NEWTON'S SECOND LAW PROBLEMS
Problems document

Brief answers to these problems are available in the Answers document.

Full solutions to the problems are available in the Solutions document, and in the YouTube videos.

You can find links to these resources at my website: www.freelance-teacher.com

Links to the documents are also in the video description boxes for the YouTube videos.

You can support these resources with a monthly pledge of $1 (or more) at my Patreon page: www.patreon.com/freelanceteacher

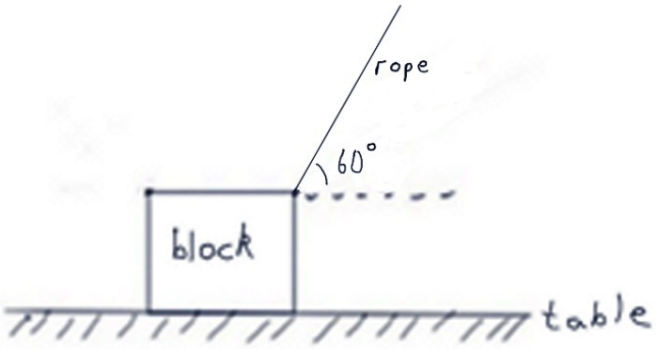
This video series is intended for students who find this material to be difficult, so in the videos I proceed slowly and repeat myself a lot. If you find the videos to move too slowly, you can simply try the problems in this Problems document, study the solutions in the Solutions document, and skip to any particular parts of the videos that cover aspects of the solutions that you find confusing.

Problems begin on next page.

Video (1)

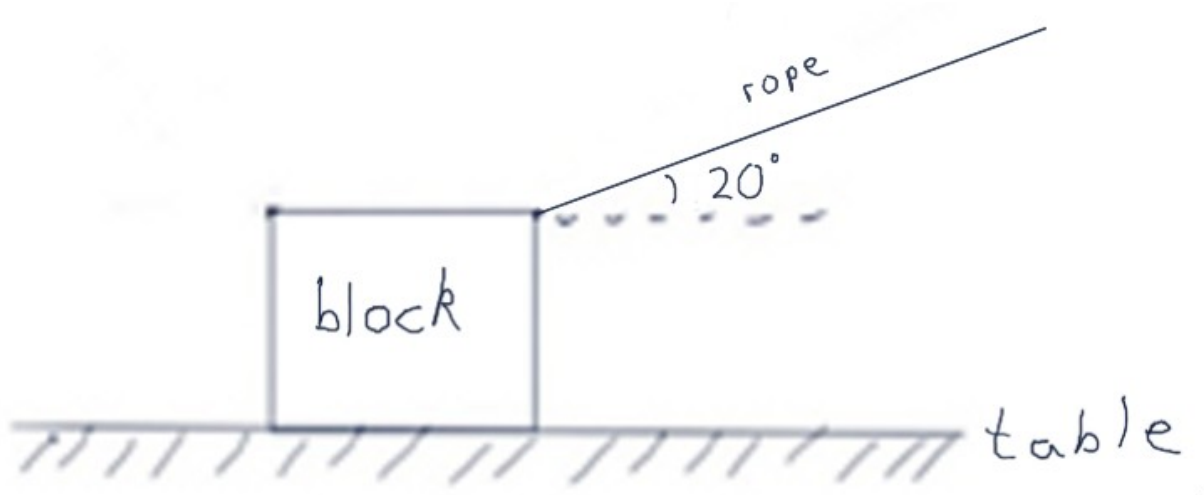
Jessica pulls a 3 kg block along a frictionless table, using a rope that forms an angle of 60° with the horizontal, as shown. The rope is massless. The tension in the rope is 15 N.

(a) Find the magnitude and direction of the normal force exerted by the table on the block.
(b) Find the magnitude and direction of the acceleration of the block.



Video (2)

A block of mass 2 kg is on a frictionless table. You pull the block with an ideal massless rope at an angle 20° above the horizontal, so that the block slides along the table with constant rightward acceleration of 4 m/s^2.
Find the magnitude and direction of the normal force between the table and the block.

