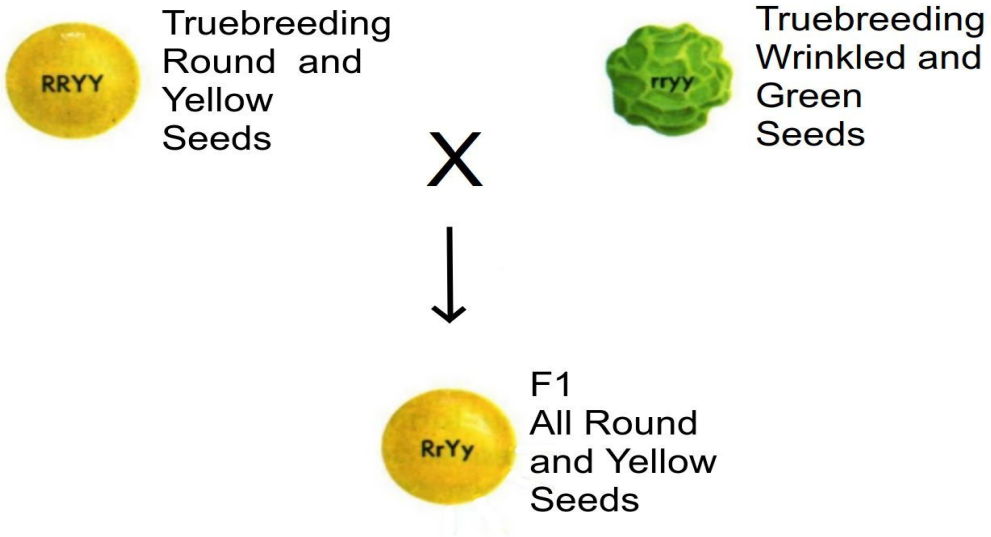
Solving Genetic Problems:

Dihybrid Cross

SBI3U Biology

Di means Two

If we are trying to figure out the inheritance of two traits at the same time, this is called a dihybrid cross.



Step 1: Read the problem carefully

Budgies are popular pet birds. The two most common colour combinations are green on yellow, and blue on white. The base colour yellow is dominant over the base colour white. Wings with black markings (called bars) are the normal wing pattern, but sometimes birds are born without any bars. This is a recessive condition called “clear wing”. If a double heterozygous green and yellow, normal wing male budgie is bred with a female of the same genotype, what can you expect to see in their offspring?

Identify all of the important information

Step 2: Assign symbols to the alleles

Budgies are popular pet birds. The two most common colour combinations are green on yellow, and blue on white. The base colour yellow is dominant over the base colour white. Wings with black markings (called bars) are the normal wing pattern, but sometimes birds are born without any bars. This is a recessive condition called “clear wing”. If a double heterozygous green and yellow, normal wing male budgie is bred with a female of the same genotype, what can you expect to see in their offspring?

Green & Yellow B

Barred Wing C

Blue & white b

Clear Wing c

Step 3: Write the P1 genotypes

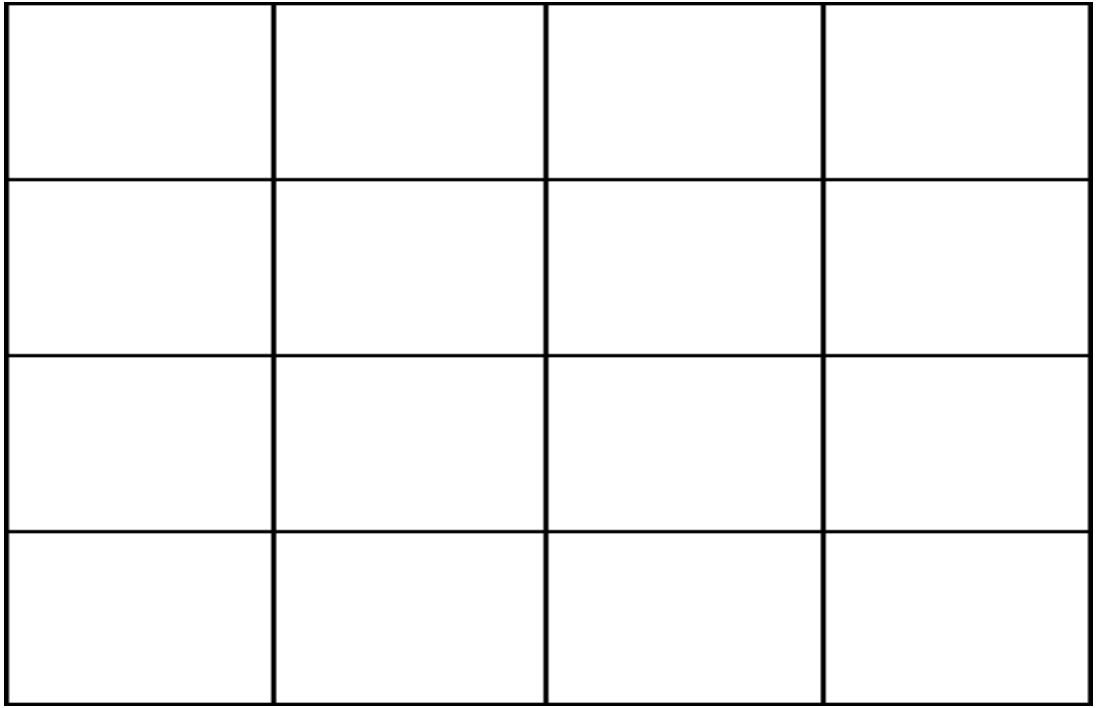
“ a double heterozygous green and yellow, normal wing male budgie is bred with a female of the same genotype “

Male: BbCc

Female: BbCc

Step 4: Draw a Punnett Square grid

If it is a dihybrid cross (two traits) then you draw a sixteen square grid.



