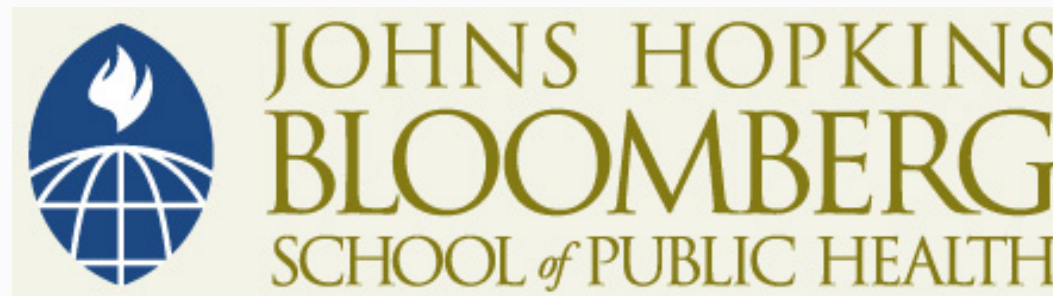


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BLOOMBERG  
SCHOOL *of* PUBLIC HEALTH

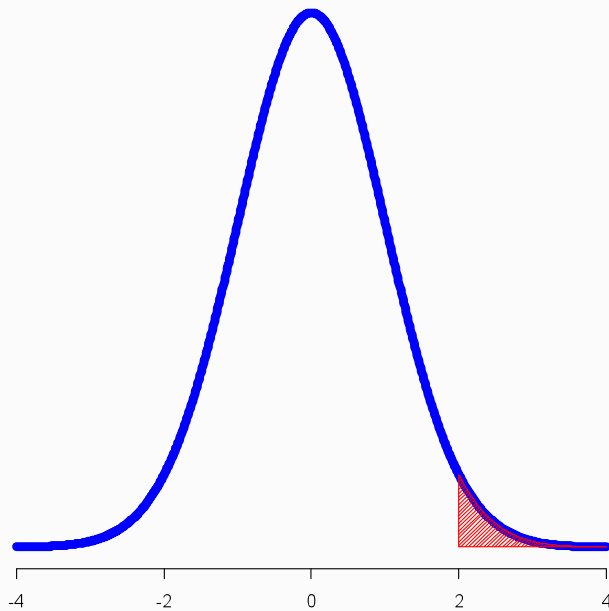
## Lecture 2b: Practice Problem Solutions

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Johns Hopkins University

# Solutions

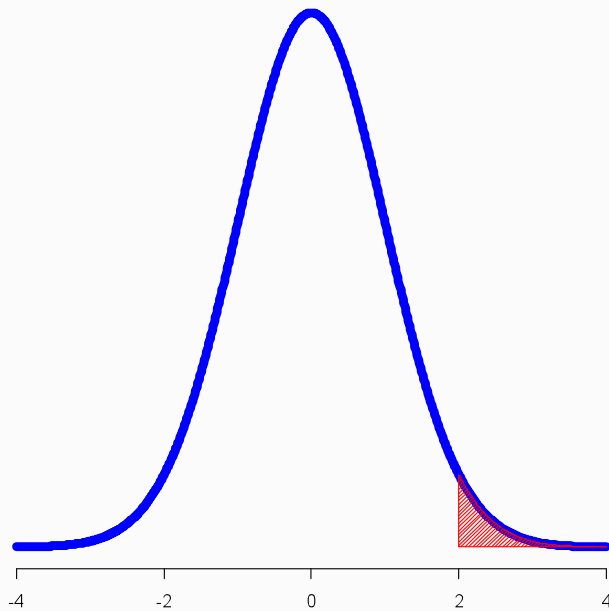
1. If you have a standard score of  $Z = 2$ , what percentage of the population has scores greater than you?



The area of the red portion is our answer!

# Solutions

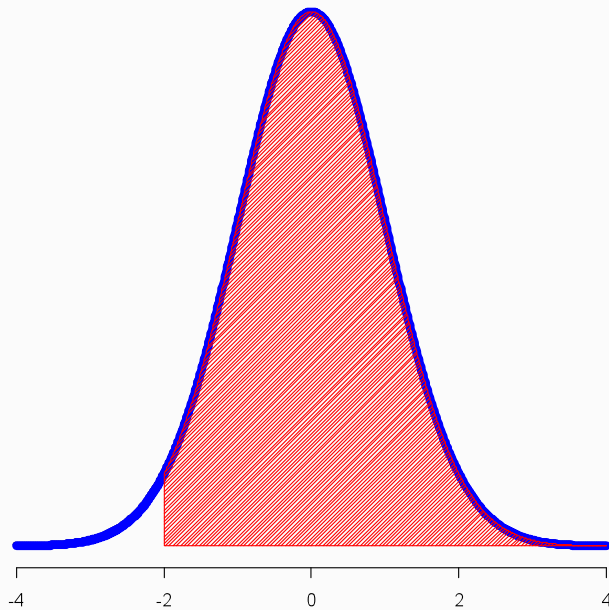
1. If you have a standard score of  $Z = 2$ , what percentage of the population has scores greater than you?



