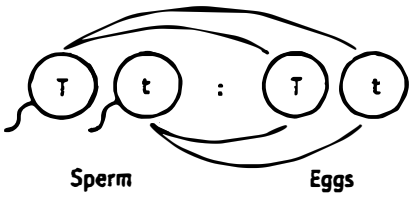
Monohybrid cross genetics: single-gene inheritance

Worked Example - Logical style

Parent phenotypes: Hybrid tall pea plant ♂ × hybrid tall pea plant ♀

Parent genotypes: Tt × Tt

Sex cells:



Sperm Eggs

F_1 genotypes: TT : Tt : Tt : tt

F_1 phenotypes: Tall : tall : tall : short

Phenotypic ratio: 3 : 1

Worked Example - Punnet style

Definitions = match them correctly

Allele	-	- the gene make-up of an individual with respect to a characteristic (e.g. Tt)
F1	-	- see heteroygous
Phenotype	-	- the genes in a genotype are identical (e.g. TT,or tt)
Genotype	-	- the genes in a genotype are different (e.g. Tt)
Homozygous	-	- the physical appearance of a genetic character (e.g. tall)
Heterozygous	-	- represents the 'first filial generation'
Hybrid	-	- various forms of the one gene (e.g. 'T' and 't' are the alleles for plant height)

1. In pea plants, tall (T) is dominant over the dwarf condition (t). Work out the genotypes and phenotypes of the offspring of the following crosses:
   (a) heterozygous tall pea plant × homozygous tall pea plant
   (b) a cross between a hybrid tall and a dwarf pea plant
   (c) a cross between two heterozygous tall pea plants

2. The lack of body pigmentation (albinism) in humans is due to a recessive allele (a) and normal pigmentation is the result of its dominant allele (A). Work out the chances (as a percentage) of the following couples producing an albino child:
   (a) normal heterozygous ♀ × normal homozygous ♂
   (b) albino ♂ × normal (carrier) ♀
   (c) normal heterozygous ♀ × normal heterozygous ♂
   (d) albino ♂ × albino ♀

3. Assume that in the families below the allele for brown eye colour is dominant over the allele for blue eye colour.
   (a) A brown-eyed man marries a blue-eyed woman. All their children are brown-eyed. What are the genotypes of all the individuals in this family?
   (b) A blue-eyed man, both of whose parents were brown-eyed, marries a brown-eyed woman. They have one child, who is blue-eyed. What are the genotypes of all the individuals mentioned?
   (c) A blue-eyed man marries a brown-eyed woman whose father was blue-eyed. What proportion of their children would you predict to have blue eyes?

4. In fruit flies, long wing (L) is dominant to short wing (l). Two long-wing flies produced 49 short-wing and 148 long-wing offspring.
   (a) What were the probable genotypes of the parents?
   (b) What proportion of the long-wing offspring should be heterozygous?

5. Heterozygous black (Bb) guinea pigs are mated to homozygous recessive (bb) whites. Predict the phenotypic ratios expected from backcrossing the black F_1 progeny to:
   (a) the black parent;
   (b) the white parent.