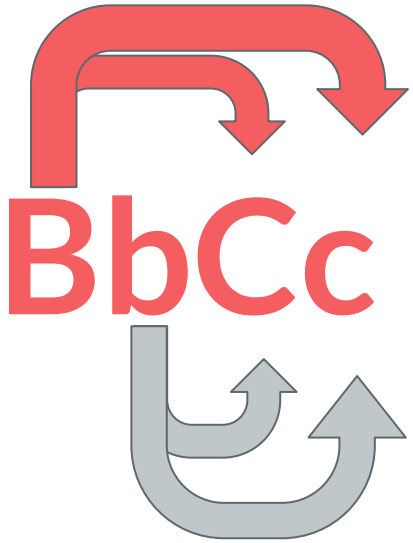
Step 5: Determine the P1 Genotypes

This is the tricky part!

Each parent passes on 4 different gene combinations.

You must have one of each symbol for each of these four.

It's like the FOIL rule in Math...



BC

Bc

bC

bc

Step 6: Fill in the P1 Genotypes

Just like in a monohybrid:

One parent across the top, the other along the side.

Only this time, four combinations.

	BC	Bc	bC	bc
BC				
Bc				
bC				
bc				

Step 7: Fill in the F1 Genotypes

Just like in a monohybrid:

One parent across the top, the other along the side.

Only this time, four combinations.

	BC	Bc	bC	bc
BC	BBCC	BBCc	BbCC	BbCc
Bc	BBCc	BBcc	BbCc	Bbcc
bC	BbCC	BbCc	bbCC	bbCc
bc	BbCc	Bbcc	bbCc	bbcc

Step 8: Analyze the offspring

Think:

What does each individual look like?.

Consider both traits at the same time

Shading, highlighting helps keep track

	BC	Bc	bC	bc
BC	BBCC	BBCc	BbCC	BbCc
Bc	BBCc	BBcc	BbCc	Bbcc
bC	BbCC	BbCc	bbCC	bbCc
bc	BbCc	Bbcc	bbCc	bbcc

Step 9: Write a Phenotypic Ratio

B_C_ Green/Barred 9

bbC_ Blue/Barred 3

B_cc Green/Clear 3

Bbcc Blue/Clear 1

9:3:3:1

	BC	Bc	bC	bc
BC	BBCC	BBCc	BbCC	BbCc
Bc	BBCc	BBcc	BbCc	Bbcc
bC	BbCC	BbCc	bbCC	bbCc
bc	BbCc	Bbcc	bbCc	bbcc

Step 9: Write a concluding statement

Budgies are popular pet birds. The two most common colour combinations are green on yellow, and blue on white. The base colour yellow is dominant over the base colour white. Wings with black markings (called bars) are the normal wing pattern, but sometimes birds are born without any bars. This is a recessive condition called “clear wing”. If a double heterozygous green and yellow, normal wing male budgie is bred with a female of the same genotype, what can you expect to see in their offspring?

The baby budgies will show four different phenotypes.
The most common one, 9/16 will look like the parents.
The least common one, 1/16, will be blue/white/clear.

Try these:

1. In pea plants, peas can be round (R dominant) or wrinkled (r recessive), yellow (Y dominant) or green (y recessive). If. If Mendel crossed two dihybrid plants, both **RrYy**, how many offspring will produce green, round peas?

Solutions:

1. Pea plants

R_Y_	9
R_yy	3
rrY_	3
rryy	1

9:3:3:1 Ratio

	RY	Ry	rY	ry
RY	RRYY	RRYy	RrYY	RrYy
Ry	RRYy	RRyy	RRYy	Rryy
rY	RrYY	RrYy	rrYY	rrYy
ry	RrYy	Rryy	rrYy	rryy

Try these:

2. Goldfish generally turn black early in their maturation, then the pigment gets destroyed and they turn orange. This is a dominant trait (O). if they stay black, it's recessive (o). Tail shape can be the normal lobed shape (L) or fancy fan shaped (l). What will the offspring of a black lobe-tail (**ooLl**) and orange fan tail (**Ooll**) look like?

Solutions:

2. Goldfish

O_L_ 4

O_ll 4

ooL_ 4

ooll 4

1:1:1:1 Ratio

	oL	ol	oL	ol
Ol	OoLl	Ooll	OoLl	Ooll
ol	ooLl	ooll	ooLl	ooll
Ol	OoLl	Ooll	OoLl	Ooll
ol	ooLl	ooll	ooLl	ooll

Try these:

3. In cats, parallel stripes are dominant (P) and splotched mackerel or bengal stripes are recessive (p). Tabby fur is dominant (T) and grey recessive (t). If a bengal tabby (**ppTT**) and a grey parallel striped cat (**Pptt**) are mated, what will their kittens look like?

Solutions:

3. Cats

P_T_ 8

P_tt 0

ppT_ 8

pptt 0

1:1 Ratio