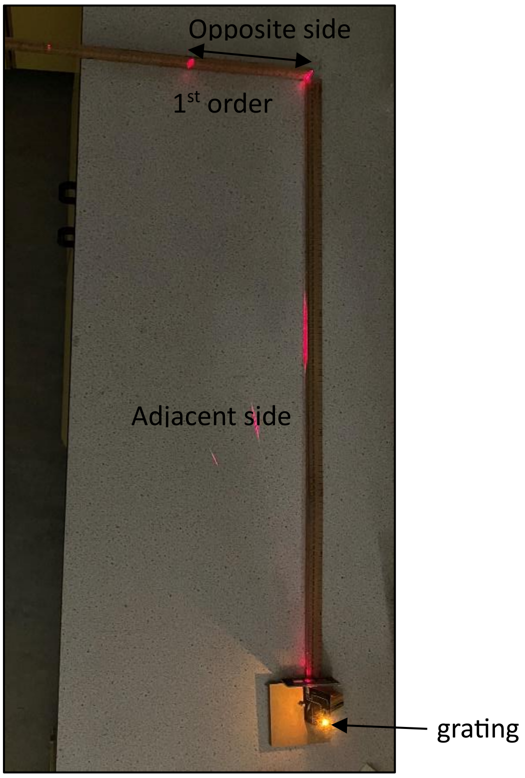
Grating Experiment

You will need:

- 5 gratings each with a different number of lines per mm,
- A Photonics explorer kit laser,
- 2 metre stick,
- Blutak or similar for fixing the metre sticks and laser in position,
- Wooden block to raise height of the laser.

Set up the apparatus as shown below:



Place the 100 lines per mm grating in position, see **Figure 1** . Record the distance from the zero order to the first order at one metre from the grating, see **Figure 1**, the opposite side and the adjacent side for the angle subtended by the first order line. Remove the grating and replace with a different grating. Repeat this procedure until you have vales for each of the gratings you have been given. Repeat the experiment as required.

Theory

$n\lambda = d \sin\theta$, where n is the order in this case n=1, λ is constant,

d is the grating spacing = $\frac{1}{grating\ lines\ per\ mm}$

$\lambda = \frac{1}{grating\ lines\ per\ mm} \sin\theta$, rearranging this equation gives $\sin\theta = \lambda \times 1000 \times (grating\ lines\ per\ m)$

A graph can therefore be plotted of sinθ against 1000x(*grating lines per m*) and the gradient of the graph will be λ for the Photonics explorer kit laser.

<u>Results</u>

Lines per mm for grating	Opposite side (cm)	Adjacent side (cm)	Tanθ	Inverse Tan	Lines per m for grating	Sinθ
80	5.1	100	0.051	0.051	80000	0.051
100	6.7	100	0.067	0.067	100000	0.067
200	13.6	100	0.136	0.135	200000	0.135
300	20.2	100	0.202	0.199	300000	0.198
600	42.9	100	0.429	0.405	600000	0.394
1000	85.0	100	0.85	0.704	1000000	0.648

Gradient gives $\lambda = 6.5\times10^{-7}$m the accepted value.