

Worksheet: Dihybrid Crosses

UNIT 3: GENETICS

STEP 1: Determine what kind of problem you are trying to solve.

STEP 2: Determine letters you will use to specify traits.

STEP 3: Determine parent's genotypes.

STEP 4: Make your punnett square and make gametes

STEP 5: Complete cross and determine possible offspring.

STEP 6: Determine genotypic and phenotypic ratios.

Two-Factor Crosses (Di-hybrid)

Ex) A tall green pea plant (TTGG) is crossed with a short white pea plant (ttgg).

TT or Tt = tall

tt = short

GG or Gg = green

gg = white

	TG	TG	TG	TG
tg	TtGg	TtGg	TtGg	TtGg
tg	TtGg	TtGg	TtGg	TtGg
tg	TtGg	TtGg	TtGg	TtGg
tg	TtGg	TtGg	TtGg	TtGg

16 Tall/Green : 0 Tall/White : 0 Short/Green : 0 Short/ White

1) A tall green pea plant (TTGg) is crossed with a tall green pea plant (TtGg)

TTGg x TtGg

	TG	Tg	TG	Tg
TG	TTGG	TTGg	TTGG	TTGg
Tg	TTGg	TTgg	TTGg	TTgg
tG	TtGG	TtGg	TtGG	TtGg
tg	TtGg	Ttgg	TtGg	Ttgg

12 Tall/Green : 4 Tall/White : 0 Short/Green : 0 Short/ White

- 2) A tall green pea plant (TtGg) is crossed with a Short white pea plant (ttgg).

$$\begin{array}{c} \text{TtGg} \\ \hline \text{TG} \quad \text{Tg} \quad \text{tG} \quad \text{tg} \end{array} \times \begin{array}{c} \text{ttgg} \\ \hline \text{tg} \quad \text{tg} \quad \text{tg} \quad \text{tg} \end{array}$$

tg	TtGg	Ttgg	ttGg	ttgg
tg	TtGg	Ttgg	ttGg	ttgg
tg	TtGg	Ttgg	ttGg	ttgg
tg	TtGg	Ttgg	ttGg	ttgg

4 Tall/Green : 4 Tall/white : 4 short/Green : 4 short/ white

- 3) A Homozygous tall, green flowered plant is crossed with a Homozygous short white flowered plant.

$$\begin{array}{c} \text{TTGG} \\ \hline \text{TG} \quad \text{TG} \quad \text{TG} \quad \text{TG} \end{array} \times \begin{array}{c} \text{ttgg} \\ \hline \text{tg} \quad \text{tg} \quad \text{tg} \quad \text{tg} \end{array}$$

tg	TtGg	TtGg	TtGg	TtGg
tg	TtGg	TtGg	TtGg	TtGg
tg	TtGg	TtGg	TtGg	TtGg
tg	TtGg	TtGg	TtGg	TtGg

16 Tall/green : 0 Tall/White : 0 Short/green: 0 Short/White

4) Two Heterozygous Tall, Green pea plants are crossed.

TtGg x TtGg

	TG	Tg	tG	tg
TG	TTGG	TTGg	TtGG	TtGg
Tg	TTGg	TTgg	TtGg	Ttgg
tG	TtGG	TtGg	ttGG	ttGg
tg	TtGg	Ttgg	ttGg	ttgg

9 Tall/Green : 3 Tall/White : 3 Short/Green : 1 Short/ White

1. In man, assume that spotted skin (S) is dominant over non-spotted skin (s) and that wooly hair (W) is dominant over non-wooly hair (w). Cross a marriage between a heterozygous spotted, non-wooly man with a heterozygous wooly-haired, non-spotted woman. Give genotypic and phenotypic ratios of offspring.

man woman
Ssww x ssWw

	Sw	Sw	sw	sw
sW	SsWw	SsWw	ssWw	ssWw
sw	Ssww	Ssww	ssww	ssww
sW	SsWw	SsWw	ssWw	ssWw
sw	Ssww	Ssww	ssww	ssww

genotype: 4 SsWw : 4 Ssww
: 4 ssww : 4 ssWw

phenotype: 1 Spot/Wooly : 1 Spot/No wool
: 1 No spot/No wool : 1 No spot/wool

2. In horses, black is dependent upon a dominant gene, B, and chestnut upon its recessive allele, b. The trotting gait is due to a dominant gene, T, the pacing gait to its recessive allele, t. If a homozygous black pacer is mated to a homozygous chestnut trotter, what will be the appearance of the F₁ generation?

