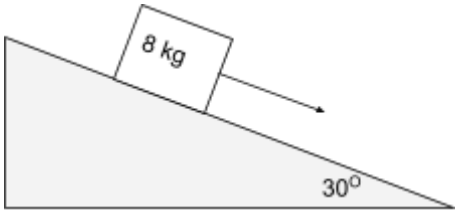
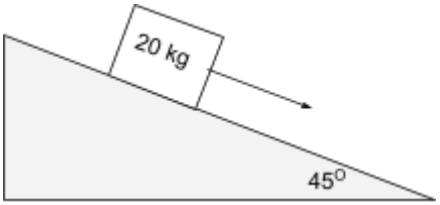
Our Dynamic Universe

Force and the inclined plane (slope)

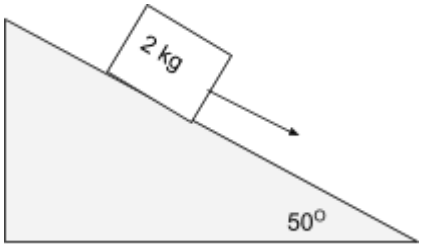
1) In each of the following situations calculate the box's component of weight parallel to the slope.



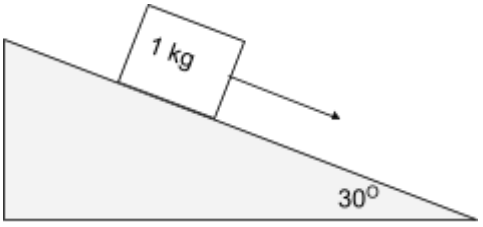
39.2 N



138.6 N

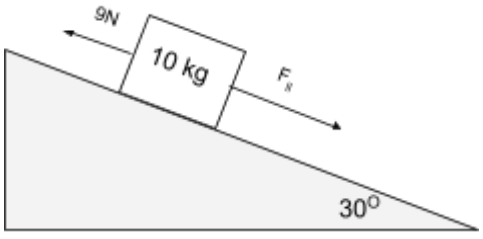


15 N

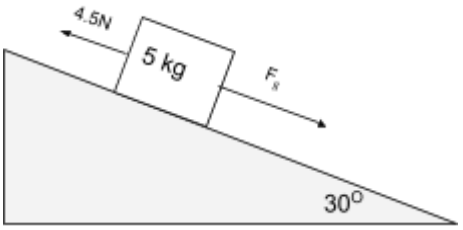


4.9 N

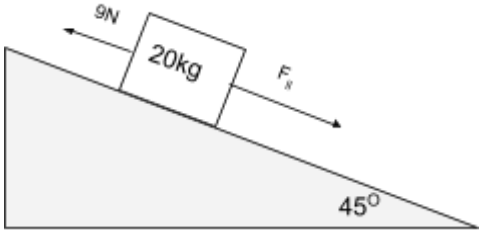
2) In the following situations calculate the component of the box's weight down parallel to the slope, the unbalanced force acting on the box and the acceleration of the box.



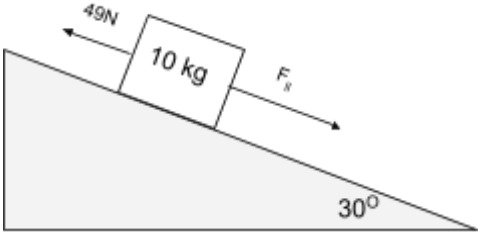
49 N, 40 N, 4 ms^{-2}



24.5 N, 20 N, 4 ms^{-2}

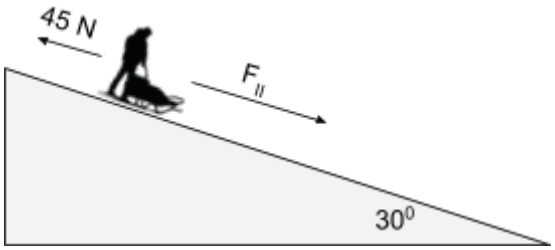


138.6 N, 129.6 N, 6.5 ms^{-2}



49 N, 0 N, 0 ms^{-2}

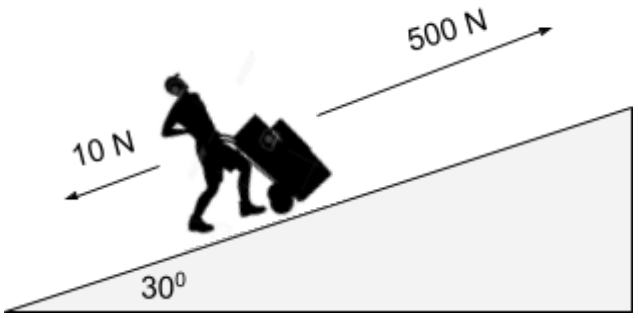
3) A sledger of mass 45 kg slides down a slope from rest at an angle of 30 degrees with a frictional force of 45 Newtons acting on the 5 kg sledge.



Find the

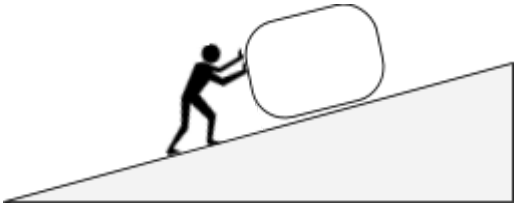
a) Component of weight acting down the slope. [245 N]
b) Resultant force acting on the sledger [200 N]
c) Acceleration of the sledger. [4 ms^{-2}]
d) Size of the sledger`s velocity 10 metres down the slope. [8.9 ms^{-1}]

4) A delivery man pushes his 100 kg barrow up an inclined plane with a force of 500 Newtons. The force of friction acting against his sleigh is 10 Newtons.
The slope has an angle of 30^0



a) Calculate the barrow`s component of weight acting down the slope. [490 N]
b) Draw a free body diagram of the forces acting parallel to the slope
c) Find the resultant force acting on Santa's sleigh. [0 N]

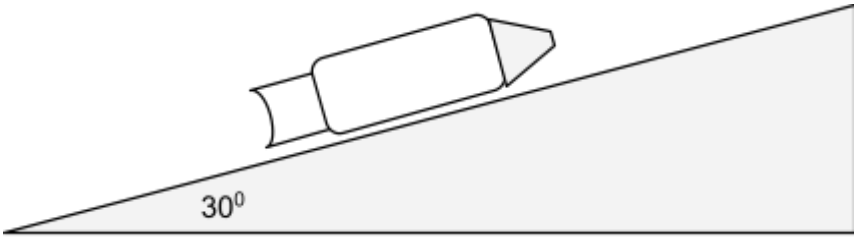
5) A worker pushes a 60 kg package up a slope, which is inclined at 45^{o} to the horizontal, with a force of 480 Newtons.
There is a frictional force of 4 Newtons acting on the package



a) Find the package`s component of weight acting down the slope.
b) Draw a free body diagram of all the forces acting parallel to the slope.
c) Calculate the size of the resultant force acting on the package
d) Find the acceleration of the block up the slope.

(a) 416 N (c) 60 N (d) 1 ms^{-2}

6) A 100 kg rocket accelerates up an inclined plane at 30 ms^{-2}. The inclined plane has a frictional force of 10 N. The angle of the inclined plane is 30^{0}.



a) Calculate the unbalanced force acting on the rocket. [3000 N]

b) Draw a diagram of the forces parallel to the inclined plane that are acting on the rocket.

c) Determine the thrust force of the rocket's engines. [3500 N]

d) The rocket travels 500 m up the inclined plane from rest.
Find the time it takes the rocket to reach the end of the inclined plane.
[5.8 s]