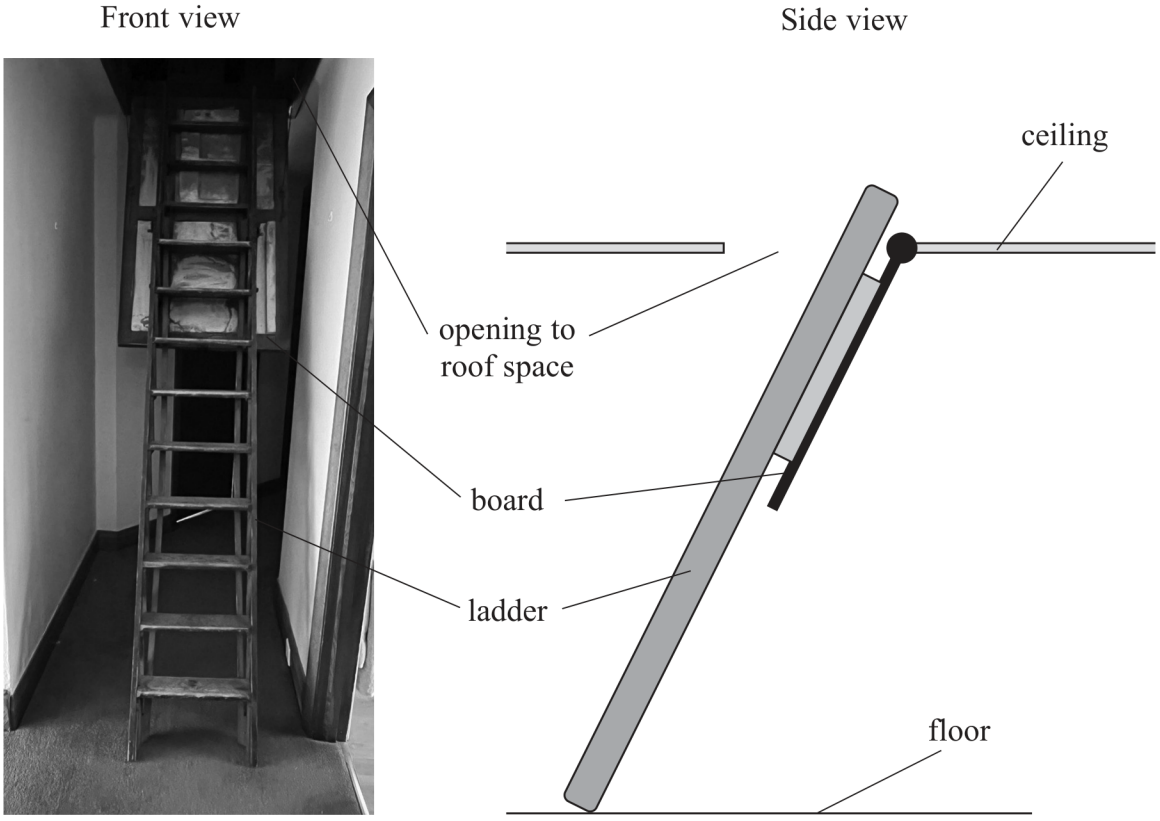
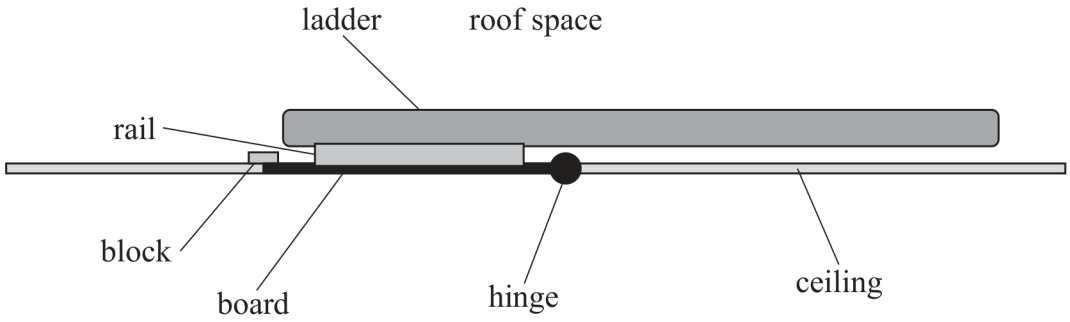
15 The photograph shows a ladder that a person can use to climb into the roof space of a building.



When not in use, the ladder is stored in the roof space and the opening to the roof space is covered by a board. The board is hinged to the ceiling at one end.

The ladder is attached to the board by a rail, as shown below. A small block prevents the board from rotating into the roof space.



(a) State what is meant by the centre of gravity of an object.

(1)

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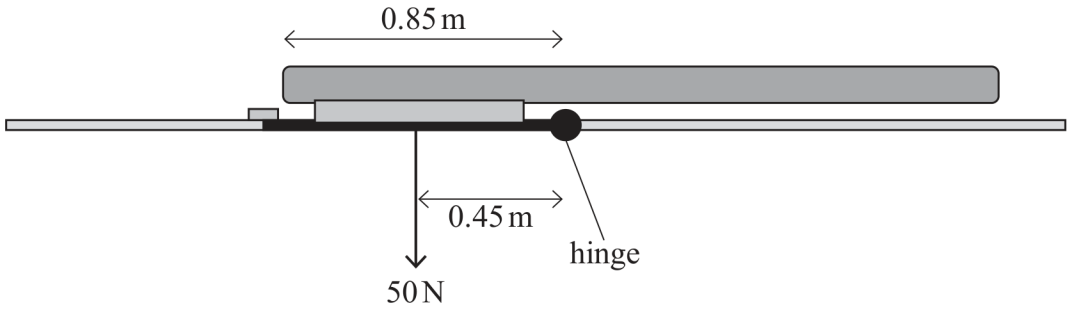
(b) The weight of the board and rail is 50 N. The weight acts at a distance of 0.45 m from the hinge as shown.

The total length of the ladder is 2.70 m, with 0.85 m to the left of the hinge.



The weight of the ladder is 54 N. Assume the ladder is uniform.

(i) Explain why the board and ladder remain in the position shown.

(5)

(ii) A downward force is required to rotate the board away from the block. This force is applied 0.80 m from the hinge.

Determine the magnitude of this force.

(2)

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Magnitude of force = ...

(Total for Question 15 = 8 marks)