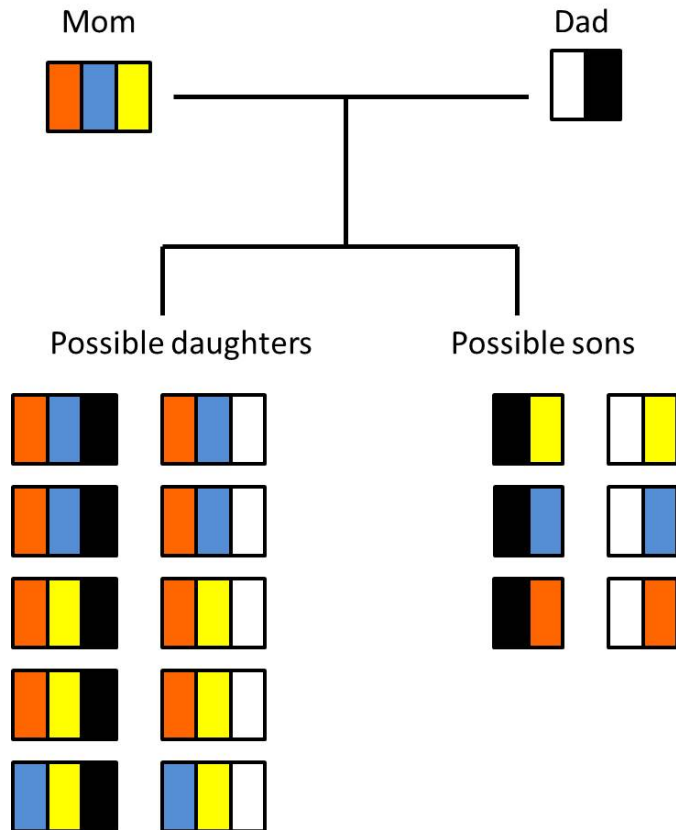


### Relatedness in trufulo toads

In trufulo toads, males have two genomes (diploid) and females have three genomes (triploid). Thus, trufulo toads are diplo-triploid. Males produce haploid sperm cells, and thus pass on one allele at each locus. Females produce two types of egg cells: diploid egg cells will develop into females after fertilization, and haploid egg cells will develop into males after fertilization. Thus, females pass on two alleles at each locus to daughters, but only one allele at each locus to sons:



1. What is the relatedness of a female to her full sister in this species?

You will need the following:

Probability that the female inherited a given allele from her mother:

Probability that, given the female inherited the allele from her mother, her sister inherited the same allele:

Probability that the female inherited a given allele from her father:

Probability that, given the female inherited the allele from her father, her sister inherited the same allele:

2. What is the relatedness of a female to her full brother in this species?

You will need the following:

Probability that the female inherited a given allele from her mother:

Probability that, given the female inherited the allele from her mother, her brother inherited the same allele:

Probability that the female inherited a given allele from her father:

Probability that, given the female inherited the allele from her father, her brother inherited the same allele:

3. What is the relatedness of a male to his full brother in this species?

You will need the following:

Probability that the male inherited a given allele from his mother:

Probability that, given the male inherited the allele from her mother, his brother inherited the same allele:

Probability that the male inherited a given allele from his father:

Probability that, given the male inherited the allele from his father, his brother inherited the same allele:

4. What is the relatedness of a female to her own daughter in this species?

5. What is the relatedness of a male to his own son in this species?

6. What is the relatedness of a female to her brother's son in this species?

7. What is the relatedness of a female to her sister's daughter in this species?

**Solutions are given on pp. 4-5**

## Solutions

1. What is the relatedness of a female to her full sister in this species?

You will need the following:

Probability that the female inherited a given allele from her mother:  $2/3$

Probability that, given the female inherited the allele from her mother, her sister inherited the same allele:  $2/3$

Probability that the female inherited a given allele from her father:  $1/3$

Probability that, given the female inherited the allele from her father, her sister inherited the same allele:  $1/2$

$$\text{relatedness} = (2/3)*(2/3) + (1/3)*(1/2) = (0.44) + (0.1666) = 0.6111$$

2. What is the relatedness of a female to her full brother in this species?

You will need the following:

Probability that the female inherited a given allele from her mother:  $(2/3)$

Probability that, given the female inherited the allele from her mother, her brother inherited the same allele:  $(1/3)$

Probability that the female inherited a given allele from her father:  $(1/3)$

Probability that, given the female inherited the allele from her father, her brother inherited the same allele:  $(1/2)$

$$\text{relatedness} = (2/3)*(1/3) + (1/3)*(1/2) = 0.3889$$

3. What is the relatedness of a male to his full brother in this species?

You will need the following:

Probability that the male inherited a given allele from his mother:  $(1/2)$

Probability that, given the male inherited the allele from her mother, his brother inherited the same allele:  $(1/3)$

Probability that the male inherited a given allele from his father:  $(1/2)$

Probability that, given the male inherited the allele from his father, his brother inherited the same allele:  $(1/2)$

$$\text{relatedness} = (1/2)*(1/3) + (1/2)*(1/2) = 0.4167$$

4. What is the relatedness of a female to her own daughter in this species?

relatedness =  $2/3$

5. What is the relatedness of a male to his own son in this species?

relatedness =  $1/2$

6. What is the relatedness of a female to her brother's son in this species?

relatedness = (answer from #2)\*(answer from #5) = 0.1944

7. What is the relatedness of a female to her sister's daughter in this species?

relatedness = (answer from #1)\*(answer from #4) = 0.4074