

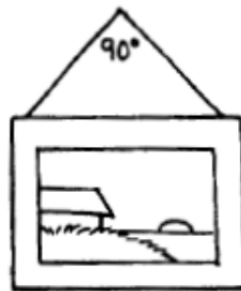
Seminary 2 Point dynamics

The unsolved problems are given as homework.

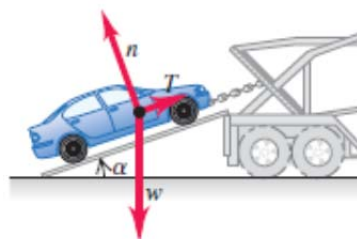
Equilibrium 1st Principle of Dynamics

DISCUSSION: Briefly remember useful notions from the course: 1st principle enunciation, equilibrium conditions, etc.

- 1) A gymnast, hangs from a bar by both arms in an effort to catch his breath. If he weighs 650. N, what is the tension in each of his arms as he hangs in place?
- 2) Two 25.0-N weights are suspended at opposite ends of a rope that passes over a light, frictionless pulley. The pulley is attached to a chain that goes to the ceiling. (a) What is the tension in the rope? (b) What is the tension in the chain?
- 3) A painting hangs from a nail on a wall as shown in the figure. If the painting weighs 126 N, what is the tension in each side of the wire supporting the painting?



- 4) Three forces act on a point: 3 N at 0° , 4 N at 90° , and 5 N at 217° . What is the net force? What fourth force will put the point in equilibrium?
- 5) A car of weight w rests on a slanted ramp attached to a trailer (Fig). Only a cable running from the trailer to the car prevents the car from rolling off the ramp. (The car's brakes are off and its transmission is in neutral.) Find the tension in the cable and the force that the ramp exerts on the car's tires.

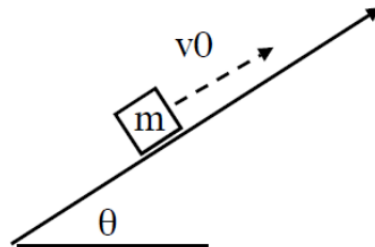


- 6) To push a box up a ramp, is the force required smaller if you push horizontally or if you push parallel to the ramp? Why?

2nd Principle of Dynamics

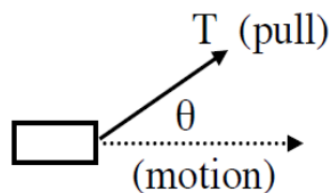
DISCUSSION: Briefly remember useful notions from the course: 2nd Principle enunciation, applications, etc.

1) An object is sent up a frictionless inclined plane (angle θ) with initial velocity v_0 . How does the velocity change with time?



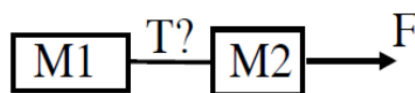
2) Pull a cart, mass m , sideways along horizontal track, with a “tilted rope”, pulling with tension T , as shown. The friction coefficient is μ .

- What is the normal force of the track on the cart?
- What is the acceleration a ?



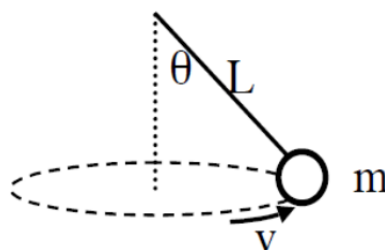
3) You pull two objects attached by ropes, with an external force F (given). The objects have masses M_1 and M_2 respectively.

- What's the acceleration a of the system?
- What's the tension T in the rope between them?



4) A tetherball (mass m) hangs on a rope (length L). It swings in a circular path, in a flat plane, with a constant speed v as shown.

- What's the tension T in the cord?
- Given the angle of the cord, θ , what is the speed v ?

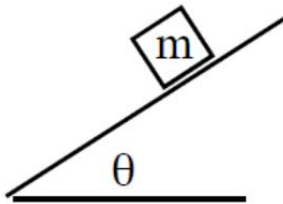


5) An object is being pulled up a 15° incline against a frictional coefficient of 0.15, and requires a force of 835 N parallel to the surface of the ramp to move it at a constant speed. What is the weight of the object?

6) A block sits at rest on an incline, sticking because of static friction. If you tilt the angle of the incline higher, there is a critical θ where the object suddenly starts to slide.

a) What is this critical angle?

b) After it just starts to slide, what will the acceleration be?



7) A 3.0 m long board has one end raised to a height of 60 cm to form an incline. A 4.0 kg mass is allowed to slide without friction down the entire length of the inclined plane.

a) What is the final speed of the mass when it reaches the bottom ?

b) If the mass is replaced with an 8.0 kg mass, what would be the new speed when it reaches the bottom?