

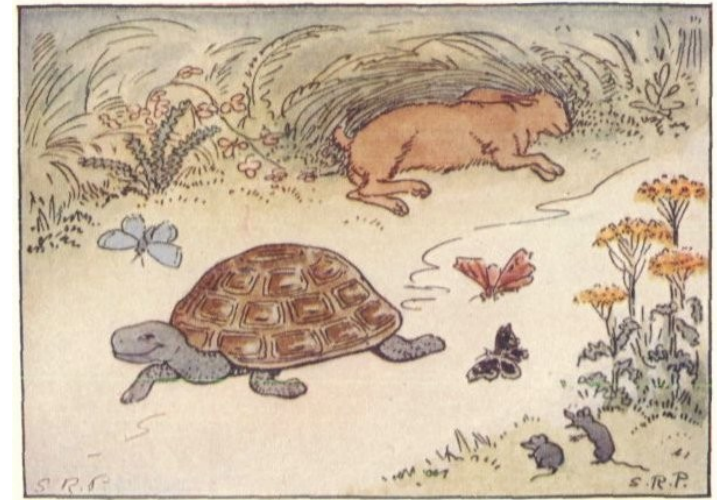
Distributions and samples

Andy Wills

Animal racing!

Your group will need:

- One toy animal *each*.
- Four dice *per group*.
- One 30cm rule *per group*.
- One “start” and one “end” marker *per group*.
- One histogram handout *per group*.



THE TORTOISE AND THE HARE

How to play

- 1) Put the **start marker** at one end of the table.
- 2) Measure 1 metre from that and place your **end marker**.
- 3) Put your toy animals on the starting line.
- 4) On your turn:
 - 1) Roll four dice, add up the score.
 - 2) Move your animal forward that many centimetres.
 - 3) Record you score **on Mentimeter**.
- 5) First person past the line wins!

Details, details...

- Put the front of the animal at the front of the start line.
- Measure your distance from the front of the animal.
- If your animal accidentally gets knocked, put it back.

Question

Is any number on one dice more likely than any other?



Distribution on a single dice

1 : |||||

2 : |||||

3 : |||||

4 : |||||

5 : |||||

6 : |||||

Does the **mentimeter** distribution look like this?

Why / why not?

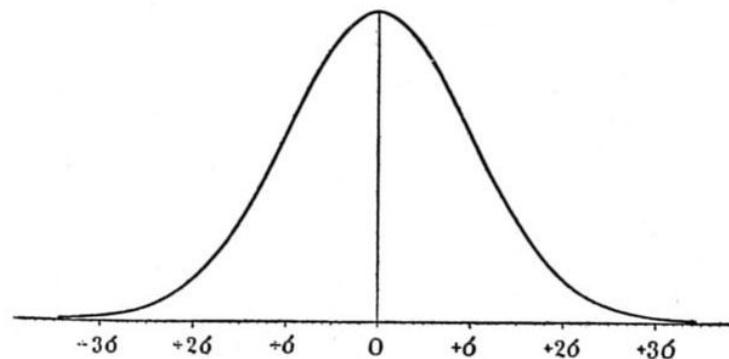
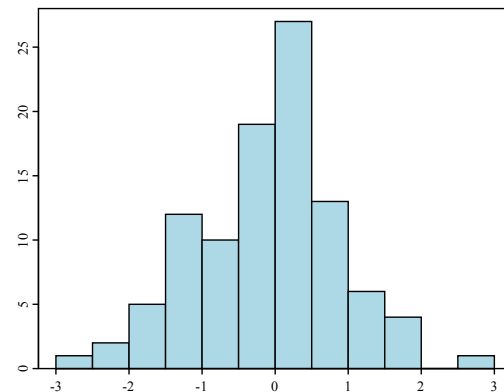


Central Limit Theorem

If a total score is the sum of a bunch of different scores, it will have approximately the same distribution **whatever the distribution of the individual scores.**

A theorem, not a theory.

Known as a *normal* or *Gaussian* distribution.



Exam hall bingo!

- Two groups of the students, the **blues** and the **pinks**, take an exam.
- I'll show you one exam score at a time.
- Without a calculator and without pen and paper, try to work out which group scores higher on exams, on average, **and enter your answer into Mentimeter.**
- *Do this as quickly as possible, BUT*
- **Don't stop until you are sure you have the right answer.**



The Results

To be revealed in class...



Sample sizes

- This demonstration is much like a psychology experiment:
 - You collect some data about two groups.
 - You collect enough of it to be confident that you know whether the groups differ.
- To be revealed in class...
 - What the minimum sample size a psychologist should accept for these two groups is.
- To be revealed next **year**:
 - How I worked out the minimum sample size.

