Typical Mathematics of a Statistics Course

Example: The One-Sample t-test
Data: $x_1 = 4, x_2 = 10$
Algebraically

1. Calculate mean: $m = \sum_i x_i / n = 7$
2. Calculate sd: $s = \sqrt{\sum_i (x_i - m)^2/(n-1)} = \sqrt{18} = 4.24$
3. Calculate t: $t = m/(s/\sqrt{n}) = 7/3$
4. Look up p-value in the t-table with df $= n - 1$: $p = 0.258$

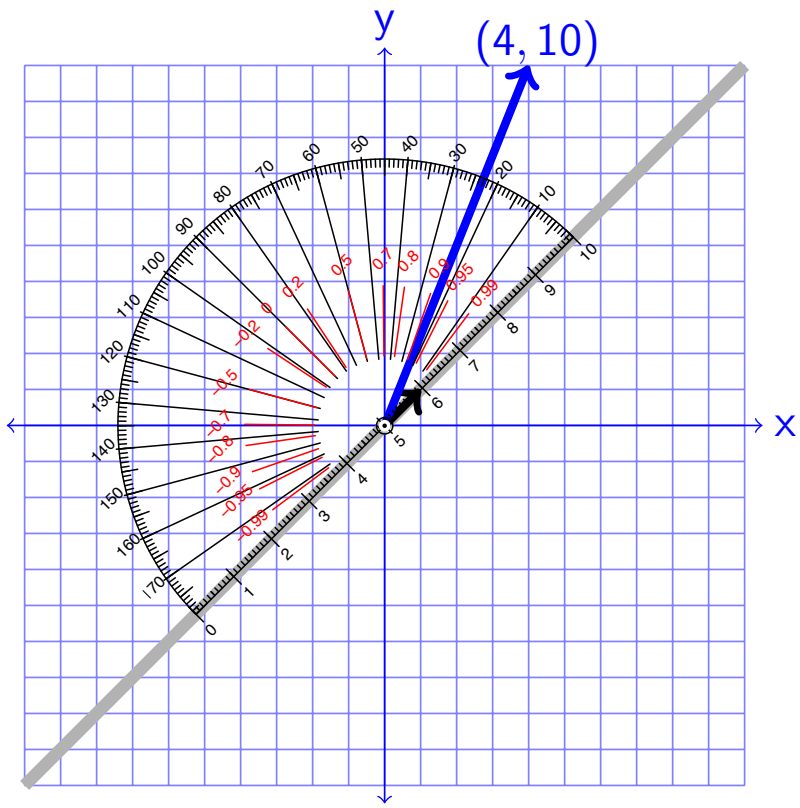
The Software-Packaging Approach

Emphasize the interpretation of results ...

```
> vals = c(4,10)
> t.test(vals)
One Sample t-test

t = 2.3333, df = 1, p-value = 0.2578
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
 -31.11861  45.11861
```

The t-test with a Protractor



1. Mark the coordinates.
2. Measure the angle: 23.2°
3. p-value is angle/90°: 0.258

The Same Logic in Higher Dimensions

Example: one-sample t-test with : $x = 2, 6, 4$

1. Find angle between $(2, 6, 4)$ and $(1, 1, 1)$ — 49°
2. p-value is the probability that a random vector would be closer than $(2, 6, 4)$ to $(1, 1, 1)$ — this is the area on the surface of a globe above 49° co-latitude.