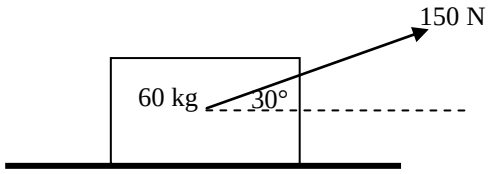
Section 2: Newton's second law

Exercise level 1

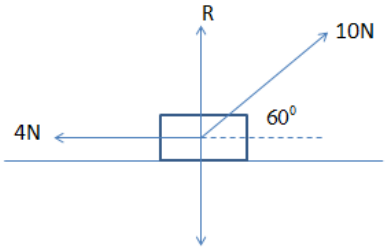
1. A box of mass 60 kg is pulled across a rough floor by an inextensible rope inclined at 30° to the horizontal.
   Given that the frictional force is 100 N and the tension in the rope is 150 N, calculate
   (i) The acceleration of the box,
   (ii) The normal reaction of the floor on the box.



2. A crate of mass 120 kg is being pulled up a smooth slope inclined at 10° to the horizontal by a cable that is parallel to the slope.
   The crate has acceleration 0.25 ms^{-2}.

   (i) Draw a diagram of the forces acting on the crate and the direction of its acceleration.
   (ii) Resolve the forces parallel to the slope and use Newton's 2nd Law to find the tension in the cable.

3. A block of mass 2 kg rests on a horizontal plane. It is being pulled by a force of 10 N at an angle of 60^0 to the horizontal, as shown in the diagram. A horizontal frictional force of 4 N is opposing the motion.



   Find
   (i) The horizontal component of the 10 N force,
   (ii) The resultant force horizontally on the block,
   (iii) The acceleration of the block,
   (iv) The distance *s*, travelled in time *t*,
   (v) The reaction force *R*.

Edexcel A level Maths Forces in 2D 2 Exercise

4. A body of mass 8 kg is initially at rest on a rough horizontal table.It is pulled along the table by a constant force of 45 N inclined at 50^0 to the horizontal. The resistance to motion from friction is 8 N. Find the acceleration of the body and the distance travelled in the first 5 seconds.

5. A body of mass 50 kg is released from rest at the top of a smooth slope inclined at 25^0 to the horizontal. Find the acceleration and the velocity of the body when it has travelled 20 m down the slope.

6. A girl slides on her sledge down a hill inclined at 20^0 to the horizontal. Resistances to motion total 30 N, and the total mass of girl and the sledge is 55 kg. Calculate
   (i) the acceleration of the girl and the sledge,
   (ii) the speed of the girl after 5 seconds, given that she starts from rest.