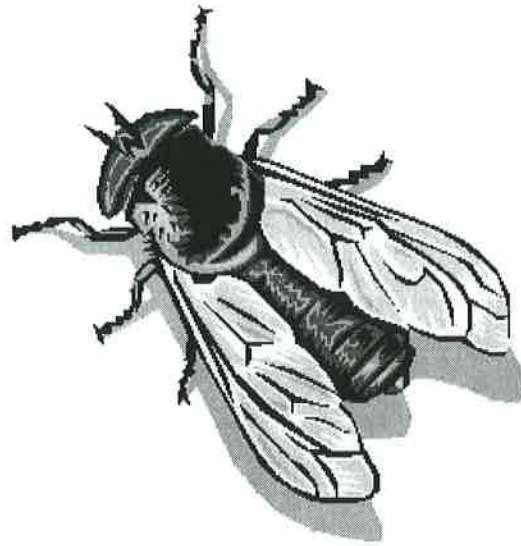


Mendelian Genetics Workbook



Name Key

Kou

1. Basic Monohybrid Practice Problems

1. A pea plant with round seeds is cross-pollinated with a pea plant that has wrinkled seeds. For the cross indicate the following:

a. the genotypes of the parents if the round-seed plant were heterozygous

Rr and rr

b. the gametes produced by the round and wrinkled-seed parents

R, r, r, r

c. the genotypes and phenotypes of the F_1 generation

	R	r	
r	Rr	rr	50% Rr - round
r	Rr	rr	50% rr - wrinkled

d. the F_2 generation if the two rounded plants from the F_1 generation were allowed to cross-pollinate

	R	r
R	RR	Rr
r	Rr	rr

2. For Labrador retrievers, black fur color (B) is dominant to yellow (b).

a. If a homozygous black male ^{BB} mated with a homozygous yellow female ^{bb} , what would the puppies look like?

	b	b	
B	Bb	Bb	100% Black
B	Bb	Bb	

- b. Explain how a homozygous black dog can have a different genotype than a heterozygous black dog.

Black is a dominant trait and will be expressed if one allele is present.

- c. Could the heterozygous black dog have the same genotype as a yellow-haired dog? Explain.

No, because black is dominant, so if a dog has the B allele, it will be expressed and the dog will be black.

3. For Dalmation dogs, the spotted condition is dominant to non-spotted.

- a. Using a Punnett square, show the cross between two heterozygous parents.

	D	d
D	DD	Dd
d	Dd	dd

- b. A spotted female Dalmation dog mates with an unknown father. From the appearance of the pups, the owner concludes that the male was a Dalmation. The owner notes that the female had six pups, 3 spotted and three non-spotted. What is the phenotype of the unknown male?

1:1 ratio

	D	d
d	Dd	dd
d	Dd	dd

The unknown male is homozygous non-spotted (dd)

4. For Mexican hairless dogs, the hairless condition is dominant to hairy. A litter of eight pups is found; six are hairless and two are hairy. What is the genotype of their parents?

6:2
3:1 ratio

	H	r
H	HH	Hr
r	Hr	rr

one parent is Hr and

2. Monohybrid Crosses

1. Circle the heterozygous genotypes.

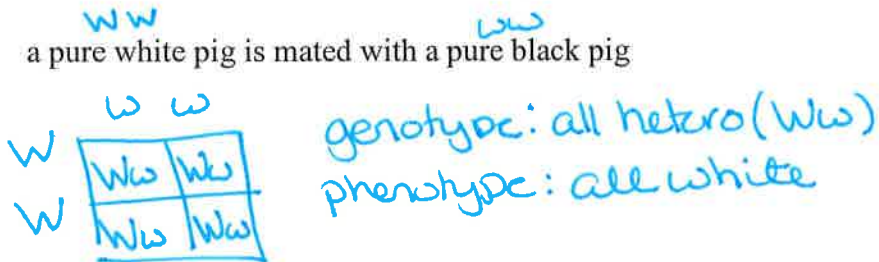
AA ss **Bb** **Ss** rr ii **Ii** RR **Tt**

2. Given that white coats (W) are dominant to black (w) in sheep, what are the phenotypes of the following genotypes?

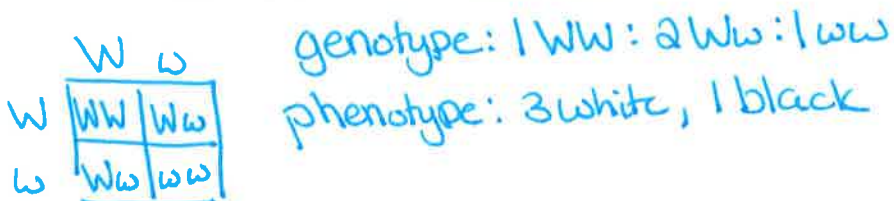
Homozygous dominant white Heterozygous white Homozygous Recessive black

3. In pigs white color (W) is dominant and black (w) is recessive. Using diagrams and mathematics, show the results of the following crosses.

