

Biology- Genetics: Who Dares Wins

Traits and Alleles Lab Report

QUESTION/ PROBLEM:

Are traits controlled by Dominant alleles more common than traits controlled by Recessive alleles?

BACKGROUND INFO

The purpose of this Lab report is to find out whether traits controlled by dominant alleles are more common than traits controlled by recessive alleles. To do so, this lab requires a survey, which surveys a range of people with various traits such as:

Dominant Alleles:

- * Free ear lobes
- * Hair on fingers
- * Widow's peak
- * Curly hair
- * Cleft chin
- * Smile dimples

Recessive Alleles:

- * Attached ear lobes
- * No hair on fingers
- * No widow's peak
- * Straight hair
- * Smooth chin
- * No smile dimples

KEY WORDS:

Trait: A characteristic that an organism can pass on to its offspring through its genes.

Alleles: The different forms of a gene.

Dominant Allele: An allele whose trait always shows up in the organism when the allele is present.

Recessive Allele: An allele that "disappears" when a dominant allele is present.

Phenotype: An organism's physical appearance, or visible traits.

Genotype: An organism's genetic makeup, or allele combinations.

Homozygous: Having two identical alleles for a trait.

Heterozygous: Having two different alleles for a trait.

Punnett Square: A chart that shows all the possible combinations of alleles that can result from a genetic cross.

HYPOTHESIS

(State your answer to the above question -What evidence/research do you have to support your hypothesis?)

If traits were controlled by dominant alleles more than traits controlled by recessive alleles then, the genotype of the parents would have to be homozygous dominant (TT) or heterozygous (Tt). That way, the offspring's would all be dominant (100% dominant) even if they are homozygous dominant (TT) or heterozygous (Tt) because the dominant allele cancels the recessive allele. This also means, that the phenotype of all these offspring's would have the dominant trait "green" appearing. (see punnett square below).

		TT	
		T	T
	T	TT	TT
	Tt	Tt	Tt
	t	Tt	Tt

If traits were controlled by recessive alleles more than traits controlled by dominant alleles, it would be the opposite or vice versa of the punnett square above and the explanation. This means, that all the offspring's would have the recessive trait "yellow" showing in the phenotype. However, this does not occur. Therefore, traits are often more controlled by dominant alleles than recessive alleles. Also, there is a greater chance of an offspring to be dominant than recessive because there are two genotypes that support the dominant alleles, homozygous TT and heterozygous Tt. Whereas, recessive alleles have a less chance to be seen in an offspring because there is only one option, to be homozygous recessive tt. This supports the statement that traits are more likely to be controlled by dominant alleles because the ratio between dominant and recessive alleles is 2 to 1.

