7 The t-distribution – Part 2

Name: _____ Class: _____ Date: _____

Recall

In Part A you estimated a mean. In real life you rarely know the population's spread:

- You must estimate the spread from the sample too.
- This extra uncertainty needs a slightly different curve.

Each idea has a worked example before the Practice.

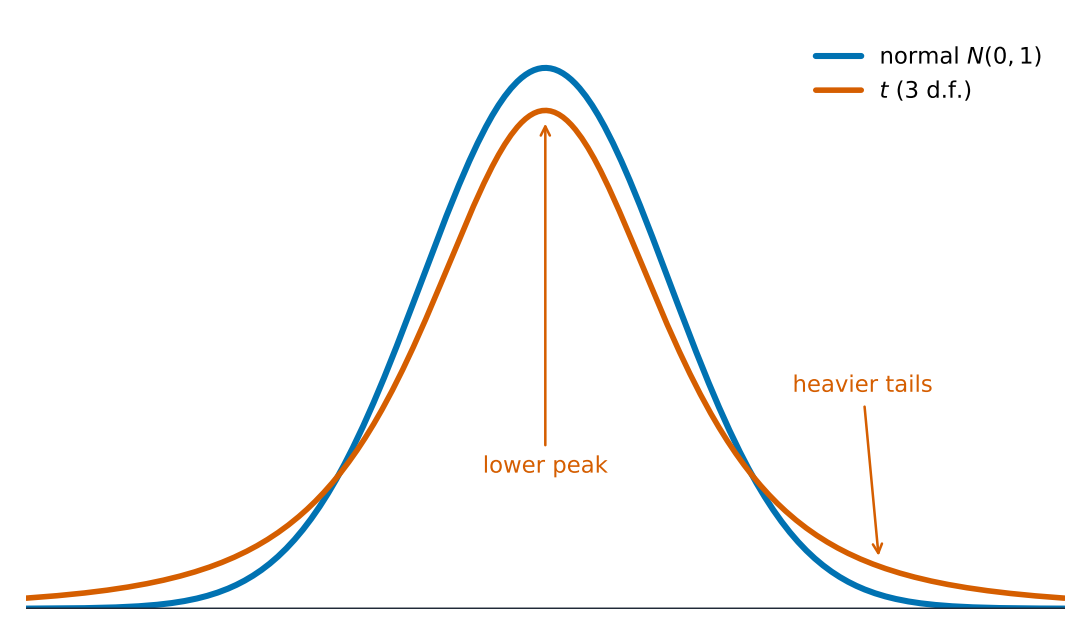
New ideas

1 When the spread is unknown

When you do not know the population's standard deviation (almost always), you estimate it from the sample. This adds uncertainty, especially for small samples.

2 The t-distribution

To handle that extra uncertainty, we use the **t-distribution** instead of the normal curve.



It looks like the bell curve but has **heavier tails**, allowing for more surprises with small samples.

■ 3 Sample size matters

The smaller the sample, the heavier the tails (more uncertainty). As the sample grows, the t-distribution gets closer and closer to the normal curve.

■ 4 Same idea, adjusted

Worked example. A confidence interval for a mean from a small sample uses a slightly wider margin (from the t-distribution) than it would with the normal curve –reflecting the extra uncertainty.

Watch out: use the **t-distribution** (not the normal) whenever you estimate the spread from the sample –which is nearly always. The two agree for large samples, but differ for small ones.

Practice

Try these in order. The methods are all above.

2.1 State why we often cannot use the population's standard deviation. [2]

2.2 State what distribution we use instead of the normal in that case. [1]

2.3 State how the t-distribution differs in shape from the normal curve. [2]

2.4 State what happens to the t-distribution as the sample size grows. [2]

2.5 State when the t-distribution should be used. [1]