



A uniform rod AB of length $2x$ and weight W rests on the smooth rim of a fixed hemispherical bowl of radius a . The end B of the rod is in contact with the rough inner surface of the bowl. The coefficient of friction between the rod and the bowl at B is $\frac{1}{3}$. A particle of weight $\frac{1}{4}W$ is attached to the end A of the rod. The end B is about to slip upwards when AB is inclined at an angle θ to the horizontal, where $\tan \theta = \frac{3}{4}$ (see diagram).

- (i) By resolving parallel to the rod, show that the normal component of the reaction of the bowl on the rod at B is $\frac{3}{4}W$. [5]

This image shows a full page of a worksheet designed for handwriting practice. It features 18 horizontal rows, each defined by two parallel dashed lines. The lines are evenly spaced and extend across the entire width of the page, providing a guide for letter height and placement. There is no text or other markings on the page.

- (ii) Find, in terms of W , the reaction between the rod and the smooth rim of the bowl. [4]

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- (iii) Find x in terms of a . [3]

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