**TIPS ON SOLVING GENETICS PROBLEMS**

**Rule number one – math is your friend!**

**Rule number two – take it one gene at a time!**

Here are some samples you should review before the quiz:

1. If an organism has the genotype AaBBccDd, how many different types of gametes could it produce?

Remember that when making a gamete, only one of the alleles the parent has is passed on at a time.

Considering one gene at a time:

 For the “A” gene, there are two possible gametes, A or a 🡪 2

 For the “B” gene, there is only one possibility, B 🡪 1

 For the “C” gene, there is only one possibility, c 🡪 1

 For the “D” gene, there are two possibilities, D or d 🡪 2

Now you just multiply the numbers together 2 x 1 x 1x 2 = 4

1. If an organism with the genotype AaBbCC was crossed with one with the genotype AaBbcc, what are the chances an offspring with the genotype AABBCC would be produced?

Remember to do one gene at a time.

 For the “A” gene, make a punnett square showing the genotypes of each parent ***for the “A” gene only***

|  |  |  |
| --- | --- | --- |
|  | A | a |
| A | AA | Aa |
| a | Aa | aa |

From the punnett square, we see the probability of an offspring with AA is ¼.

Now repeat this process for the “B” and “C” genes:

|  |  |  |
| --- | --- | --- |
|  | B | b |
| B | BB | Bb |
| b | Bb | bb |

From the punnett square, we see the probability of an offspring with BB is ¼.

|  |  |  |
| --- | --- | --- |
|  | C | C |
| c | Cc | Cc |
| c | Cc | Cc |

From the punnett square, we see the probability of producing an offspring with CC is 0.

Finally, we multiply the individual probabilities together:

¼ times ¼ times 0 = 0

There is no way those organisms could produce an offspring with that genotype! (unless a very, very rare mutation occurred

**Mendel’s Laws**

**Law of Segregation of Alleles:**

This concerns just one gene at a time. It basically says that a parent has two alleles for every trait, but that a parent *only passes one allele for each trait* on to its offspring. We now know that the alleles separate during anaphase I of meiosis.

**Law of Independent Assortment:**

This concerns two or more genes at a time. IF two genes are “unlinked” (on separate chromosomes), whether you receive the paternal allele or maternal allele for gene number one has nothing to do with which allele you receive for gene number two. As an example, whether or not you have hitchhiker’s thumb has nothing to do with whether or not you can roll your tongue. We now know this is because each pair of chromosomes lines up independently in metaphase I of meiosis.