

# Bloodlines

## Grade Levels

This activity is intended for 4th-8th grade students to refresh and reinforce their knowledge of fractions, percentages, and decimals as well as the relationships between each.

## Objectives

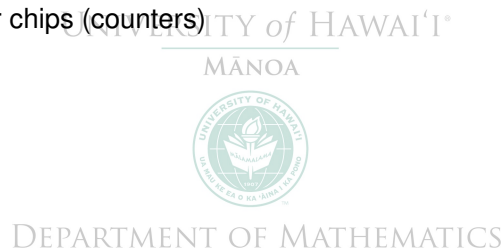
Students will concretely visualize fractions as parts of a whole, reason and justify their responses to questions with multiple answers, as well as practice linking percentages, fractions, and proportions through the application of genealogy.

## Introduction

The ancient Hawaiian people kept no written records. Other than the petroglyphs they knew no written language. Yet they lived with a sophisticated hierarchical system of land divisions, a complex classification in ranks from commoner to highest chief, and a detailed genealogy. To keep track of this vital knowledge, any transition that might be of importance, either to others or to future generations, had to be memorized and passed on. To aid with memorizing, a system of verses emerged which over the years developed into an ingenious art form. The verses were known as the oli, chants. They recorded the history of the land and the lineage of the aristocracy. The chants were crucial for the continuation of the political, social, economic, and ecological system of the Hawaiian world. After all, one's position in Hawaii depended on one's rank, and one's rank was determined by blood descent. The genealogy was often the only evidence of one's ancestry. It linked a person to all the ancestors, and through this one could show how much sacredness and royal blood had accumulated. Only specially trained kahunas (masters) could haku (compose) and memorize the long chants of aristocratic lineage. When attached to the court of a chief, they often chose others to help them with the careful editing work required to achieve the highest possible power in each chosen word. But in families of lesser rank, it was the firstborn child, the hiapo, who was expected from an early age to memorize all the family's knowledge that had to be preserved.

## Materials and Resources

- 2 Different colored blocks or chips (counters)



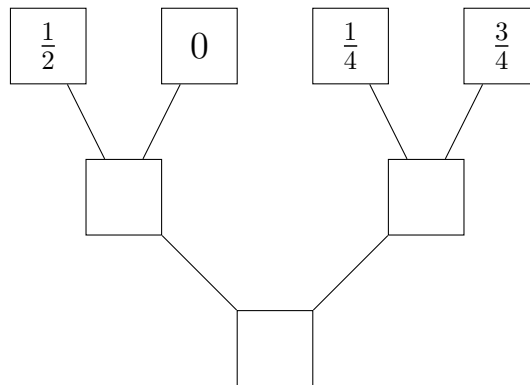
# 1 Using the Counters

By using the counters, the students can develop their own strategies to solve the problems. Consider bringing the students together to discuss their strategies. The questions require the answer to be a percentage, but are worded using fractions. With the counters, students can visualize the fractions as part of a whole and discover the relationship between ratios fractions (for 6th graders). For example: We want to find out our percentage of Hawaiian blood if only one grandparent was 100% Hawaiian and the rest are Caucasian. Let's represent the Hawaiian blood with a "red" block and the Caucasian blood with "white" blocks. Thus, we should have one red block and three white blocks. To determine our percentage of Hawaiian blood, we begin by grouping two white blocks together (forming a parent), grouping the red and remaining white block together (forming the other parent), and finally grouping them all together (creating the child, us!). It is clear from here that we have one part Hawaiian blood out of four total parts, we are 25% Hawaiian!

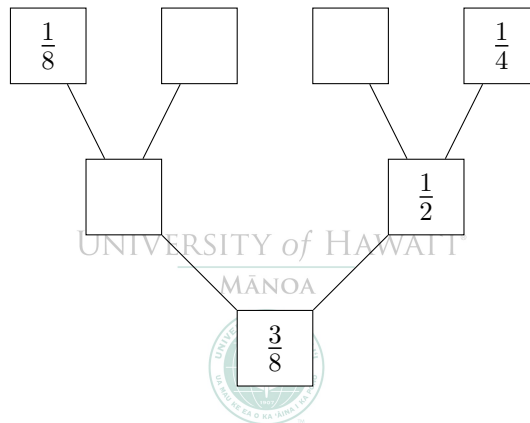
## Finding Hawaiian Proportion

For problems 1-3, you're given your ancestors proportion of Native Hawaiian blood. Calculate the fraction of Native Hawaiian you are.

