Psyc 2317 - Lecture 3

In Lecture 2, we introduced **standardized scores** (z-scores), which allow us to compare scores on one measurement scale to scores on another scale.

Formula:

$$z = \frac{x - \mu}{\sigma} = \frac{\text{raw score} - \text{mean}}{\text{std. dev.}}$$

Example:

Applicant 1

* 1270 on SAT
= 210 points above mean
= 1 SD above mean

Applicant 2

* 30 on ACT
= 9 points above mean
= 1.5 SD above mean

$$z = \frac{1270 - 1060}{210} = \frac{210}{210} = 1$$

$$z = \frac{30 - 21}{6} = \frac{9}{6} = 1.5$$

So, **Applicant 2** has the higher standardized score.

What if instead we want to compare a single measurement to the distribution of all other possible measurements?

Example: Suppose you score a 30 on the ACT,

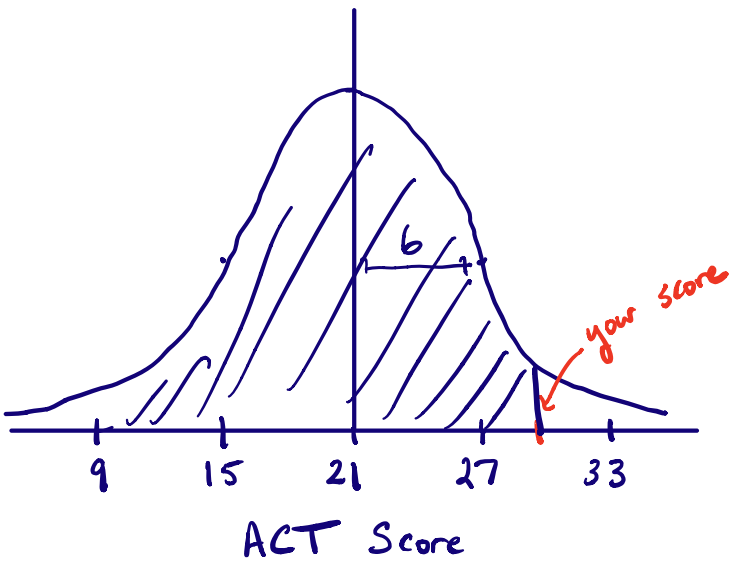
We can ask two equivalent questions:

(1) What proportion of all other test takers scored below your score of 30? (percentile)

(2) What is the probability that a randomly chosen test taker scores below your score of 30?

To answer this, we need to know something about how all other test takers' scores are distributed.

For most tests, the scores form a normal distribution



Facts about normal distribution

* peaked at the mean
* symmetric around mean
* width controlled by SD
* completely described by two parameters: μ, σ

So how do we answer our question?

* use **calculus**
  - ↳ technically, we are looking for the area under the curve, which uses integration
  - ↳ we don't have to do this.

* use **statistical tables**
  - ↳ most statistics texts have these tables as appendices.
  - ↳ mostly antiquated method

* use **statistical software**
  - ↳ R, JASP, etc.
  - ↳ problem: these are great packages, but they do too much for us right now.

* We are going to use an interactive web application that I wrote to calculate things from distributions.
  - ↳ no installation necessary!

https://tomfaulkenberry.shinyapps.io/dist_calc

SCAN ME

From the web app:

1. Set "Distribution" to Normal
2. Set "Mean" = 21 and "Standard deviation" = 6
3. Set "Find area" to Lower Tail
4. Set $a = 30$

↳ the proportion of scores less than 30 = $P(x < 30) = \underline{0.93}$

Another way to do this uses the Standard Normal distribution,

↳ $\mu = 0$
$\sigma = 1$.

Steps: (1) convert raw score to z-score

$$z = \frac{30 - 21}{6} = \frac{9}{6} = 1.5$$

(2) use web app defaults with $a = 1.5$

↳ $P(z < 1.5) = 0.93$

* Why the extra step?

→ later, we will use other standardized distributions that require this step.