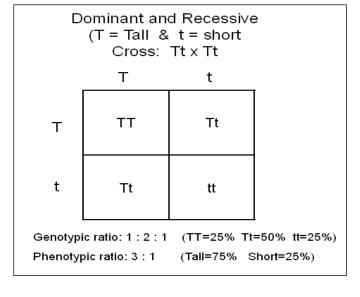
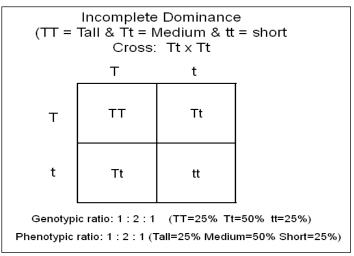
### PUNNETT SQUARE CHEAT SHEET

Below is a sampling of Punnett Square problems that you will be expected to solve. In order to do this, you will also have to understand the meaning of the terms below.

- Genotype: The letters that make up the individual. E.g. *TT or Tt*
- Phenotype: The physical characteristics of the particular trait. E.g. Tall or short
- **Dominant trait:** Signified by capital letter-E.g. *T.* If the traits you are using are dominant or recessive, this trait will "overpower" the recessive trait and will be expressed. E.g. *Tt*
- Recessive trait: Signified by small case letter-e.g. t. An organism with a recessive allele for a particular form of a trait will have that form only when the dominant allele for the trait is not present
- Homozygous: Has same letters. E.g. TT or tt (same alleles for trait)
- Heterozygous: Has different letters. E.g. Tt (different alleles for trait)
- Purebred trait: Also known as true breeding. Individuals genotype is homozygous and will only make one type of gamete. E.g TT will always produces T, and T. tt will always produce t, and t.
- Gamete: sex cells. Represented by letter N (meaning they are haploid-contain half the chromosomes
- **P generation**: The parental generation (Usually the first one in a genetic cross)
- F<sub>1</sub> generation: The *first* generation of offspring from P generation (means first filial: Latin for "son")
- **F**<sub>2</sub> **generation**: The **second** generation of offspring from P generation (means first filial: Latin for "son")
- **Monohybrid Cross**: Also known as a Single-Factor Cross. Only one trait is used in the genetic cross. E.g. T=Tall, t=short. Example: Tt x Tt
- Dihybrid Cross: Also known as a Two-factor Cross. Two trait are used in the genetic cross. E.g. T=Tall, t=short & B=Black fur, b=white fur. Example TtBb x TTBB
- **Incomplete Dominance**: One allele is not completely dominant over the other. There is a blending with the heterozygous offspring. E.g. RR=Red, Rr=Pink, and rr=white
- **Co-dominance**: Both alleles contribute to the phenotype. Offspring will have combination of two alleles. E.g. RR=Red hair, Rr=Roan (mix of red and white hairs-almost looks pink), and rr=white
- Sex-linked trait: Genes located on the sex-chromosomes called sex-linked genes. Usually found on the X chromosome. X-linked alleles are always expressed in males because males have only one X chromosome.
- **Multiple Alleles**: There are more than two-choices for the allele. Example is human blood group genes. There are three possible alleles for this gene.  $f^A$ ,  $f^B$ , and i.  $f^A$  and  $f^B$  are **co-dominant**. There are four possible phenotypes: **A, B, AB, and O**.
- Genotypic ratios: The ratio of different genotype in the offspring from a genetic cross. E.g 1:2:1
- Phenotypic ratios: The ratio of different phenotypes in the offspring from a genetic cross. E.g 3:1





# co dominance (BB = Black & BW = tan & WW = white Cross: BW x BW B W B BB BW W BW WW

Genotypic ratio: 1 : 2 : 1 (BB=25% BW=50% WW=25%)
Phenotypic ratio: 1 : 2 : 1 (White=25% Tan=50% Black=25%)

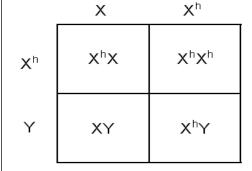
	ole Alleles AB x AO	Blood Type		
		Phenotype	Genotype	
		Type A	AA and AO	
		Туре В	BB and BO	
Cross:		Type AB	AB	
		Type O	00	
	Α	В		
			$\overline{}$	

A AA AB
O AO BO

Genotypic ratio: 1:1:1:1 (AA =25% AB=25% AO=25% BO=25%)

Phenotypic ratio: 1:1:1:1 (Type A =50% Type AB =25% Type B =25%

#### Sex-linked H = normal & h = hemophilia Cross: $XX^h \times X^hY$



Genotypic ratio: 1:1:1:1 (X<sup>h</sup>X =25% X<sup>h</sup>X<sup>h</sup>=25% XY=25% X<sup>h</sup>Y=25%)

Phenotypic ratio: 1:1:1:1
Female carrier =25% Female hemophilia =25%
Male normal =25% Male hemophilia =25%

## Dihybrid Cross Dominant and Recessive T=Tall, t=short B=Black, b=white Cross: TtBb x TtBb

	ТВ	Tb	tB	tb
ТВ	TTBB	TTBb	TtBB	TtBb
Tb	TTBb	TTbb	TtBb	Ttbb
tB	TtBB	TtBb	ttBB	ttBb
tb	TtBb	Ttbb	ttBb	ttbb

Genotypic ratio: 1:2:2:1:4:1:2:2:1
Phenotypic ratio: 9:3:3:1

#### Dihybrid Cross

Dom.-Rec. / Sex-linked T=Tall, t=short

H=Normal, h=hemophilia
Cross: homozygous Tall female carrier w/ short male

Cross: XhXTT x XYtt

	CIOSS. XXII X XIII						
	$X^hT$	$X^hT$	XT	XT			
Xt	X <sup>h</sup> XTt	X <sup>h</sup> XTt	XXTt	XXTt			
Xt	X <sup>h</sup> XTt	X <sup>h</sup> X⊤t	XXTt	XXTt			
Yt	X <sup>h</sup> Y⊤t	X <sup>h</sup> Y⊤t	XYTt	XYTt			
Yt	X <sup>h</sup> YTt	X <sup>h</sup> YTt	XYTt	XYTt			

Genotypic ratio: 4:4:4:4 or 1:1:1:1
Phenotypic ratio: 4:4:4:4 or 1:1:1:1