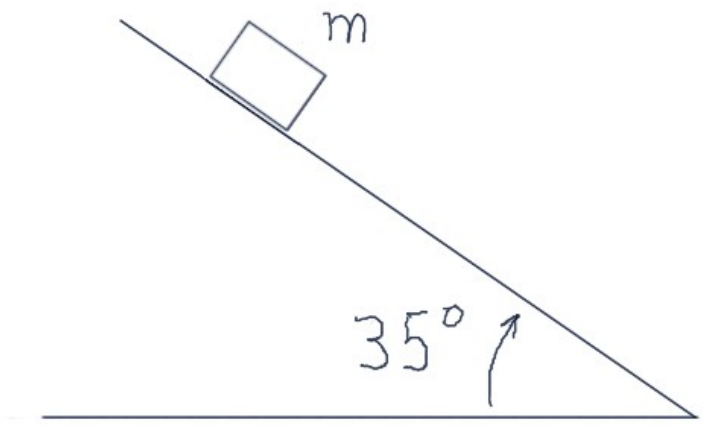


Video (3)

A mass m = 9.0 kg slides down a frictionless hill which is at an angle of $\theta = 35°$ to the horizontal.

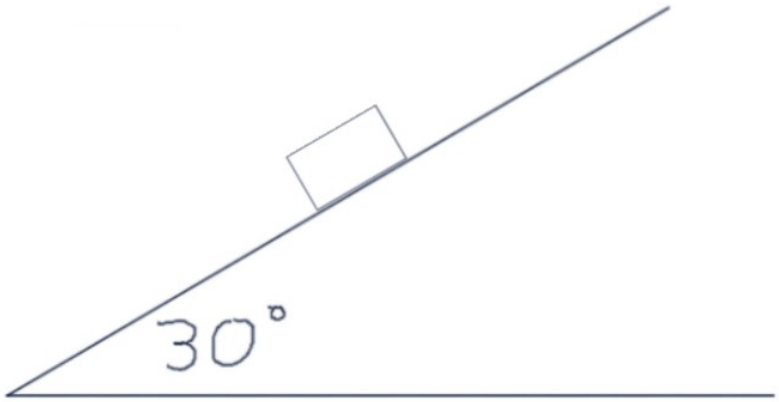
(a) Find the magnitude and direction of the normal force exerted by the surface of the hill on the mass.

(b) Find the magnitude and direction of the acceleration of the mass.



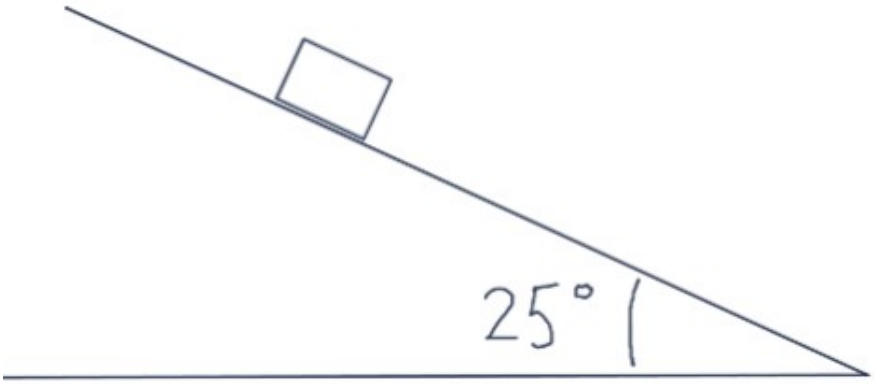
Video (4)

A man exerts a steady force of 35 N on a block of mass 3.0 kg as he pushes it up a 30° incline.
The man’s pushing force is directed parallel to the incline. Assume the surface is frictionless.
(a) Find the magnitude and direction of the normal force exerted by the surface of the incline on the block.
(b) Find the magnitude and direction of the acceleration of the block.