From the table, we know this is 2.28% of the population

# Solutions

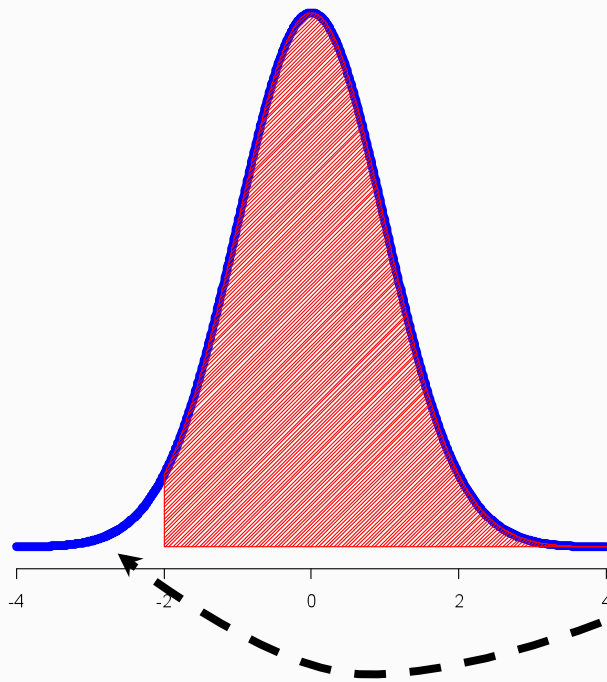
2. If you have a standard score of  $Z = -2$ , what percentage of the population has score greater than you?



Again, the area of the red portion is our answer!

# Solutions

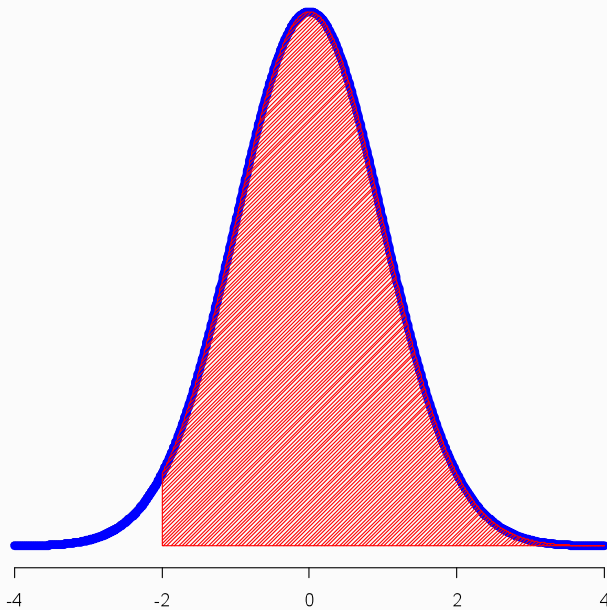
2. If you have a standard score of  $Z = -2$ , what percentage of the population has score greater than you?



From our table, we can only get the area of the white portion on the left side (2.28%)

# Solutions

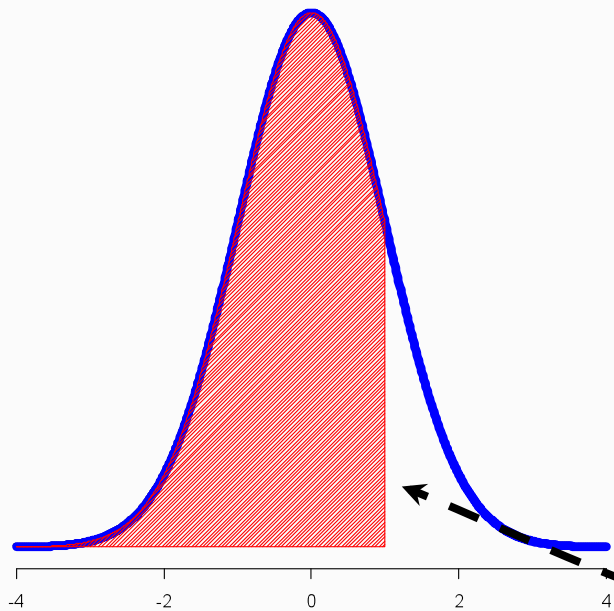
2. If you have a standard score of  $Z = -2$ , what percentage of the population has score greater than you?



