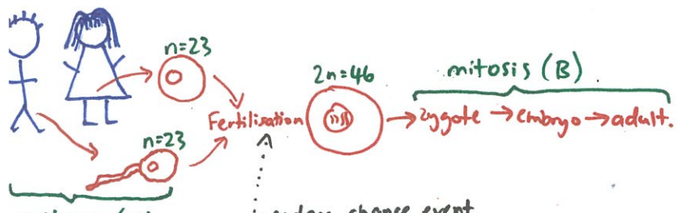
1.9 Genetic Variation (90948)

MEIOSIS (A): sex cell division, occurs in sex organs only. (ovaries / testes)
- produces gametes (n).
- Key: 4x genetically unique daughter cells produced... each gamete receives only 1 chromatid from each homologous pair.
- to. chromosomes halved (2n → n) or 46 → 23.
- 2x rounds of division
  - 1st round = homologous pairs line up.
  - 2nd round = chromosomes line up single-file.
- essentially: HH x 23 → H x 23



↳ variation source, Law of Independent Assortment 2^{23} possibilities!
- ↳ Crossing over
- ↳ Segregation

random chance event.

Female sex chromosomes = XX → all ova = carries X chromosome. (X)
Male " " = XY → sperm could be (X) or (Y) (half will carry X, half Y due to meiosis). ∴ males determine sex of offspring.

Genotype = actual alleles individual carries i.e Bb
Phenotype = expression of the alleles (what is seen).

Dominant allele = represented by capitals 'B'. Only one needs to be present in genotype to see it expressed in phenotype.

Recessive allele = both alleles need to be present to be expressed in phenotype. Shown by lowercase letter 'b'.

Homozygous = both alleles same e.g BB or bb → used for a test cross → pure-breeders

Heterozygous = alleles different e.g Bb

Punnett Squares: used to solve probable inheritance of characteristics.

FF x Ff =

	F	F
F	FF	FF
f	Ff	Ff

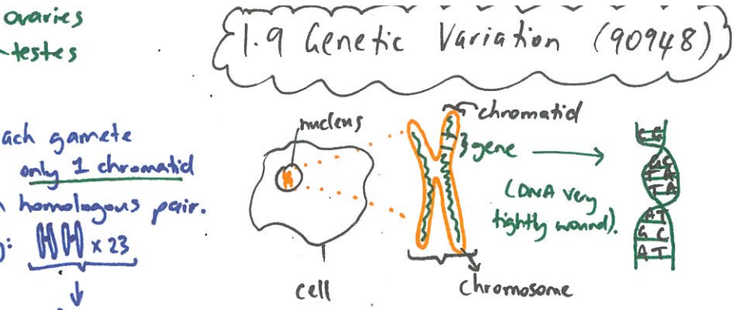
homo x hetero = dom. 100% dominant in that characteristic

Ff x ff =

	F	f
f	Ff	ff
f	Ff	ff

50% dom. characteristic
50% recessive characteristic

Note: These ratios are phenotype ratios.



chromosomes exist in homologous pairs (same size, shape, genes (identical loci)). One of each pair is from mum (maternal) and other dad (paternal). (23 pairs = 46 total).

autosomes = chromosomes (pair no. 1 - 22) for body characteristics)

sex chromosomes = XY (male) or XX (female) ⇒ info. for sex characteristics pair no. 23.

Karyotype = picture of individuals chromosomes arranged in homologous pairs.

n=23 2n=46

(B) MITOSIS: body cell division for growth and repair.
* each new cell gets complete set of chromosomes e.g 46 in humans.

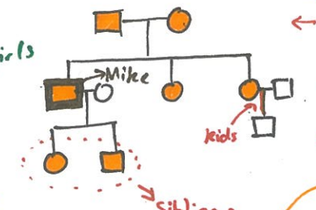
during regular cell activity, DNA is invisible, exists as long strands of chromatin.

BEFORE CELL DIVISION: chromatin, shortens, thickens and is replicated (DNA replication)

essentially: → centromere, identical chromatids

* IPMAT *

Pedigrees: chart to show relationships and traits in families.



- □ = boys ○ = girls
- ■ = has brown eyes.
- dominant over blue eyes
- ← Parents
- ← F1 (1st generation)
- ← F2 (2nd generation).

* N.B recessive traits can be found in higher numbers than dominant i.e O Blood type!

You need to be able to interpret Pedigree charts and determine possible genotypes of individuals... support probable outcomes with Punnett Squares.

i.e There is 71 genotype possible for Mike, which is most likely?

Adaptive features: Structure, Behaviour, Physiology
- allow individuals to survive and live and breed successfully.
- e.g birds migrating.

if environment changes → selection pressures change
- advantageous to have variation in population.
- adaptive features change overtime.

genetic material for all living things. (some have RNA)

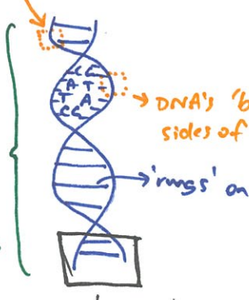
DNA: deoxyribonucleic acid
- double helix (twisted ladder)
- double-stranded

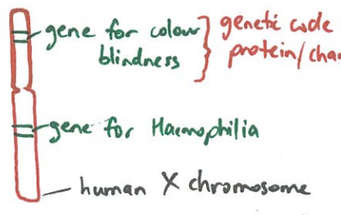
1 unit = nucleotide
- Phosphate
- deoxyribose sugar (pentose)
- nitrogen base (A, T, G or C)

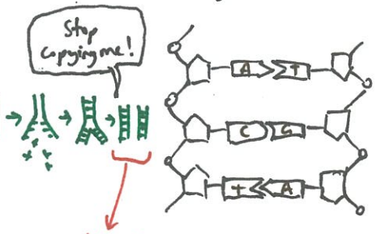
complimentary base-pairing rule = A=T, G≡C (they bond only this way due to chemical structure)

gene = section of chromosome that codes for a trait i.e eye colour.
- DNA's 'backbone' or sides of ladder = sugar + phosphate
- 'rungs' on ladder = nitrogen bases, A, T, G, C.

the order of these bases make you and I different.







Allele = alternative form of a gene, you will always have 2 alleles for each gene... one on each chromosome (of a homologous pair) i.e 'B' for eye colour from mum and 'b' for eyes from dad... in same locus.

homologous pair (not yet replicated)

heritable ← vs. → non-heritable.

if the two are not identical after DNA replication, this is called a mutation and so creates new alleles. → new variations i.e blue eyes instead of brown. Mutations are only inherited if occur in meiosis (sex cell division). NOT mitosis.

Test crosses:

what is this individuals genotype??

If individual shows dominant trait, they could be Ff or FF.

↑ ↗

to figure out which genotype they are, must be bred with homozygous recessive (ff).

This is a test cross and need large numbers of offspring to be sure.

recessive trait in offspring? ⇓ heterozygous