Week 5: Probability Distributions

Unit 4: Using the Normal Distribution to Calculate Probability

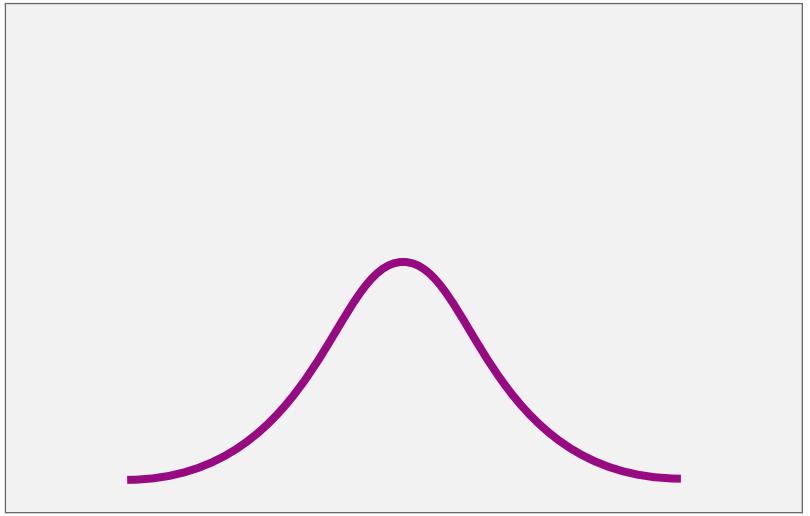
Normal distribution recap

Normal Curve

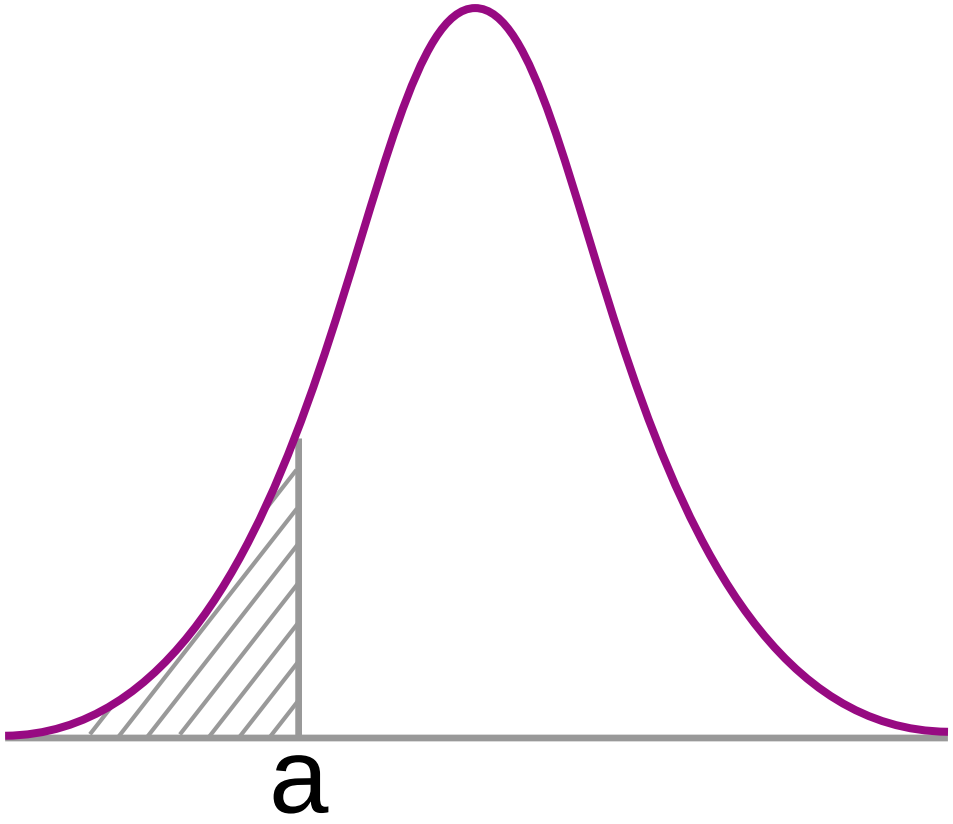
Smaller Standard Deviation

Normal Curve

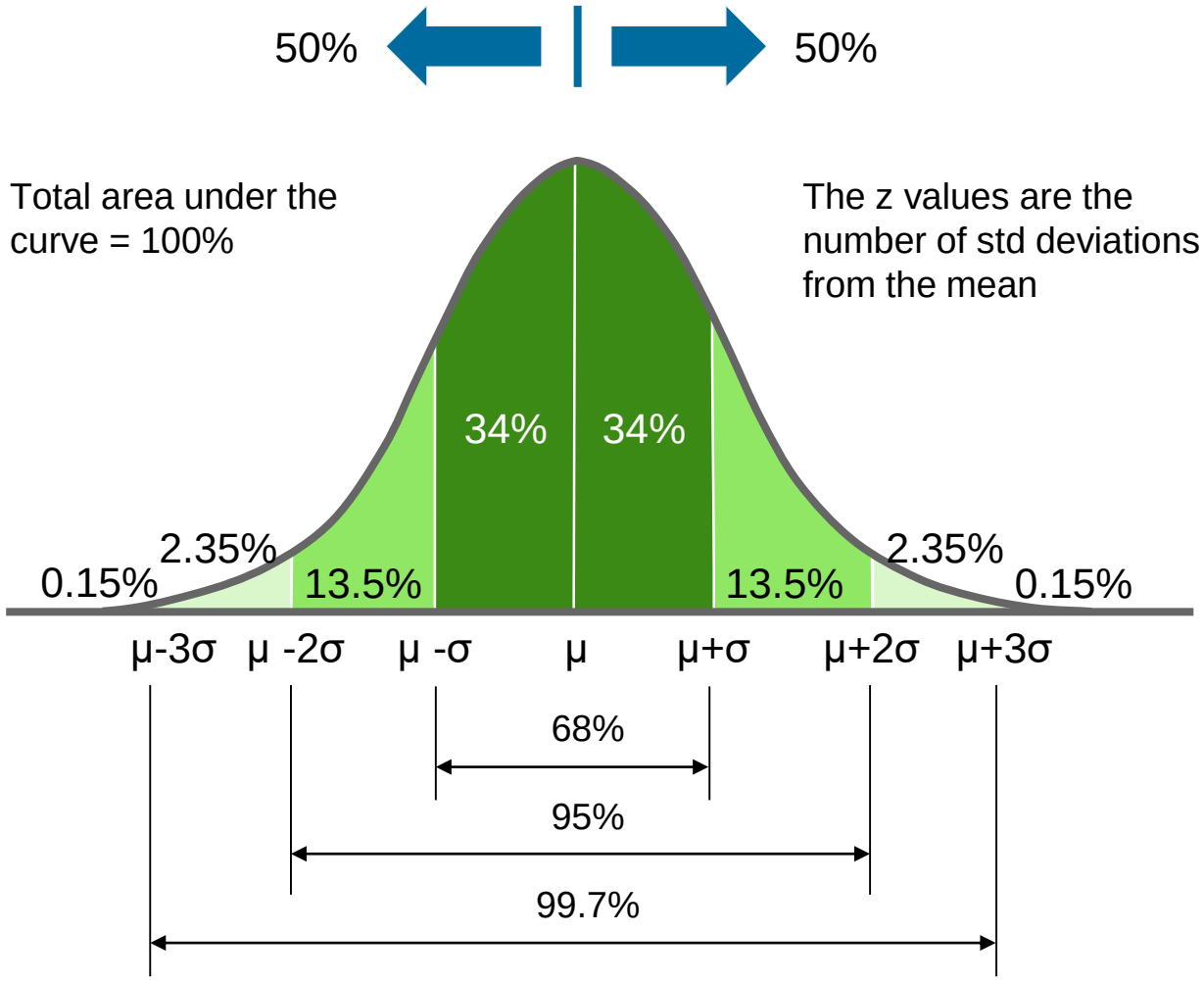
Larger Standard Deviation