VARIABLES

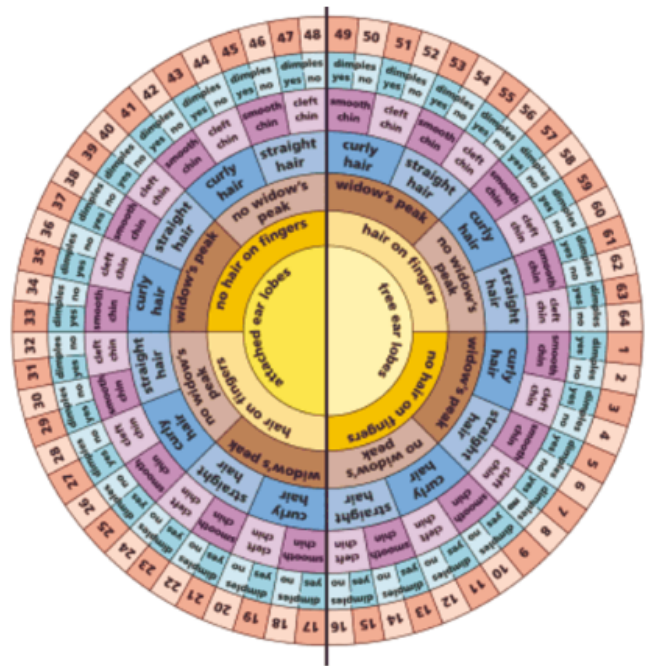
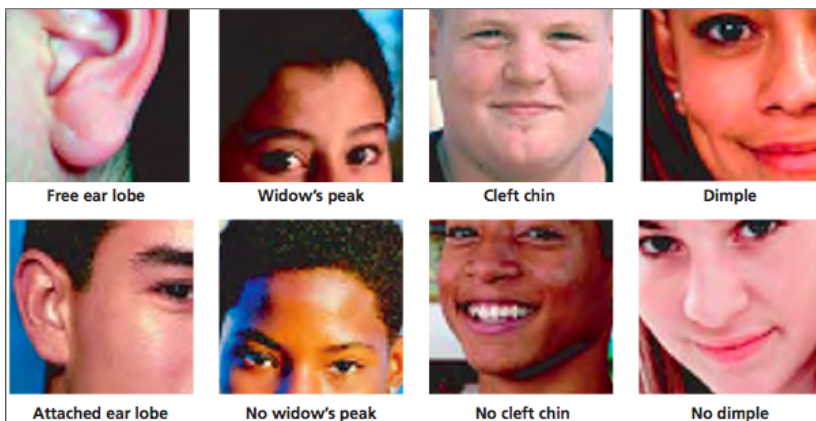
- * Independent (manipulated) variable = different people
- * Constant variables = Human beings, allele comparison chart/pictures,
- * Dependent (resultant) variables = # of people with various alleles

MATERIALS

- 1 Mirror (optional)
- Science Explorer text- Chapter 3 section 1- Skills Lab- page: 82 - 83

PROCEDURE

1. Use the trait images provided in the text to determine the traits of the classmates. (Optional) use a mirror to help.
2. Copy the data table provided in the text.
3. Fill the data table with the corresponding data collected from the classmate.
4. Display the data collected into bar graphs.
5. Then, use the trait wheel provided in the text to view the traits that appeal to each individual to get a final number.
6. Reflect/ Analyze the data collected and conclude.



