**Practice problems for independent assortment– ANSWERS**

1. Prior to cell division, each chromosome replicates or duplicates its genetic material. The products are connected by a centromere and are called:
   1. sister chromosomes.
   2. homologous chromosomes.
   3. sister chromatids.
   4. sex chromosomes.
   5. autosomes.

**The answer to this problem is c. sister chromatids.**

A

a

B

b

1. The image to the right illustrates a diploid cell with two chromosomes: the straight chromosomes are heterozygous for the A and a alleles of one gene, while the curvy chromosomes are heterozygous for the B and b alleles of a second gene. How many different genetic combinations of these alleles could be generated following meiosis?
   1. 1
   2. 2
   3. 4
   4. 6
   5. 8

**The answer to this problem is c. 4. The possible combinations are: AB, Ab, aB and ab.**

1. Short hair in rabbits is produced by a dominant gene (*l+*) and long hair by its recessive allele (*l*). Black hair results from the action of a dominant gene (*b+*) and brown hair from its allele (*b*). Determine the genotypic and the corresponding phenotypic ratios of the F1 from a cross of a female rabbit with short brown hair and a male rabbit with long black hair. Assume that the female is homozygous for short hair and the male is homozygous for black hair.

**female rabbit:** *l+l+ bb*

**male rabbit: *ll*** *b+ b+*

**all offspring will have the genotype: *l+l b+b*, and will have short black hair.**

1. A rosy-eyed *Drosophila* with wild-type bristles was crossed with a forked *Drosophila* with wild-type eyes. The F1 were wild type for both traits, whereas the F2 consisted of 306 wild-type, 94 rosy-eyed, 102 fork-bristled, and 33 forked-bristled and rosy-eyed flies. Infer the genotypes of the original parents.

**Because the F2 displays a 9:3:3:1 ratio, this indicates that the F1 must have been heterozygous for both traits. Therefore, the rosy-eyed parent must have been *rr* *f+ f+*, and theforked parent must have been *r+ r+ ff*.**

1. Calculate the probability of the all-recessive genotype for the alleles *a*, *b*, *c*, *d*, *e*, and *f* in the following cross: *Aa Bb cc dd Ee Ff* × *Aa Bb Cc dd Ee Ff*.

**To solve this, multiply the probabilities at each gene together:**

**(1/4 *aa*) x (1/4 *bb*) x (1/2 *cc*) x (1 *dd*) x (1/4 *ee*) x (1/4 *ff*) = 1/512**