Data and Similarity Modeling Projects

I. The Belly Button Hypothesis - Is the "fibobelly number" a thing?

Claim: On average, the ratio of an adult person's height, h, to their belly button height, b (the distance from the floor to their belly button) is equal to the long term behavior of the ratio of two consecutive Fibonacci numbers. Mathematically:

$$\frac{h}{b} = \lim_{n \to \infty} \frac{f_{n+1}}{f_n}$$

where

$$f_0 = 1; f_1 = 1; f_n = f_{n-2} + f_{n-1}, n \geq 2$$

Your task: Collect data from 15 people to add to the small existing dataset, and use that data to argue for or against the claim.

II. Chocolate Santas - How much chocolate is enough?

The Good-Sweet Candy Company makes high-quality solid chocolate Santas that are 2 inches tall using 4 ounces of chocolate. This year they want to make a 5-inch tall Santa and an 8-inch tall Santa using the exact same shape, growing the Santas proportionally in all dimensions. Marketing projections indicate that orders will be for 1,000 2-inch, 800 5-inch, and 100 8-inch Santas.

Your task: Develop a similarity model formula and determine how much chocolate will be needed.

III. Estimating bear weights - Empirical or similarity model?

Jellystone National Park has received a federal grant to support a study of its bear population. They are looking for simple equation relating weight to some other physical characteristic of the bears, so rangers could estimate the weight of a bear based on a simpler measurement that could be taken with a tape measure. They have data on on 100 bears tranquilized at various times in the Park, including the following measurements:

- Length nose to tail in inches
- Chest circumference around the widest part of the chest in inches
- Weight in pounds

Your task: Determine with justification which single measurement would be best to to use to estimate the weight in pounds using only a tape measure AND the simplest formula that you believe will do an adequate job.

IV. Is fertility rate a predictor of female life expectancy?

The World Health Organization periodically collects data on life expectancy and other health related issues. Claim: Increased fertility (number of births per female) reduces female life expectancy.

Your task: Use the country data collected in 2000 to argue for or against the claim.