Do Now: Genetics and Probability

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1. What is a genotype? For each genotype, indicate whether it is heterozygous (Het) or homozygous (Hom) AA _____ EE _____ Ii _____ Bb _____ ff _____ GG _____ Cc _____ nn _____ Mm _____	2. What is a Phenotype? For each genotype determine the possible phenotypes. *Purple flowers are dominant to white flowers* PP _____ Pp _____ pp _____

3. In cats, the allele for short hair is dominant (H) to long hair (h).
What genotype would a heterozygous short haired cat have? _____

What genotype would a pure breeding short haired cat have? _____

What genotype would a long haired cat have? _____
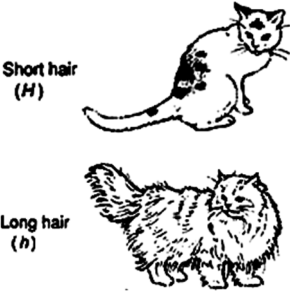
4. Show the cross for a pure breeding short haired cat and a long haired cat

What percentage of the offspring will have short hair? _____

5. Show the cross for two heterozygous short haired cat.
What percentage of the offspring will have short hair? _____

What percentage of the offspring will have long hair? _____

6. Show the cross for one heterozygous short hair cat and a long haired cat.
What percentage of the offspring will have short hair? _____

What percentage of the offspring will have long hair? _____
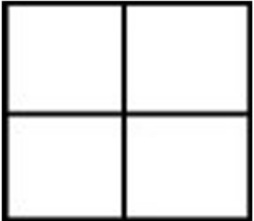
Dihybrid Crosses: A dihybrid cross involves a more complicated Punnett Square because we're looking at 2 different genes at the same time.

Consider this example: In pea-plants **yellow colored seeds (Y) is dominant to green (y)** and round shaped seeds **(R) are dominant to wrinkled (r)** seeds. A pea plant that is heterozygous for round, yellow seeds is crossed with plant that is recessive for both traits. What are the phenotypic ratios of the resulting offspring?

Step 1: Determine the parental genotypes from the text above.

Parent 1 =   Parent 2 =

Step 2: Determine all the possible gametes each parent could form through meiosis. This might feel a little like the FOIL method you learned in math class. Combine the R's and Ys of each parent to represent sperm and egg. Do this for both parents. The FOIL method will produce 4 possible gametes for both parents.

Possible Gametes for parent 1: _____, _____, _____, _____

Possible Gametes for parent 2: _____, _____, _____, _____

Step 3: Set up a large 4x4 Punnett square, place one gamete set from the parent on the top and the other on the left side. Then write the genotypes of the offspring in each box and determine how many of each phenotype you have.

Genotypes of offspring:

Phenotypes of offspring:

Dihybrid Crosses Practice:

In rabbits, grey hair (G) is dominant to white hair (g). Also in rabbits, black eyes (B) are dominant to red eyes (b).

1. What are the phenotypes of rabbits that have the following genotypes:

Ggbb _____ ggBB _____

ggbb _____ GgBb _____

2. A male rabbit with the genotype GGbb is crossed with a female rabbit with the genotype ggBb. Determine the possible gametes from each parent and set up the Punnett Square. Fill it out and determine the phenotypes and proportions in the offspring.

How many out of 16 have grey fur and black eyes?

How many out of 16 have grey fur and red eyes?

How many out of 16 have white fur and black eyes?

How many out of 16 have white fur and red eyes?

3. Two heterozygous rabbits are crossed. Determine the possible gametes from each parent and set up the Punnett Square. Fill it out and determine the phenotypes and proportions in the offspring.

How many out of 16 have grey fur and black eyes?

How many out of 16 have grey fur and red eyes?

How many out of 16 have white fur and black eyes?

How many out of 16 have white fur and red eyes?

