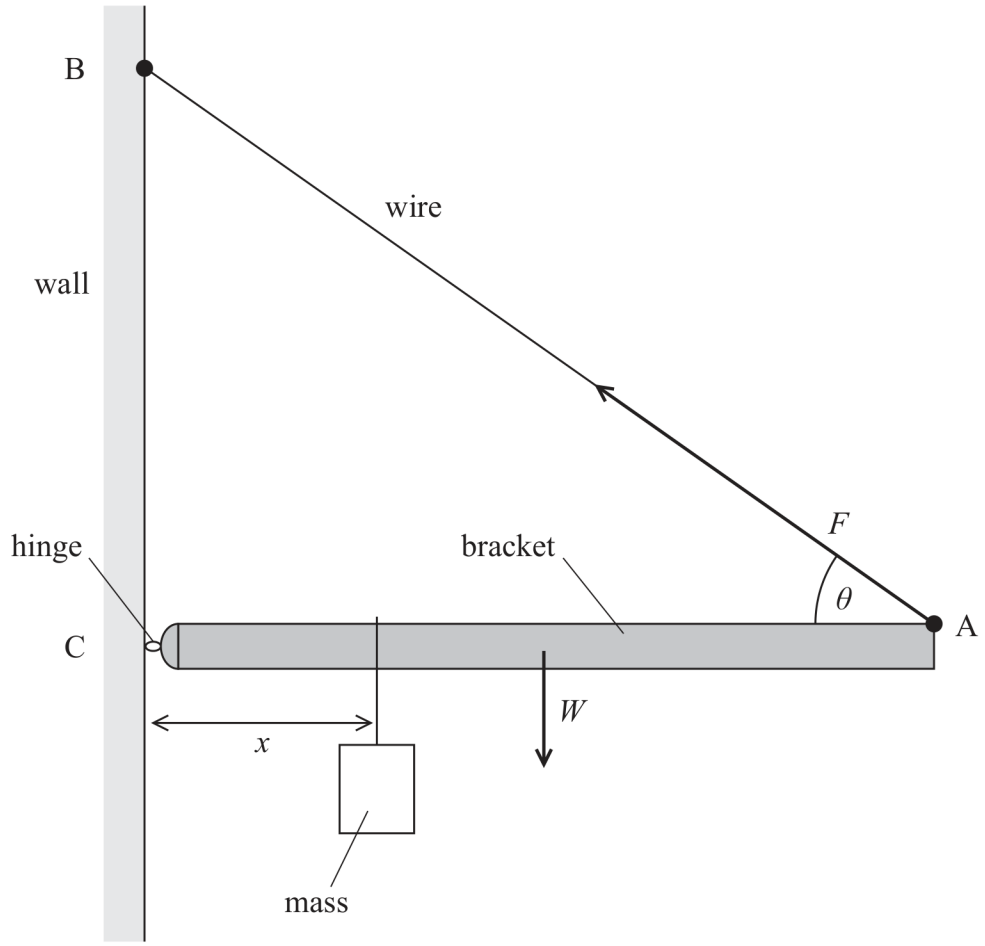
3 A student investigated the forces acting on a bracket.

The bracket of weight W was attached to a vertical wall with a hinge at point C. The bracket was held horizontally by a wire attached to the bracket at point A and to the wall at point B. The wire was at an angle θ to the bracket and exerted a force F on the bracket.

The student hung a mass from the bracket at a distance x from the hinge, as shown.



(a) Describe how the student could determine θ using a metre rule.

(2)

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(b) Describe how the student could check that the bracket was horizontal.

(1)

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(c) The student adjusted the position of the mass and measured x. For each value of x the student made corresponding measurements of F using a force meter. The results are shown in the table.

x/cm	Mean F/N
5	2
10	2.6
15	3.3
20	4.4
25	5.3
30	6.2
35	7
40	8.1
45	8.8

Criticise the recording of these results.

(3)

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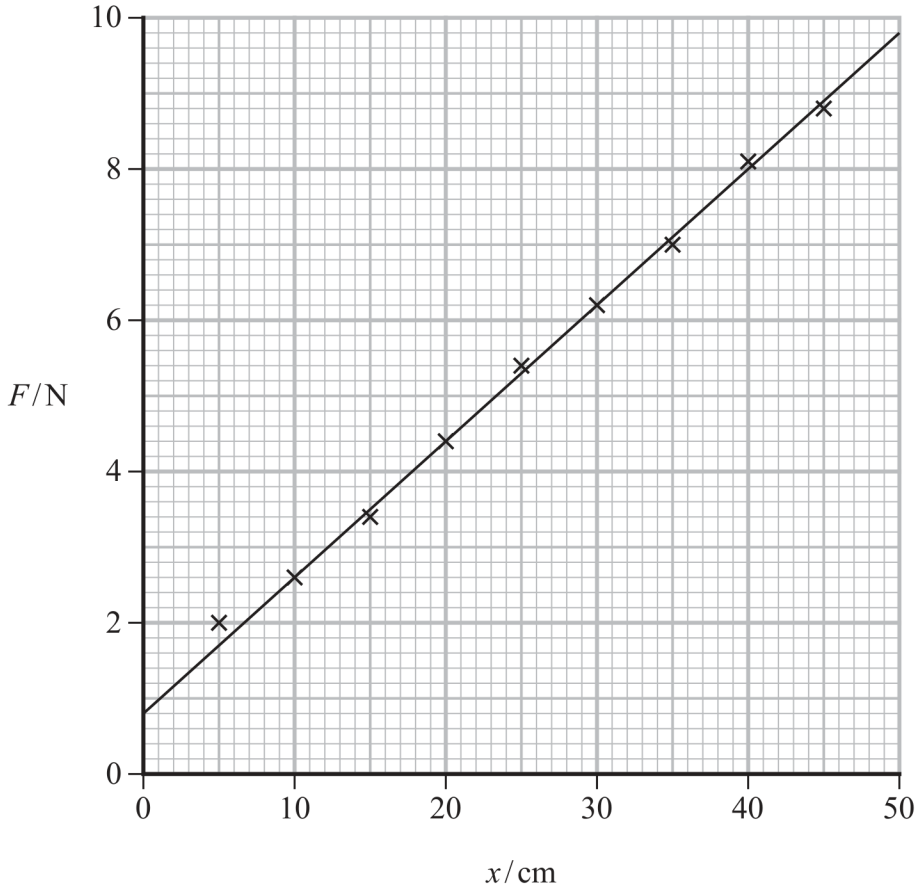
(d) The student plotted a graph of F against x, as shown.



(i) The relationship between F and x is

$$F = \frac{mgx}{l\sin\theta} + \frac{W}{2\sin\theta}$$

where

l is the length of the bracket
m is the mass hung from the bracket.

Determine a value for W using the graph.

$\theta = 42°$

(3)

$W =$ ..... N

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(ii) The value of g obtained from the graph is $9.64\,m\,s^{-2}$.

The student concluded that the value of g obtained is accurate.

Evaluate the student's conclusion.

(2)

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(Total for Question 3 = 11 marks)