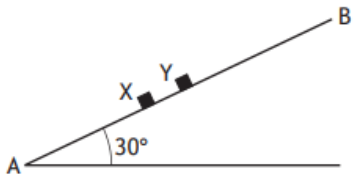
Y	Q	Momentum and Impulse
22	1	An object of mass 8 kg is at rest on a smooth horizontal surface. A constant horizontal force of magnitude 65 newtons is applied for 1.2 seconds. (a) Calculate the speed of the object after this time. **2** The object then hits a wall and rebounds in the opposite direction with no loss of energy. (b) Calculate the magnitude of the impulse of the wall on the object. **2**
19	1	A body of mass 4 kg is moving with initial velocity $(3\mathbf{i}+2\mathbf{j})$ ms^{-1}. It is given an impulse of $(6\mathbf{i}+\mathbf{j})$ Ns. Calculate the magnitude of the final velocity and the angle it makes with the x-axis. **4**
18	17	A box of mass m kg is set in motion with an initial impulse I. As it moves along the surface it experiences a resistive force proportional to the square of its velocity v m s^{-1}. By setting up a differential equation, show that the velocity of the box after t seconds can be expressed as $v=\frac{mI}{Ikt+m^2}$, where k is a constant and t is measured from the moment of impulse. **5**
17	8	Two particles, X and Y, have masses of 0·2 kg and 0·5 kg respectively. They are moving up a smooth plane AB, inclined at 30° to the horizontal as shown in the diagram.  The particles collide 3·5 metres from B when X is moving with a speed of 6 m s^{-1} and Y is moving with a speed of 3 m s^{-1}. This collision causes X to come instantaneously to rest while Y continues to travel up the slope. Show that in the subsequent motion, Y comes to rest before reaching B. **6**
16	1	A bicycle and rider have a total mass of 70 kg. They are travelling at 12 m s^{-1}. The cyclist applies the brakes for 1·5 seconds, resulting in a total resistive force of 180 newtons. What is the speed of the bicycle after 1·5 seconds? **3**
16 Sp	1	A curling stone, P, of mass 18 kg is moving with velocity $\begin{pmatrix}0\\-1{\cdot}1\end{pmatrix}$ m s^{-1} relative to a suitable set of coordinate axes. It collides with a stationary curling stone, Q, of mass 20 kg. Q then moves off with velocity $\begin{pmatrix}0{\cdot}36\\-0{\cdot}72\end{pmatrix}$ m s^{-1}. Calculate the speed with which P travels immediately after impact. **3**