In mice, the ability to run normally is a dominant trait. Mice with this trait are called running mice (R). The recessive trait causes mice to run in circles only. Mice with this trait are called waltzing mice (r). Hair color is also inherited in mice. Black hair (B) is dominant over brown hair (b).For each of the following problems, determine the parent genotypes, determine possible gametes, then construct a Punnett square to solve.

a. Cross a heterozygous running, heterozygous black mouse with a homozygous running, homozygous black mouse
Parental 1 genotype _____   Parent 2 genotype: _____
Parent 1 possible gametes: Parent 2 possible gametes:

Offspring phenotypic ratio _____

b. Cross a homozygous running, homozygous black mouse with a heterozygous running, brown mouse
Parental 1 genotype _____   Parent 2 genotype: _____
Parent 1 possible gametes: Parent 2 possible gametes:

Offspring phenotypic ratio _____

Bikini Bottom – Dihybrid Practice   Name _____

Use the chart to identify the genotypes of the
following traits:

Trait	Dominant Gene	Recessive Gene
Body Shape	Squarepants (S)	Roundpants (s)
Body Color	Yellow (Y)	Blue (y)
Eye Shape	Round (R)	Oval (r)
Nose Style	Long (L)	Stubby (l)

1. Heterozygous round eyes, blue body _____

2. Hybrid eye shape, purebred roundpants _____

3. Purebred roundpants, heterozygous long nose _____

SpongeBob's aunt, who is a roundpants, has a cute stubby nose. She has finally found the sponge of her dreams and is ready to settle down. Her fiancé always comments on how adorable her nose is (he says it reminds him of his mother's – aww, how sweet!). They wonder what the chances are of that trait being passed on. Her fiancé is a purebred squarepants and has purebred long nose.

4. Identify the genotypes of the aunt and her fiancé.

        Aunt – Roundpants, Stubby Nose = _____

        Fiancé – Purebred Squarepants, Long Nose = _____

5. What are the possible gamete combinations for each person? Aunt – _____ Fiancé – _____

6. What are the possible genotypes for their children? _____

7. What are the genotypes of SpongeBob, who is heterozygous for his yellow body color and his squarepants, and his wife SpongeSusie, who is blue and has roundpants?

        SpongeBob = _____   SpongeSusie = _____

8. What are the possible gamete combinations for each person?

        SpongeBob = _____   SpongeSusie = _____

9. Complete the Punnett square based on the information provided in #7-8 and then answer the questions.

        What is the chance of a blue baby? _____

        What is the chance of a squarepants? _____

        What is the chance of a blue squarepants? _____

        What is the chance of a purebred recessive for both traits? _____

10. In starfish, pink body color (P) is dominant to orange (p), and thick eyebrows (T) are dominant over thin (t) ones. Patrick, who is heterozygous for body color but purebred for thick eyebrows, has met Patti, who is recessive for both traits.

What is Patti's phenotype? _____

Is it possible for the new couple to have offspring that resemble their mother? Explain.

_____

_____

11. Before Patrick commits to this relationship, he would like to guarantee that his offspring would have his thick eyebrows. (He thinks they make him smarter!) You need to provide evidence for or against the marriage. This question regards eyebrows ONLY.

12. While Squidward's family boasts about being a purebred line for dominant light blue skin color, they are also purebred for a less distinguished trait: the recessive trait of baldness. Lack of hair causes Squidward some self-esteem issues that he does not want his children to face. He would like to ensure that his offspring have hair AND with his blue skin color. What traits should he look for in a bride?

> **Squidward Traits:**
> Skin Color
> Blue = B, Green = b
> Hair
> Hair = H. Bald = h

Must she have hair? Explain. _____

_____

Must she be blue? Explain. _____

_____

13. Squidward has found a potential bride prospect with the green squid Octavia. While Octavia has hair, her father does not. Determine the chances of their child being blue and having hair.

Squidward = _____   Octavia = _____

14. Use the genotypes in #13 to complete the Punnett square below and then answer the questions.

For which traits, if any, is it possible for their offspring to be purebred?

What is the probability of their children being heterozygous for both traits? _____