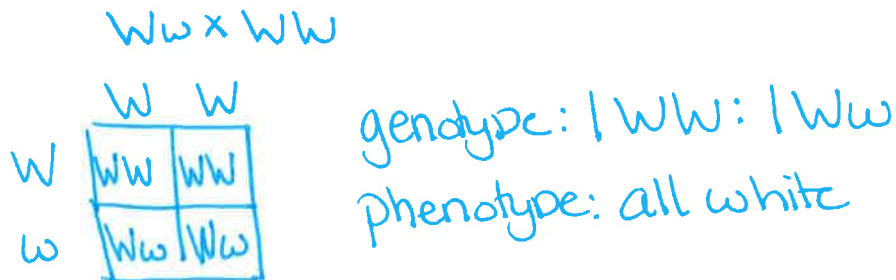
- a. a pure white pig is mated with a pure black pig



- b. two heterozygous pigs are mated $Ww \times Ww$



- c. a heterozygous pig is mated with a pure white pig



4. A female hog may give birth to as many as 16 offspring in a single litter. If white color is dominant over black, give the genotypes and phenotypes of the parents for each of the following litters.

a. 16 black piglets

Recessive \therefore offspring have $w w$

	w	w
w	$w w$	$w w$
w	$w w$	$w w$

parents (P): $w w \times w w$
phenotypes: black \times black

b. 8 black piglets and 8 white piglets

1:1 phenotype

	w	w
W	$W w$	$W w$
w	$w w$	$w w$

F = $W w \times w w$
phenotypes: white \times black

c. 16 white piglets all dominant

$W W \times W W$ OR $W w \times W W$ OR $w w \times W W$
white \times white white \times white black \times white

5. In the following cases, Z stands for a certain dominant gene and z stands for a certain recessive gene. What ratios of genotypes would you expect from the following crosses?

a. $Z Z \times Z Z$

	Z	Z
Z	$Z Z$	$Z Z$
Z	$Z Z$	$Z Z$

all heterozygotes

b. $Z z \times Z z$

	Z	z
Z	$Z Z$	$Z z$
z	$Z z$	$z z$

1:2:1 \leftarrow Ratio
 $Z Z : Z z : z z$

c. $Z z \times z z$

	Z	z
Z	$Z z$	$z z$
z	$Z z$	$z z$

1 $Z z$: 1 $z z$

d. $Z z \times Z Z$

	Z	Z
Z	$Z Z$	$Z Z$
z	$Z Z$	$Z Z$

1 $Z Z$: 1 $Z z$

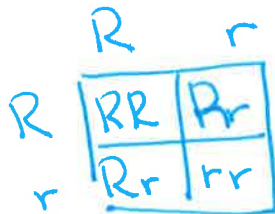
6. A spotted rabbit, when crossed with a solid-colored rabbit, produced all spotted offspring. When these F₁ rabbits were crossed among themselves, they produced 32 spotted rabbits and 10 solid-colored rabbits.

Rr

a. Which of the characters is governed by a dominant gene?

Spotted is dominant

b. How many of the spotted rabbits in the F₂ generation would be expected to be homozygous?



32 spotted rabbits
 2 out of 3 possible spotted rabbits are heterozygous
 $\therefore \frac{1}{3}$ of 32 = 10.7

c. How many of the solid-colored rabbits in the F₂ generation would be homozygous?

all 10 (the only way to express a recessive trait is to be homozygous)

7. As Mendel discovered, yellow seed color in peas is dominant to green. In the following experiments, parents with known phenotypes but unknown genotypes produced the listed progeny. Using the letter Y for the yellow gene and y for the green gene, give the most probable genotype for each parent

Parents	Yellow	Green	Parental Genotype
yellow x green yy	82	78	Yy x yy
yellow x yellow	118	39	Yy x Yy
green x green yy yy	0	50	yy x yy
yellow x green YY yy	74	0	YY x yy
yellow x yellow	90	0 no recessive	YY x YY

8. In fowl, silky feathers are recessive to normal feathers.

- a. If we have 100 birds raised from a cross between individual heterozygous for the gene, how many would be expected to be silky and how many would be expected to be normal?

	N	n	
N	NN	Nn	$3/4 \times 100 = 75$ Normal
n	Nn	nn	

$1/4 \times 100 = 25$ silky

- b. If we had a normal feather bird, what would be the easiest way to determine if it was homozygous or heterozygous?

Test cross (with a homozygous recessive)

	n	n
N	Nn	Nn
N	Nn	Nn

If homozygous dominant, all F_1 would have normal feathers

	n	n
N	Nn	Nn
n	nn	nn

If heterozygous, 50% of F_1 would have silky & other 50% would have normal