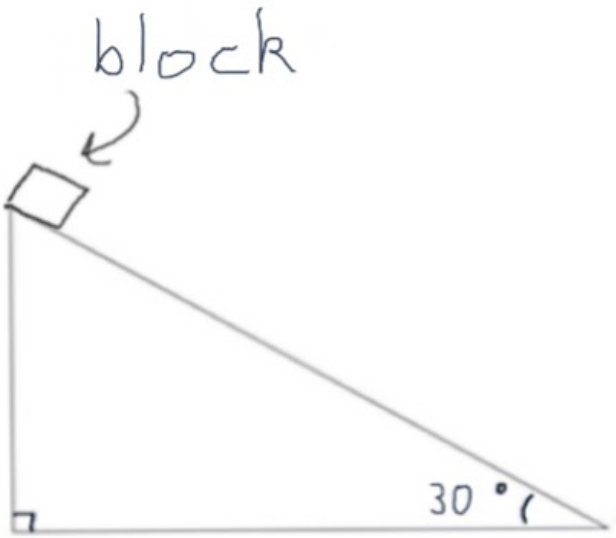
Video (5)

A mass of 12 kg slides down a hill which is at an angle of 25° to the horizontal. The coefficient of kinetic friction is 0.40.
What is the magnitude and direction of the acceleration of the mass?



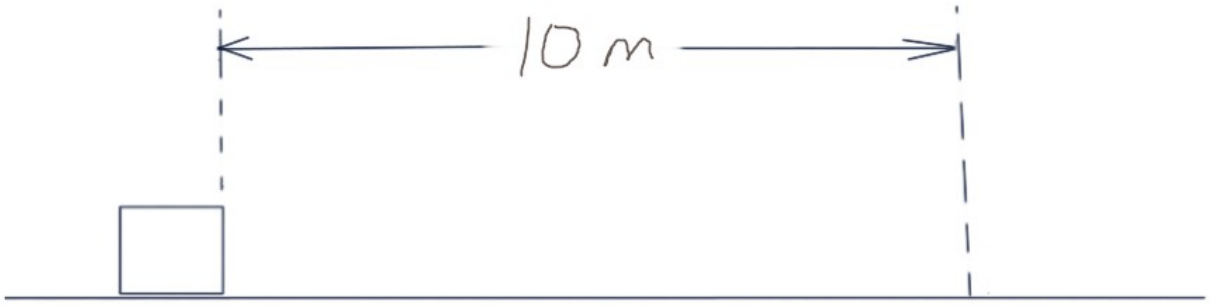
Video (6)

A block of mass 2.5 kg slides down an inclined plane. The plane is inclined at an angle 30°.
The block's acceleration has magnitude 1.4 m/s^2; the direction of the block's acceleration is "down the inclined plane".
Find the coefficient of kinetic friction between the plane and the block.



Video (7)

Starting from a speed of 10 m/s, a box of mass 20 kg slows to a stop with uniform deceleration over a distance of 10 m while sliding across a horizontal floor.
Find the coefficient of kinetic friction between the floor and the box.

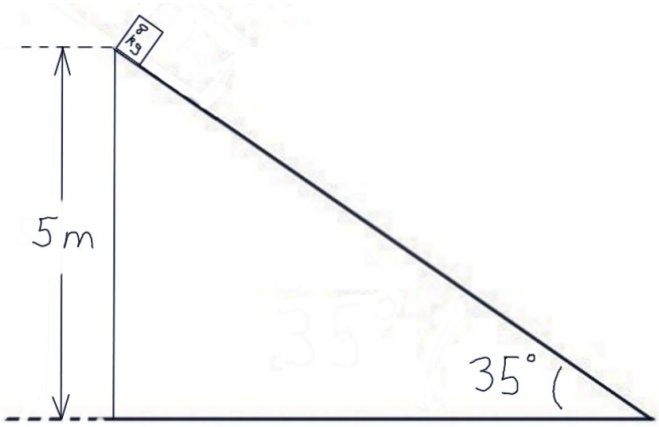


Video (8)

Starting from a speed of v_0, a block of mass m slows to a stop while sliding to the right across a horizontal floor. The coefficient of kinetic friction between the floor and the block is μ_k. Determine the distance D traveled by the block before it comes to a stop.

