POPULATION GROWTH

Teaching Guidelines

Subject: Mathematics

Topics: Algebra--Exponential Equations and Functions

Grades: 10 - 12

Knowledge and Skills:

- Can determine the equation of an exponential function that closely matches a set of points

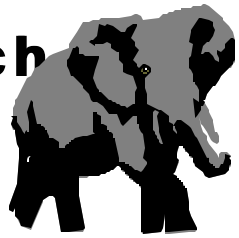
Procedure: The activity is best done by students individually or in teams of two. Distribute the handout and ensure that students understand what they are being asked to do.

Answers

Species	(t_1, Y_1)	(t_2, Y_2)	Specific equation	Actual value of Y at t = 10	Computed value of Y at t = 10	Good fit?*
Bald Eagle	(2,10)	(5,22)	$Y = 5.9 \times 10^{0.1141t}$	75	82	Yes
Elephant	(1,24)	(3,28)	$Y = 22.2 \times 10^{0.0334t}$	56	48	Yes
Panda	(2,12)	(5,14)	$Y = 10.8 \times 10^{0.0223t}$	15	18	No
Cheetah	(5,32)	(9,47)	$Y = 19.8 \times 10^{0.0417t}$	65	52	No
Grizzly bear	(3,6)	(6,12)	$Y = 3.0 \times 10^{0.10031t}$	27	30	Yes

*Discuss with students that whether or not there is a good fit is somewhat a matter of opinion, since "good" is not clearly defined. Rather than simply examine the numbers, a better way to evaluate this is by graphing the specific equation, and seeing how close the actual value at *t = 10* comes closest to the exponential curve. The scale of the graph will be a factor in this, which is why the fit for the Panda is considered "bad", even though the difference between the actual and computed value (3) is the same as for the grizzly bear, where the fit is considered "good."

Wildlife Watch



To: Analysts
From: Populations Projections Unit
Regarding: Population Growth

The data below shows the number of young produced for two different years, in a population of a given protected wildlife species (the years are counted starting from 1990). We would like to know if the relationship between "Number of young produced" (Y) and "time" (t) can in general be accurately described by an exponential function of this form:

$$Y = A \cdot 10^{kt}$$

Please determine the specific exponential function in each case by finding the values of A and k that fit the given the data--(Y_1, t_1) and (Y_2, t_2). Use that function to compute the value of Y at t = 10 (10 years), and compare it to the actual 10 year value given. Indicate whether or not you think the exponential function is a good model in each case.

Species	**(t_1, Y_1)**	**(t_2, Y_2)**	**Specific equation**	**Actual value of Y at t = 10**	**Computed value of Y at t = 10**	**Good fit?**
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