Probability and the normal distribution recap



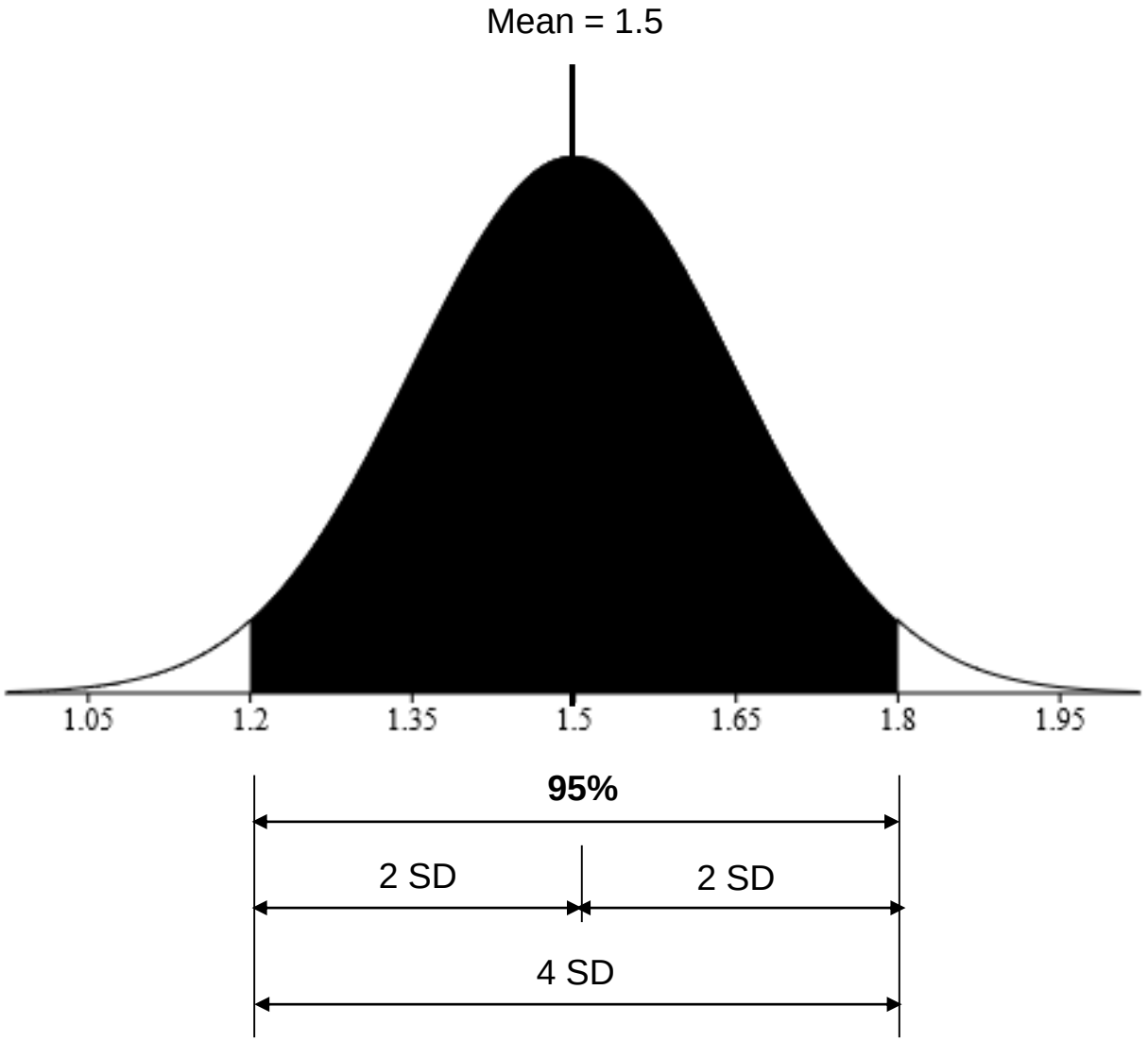
Empirical rule recap



Empirical rule example

Question

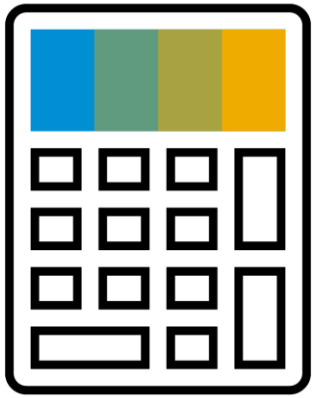
- 95% of students at school are between 1.2m and 1.8m tall.
- Assuming this data is normally distributed, calculate the mean and standard deviation.



http://davidmlane.com/hyperstat/z_table.html

Find probabilities

- How can you use this theory in practice?
- To find the probability associated with a normal random variable, use a graphing calculator, an online normal distribution calculator, or a normal distribution table.
- There are lots of normal distribution calculators available online.



