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**A Level Mathematics Year 2 Exam Questions by Topic**  
**Chapter 22: A model for friction**

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These questions are taken from the Specimen Exam materials and the real 2018 papers for the new syllabus AS and A-level mathematics courses and arranged by chapter of the textbooks by Goldie et al (available here: <https://amzn.to/39umfr5> and <https://amzn.to/3hE8kBL> ). There are a mixture of questions from OCR A, OCR B (MEI) and Edexcel. Although the style of questions varies a little across the exam boards the content of the syllabus is almost identical so these are suitable for students preparing for any exam board.

Free problem sets for all other chapters, as well as video solutions, full past papers and other content for GCSE and A-level maths can be found at:

<https://mathsaurus.com/>

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Edexcel Sample Paper 3 Question 7:

7. A rough plane is inclined to the horizontal at an angle  $\alpha$ , where  $\tan \alpha = \frac{3}{4}$ .

A particle of mass  $m$  is placed on the plane and then projected up a line of greatest slope of the plane.

The coefficient of friction between the particle and the plane is  $\mu$ .

The particle moves up the plane with a constant deceleration of  $\frac{4}{5}g$ .

- (a) Find the value of  $\mu$ .

(6)

The particle comes to rest at the point  $A$  on the plane.

- (b) Determine whether the particle will remain at  $A$ , carefully justifying your answer.

(2)

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OCR A Sample Paper 3 Question 10:

**10** A body of mass 20 kg is on a rough plane inclined at angle  $\alpha$  to the horizontal. The body is held at rest on the plane by the action of a force of magnitude  $P$  N acting up the plane in a direction parallel to a line of greatest slope of the plane. The coefficient of friction between the body and the plane is  $\mu$ .

(i) When  $P = 100$ , the body is on the point of sliding down the plane. Show that  $g \sin \alpha = g \mu \cos \alpha + 5$ . [4]

(ii) When  $P$  is increased to 150, the body is on the point of sliding up the plane. Using this and your answer to part (i), find an expression for  $\alpha$  in terms of  $g$ . [3]

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OCR B MEI 2018 Paper 1 Question 11:

**11** Fig. 11 shows two blocks at rest, connected by a light inextensible string which passes over a smooth pulley. Block A of mass 4.7 kg rests on a smooth plane inclined at  $60^\circ$  to the horizontal. Block B of mass 4 kg rests on a rough plane inclined at  $25^\circ$  to the horizontal. On either side of the pulley, the string is parallel to a line of greatest slope of the plane. Block B is on the point of sliding up the plane.

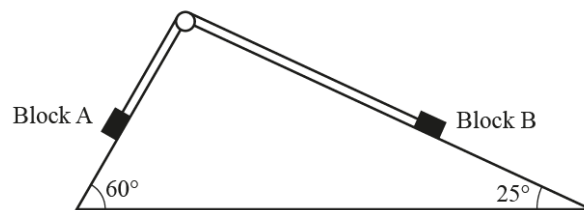


Fig. 11

(i) Show that the tension in the string is 39.9 N correct to 3 significant figures. [2]

(ii) Find the coefficient of friction between the rough plane and Block B. [5]