Sample Question to Demonstrate the Nature of Normal Distributions

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Question: Suppose a human skill can be measured by 15 questions that are each worth up to 2 points (i.e., partial credit allowed), what could be a likely distribution for overall test scores (i.e., sum of 15 questions) of 5000 randomly selected test takers?

Find a visual answer in R (see interactive figure [HERE](#)):

```
source("https://raw.githubusercontent.com/rnorouzian/m/master/qs.r")
add.norm(n.test.taker = 5000, n.question = 15, pt.worth = 2)
```


Score Distribution
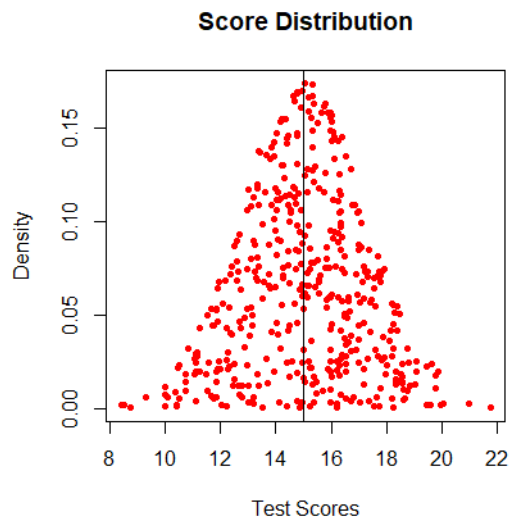
Explanation: Think of each test taker as being able to obtain any equally possible points (from 0 to 2 including any possible partial credit e.g., 0.25 etc.) on each question which when added together leads to an overall test score for that test taker. Additive phenomena (e.g., sum of 15 questions' point worth) in nature tend to cluster more heavily around their average when we study them in a population (the scientific reason is not exactly clear, see [Breiman, 1968](#)). That is, although extremely high or low realizations (e.g., high or low test scores) of that phenomenon is possible, mid-level realizations (e.g., mid-level test scores) often occur more frequently. Due to the normal distributions' symmetrical shape, the average overall score among all test takers is simply the midpoint of the lowest (i.e., 0) and the highest (i.e., 30) possible overall test score (i.e. average overall test score = 15). Overall, due to the test's additive nature, most likely, the distribution of overall test scores across all test takers is going to be a normal one centered at a mean of 15 (see figure above).

Reflection: In the absence of any other evidence, if a phenomenon in psychological and educational research may consist of addition of some measurable subcomponents, it is likely for that phenomenon to have a bell-shaped, normal distribution when studied in a population.