

5 The central limit theorem – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary

*Write each word three times.***English****Write it 3 times** (English)central limit theo-
rem _____

Recall

In Part A you saw that sample means vary. There is a beautiful pattern to how they vary:

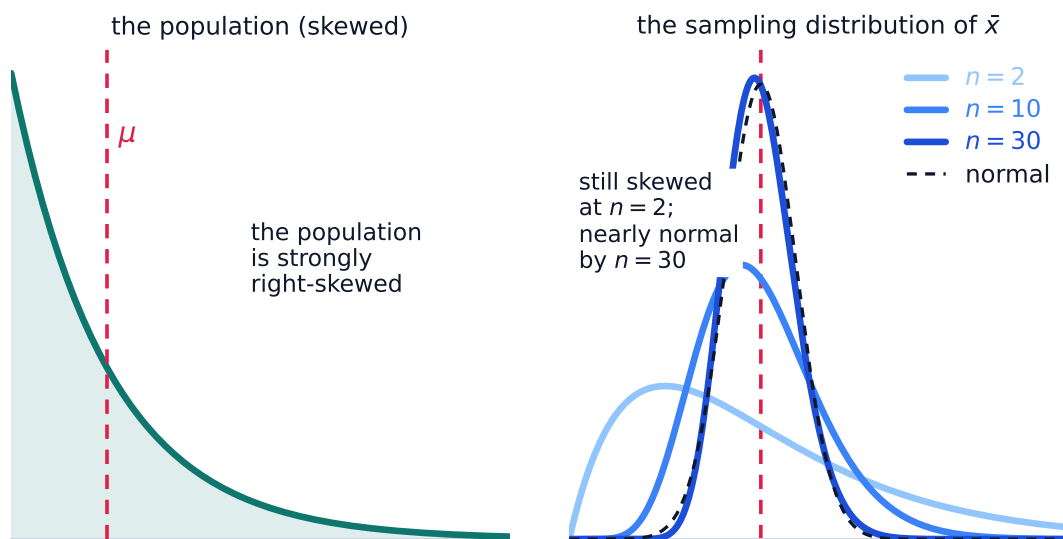
- Even if the original data are not bell-shaped, the sample means often are.
- This pattern is the key that makes statistics work.

Each idea has a worked example before the Practice.

New ideas

■ 1 The central limit theorem

The **central limit theorem** says: for a large enough sample, the distribution of the **sample mean** is approximately **normal** (bell-shaped), centered on the population mean.



CLT: for large n , $\bar{x} \approx \text{Normal}(\mu, \sigma/\sqrt{n})$ even when the population is not normal

■ 2 Even from non-normal data

Remarkably, this holds **even if the original population is not normal** – the averaging smooths things into a bell shape.

■ 3 Larger samples, tighter bell

The bigger the sample, the narrower and more normal the distribution of the sample mean becomes.

■ 4 Why it matters

Because the sample mean is approximately normal, we can use the familiar bell curve (and the 68–95–99.7 rule) to say how confident we are in an estimate – the basis of all the inference that follows.

Watch out: the central limit theorem is about the distribution of the **sample mean**, not the individual data. The raw data can be skewed while the sample means are still bell-shaped.

Practice

Try these in order. The methods are all above.

2.1 State what the central limit theorem says about the sample mean.

[2]

2.2 State the surprising part – what it does not require of the population. [2]

2.3 State what happens to the sample mean's distribution as the sample gets larger. [2]

2.4 State why the central limit theorem is so useful in statistics. [2]

2.5 State whether the theorem is about the individual data or the sample mean. [1]
