*This is the **Higher Separate** version — includes all Higher Tier content (marked ★) and all Separate Science content.*

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■ I■ = type AB)

★ **HT** Sex-linked conditions (e.g. colour blindness): gene on X chromosome, more common in males (XY)

Key Terms

Polydactyly	Dominant inherited condition — extra digits
Cystic fibrosis	Recessive inherited condition — thick mucus
Co-dominance	Both alleles expressed equally in heterozygotes
Sex-linked	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.