

FACE & HEAD VARIATION IN HUMAN GENETICS

Introduction:

Why are even closely related siblings different both in genotype and phenotype? They differ because the variety of traits in a human population is very large and reproduction continually creates new combinations of traits.

What traits would your baby have at age sixteen if both you and a classmate (your make-believe spouse) were heterozygous for each trait listed below? Illustrate how inherited traits are determined by chance with the following simulation: (As you proceed with the simulation, keep in mind that actual inheritance is much more complicated than this exercise implies and that geneticists do not yet fully understand the process.)

Procedure:

1. Pair up into make-believe sets of parents.
2. Both parents, you and your partner, record your names on the attached data sheet.
3. On the data sheet, list the genotypes and phenotypes for each trait you determine.
4. To determine the genotype for each trait, flip a coin (each partner).
 - *Heads* indicates that the parent flipping the coin contributes the gene represented in the descriptions by the capital letter.
 - *Tails* indicates that the parent flipping the coin contributes the recessive gene represented by the smaller letter.
5. Flip for the head shape.
 - From the two large drawings on page 16-10, choose the head shape that represents the genotype you have determined.
 - Draw in the phenotypes on the head shape as you determine the genotype for each trait.

Guide for Determining Individual Traits

Sex—Determine the sex and name the child. (Only father flips once because the father determines the baby's sex.)

Girl (X) –heads--

Boy (Y) –tails--

Face Shape—Choose one on page 16-10 as follows:

Round (RR, Rr)

Square (rr)

Chin Shape (I).

Very prominent (V V, V v)



Less prominent (v v)



Chin Shape (II). Flip coins for this trait only if chin shape genotype is V V or V v.

Round (RR, Rr)



Square (rr)



Cleft Chin.

Absent (AA, Aa)



Present (aa)



Skin Color. Dark color is dominant over light. At least four gene pairs are involved in determining skin color. Determine skin color by completing the following procedure:

1. Flip your coins first to determine the genotype of the first pair of genes (AA, Aa, aa).
2. Flip coins again to determine the genotype of the second pair of genes (BB, Bb, bb).
3. Flip coins again to determine the third pair of genes (CC, Cc, cc).
4. Flip your coins a final time to determine the fourth pair of genes (DD, Dd, dd).
5. Total the capital letters ("heads"), and find the skin color in the table below.

8 capitals (AABBCCDD)—Very dark black
 7 capitals (for example, AABbCCDD)—Dark black
 6 capitals (for example, AABBCcDd)—Very dark brown
 5 capitals (for example, AaBbCcDD)—Dark brown
 4 capitals (for example, AaBbCcDd)—Medium brown
 3 capitals (for example, aaBbCcDd)—Light brown
 2 capitals (for example, AaBbccdd)—Very light brown
 1 capital (for example, aabbCcdd)—Light tan
 0 capitals (aabbccdd)—white

Hair Type.

Curly (CC)



Wavy (Cc)



Straight (cc)



Widow's Peak. The hairline comes to a point in the center of the forehead. See Figure L6-3 for an illustration.

Present (WW, Ww)



Absent (ww)



Eyebrows (I)

Bushy (BB, Bb)



Fine (bb)



Eyebrows (II)

Not connected (NN, Nn)



Connected (nn)



Color of Eyebrows

Darker than hair (HH)



Same color as hair (Hh)



Lighter (hh)



Eyes—Distance apart

Close together (EE)



Average distance (Ee)



Far apart (ee)



Eyes—Size

Large (EE)



Medium (Ee)



Small (ee)



Eyes—Shape

Almond (wide) (AA, Aa)



Round (narrow) (aa)



Eye Slant

Horizontal (HH, Hh)



Upward slant (hh)



Eyelashes

Long (LL, Ll)



Short (ll)



Eye Color. Dark eyes are dominant over light. At least three gene pairs are involved in determining eye color. Determine eye color using the following procedure:

1. Flip your coins first to determine the first pair of genes (AA. Aa. aa).
2. Flip your coins again to determine the second pair of genes (BB. Bb. bb).
3. Flip your coins a final time to determine a third pair of genes (CC. Cc. cc).
4. Total the capital letters and find the eye color in the table below:

6 capitals (AABBCC)—Dark brown

5 capitals (AaBBCC, AABbCC, AABBCc)—Brown

4 capitals (AABBcc, AABbCc, AAbbCC, AaBbCC, AaBBCc, aaBBCC)—Light brown

3 capitals (AABbcc, AAbbCc, AaBbCc, AabbCC, aaBBcc, aaBbCC, AaBBcc)—Hazel (yellow-brown)

2 capitals (AAbbcc, AaBbcc, AabbCc, aaBBcc, aaBbCc, aabbCC)—Blue-green

1 capital (Aabbcc, aaBbcc, aabbCc)—Blue

0 capitals (aabbcc)—Light blue

Mouth-Size.

Wide (MM)



Average (Mm)



Narrow (mm)



Lips.

Thick (LL, Ll)



Thin (ll)



Protruding Lower-Lip.

Very protruding (HH)



Slightly protruding (Hh)



Absent (hh)



Dimples.

Present (DD, Dd)



Absent (dd)



Nose Size

Big (NN)



Average (Nn)



Small (nn)



Nose Shape

Rounded (RR, Rr)



Pointed (rr)



Nostril Shape

Rounded (RR, Rr)



Pointed (rr)



Earlobe Attachment

Free (FF, Ff)

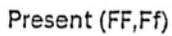


Attached (ff)

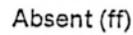


Freckles on Cheeks

Present (FF,Ff)



Absent (ff)



Hair Color. Dark hair is dominant over light. At least four gene pairs are involved in determining hair color. Determine the hair color by completing the following procedure:

1. Flip your coins first to determine the genotype of the first pair of genes (AA, Aa, aa)
2. Flip your coins again to determine the genotype of the second pair of genes (BB, Bb, bb)
3. Flip your coins again to determine the genotype of the third pair of genes (CC, Cc, cc)
4. Flip your coins a final time to determine the genotype of the fourth pair of genes (DD, Dd, dd)
5. Total the capital letters ("heads") and find the hair color in the table below. The gene combinations given are just examples of the many that are possible.

8 capitals (AABBCCDD)—Dark black
7 capitals (AABbCCDD)—Black
6 capitals (AaBbCCDD)—Dark brown
5 capitals (AaBBcCdd)—Brown
4 capitals (AaBbCcDd)—Red
3 capitals (AabbCcDd)—Dark blonde
2 capitals (AaBbccdd)—Blonde
1 capital (aaBbccdd)—Light Blonde
0 capitals (aabbccdd)—Pale yellow blonde

Name _____

Face & Head Variation Report Sheet

Parents' Names _____

Child's Name _____ Sex _____

Table 1. Face & Head Variations

	TRAIT	Gene(s) from Mother	Gene(s) from Father	Genotype	Phenotype
	Face shape				
	Chin shape				
	Cleft chin				
	Skin color				
	Hair type				
	Widow's Peak				
	Eyebrows (I)				
	Eyebrows (II)				
	Eyebrows color				
	Eyes-distance apart				
	Eyes-size				
	Eyes-shape				
	Eyes-slant				
	Eyelashes				
	Eye color				
	Mouth size				
	Lips				
	Lower lip-protruding				
	Dimples				
	Nose size				
	Nose shape				
	Nostril shape				
	Earlobe Attachment				
	Freckles on checks				
	Hair color				

Face & Head Shape

