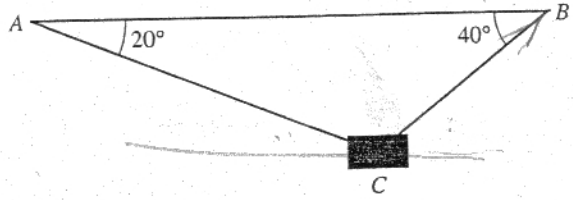
1

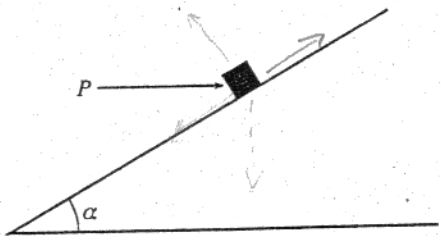


The two ends of a string are attached to two points A and B of a horizontal beam. A package of mass 2 kg is attached to the string at the point C. When the package hangs in equilibrium $\angle BAC = 20°$ and $\angle ABC = 40°$, as shown above.

By modelling the package as a particle and the string as light and inextensible, find, to 3 significant figures,

a the tension in AC, **b** the tension in BC. [Edexcel Jan 1997]

2



A box of mass m is placed on a plane, which is inclined at an angle α to the horizontal, where $\tan \alpha = \frac{3}{4}$. The plane is rough and the coefficient of friction between the box and the plane is $\frac{1}{2}$. The box is kept in equilibrium on the plane by applying a horizontal force of magnitude P to it, acting in a vertical plane containing a line of greatest slope of the plane, as shown above. Given that P has the smallest possible value which will enable the box to remain in equilibrium,

a draw a diagram, showing all the forces acting on the box, and indicating clearly the direction in which they act,

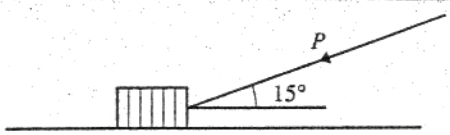
b find P in terms of m and g.

If instead P were to have the largest value which would enable the box to stay in equilibrium on the plane,

c state how the diagram of forces acting on the box should, if at all, be changed.

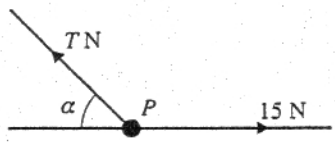
[Edexcel June 1997]

3



A box of mass 50 kg rests on rough, horizontal ground. The coefficient of friction between the box and the ground is 0.6. A force of magnitude P Newtons is applied to the box at an angle of 15° to the horizontal, as shown above, and the box is now in limiting equilibrium. By modelling the box as a particle find, to 3 significant figures, the value of P. [Edexcel Jan 199

4



A particle P of mass 2 kg is held in equilibrium under gravity by two light, inextensible strings. One string is horizontal and the other is inclined at an angle α to the horizontal, as shown in the diagram. Th tension in the horizontal string is 15 N. The tension in the other string is T newtons.

a Find the size of the angle α.

b Find the value of T. [Edexcel Jan 200

5 A particle P is acted on by three forces $\mathbf{F}_1$, $\mathbf{F}_2$ and $\mathbf{F}_3$, where $\mathbf{F}_1 = (2\mathbf{i} - 5\mathbf{j})$ N and $\mathbf{F}_2 = (4\mathbf{i} - 4\mathbf{j})$ N. Given that P is in equilibrium,

a find $\mathbf{F}_3$ in terms of $\mathbf{i}$ and $\mathbf{j}$.

The force $\mathbf{F}_3$ is now removed and P moves under the action of $\mathbf{F}_1$ and $\mathbf{F}_2$ alone.