CORPUS CHRISTI COLLEGE
SEQUERE DOMINUM

Year 12 *ATAR* Physics 3 2017

Experiment & Validation Equilibrium 6.0%

NAME: ……

Data: See Data Sheet
Approx. marks shown.

PART A EXPERIMENT *(00 marks)*

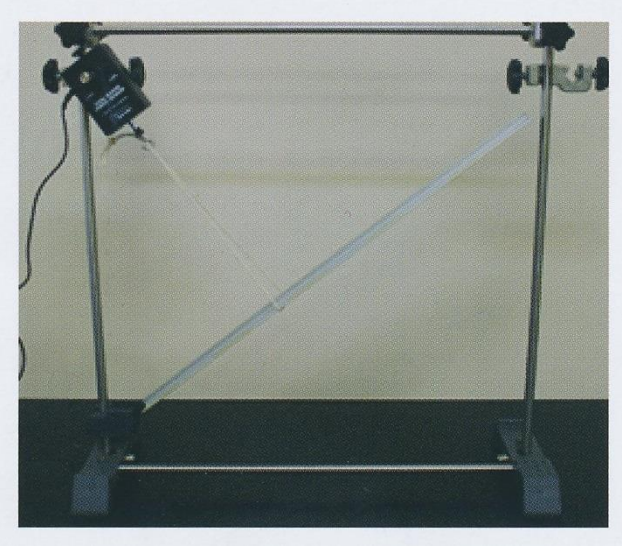
AIM:
(a) To measure the forces within a cantilever system.
(b) To assist in understanding static and rotational equilibrium.
(c) To use the Principle of Moments to determine the mass of the boom (ruler).

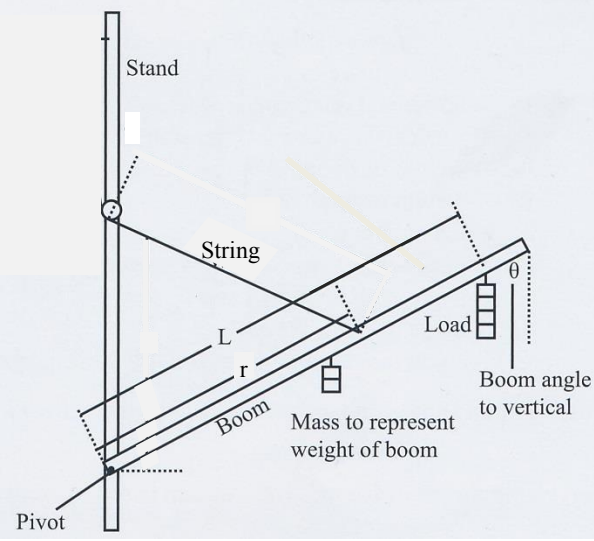
EQUIPMENT:

- data logging software
- force probes (0-50N)
- 50 cm ruler
- 2 retort stands with a brace
- protractor
- sticky tape, string and scissors
- slotted masses (20 g — 300 g)

METHOD:

1. Set up the apparatus as shown. For this system ***keep the string at right angles to the ruler***. Ensure that force probes and string are in all aligned and record the angle ***θ*** between the ruler and vertical.





2. Add a 100 g slotted mass to the end of the 50 cm ruler. Record the tension from the force probe.
3. Progressively move the load of 100 g mass from the end of ruler to the pivot. Record the tension in the string every 5 cm.
4. Repeat steps 2 and 3 for the load of 200 g mass.

RESULTS:

angle $\boldsymbol{\theta}$ =……...

Load = ……g

Weight of the Load (*Wt* or F_g) = …….. N

Table 1

Distance from the pivot along the ruler L (m)	0.50							
Tension from the force probe (N)								

PROCESSING the RESULTS:

At equilibrium, the sum of the anticlockwise moments = the sum of the clockwise moments

Hence $T \times r = Wt \text{ of load} \times d_1 + Wt \text{ of ruler} \times d_2$

