The FUTURES Channel®

MOVIE GUIDE

MOVIE NUMBER 2006

Cheetahs

The Movie:

To help save an endangered species like the cheetah, you must start by understanding its behavior. Only the brave need apply for this job, however, because this kind of biological study is up close and personal. Featured: Susan Millard, Research Supervisor, Center For Reproduction of Endangered Species, Zoological Society of San Diego. (*Movie length: 2:08*)

Background:

The beautiful cheetah is one of the world's best-known endangered species. While some wildlife biologists are working to improve this species' survival in the wild, others are trying to find ways to increase the rate at which captive cheetahs reproduce. In the San Diego Wild Animal Park, for example, more than 100 cheetah cubs have been born. To save an endangered species, you must have an understanding of the animal's physical characteristics, behavior, diet, territory requirements, and reproductive habits.

Curriculum Connections:

Fractions 1

In the wild, cheetahs usually have litters of 3–5 kittens, and only 1/4 of them survive to adulthood.

Suppose a population of 30 cheetahs in a region produces 112 kittens one year. How many can be expected to reach adulthood?

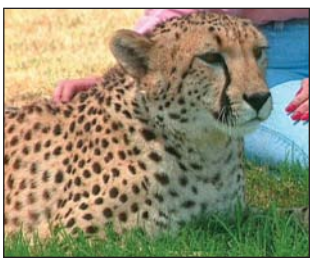
Suppose you could somehow protect a population of wild cheetahs and save 1/2 of the kittens that would normally die. How many of the 112 kittens would then survive?

Fractions 2

Suppose, in a certain region, the population of cheetahs in the year 2000 was 120. If about 1/8 of the adult cheetahs die each year, and 10 young cheetahs each year survive to reach adulthood, what would you expect the population to be five years later?

Measurement (length), Ratios 3

The cheetah is the fastest animal on earth for short periods of time, and can run up to 70 miles per hour. Does this have to do with the length of its legs? Get a picture of an adult cheetah, and pictures of other animals such as leopards, antelopes, etc. For each animal, measure to find the ratio of the length of the front leg to the length of the body (nose to rump, excluding tail). Do you think this ratio has something to do with the speed of these animals? Explain.



Measurement (area), Ratios 4

Male cheetahs live together in small groups, and each group has its own territory, which they protect from other cheetahs. In one area, the territory area of a group of male cheetahs was about 35 square kilometers.

If this area was nearly square, what could its dimensions be? What would those dimensions be in miles? How many square miles is this?

Use a map and its scale to find out the dimensions of your county. How many cheetah territories could it contain?

Would you expect cheetahs to have territories that are circular in shape? Why or why not?

Whole Number Operations, Statistics 5

If you were working with a population of cheetahs, or other animals, you would want to keep track of their physical characteristics, especially their weight.

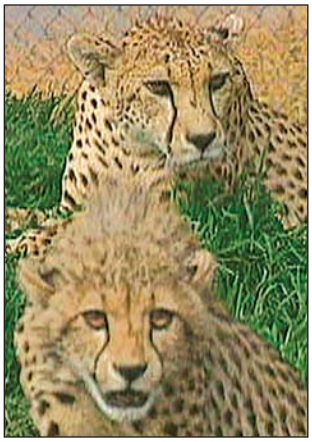
The first list below represents the weights of 25 adult male cheetahs in the wild, and the second list represents the weight of 10 adult male cheetahs being studied in captivity. Compare the data and report on your conclusions.

Wild adult male cheetahs' weights (kg): 45, 42, 46, 50, 51, 43, 47, 53, 52, 57, 46, 48, 42, 51, 57, 47, 56, 53, 50, 58, 48, 49, 57, 52, 48.

Captive cheetah's weights (kg): 45, 47, 55, 49, 52, 57, 51, 46, 49, 58.

Percents 6

In one study, researchers found that out of 117 cheetah cubs, 60 were male. What percent of the cubs were female?



Percents 7

Suppose you could protect an endangered species, and find additional territory for it, so that its population increased at a rate of 20% per year. If you start with 200 animals, what would the population be after 5 years?

