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Course/Section _____

Date _____

Professor/TA _____



Activity 15.2 Solving Problems When the Genetics Are Unknown

An understanding of Mendelian genetics allows us to determine the theoretical probabilities associated with normal transmission of autosomal and sex-linked alleles during reproduction. This understanding provides us with strategies for solving genetics problems. In real-life situations, geneticists use these strategies to determine the genetics behind specific phenotypic traits in organisms. They do this by conducting controlled crosses of experimental organisms (e.g., *Drosophila*) or by analyzing family pedigrees (as for humans).

Controlled Crosses

Two problems are presented below. In each, you are given:

- a. "Wild population"—the phenotypic characteristics of a wild population of fruit flies that were trapped randomly on a remote island.
- b. "Cross 1, 2, etc."—the phenotypic characteristics of offspring from a controlled cross. The phenotypes of the parents are indicated after each cross—e.g., "Cross 1: Male Ambler × Female Wild Type."

For each of the problems, analyze the results in each cross and answer the questions that follow.

1. Problem One

3:1

Wild population	Wild type	Ambler	Total
Male	33	17	50
Female	31	19	50
Total	64	36	100

Cross 1: ^{b_b} Male Ambler × ^{B_b} Female Wild Type

1:1

Offspring Vial 1	Wild type	Ambler	Total
Male	29	24	53
Female	29	31	50
Total	58	55	113

a. What does cross 1 tell you about dominance versus recessiveness of the alleles?

equal #s, impossible to tell wild is dominant to Ambler (homozygous recessive)

b. What does cross 1 tell you about placement of the alleles on autosomes vs. sex chromosomes?

can't tell yet. They are not linked, far away on chromosomes.

not sex linked

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Cross 2: Monocle, Spinner Female × Trifocal, Spinner Male

Mt = Monocle; Bt = Bifocal; Tr = Trifocal; Sp = Spinner; Sh = Shing

Offspring Vial 2	Mt, Sp	Mt, Sh	Bt, Sp	Bt, Sh	Tr, Sp	Tr, Sh	Total
Male	8	8	0	0	8	8	32
Female	23	0	0	0	15	0	38
Total	31	8	0	0	23	8	70

a. What does cross 2 tell you about dominance versus recessiveness of the alleles?

Mt + Bt are codominant.
 $Mt + Mt \times Mt + Bt \rightarrow Mt + Mt$ and $Mt + Bt$
 Sh from $Sp \times Sp$ so sh must be recessive.

b. What does cross 2 tell you about placement of the alleles on autosomes vs. sex chromosomes? (In your answer show the chromosomal genotypes for the parents in this cross.)

Sp + Sh alleles are on X chromosome
 The female must be $X^{Sp} X^{Sh}$ and
 male $X^{Sp} Y$

