

## AS Mathematics Exam Questions by Topic Chapter 20b: Connected Particles (not pulleys)

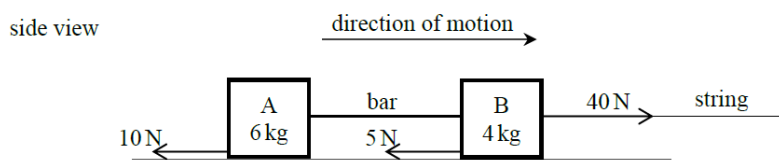
These questions are taken from the Specimen Exam materials and the real 2018 papers for the new syllabus AS and A-level mathematics courses and arranged by chapter of the textbooks by Goldie et al (available here: <https://amzn.to/39umfr5> and <https://amzn.to/3hE8kBL>). There are a mixture of questions from OCR A, OCR B (MEI), Edexcel and AQA. 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/>

### OCR B MEI Sample Paper 1 Question 14:

- 14** Blocks A and B are connected by a light rigid horizontal bar and are sliding on a rough horizontal surface. A light horizontal string exerts a force of 40 N on B. This situation is shown in Fig. 14, which also shows the direction of motion, the mass of each of the blocks and the resistances to their motion.



**Fig. 14**

- (i) Calculate the tension in the bar. [4]

The string breaks while the blocks are sliding. The resistances to motion are unchanged.

- (ii) Determine
- the magnitude of the new force in the bar,
  - whether the bar is in tension or in compression. [5]

---

AQA 2018 Paper 2 Question 17:

- 17 A buggy is pulling a roller-skater, in a straight line along a horizontal road, by means of a connecting rope as shown in the diagram.



The combined mass of the buggy and driver is 410 kg  
A driving force of 300 N and a total resistance force of 140 N act on the buggy.

The mass of the roller-skater is 72 kg  
A total resistance force of  $R$  newtons acts on the roller-skater.

The buggy and the roller-skater have an acceleration of  $0.2 \text{ m s}^{-2}$

- 17 (a) (i) Find  $R$ . [3 marks]

- 17 (a) (ii) Find the tension in the rope. [3 marks]

- 17 (b) State a necessary assumption that you have made. [1 mark]

- 17 (c) The roller-skater releases the rope at a point  $A$ , when she reaches a speed of  $6 \text{ m s}^{-1}$   
She continues to move forward, experiencing the same resistance force.  
The driver notices a change in motion of the buggy, and brings it to rest at a distance of 20 m from  $A$ .

- 17 (c) (i) Determine whether the roller-skater will stop before reaching the stationary buggy.  
Fully justify your answer. [5 marks]

- 17 (c) (ii) Explain the change in motion that the driver noticed. [2 marks]
-

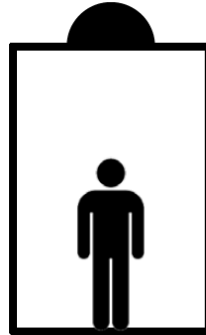
---

AQA AS Sample Paper 1 Question 14:

**14** In this question use  $g = 10 \text{ m s}^{-2}$ .

A man of mass 80 kg is travelling in a lift.

The lift is rising vertically.



The lift decelerates at a rate of  $1.5 \text{ m s}^{-2}$

Find the magnitude of the force exerted on the man by the lift.

**[3 marks]**