1. Fill in the missing information.

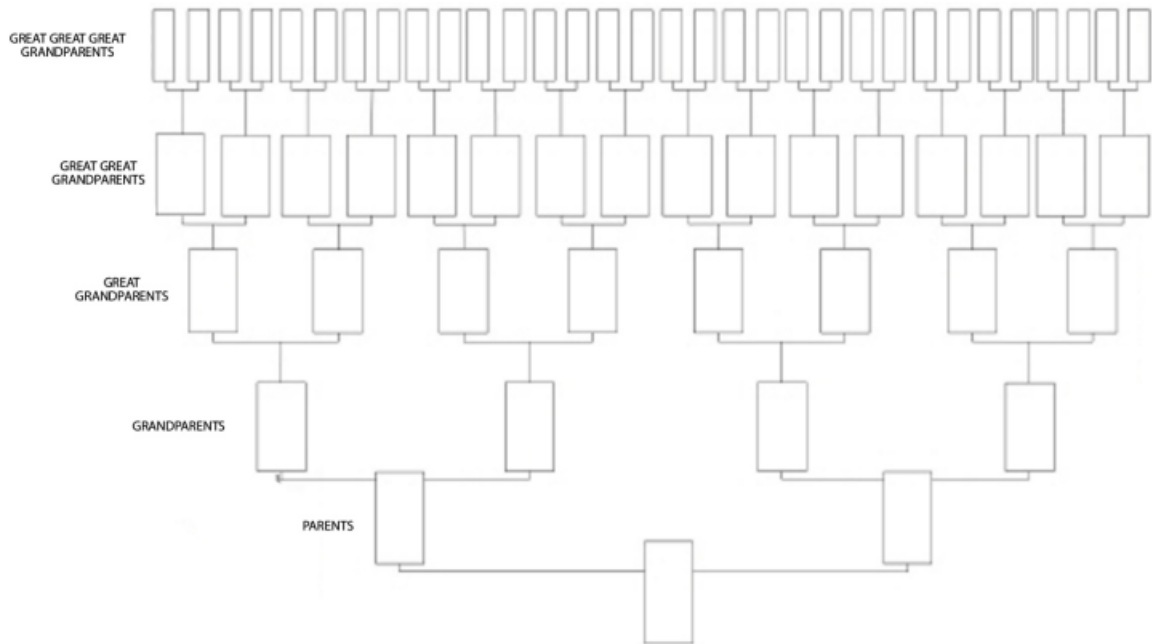


2. Fill in the missing information.

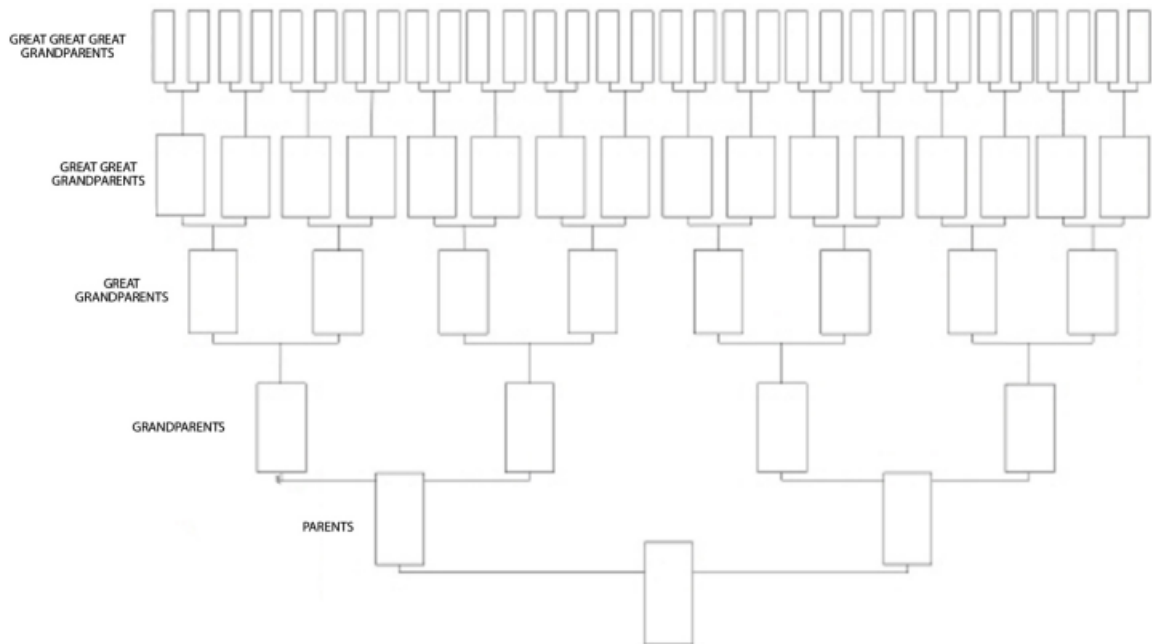


3. Fill in the diagram so that the current children in the chart is:

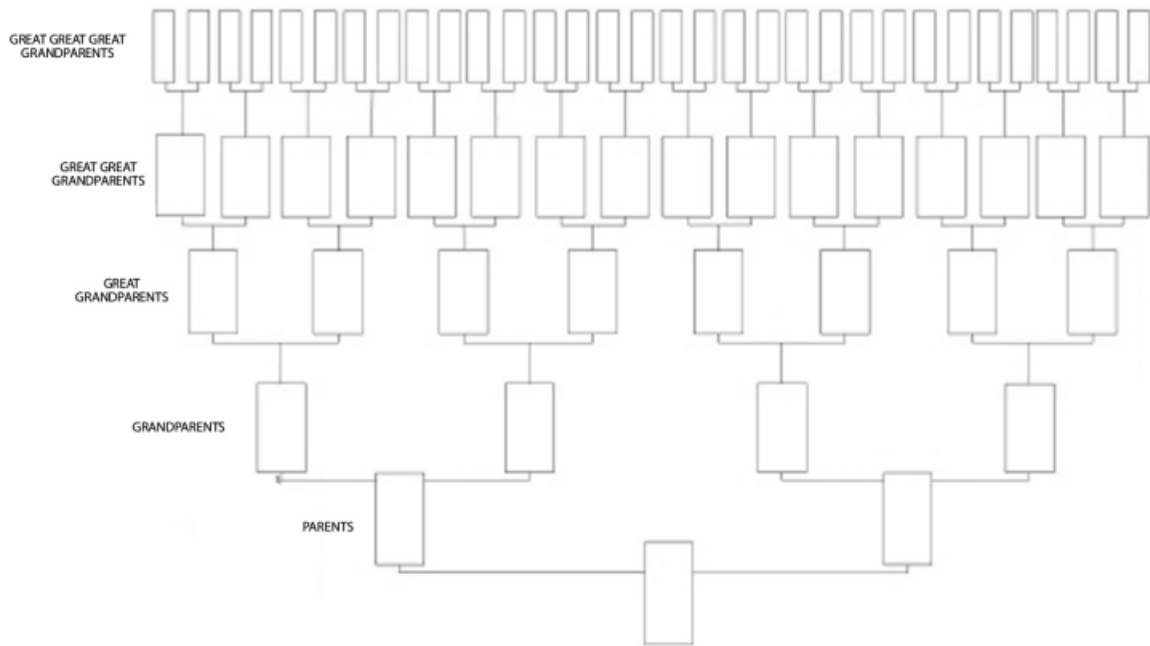
(a)  $\frac{3}{4}$  Hawaiian



(b)  $\frac{1}{16}$  Hawaiian



(c)  $\frac{7}{32}$  Hawaiian



4. Do the following,

(a) Create a general formula for the genetic information based on the parents and child. Fill in the table with possible amounts of Hawaiian Ethnicity that each parent could have.

Parents' Hawaiian Ethnicity	Child's Hawaiian Ethnicity	Formula
$(\frac{1}{2}, \frac{3}{4})$	$\frac{5}{8}$	

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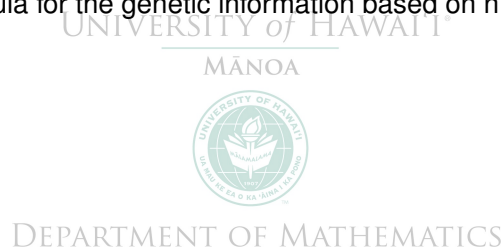
- (b) Create a general formula for the genetic information based on the grandparents and child. Use the table to help you, similar to part (a)

Grandparents' Hawaiian Ethnicity	Child's Hawaiian Ethnicity	Formula

- (c) Create a general formula for the genetic information based on the great grandparents and the child. Use the table to help you.

Great-grandparents' Hawaiian Ethnicity	Child's Hawaiian Ethnicity	Formula

- (d) Create a general formula for the genetic information based on n generations back and the child.



