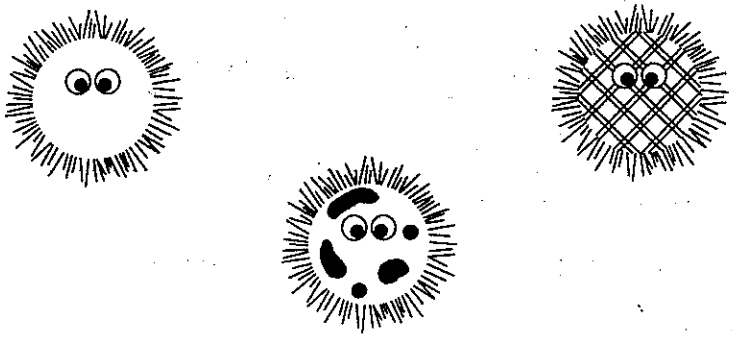
Name _____ Class _____ Date _____

Genetic Patterns in Tribbles

Many traits, such as the coats of mammals, are produced by the interaction of many genes. In this activity you will study the genetics of a fictional animal as a model for the genetics of more complex real animals.

Tribbles are animals that are familiar to most fans of science fiction. These small animals have long fur, a pleasant purr, and voracious appetites. Most tribbles reproduce asexually. However, Federation scientists exploring a remote planet have found a population of tribbles that reproduce sexually. These tribbles have fur in a variety of bright colors and patterns. Your mission: to explore the genetics of tribbles, to seek out the patterns of heredity in tribble crosses—to boldly go where no one has gone before!



1. A cross between a purebred black tribble and a purebred red tribble produces offspring that are all red in color. When two of these red offspring are crossed with one another to produce the F_2 generation, most of the F_2 tribbles are red, but a few are black.

a. What is the dominant character in these crosses? _____

b. What is the recessive character? _____

c. What genotypic and phenotypic ratios would you expect to see in the F_2 tribbles? _____

_____

2. When a blue tribble is crossed with a yellow tribble, all the offspring are green in color. A closer examination reveals that the fur of the green tribbles is composed of a mixture of blue and yellow hairs. When the green tribbles are crossed, their offspring are 1/4 blue, 1/2 green, and 1/4 yellow.

a. What pattern of heredity do these crosses show? _____

b. Select letters to symbolize the alleles and genotypes in the crosses. _____

_____

c. Draw a Punnett square in the space provided below to show a cross between a green tribble and a blue tribble.

d. What are the genotypic and phenotypic ratios in the offspring resulting from the cross in the question above? _____

_____

3. The following data are obtained from the results of many crosses between tribbles.

Parental Cross	Offspring	Parental Cross	Offspring
blue × red	all purple	yellow × white	all yellow
blue × yellow	all green	blue × black	all blue
yellow × red	all orange	red × black	all red
blue × white	all blue	yellow × black	all yellow
red × white	all red	black × white	all black

a. Which alleles are dominant? Assign letters to symbolize these alleles.

_____

_____

b. Which alleles are recessive? Assign letters to symbolize these alleles. (*Hint:* If there are two or more recessive alleles in a set of multiple alleles, each recessive allele is assigned the lowercase letter that corresponds to the capital letter of the dominant allele(s). The individual recessive alleles are then assigned lowercase letters of their own, which are written in superscript. For example, if the dominant allele is *A*, the recessive alleles might be a^a, a^b, and a^c.)

_____

_____

c. Describe the black allele's relationship to the other color alleles in terms of dominance and recessiveness.

_____

_____

_____

_____

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4. Spotted tribbles have colored spots on a white background. When two blue-spotted tribbles are crossed, 9/16 of the offspring are blue spotted, 3/16 are solid blue, 3/16 are black spotted, and 1/16 are solid black.

   a. What are the dominant characters in this cross? _____

   b. What are the recessive characters? _____

   c. Assign letters to symbolize the alleles in this cross. _____

   _____

   d. What are the genotypes of the parents in this cross? _____

   _____

5. When two red-spotted tribbles are crossed, 9 of their offspring are red spotted, 3 are solid red, and 4 are solid white.