Statistics (graphs) 8

This data represents estimates of the worldwide cheetah population. Make a graph that represents this information. Use the graph to predict the worldwide cheetah population in the year 2010.

Year	Estimate of Population
Late 1800's	100,000
Late 1950's	28,000
Early 1970's	14,000
1976	8,000 - 25,000
1984	25,000
1985	1,500 - 25,000
1987	10,000 - 15,000
1991	9,000- 12,000

Probability 9

One study found these probabilities for females giving birth:

Number of cubs in a litter	Probability of giving birth to a litter of that size
1 cub	0.0375
2 cubs	0.0375
3 cubs	0.4000
4 cubs	0.3200
5 cubs	0.200
6 cubs	0.0050

a) What is the probability that a female will give birth to a litter of three or more cubs?

b) If four cheetah females give birth, how likely is it that every one of the four litters will have five cubs?

c) Is it more likely that a litter will have three or less cubs, or four or more?

d) Use this data to predict the total number of cheetahs born in 100 litters, and explain your reasoning.

Ratios, Percents. Probability

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A researcher is observing the interaction between male and female cheetahs, trying to determine what types of behavior result in the female accepting the male as a mate.

Results of observations are shown in this table, which indicates how the male behaves, and the subsequent female behavior, when the two cheetahs are put in the same area.

Male Behavior	Female Behavior
I	I
B	I
I	S
I	I
B	I
B	R
I	R
B	I
B	R
I	I
I	I
B	I

Male Behavior	Female Behavior
B	A
I	I
I	I
I	I
I	R
B	A
B	I
I	I
B	S
B	I
B	I
B	I

Male Behavior	Female Behavior
I	I
B	A
B	I
I	I
I	I
B	S
I	S
I	I
B	I
B	A
B	U
I	A

Male Behavior	Female Behavior
I	I
B	U
B	S
B	I
I	A
I	I
B	I
B	A
B	I
B	I
I	S
B	S

I = Indifference. B = barking (male behavior) S = stretching R = rolling (female behavior) A = arched back (female behavior) U = body rubbing

For what percent of the interactions were the females indifferent? Not indifferent?
For what percent of the interactions were the males indifferent? Not indifferent?
For what percent of the interactions where the male "barked" was the female not indifferent?
Are females less likely to be indifferent if the males are not indifferent? Explain your answer.

Algebra: Variables

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- *Population size*
- *Rate of reproduction* (number of new cheetahs born each year in comparison to the total cheetah population)
- *Rate of attrition* (number of cheetahs that die each year in comparison to the total cheetah population)
- *Time*

Algebra: Expressions and Equations

12

- If P is the population at the start of the year, Y is the number of young that are born and survive, and D is the number of cheetahs that die in a year, then the population at the end of the year is given by this expression:

$$P + Y - D$$

- If P is the population at the start of the year and Y is the number of young that are born and survive in that year, then the rate of reproduction is given by this expression:

$$Y/P$$

- If no animals arrive from the outside of the region being studied, and no animals leave to the outside, then the population at the beginning of one year (say, 1996) is related to the population at the beginning of the next year (say, 1997), by this equation (where R is the rate of reproduction and A is the rate of attrition):

$$P_{1997} = P_{1996} + P_{1996}\,(R - A)$$

Algebra (patterns, relations and functions) 13

- The total population, *P,* is related to the rate of reproduction, *R*
- The total population, *P,* is related to the rate of attrition, *A*
- The total population, *P,* is related to the amount of time that passes, *t*

Algebra (linear equations, functions) 14

- If one is developing a plan for recovery of an endangered species which starts with a population of, say, 200 animals, and projects a growth in population each year of "10 animals", then the population, *P,* will be related to the number of years that pass, *t,* by this equation:

$$P = 10t + 200$$

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The Disappearing Call of the Wild, #2001	Archiving and analyzing over 2,000 hours of rainforest sounds, bio-acoustician Bernie Krause measures the decline of species as habitats disappear.