5.1

Z-Scores and the Normal Distribution

Z-Scores

- You are in your first year of college and you just took your first Calculus exam.
- Your professor tells you that the distribution of scores for the exam were approximately Normal with a mean of 72.4 and a standard deviation of 5.3.
- You earned a score of 84 and you want to know how you did relative to your peers.

First - Z-scores!

(84-72.4)/5.3

- A z-score tells us **how many standard deviations above or below the mean our data point is.**

$$z = \frac{x - \bar{x}}{s} = \frac{84 - 72.4}{5.3} = 2.19$$

- Mean of 72.4 and a standard deviation of 5.3.
- You earned a score of 84. Find and interpret your z-score. I scored 2.19 standard deviations above mean.

Z-scores...For COMPARING

- You also took a Physics test. In that class, the professor told you that the test scores were Normally Distributed with a **mean of 54.6** and a **standard deviation of 7.3**.
- **You earned a 65**
- Which score is better, relative to your peers in each class?

Calculus	**Physics**
Mean: 72.4, s.d.: 5.3	Mean: 54.6, s.d.: 4.1
Score: 84	Score: 65

z= 2.19 z=2.54

Even though you scored higher in Calc, you scored higher relative to your peers in Physics

Practice

- You are _____ inches tall. Steph Curry is 75" tall.

Practice

- You are _____ inches tall. Steph Curry is 75" tall.
- The heights of professional basketball players have a mean of 81 inches and a standard deviation of 3 inches.
- The mean height in this class is 65.9
- The standard deviation of heights in this class is 3.87.

- Who is RELATIVELY taller? You or Steph Curry?

Back to our Calc Test…

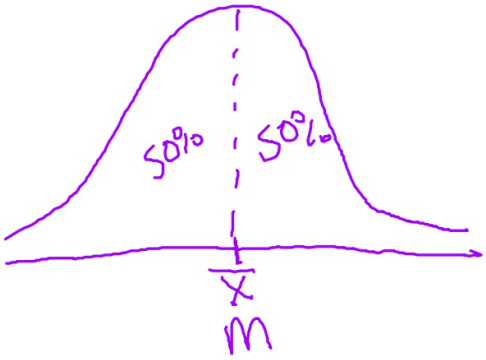
- You are in your first year of college and you just took your first Calculus exam.
- Your professor tells you that the distribution of scores for the exam were **approximately Normal** with a mean of 72.4 and a standard deviation of 5.3.
- You earned a score of 84.

I want to know **how many students I was better than!!!!**

- Because the data was Normally distributed, we can actually find that out (approximately)!

The Normal distribution

- The **normal distribution** is the most important continuous distribution in statistics!
  - Bell-shaped curve
  - Symmetrical about the mean
  - The total area under the curve is 1 (100%)
  - 50% of the area is to the left of the mean with 50% to the right.



The Normal Distribution

- The **normal distribution** is the most important continuous distribution in statistics!
  - Approximately 68% of the area is within 1 standard deviation of the mean.
  - Approximately 95% of the area is within 2 standard deviations of the mean.
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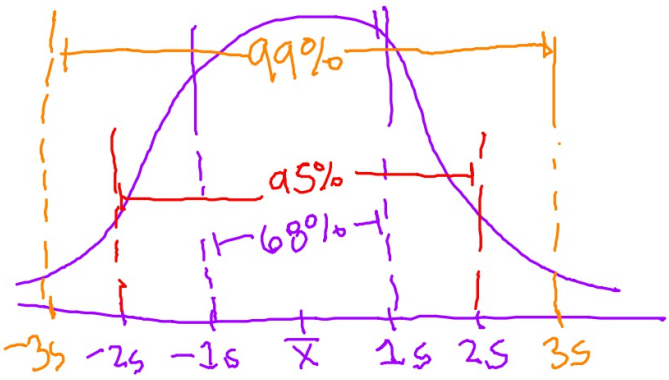

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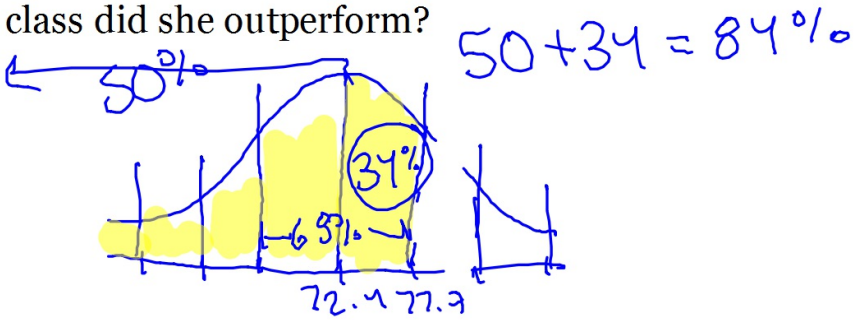
- **Let's start with your friend, who earned 77.7 on the exam.** What percent of the class did she outperform?