Because the total area under the curve is 100%, the area in red is just  $100\% - 2.28\% = 97.72\%$

# Solutions

3. If you have a standard score of  $Z = 1$ , what percentage of the population has scores less than you?

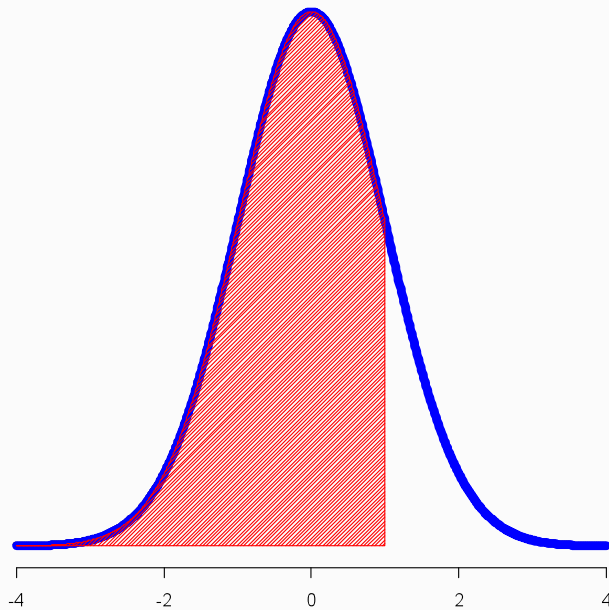


We want the area in red, but can get the area in white from the table (15.87%).



# Solutions

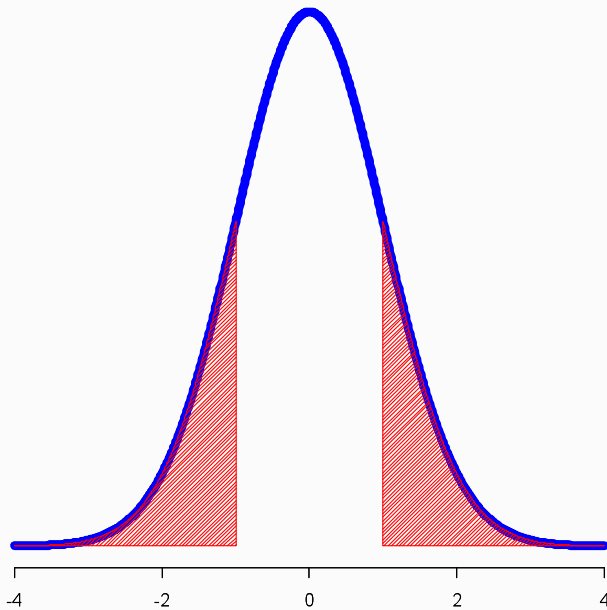
3. If you have a standard score of  $Z = 1$ , what percentage of the population has scores less than you?



The area in red is  
 $100\% - 15.87\% = 84.13\%$ .  
Approximately 84% of the  
population have scores less  
than you.

# Solutions

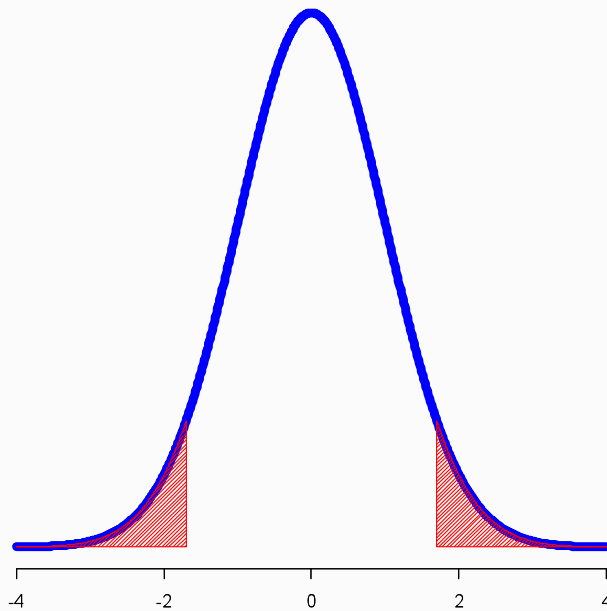
4. If you have a standard score of  $Z = 1$ , what percentage of the population has scores farther away from the population mean (in either direction) than you?



