NEWTON'S SECOND LAW PROBLEMS
Problems document

Answers to these problems are available in the Answers document.
Brief solutions to the problems are available in the Brief Solutions document.
Step-by-step solutions to each problem are available in the Step-by-Step 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.

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If you find that the video explanations move too slowly, you can simply try the problems in this Problems document, study the solutions in the Solutions documents, and, if necessary, skip to the particular parts of the videos that cover parts of the solutions that are giving you difficulty. Each video has a table of contents, to make it easier to skip to particular topics.

If you find a particular problem to be difficult, then, after studying the solution, *before* you try the next problem, you should take a blank piece of paper and retry that problem from scratch. Don't move on to the next problem in the series until you are comfortable with the solution for the current problem.

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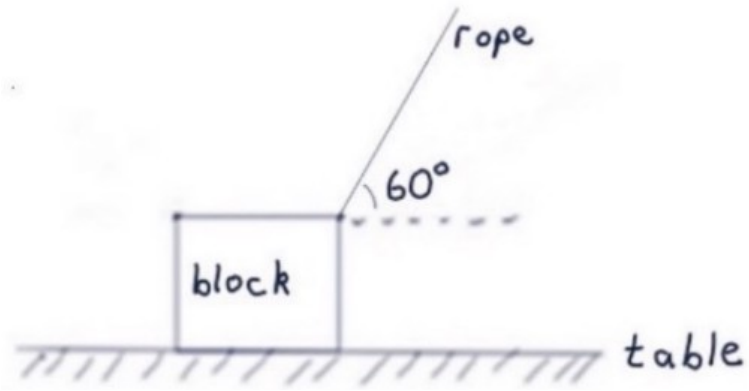
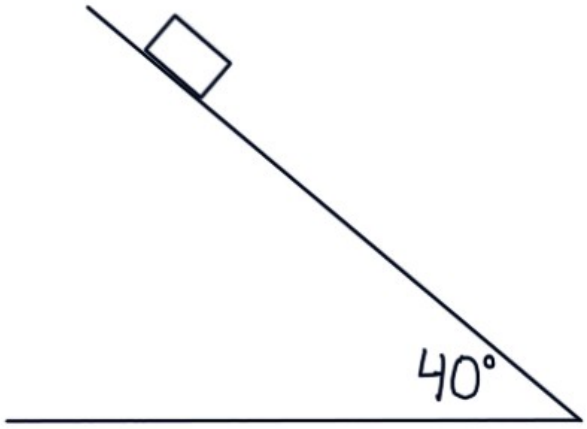
Video (1)

Jessica drags a 3.0 kg block along a table, using an ideal massless rope that forms an angle of 60° with the horizontal, as shown. The tension in the rope is 20 N. The coefficient of kinetic friction between the table and the block is 0.20. Find the magnitude and direction of the acceleration of the block.



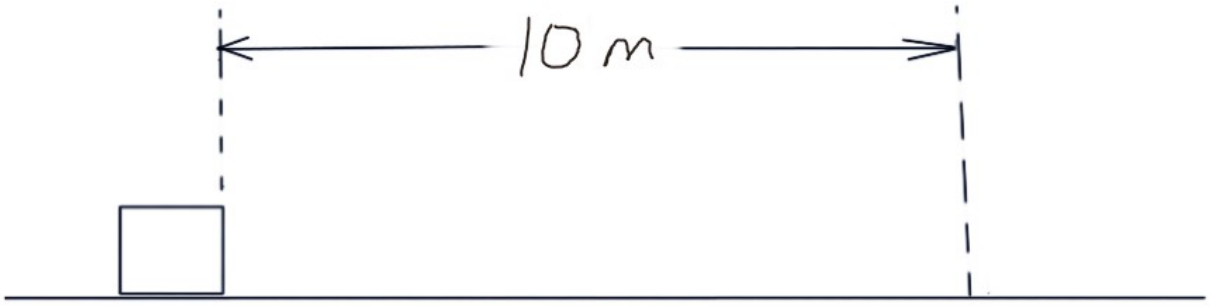
Video (2)

A mass of 10 kg slides down a hill which is at an angle of 40° to the horizontal. The coefficient of kinetic friction is 0.30. What is the acceleration of the mass?