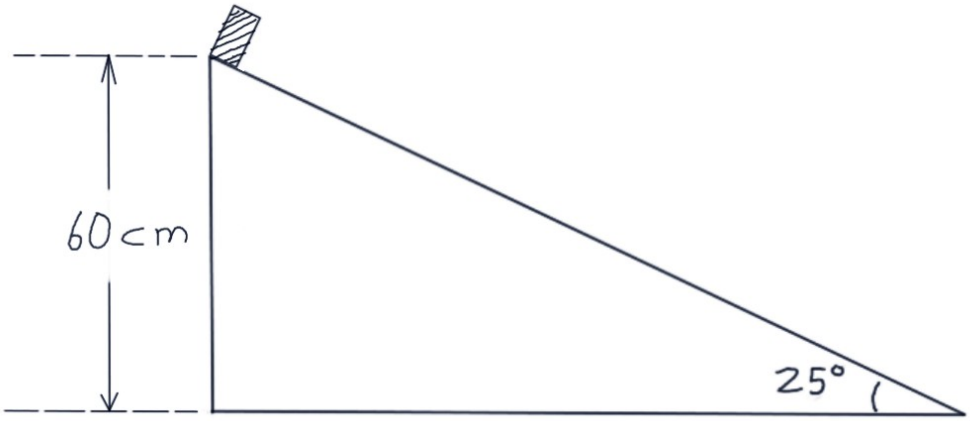
Video (9)

An 8 kg box starts sliding down a ramp which is at an angle of 35° to the horizontal. The box begins sliding from a height of 5 m. The coefficient of kinetic friction is 0.3.
How long does it take the box to reach the bottom of the ramp?



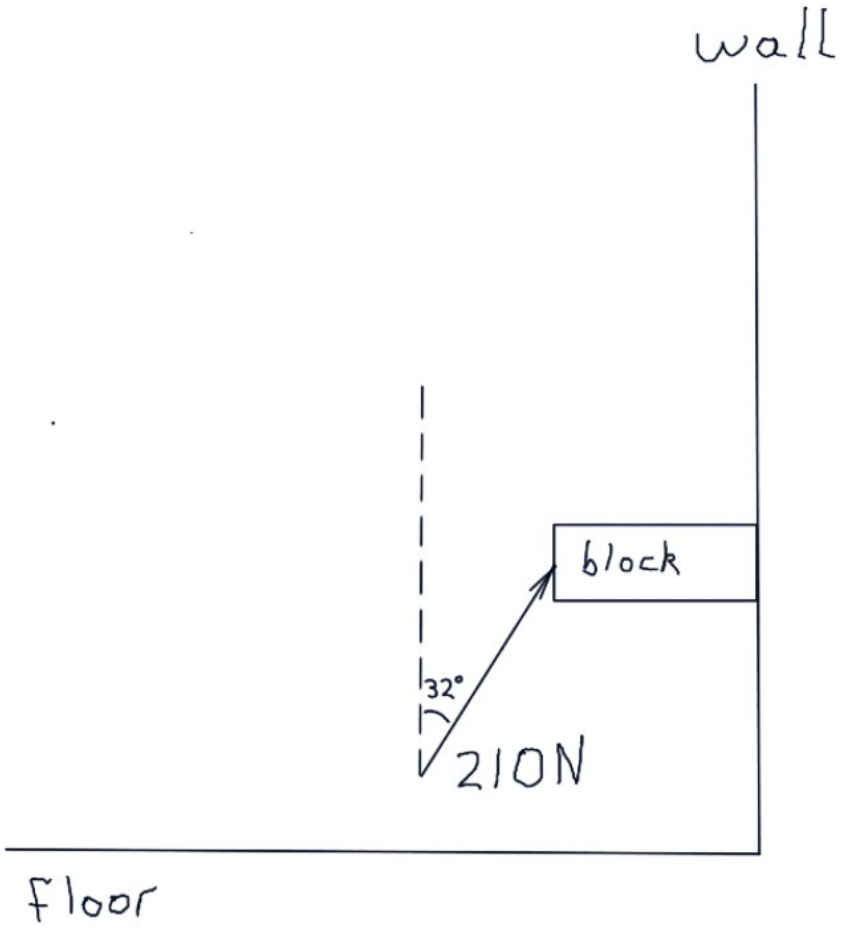
Video (10)

Starting from rest, a 4 kg mass slides down a 25° incline that has a height of 60 cm. It takes the mass 2.5 seconds to reach the bottom of the incline.
Determine the coefficient of kinetic friction.



Video (11)

Jessica pushes a 12 kg block up a wall with a constant force of 210 N at an angle of 32° from the vertical, as shown in the figure. The block begins at rest, with the top of the block at a position 0.6 m above the floor. The wall is 1.8 m high. The coefficient of friction between the block and the wall is 0.3. What is the block's speed when the top of the block reaches the top of the wall?



More problems to come.