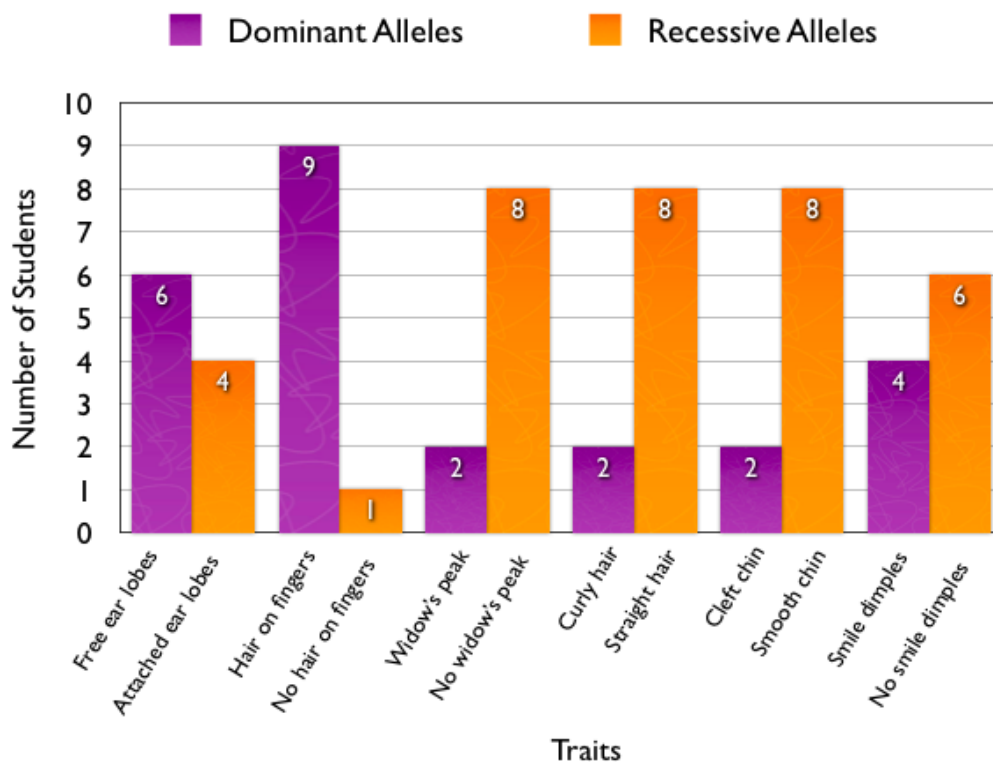
DATA

Describe your observations. The traits listed under Trait 1 in the data table are controlled by dominant alleles. The traits listed under Trait 2 are controlled by recessive alleles.

Data Table:

Traits Possessed						
Sample Space: 10 students						
	Trait 1	Tally	Number	Trait 2	Tally	Number
A	Free ear lobes	 I	6	Attached ear lobes		4
B	Hair on fingers	 	9	No hair on fingers	I	1
C	Widow's peak		2	No widow's peak	 	8
D	Curly hair		2	Straight hair	 	8
E	Cleft chin		2	Smooth chin	 	8
F	Smile dimples		4	No smile dimples	 I	6

Column Graph:



- * The chart shows that there were 10 more students with recessive alleles than dominant alleles in the different traits. 35 : 25
- * The trait controlled by dominant alleles with the majority of students is: Hair on fingers.
- * The traits controlled by recessive alleles with the majority of students are: No widow's peak, Straight hair, and smooth chin.
- * The traits controlled by dominant alleles with the minority of students are: Widow's peak, Curly hair, and cleft chin.
- * The trait controlled by recessive alleles with the minority of students is: No hair on fingers.

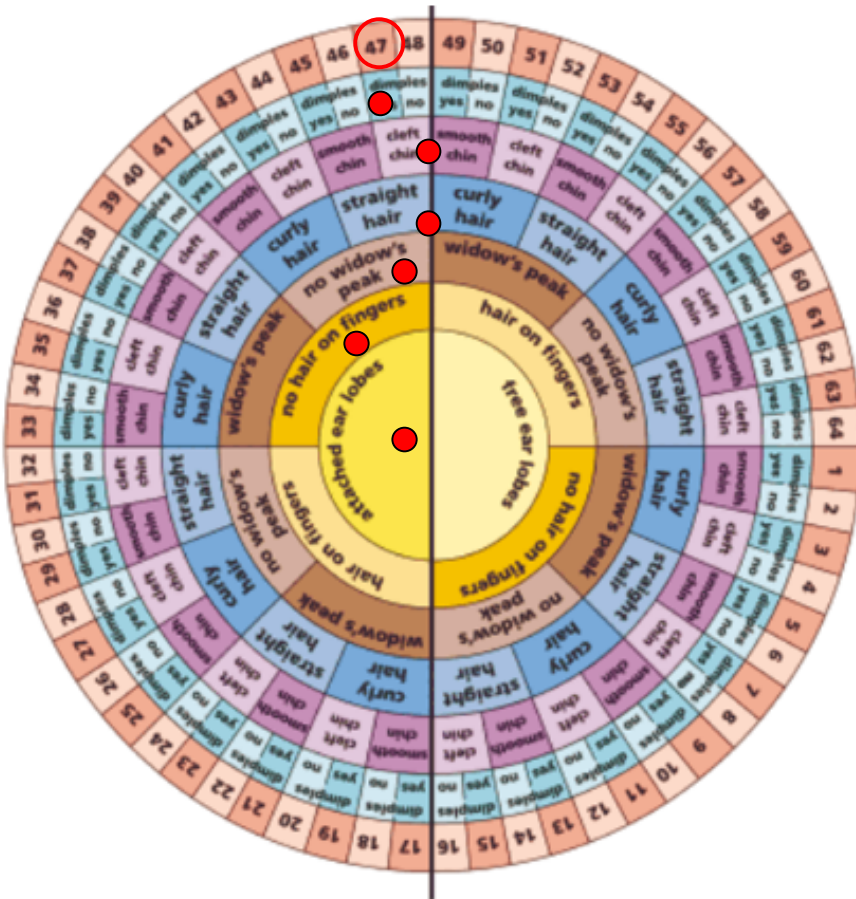
The Trait Wheel

As an example:

The image on the left shows how to use the trait wheel to find the final number of an individual.

