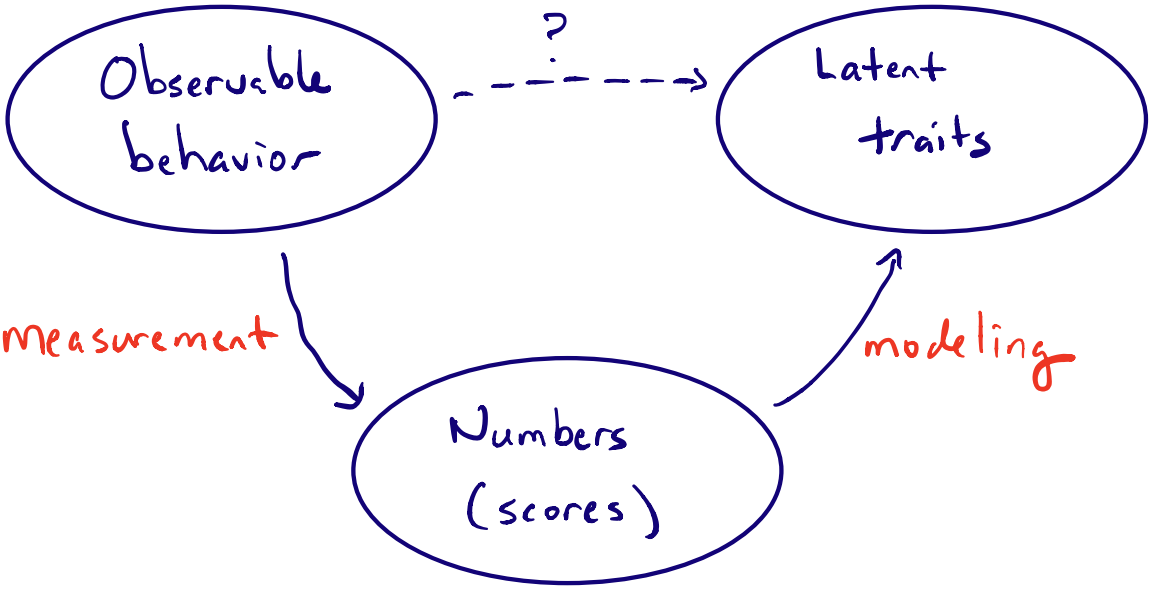
Lecture 1

Goal of psychological testing / psychometrics

↳ measure human behavior / attitudes / beliefs, etc.



Later, we'll discuss properties of psychological tests.

For now, let's focus on scores. Suppose you score a 32 on some test. How did you do?

We need to transform the score to an appropriate scale.

In this lecture, we'll discuss one such transformation:

percentiles

Percentiles

The **percentile rank** of a trait value is the percentage of people in a reference group who have trait values less than or equal to that trait value.

Ex: if 75 out of 100 people have "math ability" ≤ 17.3, then 17.3 equates to a percentile rank of 75.

Technical issue: trait values are **unobservable**. — we can only estimate them with scores

1. we assume that any whole number test score represents a **range** of trait values = score $\pm$ 0.5
2. also assume that every trait value in the range is equally likely

Example: Suppose six people score 17.

* score = 17 represents trait values between 16.5 and 17.5
* three have trait value below 17, three above 17

Example 1: Consider the following distribution of scores:

score	frequency	Cumulative freq. (cf)
50-59	6	50
40-49	12	44
30-39	17	32
20-29	10	15
10-19	2	5
0-9	3	3

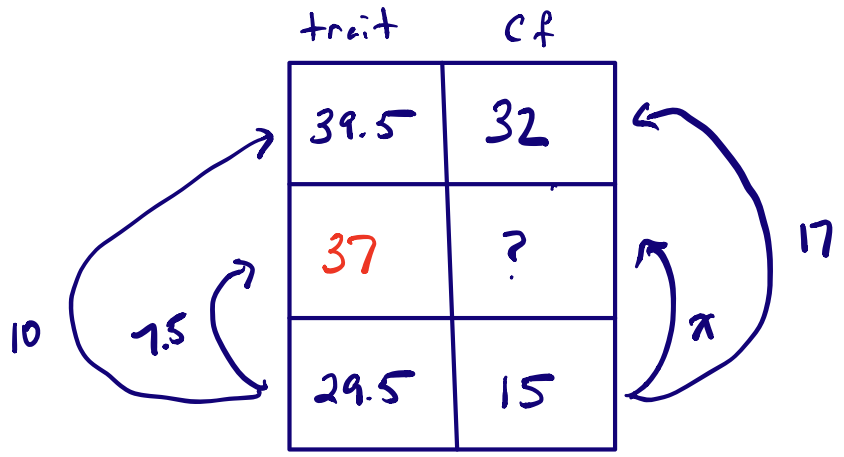
Compute the percentile rank for trait value of 37.

Need to find number of scores which represent trait values ≤ 37.

Then, we calculate the percentage of this number out of the total # of scores.

First, note that 37 falls in score range 30-39, wh represents trait values between 29.5 and 39.5 (by Assumption 1)

Now we can set up a proportion table:



So $\frac{7.5}{10} = \frac{x}{17}$ $\longrightarrow$ $10x = 127.5$

$\longrightarrow$ $x = 12.75$

thus, $cf = 15 + x = 15 + 12.75$

$= 27.75$

Hence the percentile rank is

$$\frac{27.75}{50} \times 100 = 55.5$$

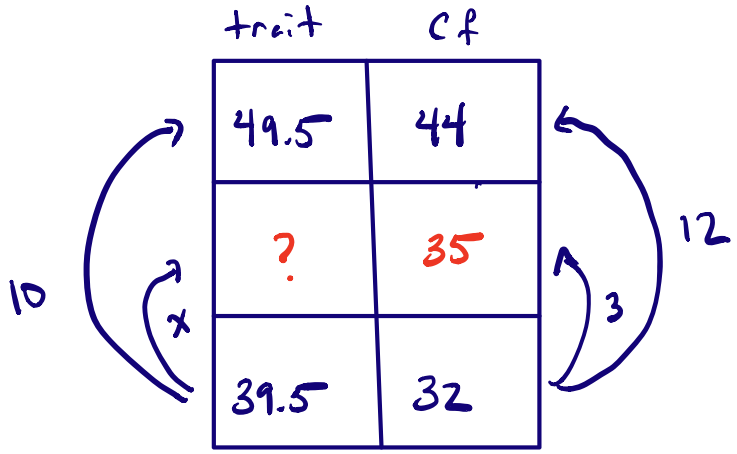
Example 2: find trait value corresponding to 70th percentile.

* 70% of 50 is 35 → so what trait value has 35 scores at or below it?

* from table, 44 people below 49.5
  32 people below 39.5

so 35 corresponds to a trait value between 39.5 and 49.5

Again, use a proportion diagram:



$$\frac{x}{10} = \frac{3}{12} \longrightarrow 12x = 30 \longrightarrow x = 2.5$$

So trait value $= 39.5 + x$

$= 39.5 + 2.5$

$= 42$

Summary:

* percentiles can be computed for any test
* easily interpretable
* for us, first example of computations which require us to make assumptions about the mapping between observable scores and latent (unobservable) traits.