INS Biology Homework Week 3 **NAME:** ANSWER KEY
Due Wednesday, October 10
Your responses should be relatively brief, providing only the necessary information to answer the question.

1. What mathematical equation would help you determine how many different chromosome arrangements at the metaphase plate of Meiosis I a cell could have? Use it to calculate the total possible number of chromosome arrangements at the metaphase plate of Meiosis I for a cell that is n=16.

$2^n = 2^{16} = 65{,}536 = 6.55 \times 10^4$

2. On the back of this page, draw Punnett squares for these three crosses: A) white-eyed male crossed with a true-breeding red-eyed female; B) an F1 female from the cross in A with a red-eyed male; and C) an F1 female from the cross in A with a white-eyed male. Be sure to label all of your chromosomes for full credit!

	X^{wt}	X^{wt}
X^w	X^wX^{wt}	X^wX^{wt}
Y	$X^{wt}Y$	$X^{wt}Y$

	X^{w}	X^{wt}
X^{wt}	X^wX^{wt}	$X^{wt}X^{wt}$
Y	X^wY	$X^{wt}Y$

2.a) Female= True Breeding Red-Eye = $X^{wt}X^{wt}$
Male= White-Eye = X^wY

2.b) F1 Female= Heterozygous = X^wX^{wt}
Male= Red-Eye = $X^{wt}Y$

	X^{w}	X^{wt}
X^w	X^wX^w	$X^{wt}X^w$
Y	X^wY	$X^{wt}Y$

2.c) F1 Female= Heterozygous = X^wX^{wt}
Male= White Eye = X^wY

3. Determine the genotypes of true-breeding flies (both male and female) for white-eyes and red eyes. Draw a cross between a true breeding white-eyed male with at true breeding red-eyed female. Draw the reciprocal cross.

Sex	True Breeding Red Eyes	True Breeding White Eyes
Female	$X^{wt}X^{wt}$	$X^{w}X^{w}$
Male	$X^{wt}Y$	$X^{w}Y$

	X^{wt}	X^{wt}
X^{w}	$X^{w}X^{wt}$	$X^{w}X^{wt}$
Y	$X^{wt}Y$	$X^{wt}Y$

Female= True Breeding Red-Eye = $X^{wt}X^{wt}$
Male= True Breeding White-Eye = $X^{w}Y$

	X^{w}	X^{w}
X^{wt}	$X^{w}X^{wt}$	$X^{w}X^{wt}$
Y	$X^{w}Y$	$X^{w}Y$

Female = True Breeding White-Eye = $X^{w}X^{w}$
Male = True Breeding Red-Eye = $X^{wt}Y$

4. What are the genotype ratios in female offspring when we cross true-breeding red-eyed males with a female that is heterozygous for eye color? In the same cross, what are the genotype and phenotype ratios of the males?

	X^{wt}	X^{w}
X^{wt}	$X^{wt}X^{wt}$	$X^{w}X^{wt}$
Y	$X^{wt}Y$	$X^{w}Y$

Female= Heterozygous = $X^{wt}X^{w}$
Male= True Breeding Red-Eye = $X^{w}Y$

Female Genotype: 50% of females are homozygous for red eyes
Male Genotype and Phenyotypes: 50% of males have red eyes ($X^{wt}Y$) and 50% have white eyes ($X^{w}Y$)

5. If genes lie on chromosomes, and chromosomes assort independently, then what type of assortment should we expect from genes that lie on the SAME chromosome, dependent assortment or independent assortment? Explain your reasoning.
Dependent Assortment: When genes lie on the same chromosome, the genes move together to the opposite sides of the cell. Crossing over may disrupt exactly which allele is present, but the general principle is the same.

6. How many gamete types can a female who is heterozygous for eye color and body color produce?
$X^{w+y}X^{wy+}$ (alternatively it could be written as $X^{w+y+}X^{wy}$)
X^{w+y} X^{wy+} X^{wy} X^{w+y+}

7. What phenotypic ratios do we expect in female offspring from a cross between X^{w+y}/X^{wy+} and X^{wy+}/Y?

	X^{w+y}	X^{wy+}
X^{wy+}	$X^{w+y}X^{wy+}$	$X^{wy+}X^{wy+}$
Y	$X^{w+y}Y$	$X^{wy+}Y$

Female Parent = $X^{w+y}X^{wy+}$
Male Parent = $X^{wy+}Y$

50% of females will be white eyed, gray bodied, and 50% of females will be red-eyed, gray bodied.