

## New dog aging calculations



*Dudley born 11/10/2019*

A few days ago, we adopted a puppy rescued from Puerto Rico. His name is Dudley. He was one of 5 puppies born at the rescue after his mom, Sandy, was thrown away into their trash bin. He looks pretty cute and so far, he's learning fast and is sweet to be with.

We have a lot of years together to get to know and trust each other. I'll keep you all posted.

Geneticists have just discovered a new way for judging a dog's age corresponding to its human's age.

We've heard before that dogs age about 7 years for every one human year. That approximation probably came from the fact that the life-span of a dog is about 10 years and the average human life-span is 70 years. But now we are learning that this calculation is grossly oversimplified.

1. According to that previous formula,  $7 * (\text{Dog's age}) = \text{apparent human age}$ , how old would my new puppy, Dudley, be in human years?

Geneticists have found markers that attach to DNA molecules that help make more accurate judgements about aging. As living things age, their DNA molecules (the molecules which contain their genetic codes) are attached by methyl markers ( $\text{CH}_3$ ). These markers affect the function of the DNA molecule by turning off some of the genetic code. This process is called **DNA methylation**.

The new formula, which applies to dogs older than one year, says that a canine's human age roughly equals  $16 * \ln(\text{dog age}) + 31$

2. What do you think this part;  $\ln(\text{dog age})$  of the formula means? (You may not have seen this notation before. Don't worry about this answer if you have never seen or heard of natural logarithms.)

The **LN** key on your calculator returns the natural logarithm of any positive number that you enter. This means that your calculator will show you what exponent you need to raise Euler's number, **e** to, to get that inputted number. Euler's number is named for Leonhard Euler who was a famous mathematician in the 18th century (1707 - 1783). The number has a value of about 2.71828. This number is found in calculations for finding compound interest and probability values.

- Use your calculator and the natural logarithm key to find the approximate age of a 1 year old dog according to this new formula.

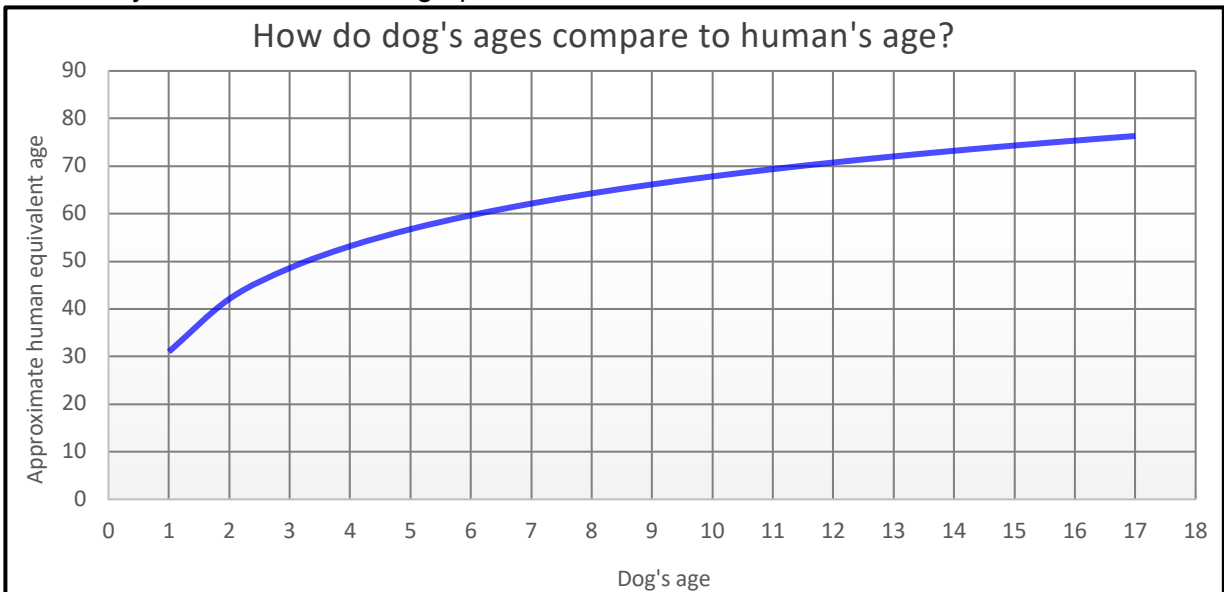
The natural logarithm of a number tells you what exponent you would need to give **e** (2.71828) in order to get the value that you entered in the parenthesis after the natural logarithm function.

For instance:  $\ln(5) = 1.60944$   
 and  $e^{1.60944} \approx 5$

- Use your calculator to find out what the natural logarithm of 1 is?
- Does that make any sense to you? Please explain.



We used the new formula to create a chart of the equivalent age of dogs that are both older than 1 year and younger than 18 years old. Below is a graph of our results.



- Make at least 3 observations about this data.

7. Summarize the evident pacing of a dog's maturity?
  
  
  
  
  
  
  
  
  
  
8. Does **any** apparent dog's age in the data seem to be about 7 times its age in actual years old? Please explain your thoughts with examples.
  
  
  
  
  
  
  
  
  
  
9. Choose your family's dog or a dog that you know and figure out his/her human age with the new formula.
  
  
  
  
  
  
  
  
  
  
10. If your dog of was to live to be the equivalent of a 90-year old human, how old would your dog be in actual years?

Sources: <https://www.biorxiv.org/content/10.1101/829192v1?ct=>  
<https://www.smithsonianmag.com/smart-news/theres-new-better-formula-calculating-dog-years-180973575/>  
[https://en.wikipedia.org/wiki/E\\_\(mathematical\\_constant\)](https://en.wikipedia.org/wiki/E_(mathematical_constant))  
<https://genomebiology.biomedcentral.com/articles/10.1186/s13059-019-1824-y>

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