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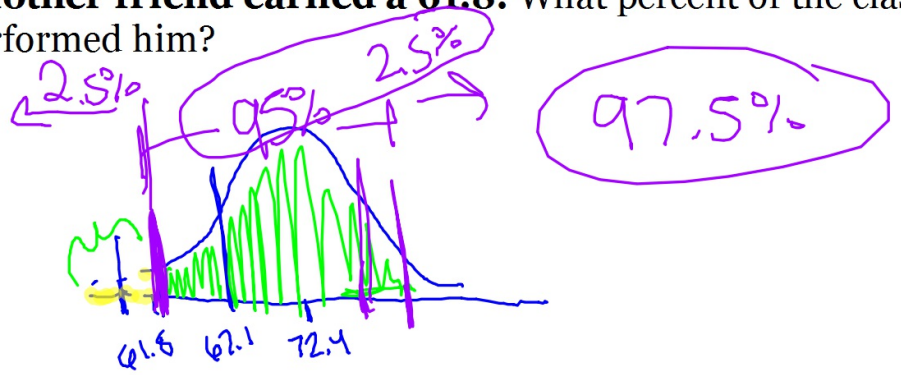
- **Another friend earned a 61.8.** What percent of the class outperformed him?



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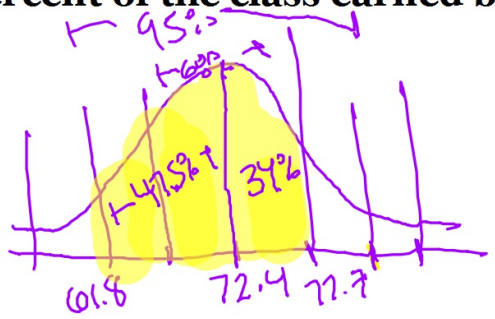
- **What percent of the class earned between their scores (61.8 and 77.7)?**



Some practice with that...

- **Calc Test - approximately Normal** with a mean of 72.4 and a standard deviation of 5.3.
- What percent of your classmates scored between 67.1 and 77.7?
- What percent of your classmates scored more than 83?
- What percent of your classmates scores less than 67.1?

You want to know- What proportion of students in the class scored lower than me?

- Normally distributed with a mean of 72.4 and a standard deviation of 5.3.
- You earned a score of 84.

- Luckily, our GDC has this covered....

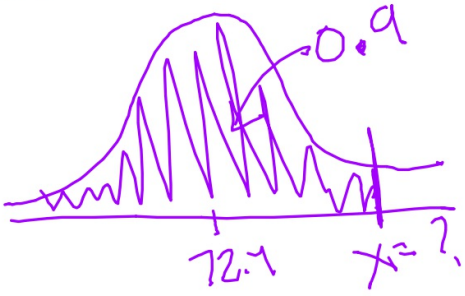
Practice

- Your friend earned a 73. What percent of students scored higher than her?

- What percent of students earned scores between you and your friend?

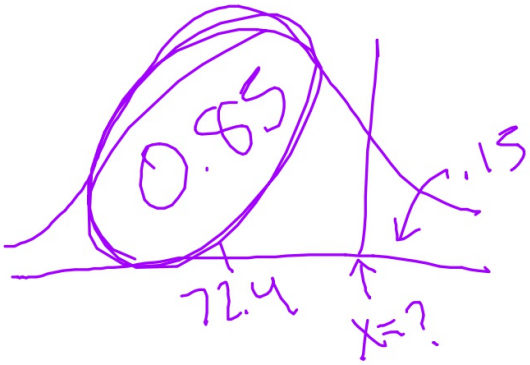
Inverse Norm

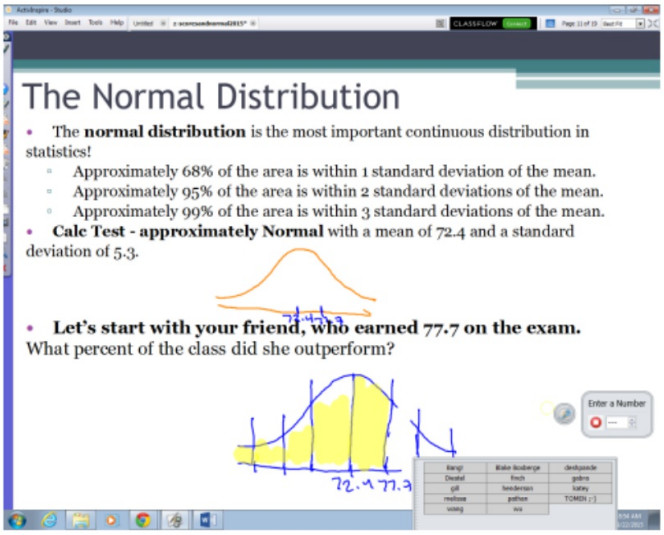
- One of your classmates shares that she scored higher than 90% of students on the exam. What was her score?



Inverse Norm

- Another classmate shares that he scored lower than only 15% of students, what grade did he earn?

