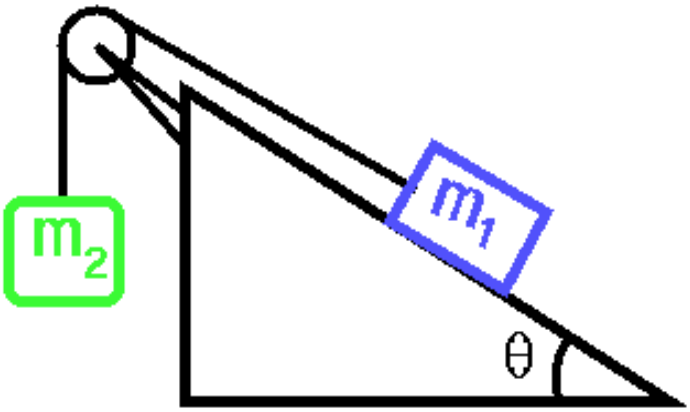
Objects Connected at an Angle



We approach this problem like the others:

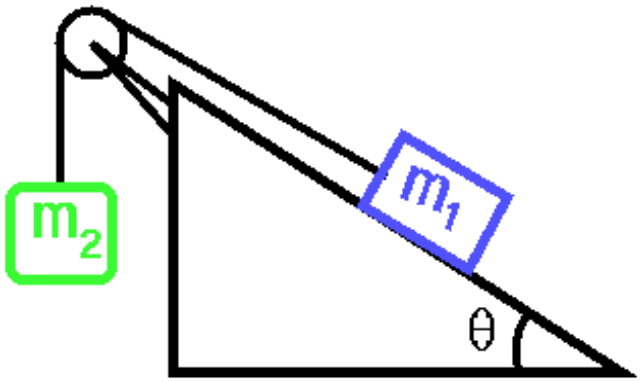
- Picture the motion in one dimension.
- Apply Newton's second law.

Physics 122: Newton's 2nd Law in 2D

A counterweight is used to slide an object up an inclined plane that makes a 40^{o} angle with the horizontal. The counterweight has a mass of 35 kg and is suspended with a massless string and a friction less pulley. The coefficient of kinetic friction on the plane is 0.23.

a) For the acceleration of the object not to exceed 0.42 m/s^2 up the ramp, what must be the minimum mass of the object? (39 kg)

b) What mass would result in an acceleration of 0.21 m/s^2 down the ramp? (80 kg)



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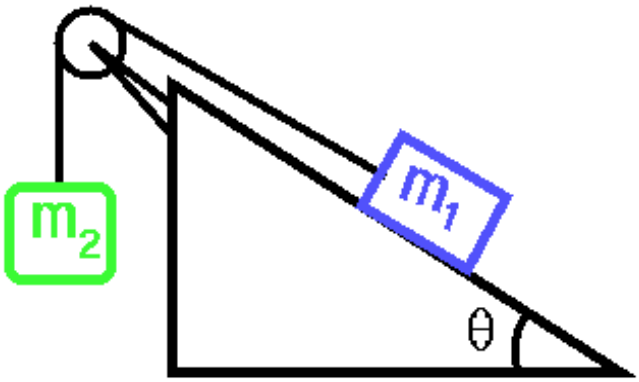
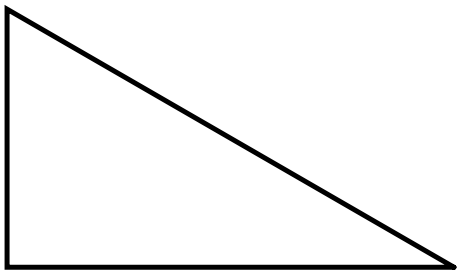


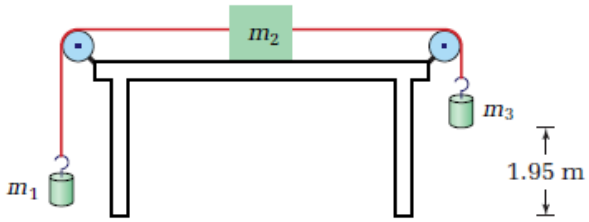
A counterweight is used to slide an object up an inclined plane that makes a 42^{o} angle with the horizontal. The counterweight has a mass of 40 kg and is suspended with a massless string and a friction less pulley. The coefficient of kinetic friction on the plane is 0.33. For the acceleration of the object not to exceed 0.22 m/s^{2} up the ramp, what must be the minimum mass of the object?



A counterweight is used to slide an object up an inclined plane of 20 ◦. The counterweight has a mass of 25 kg and is suspended with a massless string and a friction less pulley. The coefficient of friction on the plane is 0.19. What is the acceleration of a 16 kg object?

Questions 27 & 28 only

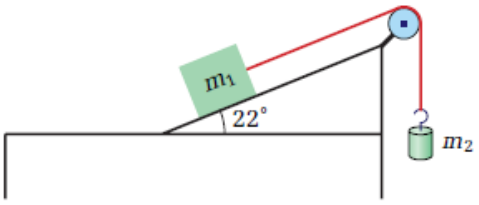
26. The objects in the diagram have the following masses: $m_1 = 228$ g, $m_2 = 615$ g, and $m_3 = 455$ g. The coefficient of kinetic friction between the block and the table is 0.260. Mass m_3 is 1.95 m above the floor. What will be the time interval between the instant that the masses start to move and the instant when mass m_3 hits the floor?



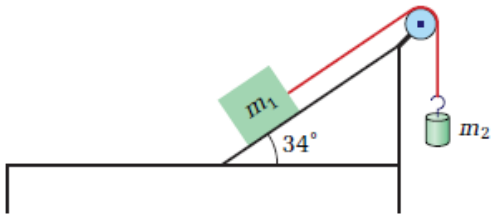
27. The block in the diagram has a mass of 145 g and the freely hanging object has a mass of 85 g. The coefficient of kinetic friction between the block and the ramp is 0.18. The ramp makes an angle of 22° with the horizontal.

(a) What will be the speed of the masses 2.5 s after they just start to move?

(b) What is the tension in the string while they are moving?



28. The block in the diagram has a mass of 725 g, and the hanging object has a mass of 595 g. The coefficient of static friction between the block and the inclined plane is 0.47, and the coefficient of kinetic friction is 0.12. The inclined plane makes an angle of 34° with the horizontal.



(a) What force directed up the incline would you have to apply to the block, to make the objects start to move?

(b) After the objects start to move, what will be their acceleration?

(c) What will be the tension in the string when the objects are moving?