- Here are some examples for you:

https://www.mathportal.org/calculators/statistics-calculator/normal-distribution-calculator.php

https://stattrek.com/online-calculator/normal.aspx

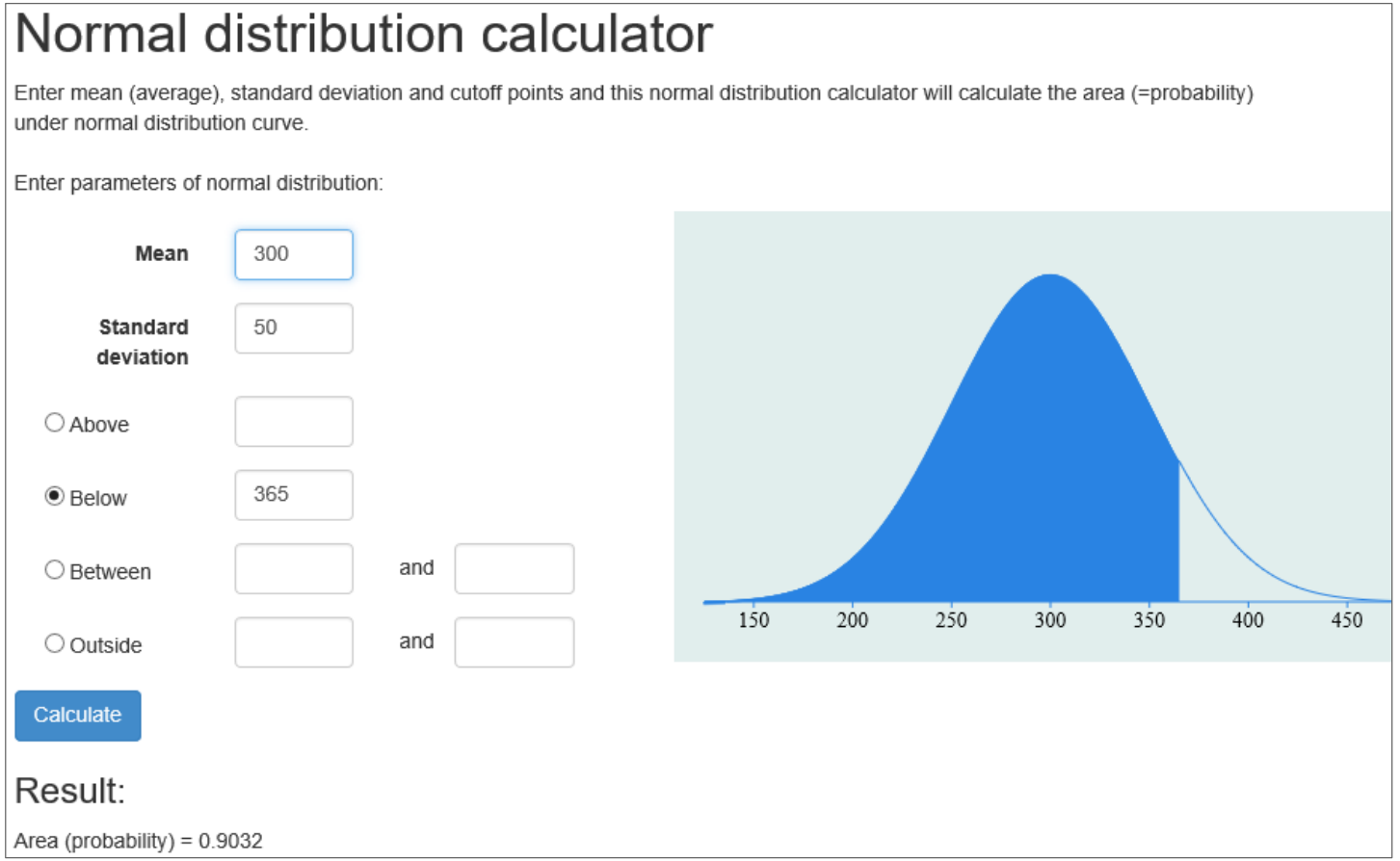
https://www.hackmath.net/en/calculator/normal-distribution

http://davidmlane.com/hyperstat/z_table.html

Example 1

Question

- On average, a light bulb lasts 300 days with a standard deviation of 50 days.
- Assuming that bulb life is normally distributed, what is the probability that the light bulb will last at most 365 days?



