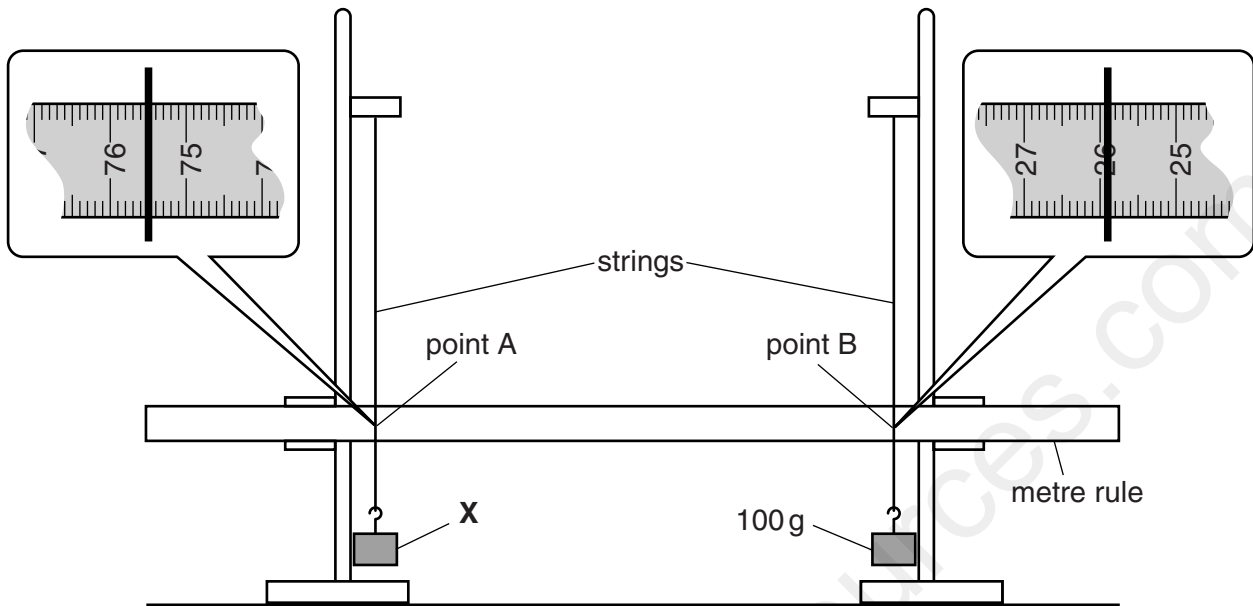# MASS OF AN OBJECT

1 The class is determining the mass of an object using two strings.
The apparatus is set up as shown in Fig. 1.1.

Fig. 1.1

(a) (i) Record the scale reading a_0 at point A, where the string crosses the rule, as indicated in the enlarged section of Fig. 1.1.

$a_0 = $ ....

(ii) Record the scale reading b_0 at point B.

$b_0 = $ ....

[2]

