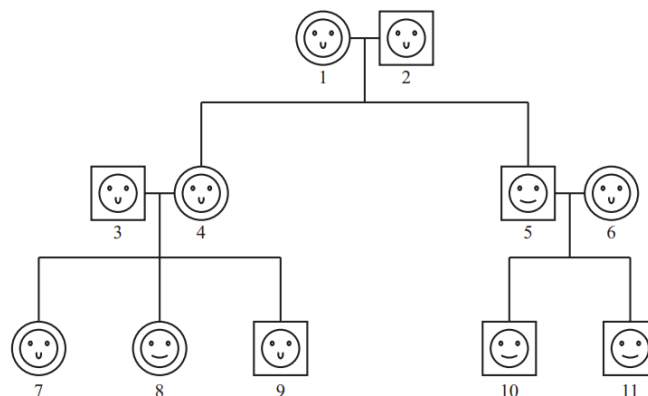
You should include at least two Punnett squares with your explanation

- explain how the animal breeder could make sure that the offspring would always be pure breeding.



2014:4

In the family tree below, people who are tongue rollers are shown as ☺ while those who cannot roll their tongue are shown as ☹.



Use the letters T and t to represent the alleles for tongue rolling (T) and non-rolling (t).

- (a) (i) Use the family tree above to work out the genotype of individual 5.
(ii) Explain how you worked this out.

- (b) Use the family tree to explain why individual 6 must be Tt.

- (c) Explain why the genotypes for individuals 3 and 4 both must be Tt.

In your answer you should:

- draw Punnett squares in the box below
- explain why the genotypes of individuals 3 and 4 cannot be TT or tt.