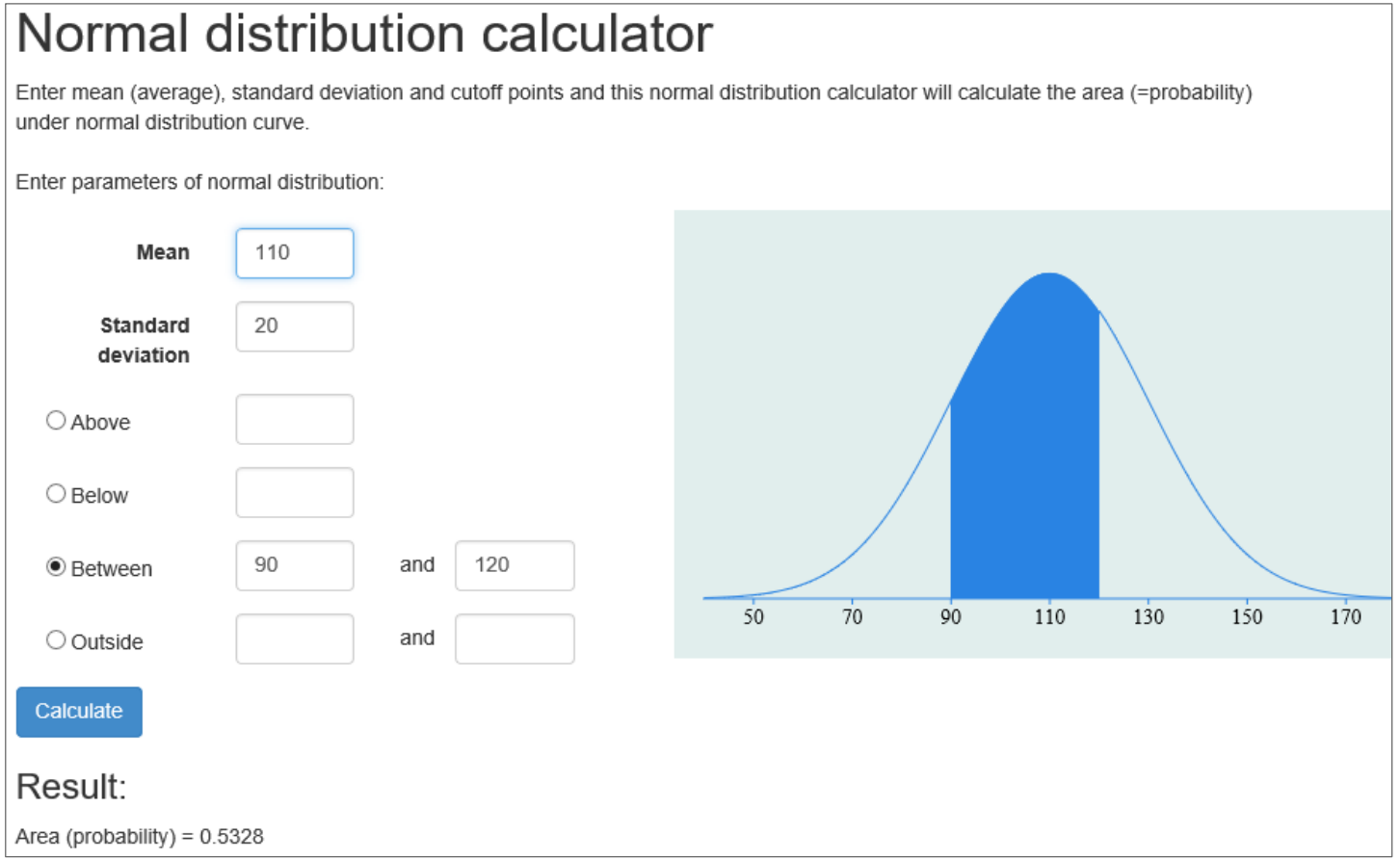
https://www.hackmath.net/en/calculator/normal-distribution

https://www.hackmath.net/en/calculator/normal-distribution?mean=300&sd=50&above=&area=below&below=365&ll=&ul=&outsideLL=&outsideUL=&draw=Calculate

Example 2

Question

- Scores on an IQ test are normally distributed.
- If the test has a mean of 110 and a standard deviation of 20, what is the probability that a person who takes the test will score between 90 and 120?

