

QQQ – Mechanics Year 2 – Chapter 5 – Resolving Forces & Friction (Version 1)

Total Marks: 22

(22 = Platinum, 20 = Gold, 18 = Silver, 15 = Bronze)

1.



Figure 1

A particle P has mass 5 kg.

The particle is pulled along a rough horizontal plane by a horizontal force of magnitude 28 N.

The only resistance to motion is a frictional force of magnitude F newtons, as shown in Figure 1.

(a) Find the magnitude of the normal reaction of the plane on P (1)

The particle is accelerating along the plane at 1.4 m s^{-2}

(b) Find the value of F (2)

The coefficient of friction between P and the plane is μ

(c) Find the value of μ , giving your answer to 2 significant figures. (1)

(Total 4 marks)

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2. A 15 kg box is suspended in the air by a rope which makes an angle of 30° with the vertical.

The box is held in place by a string which is horizontal.

(a) Draw a diagram showing the forces acting on the box. [1]

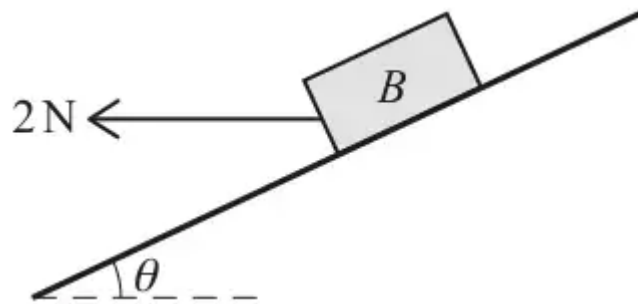
(b) Calculate the tension in the rope. [2]

(c) Calculate the tension in the string. [2]

(Total 5 marks)

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3.



A block B of weight 10 N lies at rest in equilibrium on a rough plane inclined at θ to the horizontal. A horizontal force of magnitude 2 N , acting above a line of greatest slope, is applied to B (see diagram).

(a) Complete the diagram in the Printed Answer Booklet to show all the forces acting on B .

[1]

It is given that B remains at rest and the coefficient of friction between B and the plane is 0.8 .

(b) Determine the greatest possible value of $\tan \theta$.

[5]

(Total 6 marks)

4. 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° to the horizontal. Block B of mass 4 kg rests on a rough plane inclined at 25° 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.

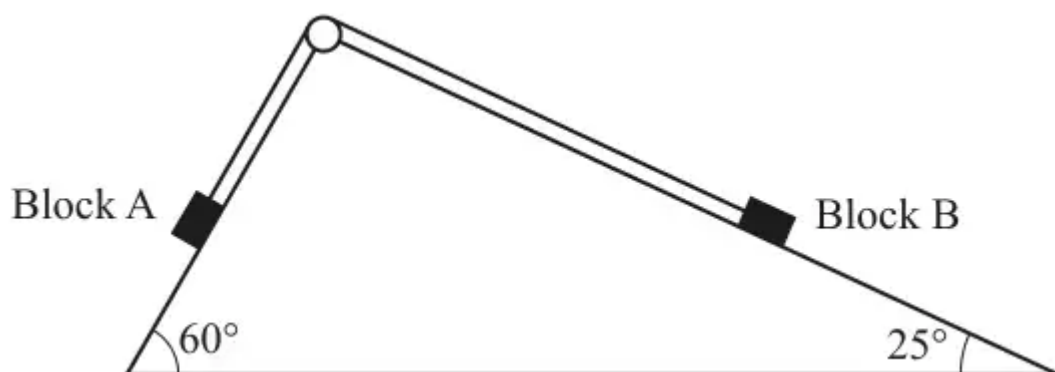


Fig. 11

- (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]

(Total 7 marks)