

Inheritance

International Baccalaureate · IB Diploma · Biology · HL

Scope and prerequisites

This handout covers selected HL topics for the course first assessed in 2025; it is not the whole syllabus.

Prerequisites: read the stated quantities and units, and use arithmetic and the model conditions below.

The examples are original and fictional: they are not real measurements or real student investigations.

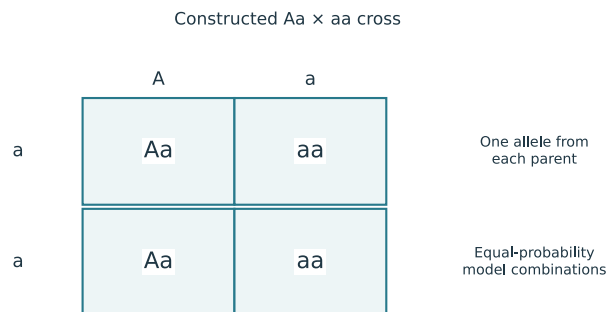
Inheritance, variation and probability

■ What would explain this observation?

- Two parents can carry a recessive **allele** without expressing the associated phenotype. Their children do not have to match the parents phenotypically.

■ Build the model

- An allele is a variant of a gene.
- A **genotype** lists alleles; a phenotype is the expressed characteristic, influenced by genotype and sometimes environment.
- Dominant and recessive describe the relationship between alleles, not how common they are.
- allele: A variant of a gene.
- genotype: The alleles an organism carries.



Boxes show possible outcomes, not a fixed sequence of births.

In an Aa × aa cross, each offspring has an equal chance of Aa or aa

■ Choose evidence that can test it

- In a simple monohybrid cross Aa × Aa, gametes carry A or a.
- Combining independent gametes gives AA, Aa, Aa and aa.
- The predicted probabilities describe many possible fertilizations, not a fixed order of children.

In the lab: Write parental genotypes and gametes before making the grid. State the inheritance model and phenotype key. Use a pedigree to check consistency with a model; do not infer certainty from a small family alone.

■ Work from known quantities

- Known: Aa × Aa with complete dominance.
- Probability of aa = $1/4 = 25\%$.
- Probability of the dominant phenotype = $3/4 = 75\%$.
- If four children are born, there is no guarantee that exactly one has the recessive phenotype.

Your turn: In Aa × aa, what percentage of offspring are predicted to be aa?

■ Check the conclusion and its limits

- A dominant allele can be rare.
- Mutation is a source of new variation; selection changes the relative success of existing variants rather than directing mutations toward a goal.

Not true: A dominant allele must be the most common allele in a population. Dominant describes how an allele is expressed in a heterozygote, not how common it is. A dominant allele can be rare in a population and a recessive allele can be common; frequency depends on inheritance and selection, not dominance.

Key:

- An allele is a variant of a gene.
- In a simple monohybrid cross Aa × Aa, gametes carry A or a.
- Watch for: A dominant allele can be rare.

■ Write from an expected 5 offspring

- Aa crosses with Aa. There are 20 offspring. Complete dominance applies.
- Find the expected number of aa offspring. The count is not a guarantee.