

## Investigation of the Principle of Moments

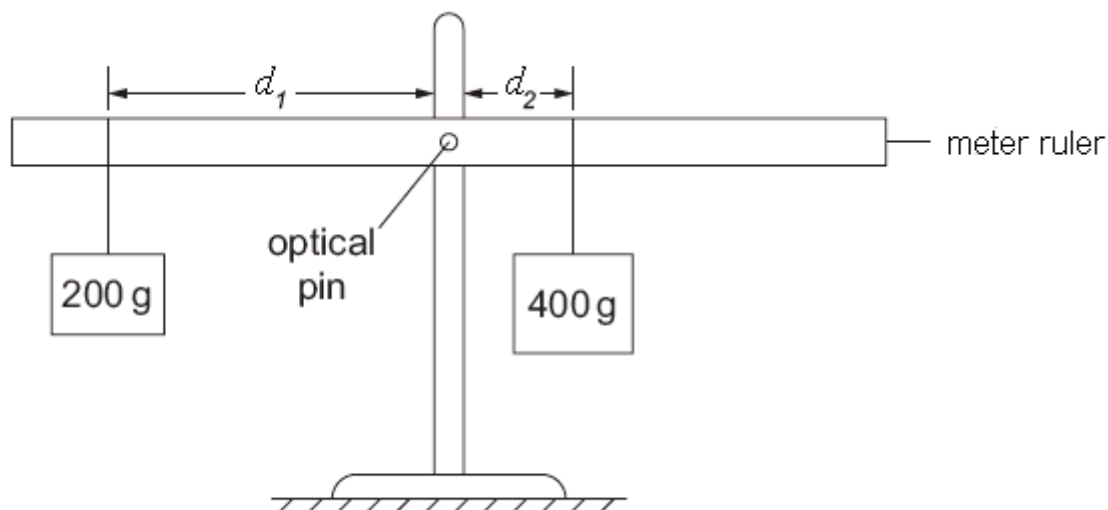
### Introduction

A force can have a moment (turning effect) about a hinge or a pivot which may be clockwise or anticlockwise. For any object in equilibrium the total clockwise moment must be equal to the total anticlockwise moment. In this investigation a metre ruler and 100 g masses are used to verify the Principle of Moments.

### Apparatus

metre ruler with small hole at centre  
 $2 \times 100\text{g}$  mass hangers  
 $8 \times 100\text{g}$  masses  
 $2 \times$  loops of cotton  
 clamp stand, boss and clamp  
 optical pin and cork  
 small piece of plasticine

### Diagram of Apparatus



## Method

1. Add plasticine to one end of the metre ruler so that it is balanced.
2. Use a cotton loop to hang a mass of 200g at the 10cm mark on the metre rule ( $d_1 = 40$  cm).
3. Use a cotton loop to hang a mass of 400g on the other side of the pivot so that the metre rule is balanced once again. Record the distance  $d_2$ .
4. Repeat steps 2 and 3 for  $d_1 = 30$  cm and then  $d_1 = 20$  cm.
5. Use a cotton loop to hang a mass of 200g at the 5cm mark on the metre rule ( $d_1 = 45$  cm).
6. Use a cotton loop to hang a mass of 600g on the other side of the pivot so that the metre rule is balanced once again. Record the distance  $d_2$ .
7. Repeat steps 5 and 6 for  $d_1 = 30$  cm and then  $d_1 = 15$  cm.
8. Use a cotton loop to hang a mass of 200g at the 10cm mark on the metre rule ( $d_1 = 40$  cm).
9. Use a cotton loop to hang a mass of 800g on the other side of the pivot so that the metre rule is balanced once again. Record the distance  $d_2$ .
10. Repeat steps 8 and 9 for  $d_1 = 20$  cm.

## Analysis

1. Calculate the clockwise and anticlockwise moment for each mass using the following formula ( $100\text{g} = 1\text{ N}$ ):  

$$\text{Moment} = F d$$
2. Determine if the Principle of Moments is satisfied for each pair of values.