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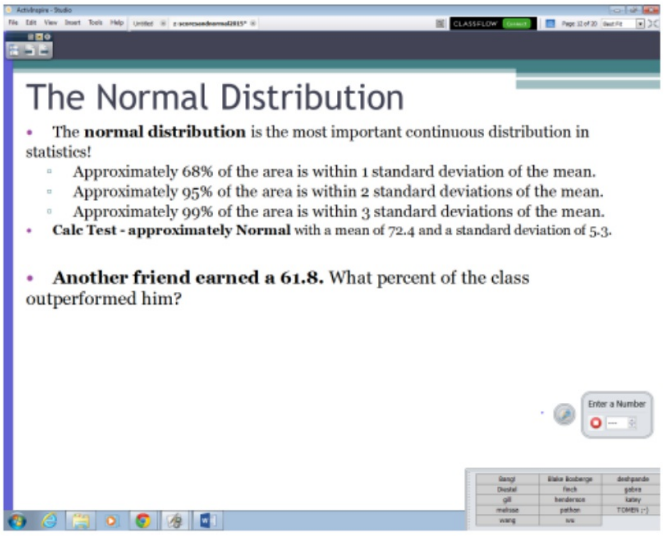
What percent of the class did she outperform?
Enter a Number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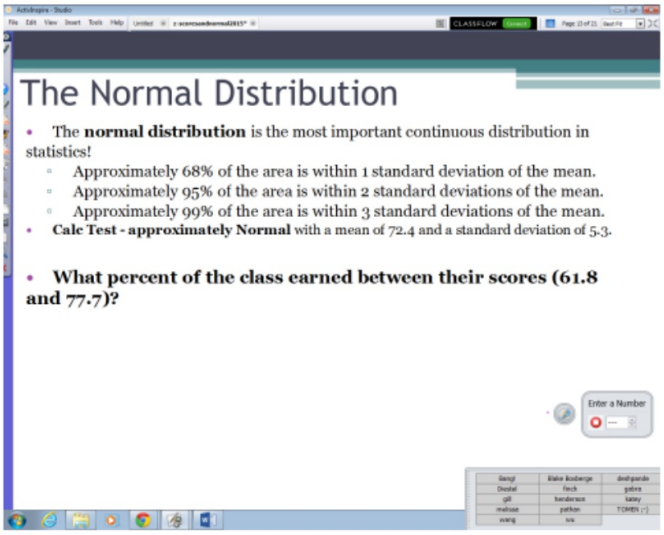
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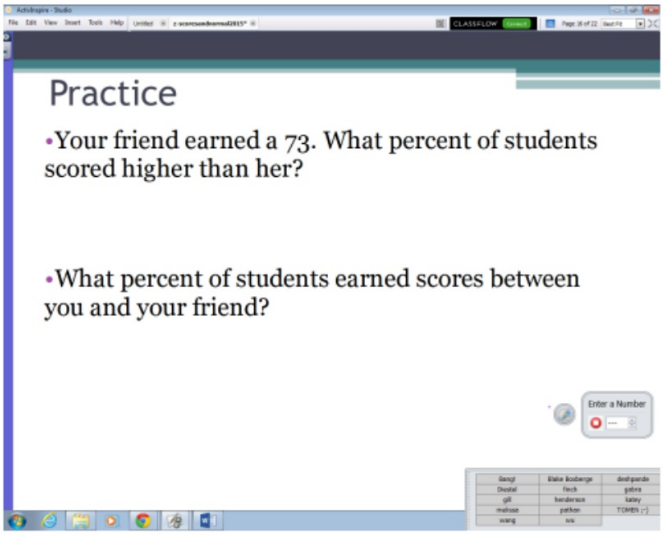
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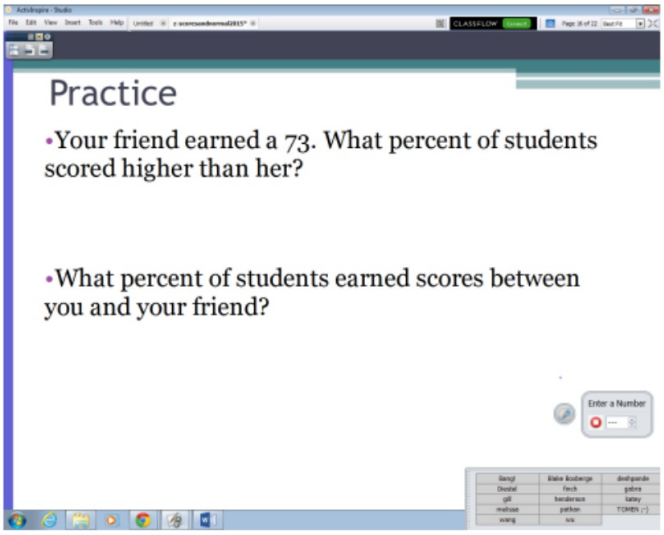
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