# Counting And all That

WALTA Meeting

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# How do we measure a rate?

- Measure number of “events” or counts: N
- Measure time interval T.
- Rate is the **ratio** N/T, usually expressed in Hz, or counts per second.

# Basic rule for presenting experimental data:

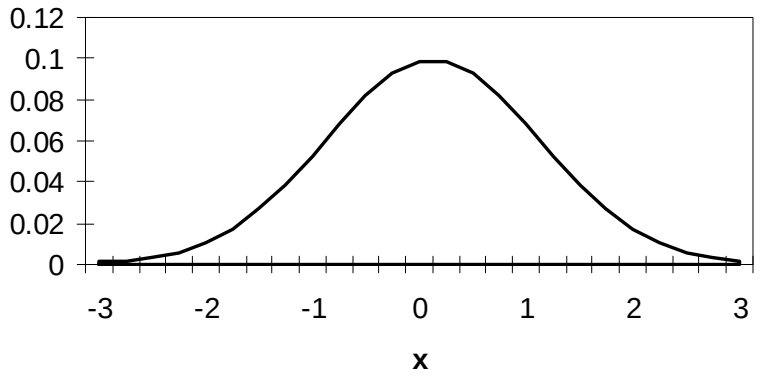
- Determine the uncertainty:
  - Statistical (easy)
  - Systematic (very hard, especially if you don’t know what might be wrong!
- Best way to tell: repeat, repeat

# Statistical uncertainty for counting

$$N \pm \sqrt{N}$$

# What does the $x \pm \sigma$ mean?

- The “true” measurement is:
  - within the interval $x-\sigma$ to $x+\sigma$ 68% of the time
  - within the interval $x-2\sigma$ to $x+2\sigma$ 95% of the time
- If N is greater than 10 or so, the distribution is approximately that of a gaussian:
  - example with mean 0 and sigma 1.



# Example:

- Measure 49 counts in 10 minutes
- Rate is 49/10 = 4.9 counts/min
- Statistical uncertainty is: $\sqrt{49} = 7$
- Statistical error in the rate is 7/10 = 0.7 counts/min
- Rate should be quoted as:

$$4.9 \pm 0.7$$