

DETERMINING WEIGHT USING MOMENTS

- 1 A student is using a balancing method to determine the weight of a piece of soft modelling clay. The apparatus is shown in Fig. 2.1.

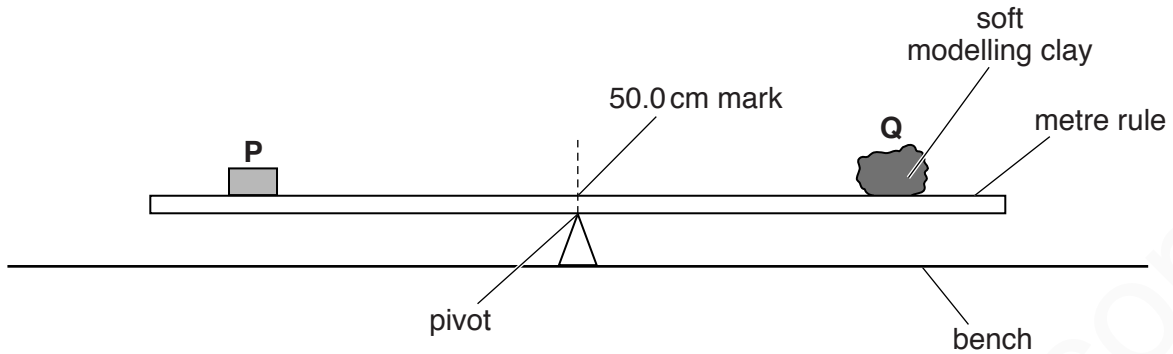


Fig. 2.1

P is a metal cube of weight $P = 1.0\text{ N}$. **Q** is the piece of soft modelling clay.

The student places the cube **P** so that its weight acts at a distance x from the pivot.

He adjusts the position of **Q** to balance the rule and measures the distance y from the centre of **Q** to the pivot. He calculates the weight W of **Q** using the equation $W = \frac{Px}{y}$.

- (a) On Fig. 2.1, mark clearly the distance x . [1]

- (b) Suggest a change to **Q** that would make it easier to find the value of y accurately.

.....
.....[1]

- (c) It is difficult to achieve an exact balance of the metre rule in this type of experiment. This can make the result unreliable.

Explain how you would reduce the effect of this problem to improve the reliability of the experiment.

.....
.....
.....[1]

(d) The metal cube **P** is larger than the width of the metre rule.

Explain briefly how you would determine the reading of the metre rule scale at the position of the centre of mass of **P**. You may draw a diagram.

.....
.....
.....[2]

(e) Before starting the experiment, the student determines the position of the centre of mass of the metre rule.

Explain briefly how you would do this.

.....
.....[1]

[Total: 6]

MARKING SCHEME

(a)	x shown clearly from centre of P to pivot	1
(b)	Make Q into a cube/regular shape/small contact area with rule	1
(c)	Move Q or P slowly one way until it just tips, then back other way until it tips back and take middle reading OR repeat procedure/experiment AND take average	1
(d)	Measure width w of cube Place w/2 either side of desired position	1
	OR draw centre line on cube/find centre of mass of cube and mark side of rule in desired position OR take readings on both sides of the cube and find the mean	1
(e)	Place rule on pivot (without P and Q) and record/find balance point	
		Total: 6