

This is the **Higher Combined** version — includes Higher Tier content. Some Separate-only details are omitted.

Punnett squares allow prediction of offspring genotype and phenotype ratios in genetic crosses.

- Dominant allele: expressed with ONE copy. Recessive: needs TWO copies
- Homozygous (BB or bb), heterozygous (Bb)
- Punnett square: write parental gametes along top and side, fill four boxes with offspring genotypes
- Bb × Bb: ratio 1 BB : 2 Bb : 1 bb → 3 dominant : 1 recessive phenotype
- Polydactyly: dominant. Cystic fibrosis: recessive (both parents can be carriers Ff)
- ★ HT Co-dominance: both alleles expressed in heterozygote (e.g. ABO blood groups: I<sup>A</sup> I<sup>B</sup> = type AB)
- ★ HT Sex-linked conditions (e.g. colour blindness): gene on X chromosome, more common in males (XY)

### Key Terms

<b>Polydactyly</b>	Dominant inherited condition — extra digits
<b>Cystic fibrosis</b>	Recessive inherited condition — thick mucus
<b>Co-dominance</b>	Both alleles expressed equally in heterozygotes
<b>Sex-linked</b>	Trait whose gene is on the X chromosome

■ **Exam Tip:** Always draw the FULL Punnett square. Write gametes of each parent along top and side first, then fill in. Show all four boxes — marks given for correct working even if final answer has an error.