   Two of the solid white tribbles when crossed with purebred solid red tribbles produce 1/2 solid red tribbles and 1/2 spotted red tribbles. One of the solid white tribbles when crossed with a purebred solid red tribble produces only red spotted offspring. And one of the solid white tribbles when crossed with a purebred red tribble produces only solid red offspring.

   a. Identify the dominant characters in these crosses. _____

   _____

   b. Identify the recessive characters in these crosses. _____

   _____

   c. Explain why some of the white tribbles appeared solid even though they had the dominant spotted allele. _____

   _____

   _____

6. When a blue tribble is crossed with a white tribble, all the offspring are pale-blue in color. When two of the pale-blue offspring are crossed to produce an F_2 generation, 1/4 of the F_2 tribbles are blue, 1/2 are pale-blue, and 1/4 are white. Additional experiments show that the blue color is caused by the same blue allele you studied earlier. Thus, the pale-blue and white coat colors are caused by the interaction of the blue alleles with another gene, which you call *D*.

   a. What trait appears to be controlled by gene D? Explain. _____

   _____

   b. You decide that *D* is incompletely dominant over *d*. Explain why you think these alleles show incomplete dominance. _____

   _____

   _____

c. What happens to the coat color in tribbles that are homozygous for the *d* allele? _____

_____

d. According to the results of genetic experiments so far, what combinations of alleles result in a white coat color in tribbles? _____

_____

7. A cross between a white tribble and a purple tribble produces 1/4 pale-purple, 1/4 pale-green, 1/4 pink, and 1/4 pale-orange offspring. When two of the pale-orange offspring are crossed, their offspring are 1/16 red, 2/16 pink, 2/16 orange, 4/16 pale-orange, 1/16 yellow, 2/16 pale-yellow, and 1/4 white.

a. What are the genotypes of the original white and purple tribbles? _____

_____

b. What are the genotypes of the pale-orange tribbles? _____

_____

8. You find a male tribble that has blue plaid fur. When you cross this male with a purebred solid blue female, all the offspring are solid blue in color. A cross between two of these F_1 tribbles produces an F_2 generation that is 3/4 solid-blue and 1/4 blue plaid. All of the blue plaid F_2 tribbles are male.

a. How is plaid fur inherited in tribbles? (Assume sex determination is the same in tribbles as in humans.) _____

_____

b. What cross would produce offspring that are 1/2 solid blue and 1/2 blue plaid?

_____

9. Complete the following table using the same symbols you selected earlier.

GENES IN TRIBBLES		
Trait	**Dominant Allele**	**Recessive Allele**
Coat color	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____
Coat pattern	normal (*X* _____)	plaid (*X* _____)
_____	normal (*D*)	_____ (*d*)
Spots	_____ _____	_____ _____

Name Answer Key Class _____ Date _____

CHAPTER 10

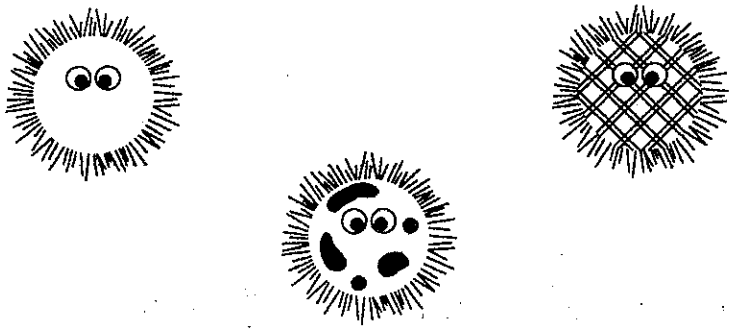
Genes and Chromosomes
Section 10–3

SKILL ACTIVITY—Identifying patterns

Genetic Patterns in Tribbles

Many traits, such as the coats of mammals, are produced by the interaction of many genes. In this activity you will study the genetics of a fictional animal as a model for the genetics of more complex real animals.

Tribbles are animals that are familiar to most fans of science fiction. These small animals have long fur, a pleasant purr, and voracious appetites. Most tribbles reproduce asexually. However, Federation scientists exploring a remote planet have found a population of tribbles that reproduce sexually. These tribbles have fur in a variety of bright colors and patterns. Your mission: to explore the genetics of tribbles, to seek out the patterns of heredity in tribble crosses—to boldly go where no one has gone before!



1. A cross between a purebred black tribble and a purebred red tribble produces offspring that are all red in color. When two of these red offspring are crossed with one another to produce the F_2 generation, most of the F_2 tribbles are red, but a few are black.

   a. What is the dominant character in these crosses? red

   b. What is the recessive character? black

   c. What genotypic and phenotypic ratios would you expect to see in the F_2 tribbles? geno 1:2:1
   pheno 3 red : 1 black RR Rr rr

2. When a blue tribble is crossed with a yellow tribble, all the offspring are green in color. A closer examination reveals that the fur of the green tribbles is composed of a mixture of blue and yellow hairs. When the green tribbles are crossed, their offspring are 1/4 blue, 1/2 green, and 1/4 yellow.

   a. What pattern of heredity do these crosses show? co dominance

   b. Select letters to symbolize the alleles and genotypes in the crosses.
   can use letters with F^x or just use capital letters

c. Draw a Punnett square in the space provided below to show a cross between a green tribble and a blue tribble. BB x BW