The area in red is  $2 * 15.87\% = 31.74\%$ : Approximately 32% of the population are farther away from the mean than you.

# Solutions

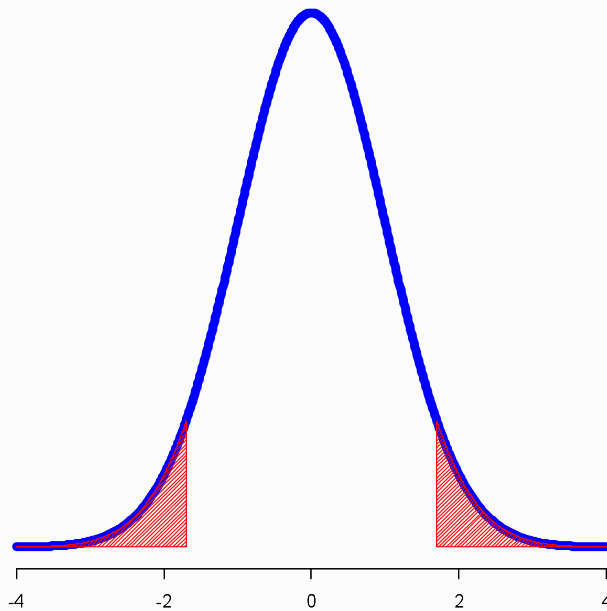
5. If you have a standard score of  $Z = -1.7$ , what percentage of the population has scores farther away from the population mean (in either direction) than you



The area in red is what we want. But it's not in the table in the notes. Any ideas? Does it make any sense to take the average of 32% (the area beyond 1 SD, from last problem) and 5% (the area beyond 2 SDs from table)?

# Solutions

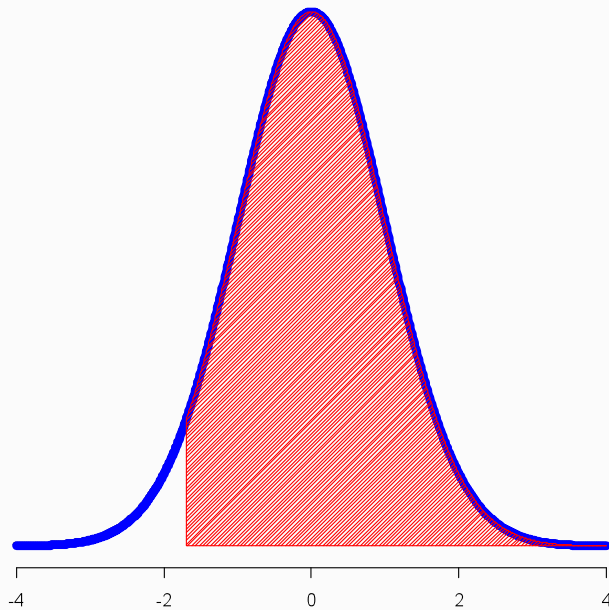
5. If you have a standard score of  $Z = -1.7$ , what percentage of the population has scores farther away from the population mean (in either direction) than you



Okay: so the answer is 9%.  
Approximately 9% of the observations in a set of normally distributed observations will fall beyond 1.7 standard deviations from their overall mean. See if you can verify this with Stata, online, or a more complete table than given in the class notes.

# Solutions

6. If you have a standard score of  $Z = -1.7$ , what percentage of the population has scores greater than you?



Since 9% is beyond 1.7 SDs in either direction, 4.5% is less than -1.7 SDs from the mean (by symmetry). As such,  $100\% - 4.5\% = 95.5\%$  is greater than -1.7 SDs away from the overall mean.

## Solutions

7. Suppose the distribution of grades in your statistics class is normal, with mean = 83.4,  $s = 7$ . There are 120 total in the class. If you score a 97.4 in the class, roughly how many people have scores higher than you?

$$z = \frac{\textit{Observed} - \textit{Mean}}{sd} = \frac{97.4 - 83.4}{7} = \frac{14}{7} = 2$$

# Solutions

## 7. (Continued)

- If you have a standard score of 2, we know that 2.3% of the population has a score greater than you (and therefore a higher exam score)
- There are 120 people in the class
- So about  $(.023)(120) = 2.76 \approx 3$  people have higher scores
- Good job!