Video (3)

Starting from a speed of 10 m/s, a box with mass 40 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 (4)

In this video we discuss the *meaning* of the concepts and formulas we have been using in the previous videos.

If you are not interested in, or don't have the time for, a discussion of these topics, you can simply proceed to the next video in this series, which contains another Newton's Second Law problem.

The material covered in this video is also discussed in the "Step-by-step Solutions" document.

Topics discussed in this video:

The difference between the *force* of friction and the *coefficient* of friction
The *meaning* of the formula $f_k = \mu_k n$

The difference between *velocity* and *acceleration*

Newton's First Law

The *meaning* of Newton's Second Law: net force and acceleration

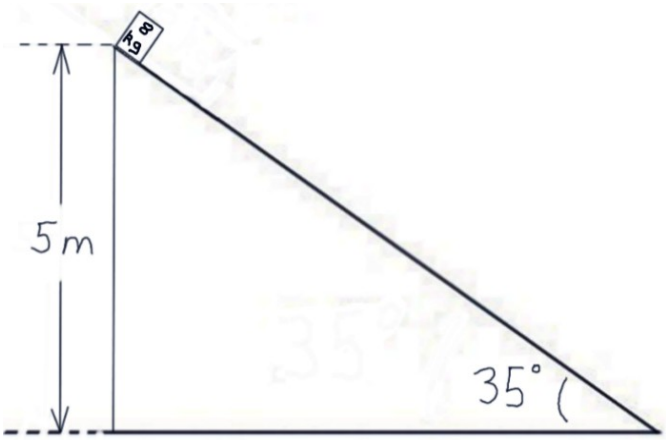
The meaning of the concept of *net force*

The difference between *mass* and *weight*
The *meaning* of the formula $w = mg$

The *meaning* of Newton's Second Law: mass and acceleration

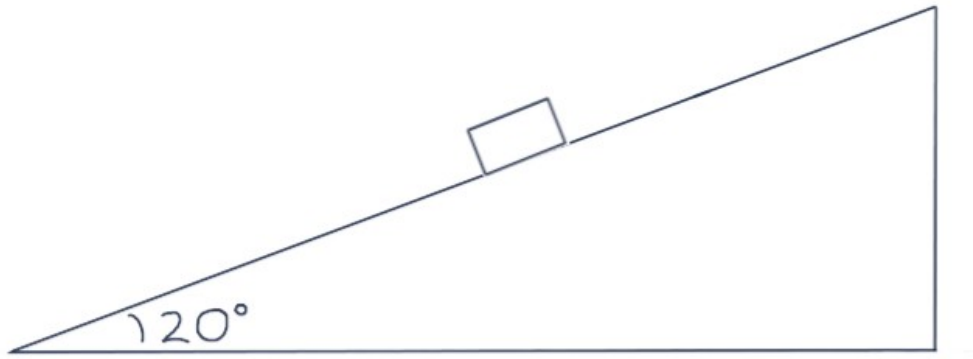
Video (5)

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 (6)

A block of mass 4.0 kg is sitting on an inclined plane. The plane is inclined at an angle of 20° above the horizontal. The coefficient of static friction between the plane and the block is 0.25; the kinetic friction coefficient is 0.10.
Suppose that someone exerts a force on the block parallel to the incline.
(a) What minimum force must be exerted on the block to get it started moving up the incline?
(b) If this force is continually applied, what will be the acceleration of the block once it starts moving up the incline?



Video (7)

A 6.0 kg box is being pushed against a wall by a force F_{app} which is applied at an angle of 35° above the horizontal. The coefficient of static friction between the wall and the box is 0.40; the kinetic friction coefficient is 0.25.
(a) What minimum value of F_{app} is required to prevent the box from sliding down the wall?
(b) Now suppose that the value of F_{app} is reduced to half this value. Determine the acceleration of the box.