	B	B
B	BB	BB
W	BW	BW

1 : 1
blue (hom) green (het)

d. What are the genotypic and phenotypic ratios in the offspring resulting from the cross in the question above? _____

3. The following data are obtained from the results of many crosses between tribbles.

Parental Cross	Offspring	Parental Cross	Offspring
blue × red	all purple	yellow × white	all yellow
blue × yellow	all green	blue × black	all blue
yellow × red	all orange	red × black	all red
blue × white	all blue	yellow × black	all yellow
red × white	all red	black × white	all black

a. Which alleles are dominant? Assign letters to symbolize these alleles.
B - blue R red Y - yellow
~~W - white~~

b. Which alleles are recessive? Assign letters to symbolize these alleles. (*Hint:* If there are two or more recessive alleles in a set of multiple alleles, each recessive allele is assigned the lowercase letter that corresponds to the capital letter of the dominant allele(s). The individual recessive alleles are then assigned lowercase letters of their own, which are written in superscript. For example, if the dominant allele is *A*, the recessive alleles might be a^a, a^b, and a^c.)
w white b black.

c. Describe the black allele's relationship to the other color alleles in terms of dominance and recessiveness.
black is recessive except when paired w/ white

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4. Spotted tribbles have colored spots on a white background. When two blue-spotted tribbles are crossed, 9/16 of the offspring are blue spotted, 3/16 are solid blue, 3/16 are black spotted, and 1/16 are solid black.

a. What are the dominant characters in this cross? spots + blue

b. What are the recessive characters? solid + black

c. Assign letters to symbolize the alleles in this cross. B blue, b black T spots t solid

d. What are the genotypes of the parents in this cross? BbTt x BbTt

5. When two red-spotted tribbles are crossed, 9 of their offspring are red spotted, 3 are solid red, and 4 are solid white.

Two of the solid white tribbles, when crossed with purebred solid red tribbles produce 1/2 solid red tribbles and 1/2 spotted red tribbles. One of the solid white tribbles when crossed with a purebred solid red tribble produces only red spotted offspring. And one of the solid white tribbles when crossed with a purebred red tribble produces only solid red offspring.

a. Identify the dominant characters in these crosses. red + spots

b. Identify the recessive characters in these crosses. white + solid

c. Explain why some of the white tribbles appeared solid even though they had the dominant spotted allele. white spots will not appear on a white background

6. When a blue tribble is crossed with a white tribble, all the offspring are pale-blue in color. When two of the pale-blue offspring are crossed to produce an F_2 generation, 1/4 of the F_2 tribbles are blue, 1/2 are pale-blue, and 1/4 are white. Additional experiments show that the blue color is caused by the same blue allele you studied earlier. Thus, the pale-blue and white coat colors are caused by the interaction of the blue alleles with another gene, which you call *D*.

a. What trait appears to be controlled by gene D? Explain. controls amt of pigment produced

b. You decide that *D* is incompletely dominant over *d*. Explain why you think these alleles show incomplete dominance. D does not compensate fully for d, the inactive allele

c. What happens to the coat color in tribbles that are homozygous for the *d* allele? _____

No pigment produced so color is white

d. According to the results of genetic experiments so far, what combinations of alleles result in a white coat color in tribbles? ww, dd, WWTT

7. A cross between a white tribble and a purple tribble produces 1/4 pale-purple, 1/4 pale-green, 1/4 pink, and 1/4 pale-orange offspring. When two of the pale-orange offspring are crossed, their offspring are 1/16 red, 2/16 pink, 2/16 orange, 4/16 pale-orange, 1/16 yellow, 2/16 pale-yellow, and 1/4 white.

a. What are the genotypes of the original white and purple tribbles? F^BF^R DD + F^YF^Rdd

b. What are the genotypes of the pale-orange tribbles? F^YF^R Dd

8. You find a male tribble that has blue plaid fur. When you cross this male with a purebred solid blue female, all the offspring are solid blue in color. A cross between two of these F_1 tribbles produces an F_2 generation that is 3/4 solid-blue and 1/4 blue plaid. All of the blue plaid F_2 tribbles are male.

a. How is plaid fur inherited in tribbles? (Assume sex determination is the same in tribbles as in humans.) sex linked

b. What cross would produce offspring that are 1/2 solid blue and 1/2 blue plaid?

$F^BF^BX^nY$ x $F^BF^BX^NX^n$

9. Complete the following table using the same symbols you selected earlier.

GENES IN TRIBBLES		
Trait	**Dominant Allele**	**Recessive Allele**
Coat color	dom-blue F^B	red yellow F^R F^Y
Coat pattern	normal (*X* _____)	plaid (*X* _____)
_____	normal (*D*)	_____ (*d*)
Spots	_____	_____