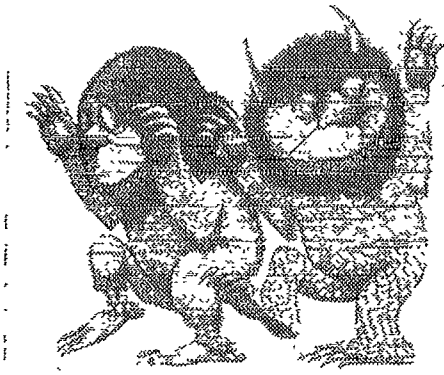


Sample Genetics Problems



The following genes in Ogres have been described and analyzed:

T = allele for two-headedness (dominant)

t = allele for one head (recessive)

H = allele for hairy body (dominant)

h = allele for non-hairy body (recessive)

B = allele for brown eye color (dominant)

b = allele for red eye color (recessive)

L = allele for very long tusks (Incomplete Dominance)

L' = allele for no tusks (Incomplete Dominance)

A = allele for long horns (dominant and sex-linked) (X)

a = allele for short horns (recessive and sex-linked) (X)

1. A one-headed ogre marries a two-headed but heterozygous female, what proportion of their offspring are expected to be two-headed?
2. Two brown-eyed but heterozygous ogres marry, what proportion of their offspring are expected to be red-eyed?
3. A hairy ogre marries a non-hairy female, and their first offspring is non-hairy. What is the genotype of the father?
4. A two-headed (heterozygous), red-eyed ogre takes a one-headed brown-eyed (heterozygous) wife. What is the expected phenotypic ratio of their offspring?
5. A hairy (heterozygous) brown-eyed (heterozygous) ogre takes a hairy (heterozygous) red-eyed wife. What is the expected phenotypic ratio of their offspring?
6. A one-headed short-tusked ogre takes a wife who is heterozygous for both traits. What is the expected phenotypic ratio of their offspring?
7. A (heterozygous) two-headed very long-tusked ogre marries a one-headed tuskless female ogre. What is the expected phenotypic ratio of their offspring?
8. A long-horned ogre marries a (heterozygous) long-horned female. What is the expected phenotypic ratio of their offspring?
9. A short-horned ogre marries a (heterozygous) long-horned female. What is the expected phenotypic ratio of their offspring?

Principles of Biology 101

Answers to Sample Genetics Problems:

1. $tt \times Tt$

Offspring are: 50% two-headed and 50% one-headed.

2. $Bb \times Bb$

Offspring are: 75% brown-eyed and 25% red-eyed.

3. The father must be Heterozygous if his child was homozygous recessive.

4. $Tt, bb \times tt, Bb$

Offspring are: 25% two-headed and brown-eyed, 25% two-headed and red-eyed, 25% one-headed and brown-eyed, and 25% one-headed and red-eyed.

5. $Hh, Bb \times Hh, bb$

Offspring are: 37.5% (3/8) hairy and brown-eyed, 37.5% (3/8) hairy and red-eyed, 12.5% (1/8) nonhairy and brown-eyed, and 12.5% (1/8) nonhairy and red-eyed.

6. $tt, LL' \times Tt, Ll'$

Offspring are: 12.5% (1/8) two-headed and long-tusked, 25% (2/8) two-headed and short-tusked, 12.5% (1/8) two-headed and no tusks, 12.5% (1/8) one-headed and long-tusked, 25% (2/8) one-headed and short-tusked, and 12.5% (1/8) one-headed and no tusks.

7. $Tt, LL \times tt, Ll'$

Offspring are: 50% two-headed and short-tusked, and 50% one-headed and short-tusked.

8. $X(A) X(a) \times X(A) Y$

Offspring are: 100% of daughters are long-horned, 50% of sons are long-horned, and 50% of sons are short-horned.

9. $X(A) X(a) \times X(a) Y$

Offspring are: 50% of daughters are long-horned, 50% of daughters are short-horned, 50% of sons are long-horned, and 50% of sons are short-horned.