BBtt x bbTT

	Bt	Bt	Bt	Bt
bT	BbTt	BbTt	BbTt	BbTt
bT	BbTt	BbTt	BbTt	BbTt
bT	BbTt	BbTt	BbTt	BbTt
bT	BbTt	BbTt	BbTt	BbTt

all offspring will have BbTt
and it will all be a
heterozygous black trotter

Name _____

Period _____

c. Cross a waltzing brown mouse with a waltzing brown mouse

Parental genotypes $rrbb \times rrbb$

Possible gametes rb

Offspring phenotypic ratio all waltzing brown

	rb	rb	rb	rb
rb	$rrbb$	$rrbb$	$rrbb$	$rrbb$
rb	$rrbb$	$rrbb$	$rrbb$	$rrbb$
rb	$rrbb$	$rrbb$	$rrbb$	$rrbb$
rb	$rrbb$	$rrbb$	$rrbb$	$rrbb$

d. Cross a homozygous running, heterozygous black mouse with a waltzing brown mouse

Parental genotypes $RRBb \times rrbb$

Possible gametes RB Rb rb

Offspring phenotypic ratio 1 running brown : 1 running black

	RB	Rb	RB	Rb
rb	$RrBb$	$Rrbb$	$RrBb$	$Rrbb$
rb	↓	↓	↓	↓
rb	↓	↓	↓	↓
rb	↓	↓	↓	↓

e. Cross a heterozygous running, brown mouse with a heterozygous running, homozygous black mouse

Parental genotypes $Rrbb \times RrBB$

Possible gametes Rb rb RB rB

Offspring phenotypic ratio 3 running black : 1 waltzing black

	Rb	Rb	rb	rb
RB	$RRBb$	$RRBb$	$RrBb$ →	
RB	$RRBb$	$RRBb$	↓	↓
rB	$RrBb$ →		$rrBb$ →	
rB	↓	↓	↓	↓

f. Cross a heterozygous running, heterozygous black mouse with a heterozygous running, heterozygous black mouse

Parental genotypes $RrBb \times RrBb$

Possible gametes RB Rb rB rb

Offspring phenotypic ratio _____

	RB	Rb	rB	rb
RB	$RRBB$	$RRBb$	$RrBB$	$RrBb$
Rb	$RRBb$	$RRbb$	$RrBb$	$Rrbb$
rB	$RrBB$	$RrBb$	$rrBB$	$rrBb$
rb	$RrBb$	$Rrbb$	$rrBb$	$rrbb$

1 waltzing brown : 3 waltzing black :
3 running brown : 9 running black

1. Set up a punnett square using the following information:

- Dominate allele for tall plants = D
- Recessive allele for dwarf plants = d
- Dominate allele for purple flowers = W
- Recessive allele for white flowers = w
- Cross a homozygous dominate parent (DDWW) with a homozygous recessive parent (ddww)

DW

dw	DdWw			

2. Using the punnett square in question #1:

a. What is the probability of producing tall plants with purple flowers? 100%

Possible genotype(s)? DdWw in this cross.
(For this phenotype, also: DDWW, DdWW, DDWw, DdWw.)

b. What is the probability of producing dwarf plants with white flowers? 0%

Possible genotype(s)? (ddww only)

c. What is the probability of producing tall plants with white flowers? 0%

Possible genotype(s)? (DDww, Ddww)

d. What is the probability of producing dwarf plants with purple flowers? 0%

Possible genotype(s)? (ddWw, ddWw)

3. Set up a punnett square using the following information:

- Dominate allele for black fur in guinea pigs = B
- Recessive allele for white fur in guinea pigs = b
- Dominate allele for rough fur in guinea pigs = R
- Recessive allele for smooth fur in guinea pigs = r
- Cross a heterozygous parent (BbRr) with a heterozygous parent (BbRr)

	BR	bR	Br	br
BR	BBRR	BbRR	BBRr	BbRr
bR	BbRR	bbRR	BbRr	bbRr
Br	BBRr	BbRr	BBrr	Bbrr
br	BbRr	bbRr	Bbrr	bbrr

4. Using the punnett square in question #3:

a. What is the probability of producing guinea pigs with black, rough fur? 9/16

Possible genotype(s)? BBRR; BbRR; BBRr; BbRr

b. What is the probability of producing guinea pigs with black, smooth fur? 3/16

Possible genotype(s)? BBrr; Bbrr

c. What is the probability of producing guinea pigs with white, rough fur? 3/16

Possible genotype(s)? bbRr; bbRR

d. What is the probability of producing guinea pigs with white, smooth fur? 1/16

Possible genotype(s)? bbrr