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DNA & genetic inheritance

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cheat sheet

Genes are sections of **DNA** that code for proteins. You inherit **two alleles** of each gene, one from each parent, and a **Punnett square** shows the possible outcomes.

1 Key terms

Term	Meaning	Example
gene	a section of DNA that codes for a protein	the gene for the CFTR protein
allele	a different version of a gene	F or f
dominant	shows even if only one copy is present	F (capital letter)
recessive	shows only if both copies are this allele	f (small letter)
homozygous	two identical alleles	FF or ff
heterozygous	two different alleles	Ff
genotype	the alleles you have	Ff
phenotype	what you can see or measure	unaffected, or cystic fibrosis

2 Punnett square

Carriers (Ff) × carriers (Ff)

parent 1 gametes \ parent 2 gametes	F	f
F	FF	Ff
f	Ff	ff

- Genotypes: **1 FF : 2 Ff : 1 ff**
- Phenotypes: **3 unaffected : 1 cystic fibrosis**
- Chance of cystic fibrosis: 1 in 4 = **25%**

3 Worked example

Example

Both parents are Ff. What is the chance a child has cystic fibrosis (ff)?

4 equally likely boxes

only 1 box is ff

1 ÷ 4 = 0.25 = 25%

Each child has the **same chance**, however many children came before.

4 Sex determination

mother \ father	X	Y
X	XX	XY
X	XX	XY

Females are **XX**, males are **XY**.

2 XX : 2 XY = 1 : 1, so a **50%** chance of a girl or a boy.

5 DNA in the cell

46 chromosomes in a body cell

23 pairs

DNA is a **double helix** in the nucleus. Bases pair **A–T** and **C–G**. Gametes carry **23**, one from each pair.

Watch out

- ✕ Mixing up **genotype** (the alleles, e.g. Ff) and **phenotype** (what you see).
- ✕ Thinking **dominant** means more common. It only means it **shows** with one copy.
- ✕ Saying a **carrier** (Ff) has the disorder. They do **not**: the recessive allele is hidden.
- ✕ Thinking 1 in 4 means exactly one in every four children. It is a **probability**, not a guarantee.

Exam tips

- Write the **parents' genotypes** and the **gametes** before you draw the square.
- Give probability as a **fraction, decimal or percentage**: ¼, 0.25 or 25%.
- Put a **key** in: say which letter is the dominant and which the recessive allele.

Try it: cross Ff with ff. What is the probability that a child has cystic fibrosis?

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