What to do?

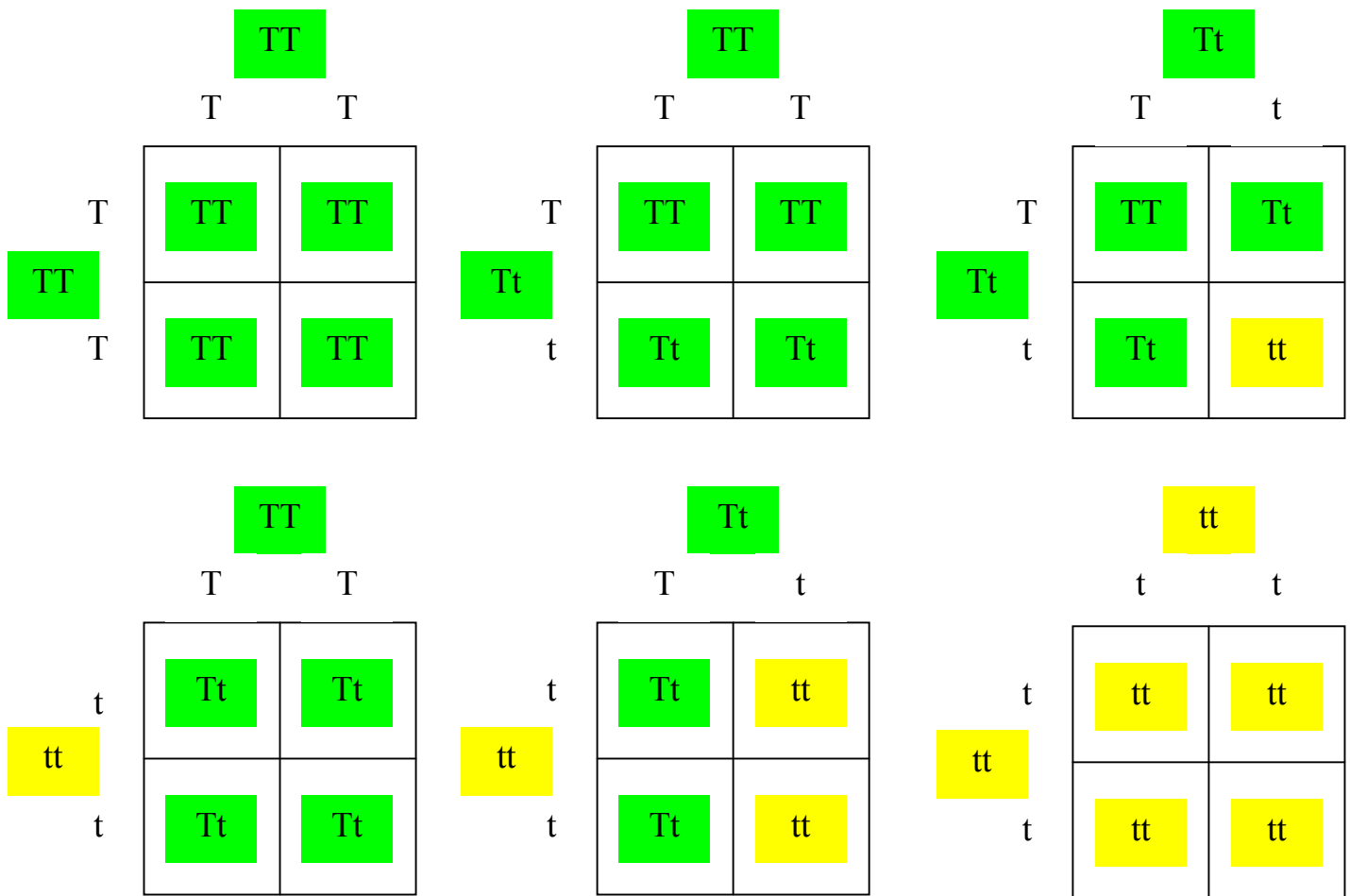
Follow the traits that a person has by moving a chip or an object onto the next description that applies to that person. Continue to use the chip or object to trace the person's trait until it reaches a final number on the outside rim of the circle.



