Homework 2 example solution and marking guidance.

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Solution to part A:

Selecting 4.00 ± 0.01 mm results in using **13.06%** of the total production for the most demanding part of the detector.

Working:

This is an integral from 3.99 to 4.01. ie. From $(x-\mu)/\sigma = (3.99-4.01)/0.01 = -1/3$ to $(x-\mu)/\sigma = 0$.

From the double sided integral table, prob for 0.33 = 25.86, for 0.34 = 26.61 but we want 0.3333…

Interpolate for accuracy: (26.61-25.86)/3 = 0.25, add this to 25.86 = 26.11.

Divide by two for one sided integral = 13.055%

Marks [5] for:

- Identifying correct integral range
- Correct values from table
- Correct interpolation
- Divide by 2
- Correct answer

Solution to part B:

To select 65% of sheets symmetrically around the mean requires cuts on the **$\pm 0.9346\sigma$** which is equivalent to the range **3.9539 to 4.0661 mm**.

Working:

*Looking at the two sided integral table, 0.93sigma around mean = 64.76, 0.94sigma = 65.28. Interpolating between these ((65-64.76)/(65.28-64.76))*0.3 = 0.046*

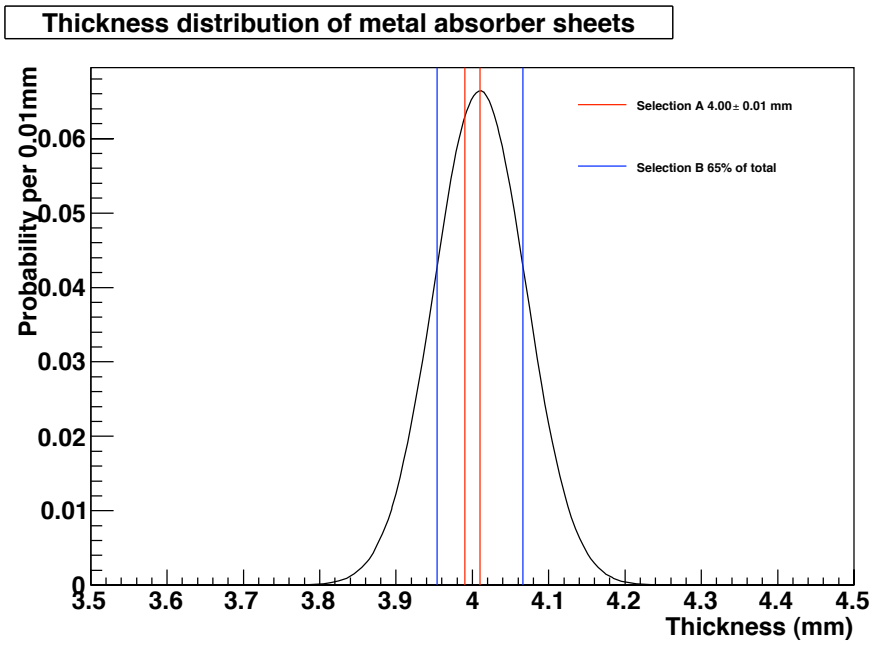
0.93+0.046 = 0.9346sigma

*range is 4.01 – 0.9346*0.06 = 3.9539 to 4.01 + 0.9346*0.06 = 4.0661*

Marks [5] for:

- Identifying correct values from integral table
- Interpolation
- Expression in terms of sigma
- Correct lower limit
- Correct upper limit

The sketch graph should look like this:



Obviously the sketch doesn't have to be this accurate. Marks [10 total] for:

- Good, symmetric Gaussian shape
- Correct maximum at mean = 4.01mm
- Reasonable x-axis scale. Students should get this using ±σ or the FWHM
- X-axis label
- Units
- X axis values
- Correctly marked range for part A
- Correctly marked range for part B
- Title
- Suitable y-scale and axis title (if normalised per unit gives probability)