5. Based on the previous problem, what would the implied range be? What would the domain be for all the unknowns be? Why?

6. Can a child that is  $\frac{1}{8}$  Hawaiian have one parent that is  $\frac{3}{4}$  Hawaiian? Why or why not?

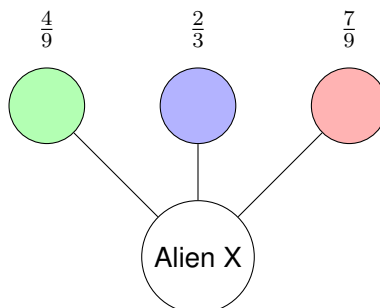
7. Can a parent who is  $\frac{1}{4}$  Hawaiian have a child that is  $\frac{1}{2}$  Hawaiian? Why or why not?

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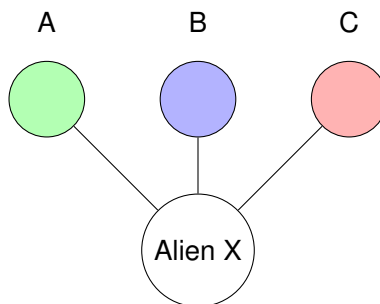


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8. Suppose you have found an alien species which needs three parents and the parents of alien X have the following amount of a specific geneology. Calculate how much of that geneology will be passed onto alien X.



9. Create a general formula to solve for alien X's specific geneology.



**Challenge Problems:**

10. If we assume that there are no overlaps, how many people would you need to look for if you wanted to track all your relatives going back one generation? 2-generations? 10-generations?  $n$ -generations?
11. From the previous problem, what would your answers be if it took three parents to make one offspring?
12. Assuming that you can look back an unlimited number of generations with no overlap, what is the implied domain and range for the previous two problems?