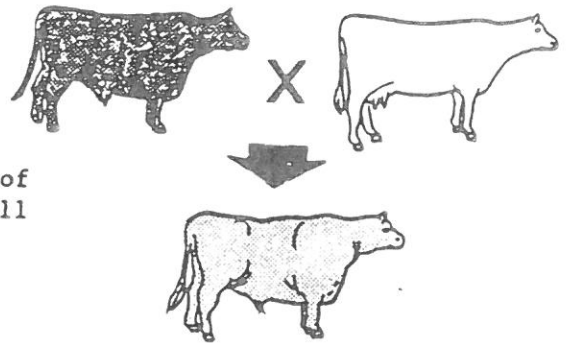


incomplete & co-dominance

Many characteristics studied in genetics are controlled by genes which are dominant or recessive.

However, not all characteristics follow this pattern.

Here is one example:



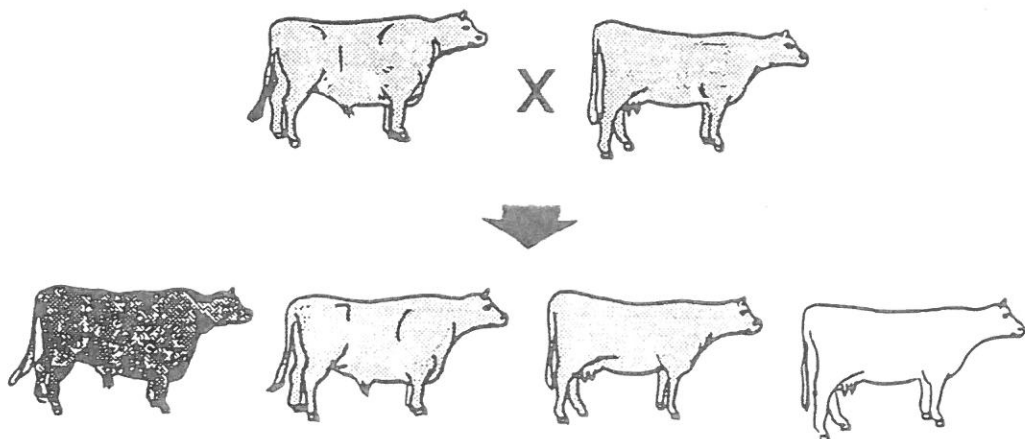
- Q1 • Describe the offspring from the mating of a white poll shorthorn cow and a red poll shorthorn bull.

- Q2 • Can you describe either red or white coat colour in poll shorthorn cattle as a dominant feature?

(Give a reason for your answer.)

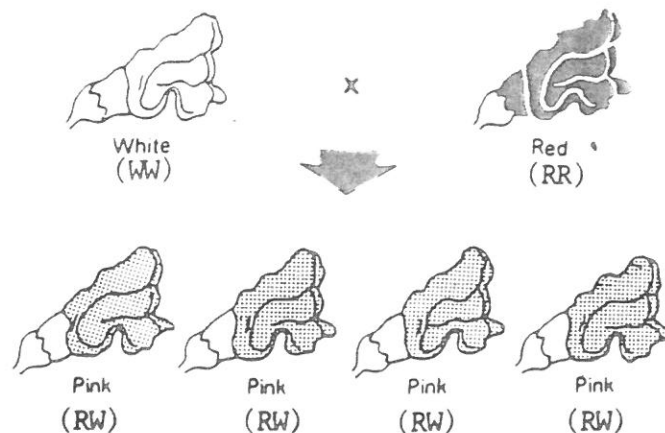
This case does *not* fit the dominant/recessive model. We describe this as a case of *CO-DOMINANCE*. The *hybrid* offspring shows the effect of both the red and white genes and is called *roan*.

What type of offspring are produced if a *roan* poll shorthorn cow is mated with a *roan* poll shorthorn bull?



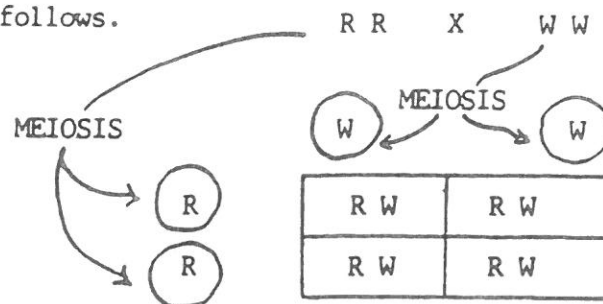
- Q3 List the offspring produced by this mating.

When red-flowering snapdragon plants are crossed with white-flowering snapdragon plants, pink-flowered plants result. This is a case of *INCOMPLETE DOMINANCE*. The hybrid is *intermediate* between the parent types.



This result can be explained by assuming the gene for red petals (R) blends with the gene for white petals (W) when both genes are present so that an intermediate pink colour results:

This can be predicted as follows.



Q5 Consider the fertilization of a pink snapdragon by pollen from another pink snapdragon.



