

Exercise:

Use a **Punnet square** to answer the following questions and state the **phenotype** and **genotype ratios** obtained in the crosses below:

1. Outcome of crossing the F_1 ($YyRr$, above) to :

- a) a true breeding **round** and **yellow** pea plant?
- b) a true breeding **wrinkled** and **green** pea plant?
- c) A **round** and **green** pea plant?
- d) A **wrinkled** and **yellow** pea plant?

2. What is the outcome of crossing a **round** and **green** pea plant with one that is **wrinkled** and **green**?

1. Ans: Outcome of crossing the F₁ (**YyRr**, above) to :

a) a true breeding **round** and **yellow** pea plant?

Parents **YyRr** x true breeding **round** and **yellow**

YyRr x **RRYY** (**Dominant traits**)

Gametes **[YR, Yr, yR, yr]** x **RY**

Gametes	RY	
YR	YYRR	round and yellow
Yr	YYRr	round and yellow
yR	YyRR	round and yellow
yr	YyRr	round and yellow

1. Ans: Outcome of crossing the F_1 ($YyRr$, above) to :

d) A **round** and **green** pea plant?

Parents $YyRr$ x **round** and **green**

= $YyRr$ x **RRyy** or **Rryy** (possibilities)

Gametes [YR, Yr, yR, yr] x **Ry** or

Gametes [YR, Yr, yR, yr] x [**Ry, ry**]

	Ry	ry	
YR	$YyRR$	$YyRr$	<i>Phenotype??</i>
Yr	$YyRr$	$Yyrr$	<i>Phenotype??</i>
yR	$yyRR$	$yyRr$	<i>Phenotype??</i>
yr	$yyRr$	$yyrr$	<i>Phenotype??</i>

Tri-hybrid Crosses

- A **tri-hybrid** cross involves the same steps as a dihybrid cross, but instead of looking at the inheritance pattern of two specific traits, it is possible to look at **three different traits** and the probability of their combination showing up in the genotype.

True breeding parents

(Dominant, Recessive)

Gametes

F1

F1 x F1

Gametes

F2

• In the case of the pea plants, we could also look at the inheritance pattern of the seed color (**yellow/Green**), the plant height (**tall/short**) of the plants, and texture of the seeds (**Round/wrinkled**).

Pair of **homologous** chromosomes - **Trihybrid**

True breeding Tall
Yellow & Rounded
parent [**ttyyrr**]

gametogenesis

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Allele
for **short** plant

t

Allele
for **green** color

y

Allele
for **wrinkled**
texture

r

True breeding Tall
Yellow & Rounded
parent [**TTYRRR**]

gametogenesis

T

Allele
for **Tall** plant

Y

Allele
for **Yellow** color

R

Allele
for **Smooth** texture

F₁

NB: the three genes could be located on different chromosomes

Trihybrid Punnett Square

	TYR	TYr	TyR	Tyr	tYR	tyR	tYr	tyr
TYR	TTYRRR							
TYr								
TyR						Tt yy RR		
Tyr								
tYR				Tt Yy Rr				
tyR								
tYr								
tyr			Tt yy Rr					ttyyrr

What are the ratio of (i) **Phenotypes** and (ii) **Genotypes** giving the phenotypes

Exercise

- With regards to the crosses below:

i. **TTYyRr** \times **TTYyRr**

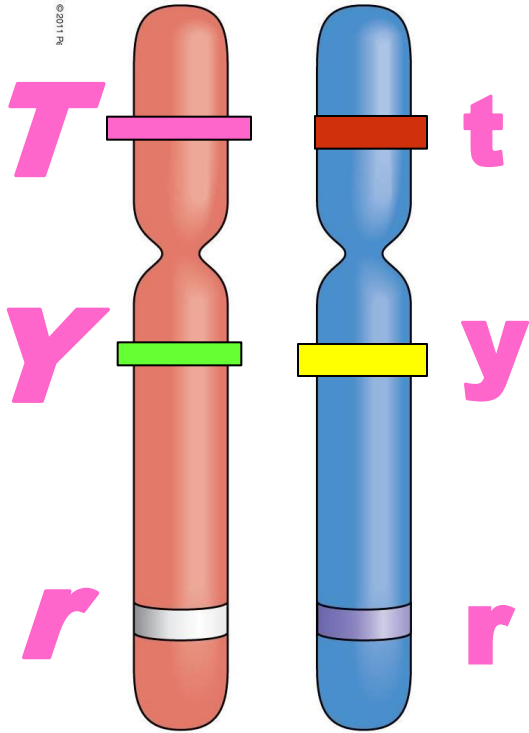
ii. **TtYyRr** \times **ttyyrr**

iii. **TtYyrr** \times **TtYyRR** (eg)

iv. **TtYyRr** \times **TtYyRr**

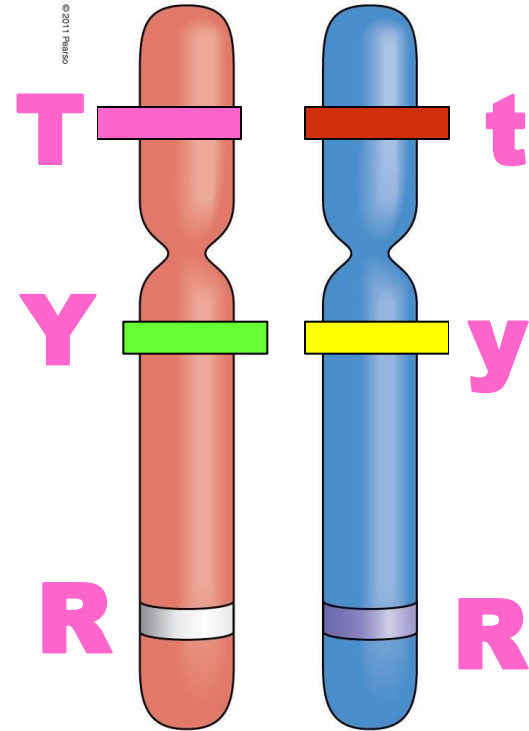
- a) What phenotypes are represented by the genotypes in the above parents?
- b) Predict the outcome of the above crosses in the phenotype and state the ratio.

TtYyrr x TtYyRR



Gametes

Tyr, tYr, Tyr, tyr



Gametes

TyR, tYR, TyR, tyR

TtYyrr x **TtYyRR**

	TyR	tYR	TyR	tyR
TYr	TTYyRr			
tYr			TtYyRr	
Tyr				
tyr		ttYyRr		ttyyRr