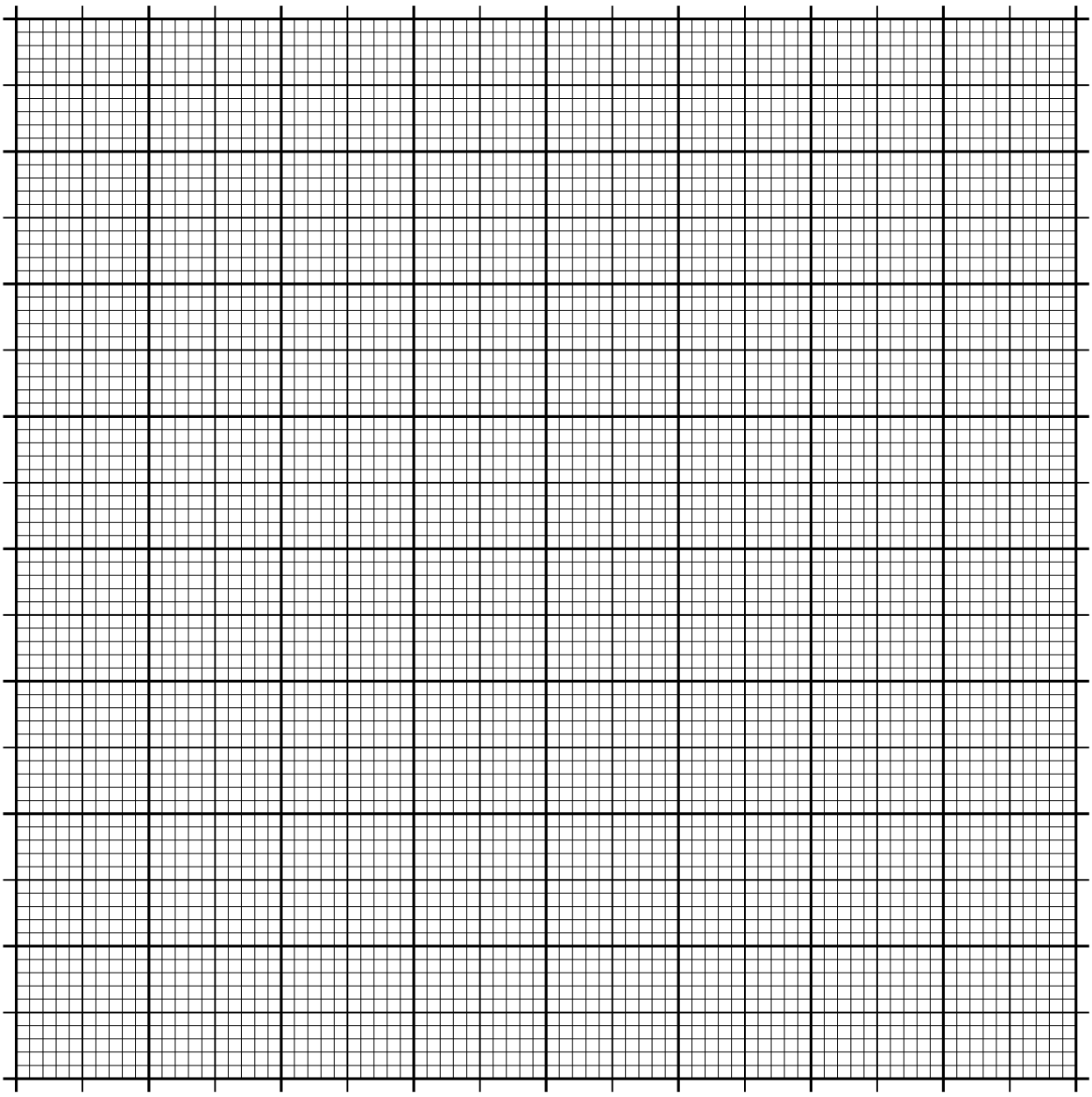
This follows the relationship $y = m x + c$

1. Complete Table 2. There is space for your working at the bottom of this page.

Table 1

$T \times r$ (Nm)								
$Wt \text{ of load} \times d_1$ (Nm)								

2. Graph $T \times r$ vs $Wt \text{ of load} \times d_1$ for the given load. Draw the line of best fit.



3. From the graph determine the equation of the line of best fit. Show your working clearly.

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4. Using the equation of the line of best fit, and graph theory, determine the mass of the ruler. Show your working clearly.

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CONCLUSION:

What trend or relationship do you observe in the graph of tension vs position of the Load? Consider the Aim of the experiment.

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ERRORS:

Discuss the errors involved in this experiment.

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