

Math Virtual Learning

AP stats / Transforming Random Variables

May 7th, 2020



Lesson: May 7th, 2020

Objective/Learning Target:
Students will review methods of transforming and combining random variables.

Review #1

A study finds that the average capybara weighs approximately 113 pounds with a standard deviation of 18 pounds. It is later realized that the scale had a consistent error adding 3 pounds to each capybaras weight. We would also like to have the weight in kilograms (2.2lbs per 1 kg). Perform the appropriate transformations.

Review #2

Using the answer from the previous review problem, what is the average difference between the weight of two capybaras? What is the standard deviation of those differences?

Answers

#1 - To change the mean, we will first take care of the error so $113-3 = 110$, then we will change the scale, $110/2.2 = 50\text{kg}$. We could write the two transformations in a single expression $(113-3)/2.2 = 50\text{kg}$. The standard deviation will not change with the error, but will change with the change of scale. So $18/2.2 = 8.18\text{ kg}$. So the capybaras are 50 kg on average with a standard deviation of 8.18 kg.

#2 - On average the weight of the first capybara is 50 kg, and the second is also 50 kg, because they are chosen from the same population. Thus on average the difference in the weights of two capybaras is $50-50 = 0\text{ kg}$. To find the standard deviation we need to find the variance of each (squared standard deviation), add the variances, and the square root to get back to standard deviation. Resulting in:

$$\sqrt{18^2 + 18^2} = \sqrt{648} \approx 25.5$$

Combining and Transforming Random Variables

The ability to transform variables is a key component to many statistical operations. We transform our data sets to follow the standard normal distribution, when we calculate z -scores. We combine two distributions whenever we run a 2 sample or 2 proportion test. Higher level statistics rely on these same skills for more advanced tests as well. We can also use them to account for consistent errors and to change scales. However, there are some rules we need to make sure we are paying attention to. Please review the following video.

[Transformations of random variables](#)

Extra Practice

[Practice Problem](#)

[Answers](#)