

The Normal Distribution

Reading

- Section 6.1
- Section 6.2

Practice Problems

6.1 (Page 357) 6, 7, 11, 12, 13, 15, 16, 18, 21, 23, 31, 32

6.2 (Page 359) 48, 49, 51, 52, 53, 54, 55

6.1 (Page 361) 60, 61, 63, 64, 65, 67

6.2 (Page 362) 68, 69, 70, 71, 72

Notes

- The **Normal Distribution** is a bell-shaped curve.
- Its equation depends on two parameters, μ (mean) and σ (standard deviation)
 - μ controls the center
 - σ controls the width. More specifically, it is the distance between the center and the “inflection point”.
- Denoted $N(\mu, \sigma)$.
- We use Table A or calculator/computer for computing values. We will explain shortly.
- Key step: z -scores.

$$z = \frac{x - \mu}{\sigma}$$

- They are a simple rescaling of the x values.
- Can also write:

$$x = \mu + \sigma \times z$$

z scores measure “number of standard deviations away from the mean” that the corresponding x value is.

- z -scores follow **Standard Normal Distribution**. With mean 0 and standard deviation 1.
- It is those z values we can look up in the table.

Working with z values and Table A

- Compute z from x if need be.
- Look z up in the table. For example say $z = 2.31$:
 - Find 2.3 on the left column.
 - Find 0.01 at the top row.
 - Their intersection is the “p-value”.
- p-value is “the percent of values below this value”.
- Use that to compute the answer to the actual question.
- For values with more decimals, round to closest end, or average results in two ends.

Practice questions:

- What percent of the data is below $z = 1.23$?
- What percent of the data is below $z = -1.5$?
- What percent of the data is below $z = -1.555$?
- What percent of the data is above $z = 2.1$?
- What percent of the data is between $z = 1.56$ and $z = 2.1$?

Inverse Lookups in Table A

- Do this if you know a p and want to find a z :
- Make sure the p represents “data below a point”. If not convert it.
- Look for the p INSIDE Table A. You will probably find one value bigger than it, right next to a value smaller than it.
- If your p is closer to one of these values, just use the z from that value.
- If it's closer to the middle between, them, use the average of the two z values.

Practice questions:

- At what z is the first quartile?
- At what z is the third quartile?
- What is the IQR for the standard normal distribution?
- Find the z range where the middle 20% of the data lies.