ANALYSIS

Explain your data. Make sure you use all relevant vocabulary in your description. Which traits controlled by dominant alleles were shown by a majority of students? Which traits controlled by recessive alleles were shown by a majority of students? (why)

The data gathered from the survey surprisingly shows, that there is 10 more students with recessive traits than with dominant traits. This probably occurred because as an international school the students are from various nationalities with various traits. So, the majority of students in the class were probably from countries, for example Germany with common traits such as light hair and blue eyes, which are recessive traits. Or for example some students in the class were Asian and had common features or traits such as no widows peak, straight hair, and smooth chin, which are more common recessive traits seen in Asia. However, countries also have dominant traits specifically seen in that region, for example in Europe a majority of people have hair on their fingers. So, there is a likely chance that their children would have that dominant trait. Then, there are students in the class that may be a mix between two or more countries. So, they would have more diverse traits, both recessive and dominant alleles for different traits. So, as an international school there obviously would be a diversity of both recessive and dominant traits because their nationality effected them. But students would also have a diversity of both recessive and dominant alleles for different traits because of their genotype. If a student's parent were both homozygous dominant (TT) then, they would have a 100% chance to have the dominant trait. If a student's parent had a homozygous dominant (TT) and a heterozygous (Tt) then, they would have a 100% chance to have the dominant trait as well. If a student's parent were both heterozygous (Tt) then, they would have a 75% chance to have the dominant trait and 25% chance to have the recessive trait. If a student's parent were homozygous dominant (TT) and homozygous recessive (tt) then, they would have a 100% chance to have the dominant trait. If as student's parent were homozygous recessive (tt) and heterozygous (Tf) then, they would have a 50% chance to have the dominant trait and a 50% chance to have the recessive trait. Finally, if the student's parent were both homozygous (tt) then, they would have a 100% chance to have the recessive trait. (see image below)



CONCLUSION

Has your hypothesis been proved or disproved. Why? What evidence did you observe to support this statement?

The hypothesis has been disproved because there was 10 more students with recessive alleles than dominant alleles in the different traits, a ratio of 35 : 25. This probably occurred because as an international school the students in class were from a variety of nationalities with different traits more common to that region as explained in the analysis. Also, it might have happened because the parents of most students had a recessive allele in their genotype which appeared in their offspring.

ERROR ANALYSIS/ IMPROVEMENTS

Error analysis/ improvements: highlights any anomalies in the method which could lead to faulty data. Human or equipment error are not valid anomalies as these should not occur.

Some errors may be seen in the data table, because some students are between two traits and are hard to identify such as: cleft chin and smooth chin or free ear lobes and attached ear lobes. So, some guessing had to be made and therefore, the data may differ from other people.

An improvement that could be made is the sample space. If the survey had a larger sample space then the hypothesis would've been proved because the dominant alleles would appear more and more and if the whole world was taken, then the traits controlled by dominant alleles would be more common than traits controlled by recessive alleles. This is because all the countries and nationalities would be taken into consideration. Another improvement that could be made is the data table units. The data table could have been grouped with nationalities and therefore, the data would show which countries with the students had greater traits controlled by dominant or recessive alleles.

ANALYSIS - WHEEL OF TRAITS

How many students ended up on the same number on the circle of traits? How many students were the only ones to have their number? What do the results suggest about each person's combination of traits?