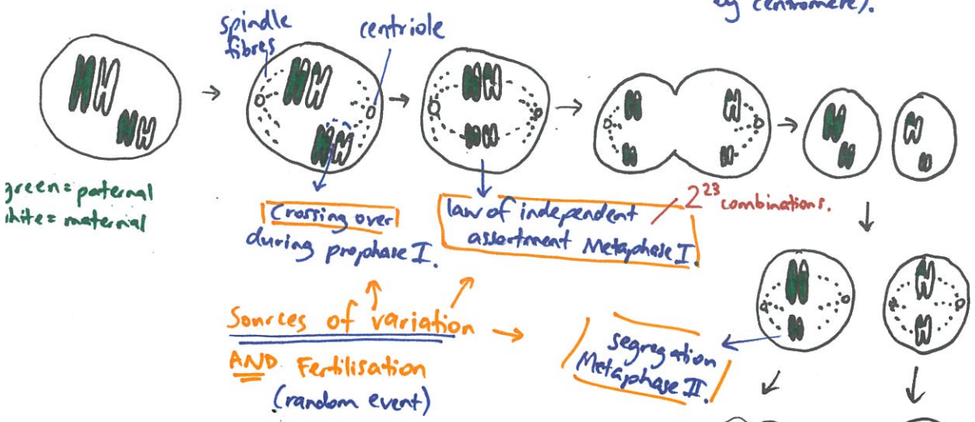
Meiosis

- 2 divisions, 1st set = homologous pairs separated, 2nd = chromatids separated.
- occurs in sex organs (ovaries & testes)
- produces gametes (sperm + ova) ← "haploid" n=23
- result = 4x daughter cells

body cell (2n) ↑ "diploid"

homologous chromosomes (23 pairs in humans) → identical shape, length, genes BUT could have different alleles. ↓ one from mum, one from dad.

* BEFORE meiosis can begin, each chromosome must be replicated (DNA replication) to form 2 chromatids. (held together by centromere).



Linkage = alleles that occur on same chromosome.
- ↳ inherited together.
- ↳ can be separated by crossing over. ↓ produces different combinations of alleles.

* reminder: this was with only 2 homologous pairs... humans = 23 pairs!!! ⇒ lots & lots of possibilities.

Inheritance: lethal alleles, multiple alleles → Monohybrid, Dihybrid
- complete dominance
- incomplete dominance
- co-dominance

Multiple alleles = > 2 alleles for a gene. You will only ever find 2 present in genotype. e.g I^AI^B in blood grouping. (3x possible alleles).

Monohybrid = one characteristic controlled by one gene
- 'capital letter' = dominant allele i.e R
- 'lower case' = recessive allele i.e r
- heterozygous = Rr or RrTt (2 genes, 4 alleles)
- homozygous = rr or RR or RRTT or rrtt

2x heterozygotes (Rr x Rr)

	R	r
R	RR	Rr
r	Rr	rr

phenotype = 3:1 ratio expected... this is a chance event!

Complete dominance = only one dominant allele needed to be present to have that characteristic expressed and masks recessive allele (if present). only 2 possible phenotypes.

2.5 Genetic Variation (91157)

gene = basic unit of heredity, a length of DNA that codes for a protein/trait.

allele = alternative form of a gene.

genotype = genetic make up of an individual, the actual alleles an individual has.

phenotype = expression of the genotype, what is seen

genotype + environment → phenotype

gene pool = all alleles present in a population.

allele frequency = no. of times an allele occurs in a population.

mutation = change in base sequence of DNA. They are spontaneous, random, rare.
- ↳ could be increased by mutagens (UV, chemicals, environmental factors).

gene mutations = insertion, deletion, substitution.
- ↳ same sense, mis-sense, non-sense.
- ↳ source of genetic variation.
- ↳ if in gametes, mutation is heritable, new mutated allele enters gene pool.... now subject to Natural Selection.
  - "selected for" = survives & reproduces.
  - "selected against" = dies/no reproduction.

Genetic diversity = range of alleles present in gene pool. ↑ no. different alleles = ↑ genetic diversity. this is good... more 'material' for natural selection to act on → if environment changes, higher chance of favourable alleles.

Test cross = breeding w/ homozygous recessive to determine genotype of an individual.... if no offspring have recessive trait → original parent must be homozygous.

Incomplete dominance = for heterozygous individuals, neither allele dominates the other, both contribute to produce an intermediate/blended phenotype.
- 3x possible phenotypes e.g RR = red snapdragon flowers, rr = white " " , Rr = pink " "

Codominance = for heterozygous individuals, both alleles are equally dominant, both alleles expressed in phenotype, independent of each other. (2x diff. uppercase letters used.)
e.g cows RR = red, W = white, RW = roan (mixture of some hairs red and some white)

Lethal alleles = when a mutation results in an allele producing non-functional version of a protein.
- lethal combination = dies before or after birth.
- changes expected phenotype ratio e.g 2x heterozygotes = 2:1 (not 3:1)
- e.g CC = lethal, Cc = curly wings in flies, cc = normal wings

Population Genetics, Key definitions

Gene Pool: total no. of alleles present in population.
↳ Factors affecting frequencies: mutation, natural selection, migration, genetic drift

Evolution: change in allele frequencies over time. Process of how new species develop.

Mutations: source of new alleles in gene pool. ESSential for Evolution

Genetic drift: change in allele frequencies due to CHANCE. (not selection)
↳ prominent in small populations. e.g recessive allele lost due to BBKBB

Founder Effect: small group colonises geographically isolated area. Not a good representation of allele frequencies in original population. e.g seed colonising NZ from Australia.

Bottleneck Effect: pop. rapidly reduced in numbers due to catastrophic event or sudden selection pressure. If pop. recovers → reduced diversity.

	Affected by Independent Assort?	increases genetic variation?	crossing over?	no. of homologous pairs.	no. of possible gametes
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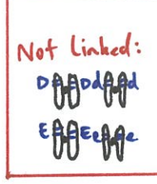
Not Linked: 	✓	✓	✓	2	4 DE dE De de

Linkage: ignoring crossing over.... first

YyFf x yyff =

1:1:1:1 expected phenotype ratio.

BUT, if linked, ratio changes due to recombinants.

Dihybrid Inheritance: 2 characteristics controlled by 2 genes. Could be linked or not linked. e.g w/ no linkage

F1 { TTYY x ttyy = all F1 TtYy (TY x ty)

TtYy x TtXy =

possible gametes = TY, Ty, tY, ty

	TY	Ty	tY	ty
TY	+	+	+	+
Ty	+	+	+	+
tY	+	+	+	+
ty	+	+	+	+

9 : 3 : 3 : 1 phenotype ratio.

(without linkage / w/ linkage)