- What gene symbols should be used to represent each pink parent?
- What type(s) of gene(s) for colour will be carried by the pollen?
- What type(s) of gene(s) for colour will be carried by the eggs?
- Use a table to show all possible combinations of pollen grains with egg cells. (Similar to the table above).
- Predict the most likely outcome when 1000 snapdragons are produced by crossing pink parents.

Q6 What results would you expect if you were to cross red-flowering plants with pink-flowering plants? Explain your answer fully.

GENETICS EXERCISES

Example 1 is done for you. Notice how the working is set out logically and the answer stated clearly.

Set out and complete questions 2 to 8 as shown.

- Q1. A black-haired true-breeding male guinea pig is mated with a white-haired true-breeding female. The gene for black hair is dominant over the gene for white hair, which is recessive. What are the chances of a white-haired individual appearing in (i) the first generation of offspring; (ii) the second generation of offspring?

SYMBOLS FOR GENES:- Black B; white b.

<u>1st GENERATION</u>	Male	Female
Parents	B B	b b
Gametes	B	b
Offspring	<div style="display: flex; justify-content: space-around; align-items: center;"> ↘ ↙ </div> B b	
		<u>ALL BLACK</u>

<u>2nd GENERATION</u>	Male	Female
Parents	B b	B b
Gametes	B b	B b

OFFSPRING	SPERM	EGGS	
		B	b
	B	BB black	Bb black
	b	Bb black	bb white

There would be no white individuals in the first generation, and there would be 1 chance in 4 of a white individual appearing in the second generation.

- Q2. The gene for red flowers in pea plants is dominant over the gene for white flowers. A true-breeding red-flowered plant is crossed with a true-breeding white-flowered plant to produce 200 offspring. These are allowed to self-pollinate and produce a second generation consisting of 10,000 offspring.



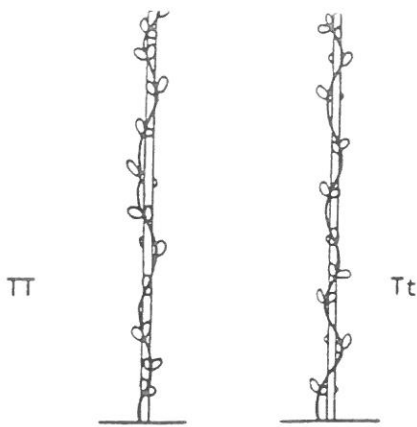
RR



rr

How many white-flowered plants should occur in (i) the first generation of 200 individuals; (ii) the second generation of 10,000 individuals? (Symbols for genes:- red R; white r.)

Q 3.



When a true-breeding tall pea plant is crossed with a dwarf pea plant, all of the offspring are tall hybrids. One of these tall hybrids is then crossed with a true-breeding tall pea plant to produce 100 offspring. How many of these should be dwarf plants? (Symbols for genes:- tall T; dwarf t.)

Q4. In domestic cats, the gene for short hair (S) is dominant over the gene for long hair (s).

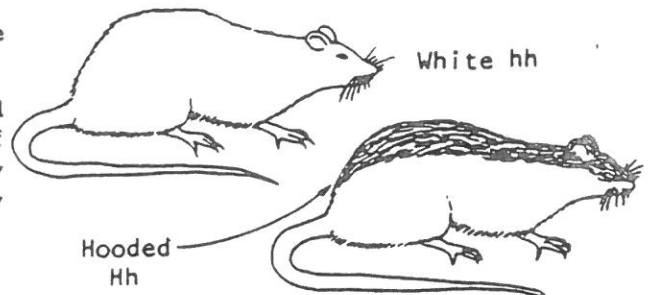


A short-haired hybrid female cat (Ss) mates with a long-haired male. What proportion of their kittens should have long hair? 25%

Q 5. There is a variety of laboratory rat which has a black or brown coloured patch on the head and spine. They are called "hooded". The gene for hoodedness (H) is dominant over the gene for plain white hair colour (h).

(a) What are the chances of two white rats producing a hooded offspring? 50%

(b) A hybrid hooded male rat is mated with a white female to produce a litter of eight offspring. Theoretically, how many of these should be hooded and how many should be white?



Q 6. A true-breeding long-haired male guinea pig is mated with a true-breeding short-haired female. All of the offspring of the first generation have short hair.

(a) Which is dominant, the gene for long hair or the gene for short hair?

(b) One of these short-haired offspring is then mated with a long-haired guinea pig, to produce four offspring. Theoretically, how many of these should have long hair?

Q 7 A white-flowered snapdragon is crossed with a pink-flowered snapdragon to produce 100 offspring. How many of these should have (a) red flowers; (b) white flowers; (c) pink flowers?

Q 8 In Andalusian fowl, the gene for black feathers is incompletely dominant over the gene for white feathers. The hybrids have blue-grey feathers.

What would be the theoretical distribution of feather colour obtainable from each of the following crosses:-

- a blue-grey rooster with a blue-grey hen;
- a blue-grey hen with a white rooster;
- a blue-grey rooster with a black hen?