(b) A loop of string is placed around the vertical strings so that they are pulled closer together, as shown in Fig. 1.2. The loop is horizontal and is just above the rule.
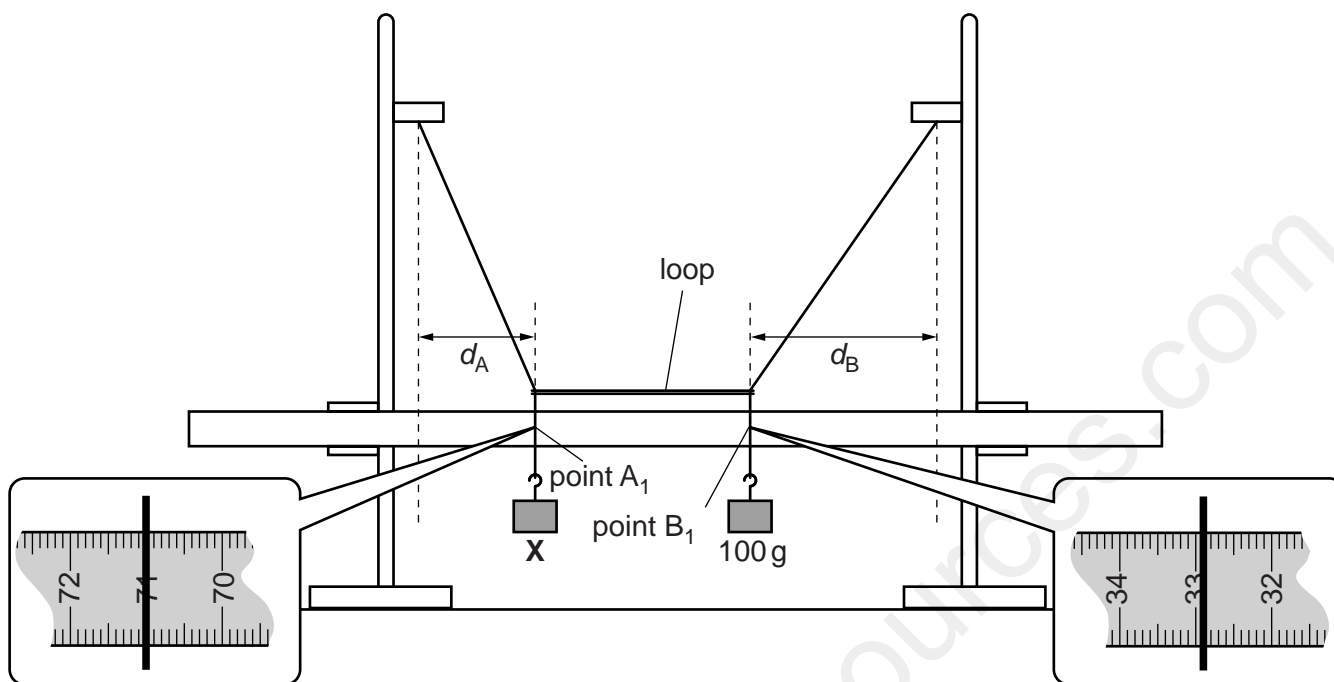

Fig. 1.2

(i) Record the scale reading a_1 at point A_1 as indicated in the enlarged section of Fig. 1.2.

$a_1 = $ ....

(ii) Record the scale reading b_1 at point B_1.

$b_1 = $ ....
[1]

(iii) Calculate and record the distance d_A, shown in Fig. 1.2. Use your results from **(a)(i)** and **(b)(i)**. d_A is the difference between a_0 and a_1.

$d_A = $ ....

(iv) Calculate and record the distance d_B. Use your results from **(a)(ii)** and **(b)(ii)**. d_B is the difference between b_1 and b_0.

$d_B = $ ....
[1]

(c) Calculate the mass M of object **X**, using your results from **(b)(iii)** and **(b)(iv)** and the equation $M = \dfrac{k\,d_B}{d_A}$ where $k = 100\,g$.

$M = $ ....[2]

(d) Explain how you could ensure that the loop is horizontal in **(b)**. You may draw a diagram.

....

....

....[1]

(e) A student suggests that d_A and d_B might be directly proportional to each other.

Briefly describe how this experiment could be extended to investigate the suggestion.

....

....

....[2]

[Total: 9]

(a) a_0 = 75.5 (cm) AND b_0 = 25.9 (cm), accept in mm [1]

matching unit [1]

(b) a_1 = 71.(0) AND b_1 = 32.9 [1]

d_A = 4.5 <u>and</u> d_B = 7.(0), allow ecf from earlier results [1]

(c) M value rounds to 160 (g), allow ecf from **(b)** [1]

2 or 3 sig. figs. and unit: g [1]

(d) appropriate explanation, e.g.
- measure height (from bench)/distance from rule at two places
- line up with rule or suitable horizontal surface
- use of spirit level [1]

(e) repeat with different (sized) loops/different values (of d_A, d_B) [1]

any one from:
- (at least) 3 more sets of results and evaluate d_A:d_B
- plot a graph to (check if) a straight line through the origin [1]

[Total: 9]