**Relating Mendel’s Laws to Meiosis**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Materials:** two of each gene. There are pink genes, red, yellow and blue genes. Each has an allele marked on it. An allele is a trait – dominant is capital and recessive is a small letter.

1. How many possible ways can two genes combine to make different gametes (drawing it out should help you visualize the combinations)?
2. How many possible ways can three genes combine to make different gametes (draw it out)?
3. How many possible ways can 22 genes combine to make different gametes?

Next we’ll create possible children based on the parents’ genetic make-up.

1. Create a father and a mother who are both heterozygous for each gene. Heterozygous means they have one of each (dominant and recessive copy of a chromosome pair.)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Child 1 | Child 2 | Child 3 | Child 4 |
| Chromosome Pink |  |  |  |  |
| Chromosome Red |  |  |  |  |
| Chromosome Yellow |  |  |  |  |
| Chromosome Blue |  |  |  |  |

1. Are all the possible combinations of children shown above?
2. How would the children be different if we started with parents who were both homozygous recessive for all 4 genes? Homozygous means they have both copies of a chromosome the same.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Child 1 | Child 2 | Child 3 | Child 4 |
| Chromosome Pink |  |  |  |  |
| Chromosome Red |  |  |  |  |
| Chromosome Yellow |  |  |  |  |
| Chromosome Blue |  |  |  |  |

1. How would the children be different if we started with one parent who is homozygous dominant and one that is homozygous recessive for all 4 genes?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Child 1 | Child 2 | Child 3 | Child 4 |
| Chromosome Pink |  |  |  |  |
| Chromosome Red |  |  |  |  |
| Chromosome Yellow |  |  |  |  |
| Chromosome Blue |  |  |  |  |

**Relating Inheritance to probability calculations**

To calculate the chance that some particular genotype will result from a certain cross, one has to understand probability – the chance that something will happen. The chance that you’ll roll a 4 on a 6 sided die is 1/6.

Independent events are multiplied together: for example the chance that you will roll two 4’s in a row on a die is 1/6 x 1/6 = 1/36

Dependent events are added together: for example, the chance that you will roll a 3 or a 4 on a six sided die is 1/6 + 1/6 = 1/3.

**Use only 2 genes for questions 8-10. Pink and Yellow.** Start with each parent being heterozygous for each. Gg Ff.

1. Is the chance that the child will inherit the “g” allele on chromosome pink independent or dependent on whether the child will inherit the “F” allele on chromosome yellow?
2. a. What is the chance that a gamete (sperm or egg) would contain the “g” allele?
   1. What is the chance that a gamete would contain the “F” allele?
   2. What is the chance that a gamete would contain “g” and “F” (be genotype Fg)?
3. Try using a Punnett Square to figure these probabilities.
4. Draw a Punnett Square to identify all the possible gametes a parent can make.
5. Make another square using the possible gametes from a. and fill in all the possible children.

**Problems**:

1. Ellen does not have blue eyes, but her brother Michael has this recessive trait (see pedigree above). Are either, both, or neither of the parents of Ellen and Michael heterozygous (carries) of blue eyes?
2. Make a Punnett Square to help figure out what the probability is that Ellen is a carrier of blue eyes.
3. Ellen wonders if her unborn child will have blue eyes. Ellen’s husband is not a carrier. What is the probability that the child will have blue eyes?
4. If Ellen is a carrier, what is the probability that the child will also be a carrier? Make a Punnett Square assuming that Ellen is a carrier while her husband is not.
5. If Ellen is not a carrier, what is the chance that the child will be a carrier?
6. What is the overall chance that Ellen’s child will be a carrier (taking into account the possibility that Ellen might not be a carrier)?
7. Straight hair is a recessive trait. Ellen and her husband both have straight hair. What are the chances that their child will have straight hair?