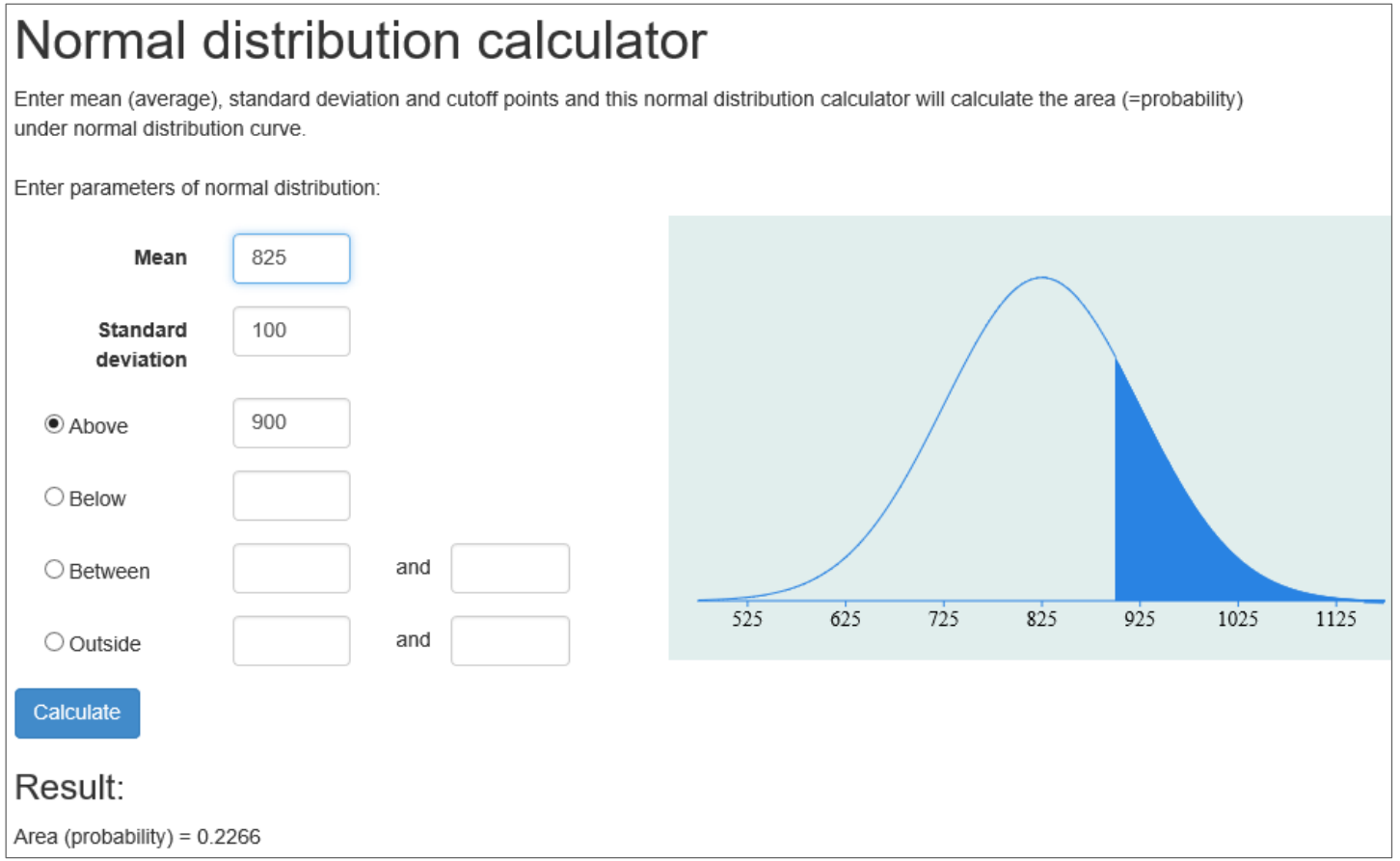


https://www.hackmath.net/en/calculator/normal-distribution?mean=110&sd=20&above=&below=&area=between&ll=90&ul=120&outsideLL=&outsideUL=&draw=Calculate

Example 3

Question

- A student achieved a score of 900 in an exam.
- The mean test score was 825 with a standard deviation of 100.
- Assuming that test scores are normally distributed, what proportion of students achieved a higher score than 900?



https://www.hackmath.net/en/calculator/normal-distribution?mean=825&sd=100&area=above&above=900&below=&ll=&ul=&outsideLL=&outsideUL=&draw=Calculate

Summary

- The **normal distribution** refers to a family of continuous probability distributions.
- The area under the normal distribution curve can be used to calculate probabilities for a normally distributed random variable.
- There are lots of normal distribution calculators available online. Given the mean and standard deviation, the calculator can be used to calculate the area under the normal curve (the probability):
  - less than a value
  - greater than a value
  - between values
  - outside two values

https://stattrek.com/probability-distributions/normal.aspx

https://www.mathsisfun.com/data/standard-normal-distribution.html

https://statistics.laerd.com/statistical-guides/normal-distribution-calculations.php

Thank you.

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