Course Code: ESC106A
Course Title: Construction Materials and Engineering Mechanics

Lecture No. 47:
Block Friction and Related Problems

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Lecture Intended Learning Outcomes

At the end of this lecture, students will be able to:

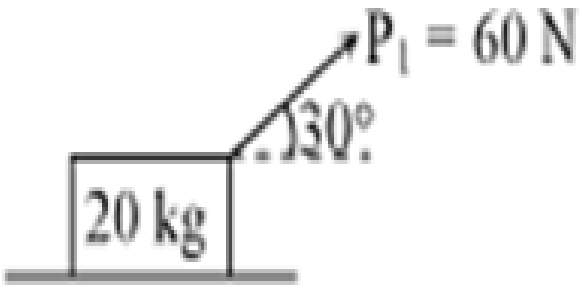
- Draw Free Body diagrams of Blocks in the given problems
- Evaluate frictional forces or weight of the block or find tension in the string connecting the blocks by assuming impending state of the block

Contents

- Numerical problems on block friction

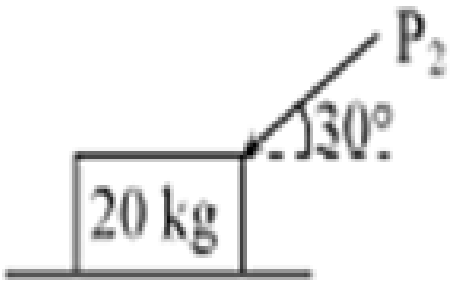
Block Friction: Problem 1

Example: A 60N pulling force P1 acting at 30˚ w.r.t. the horizontal is required to the pull the 20kg block to the right. Hence find μ between the block and the surface.(μ=0.313)



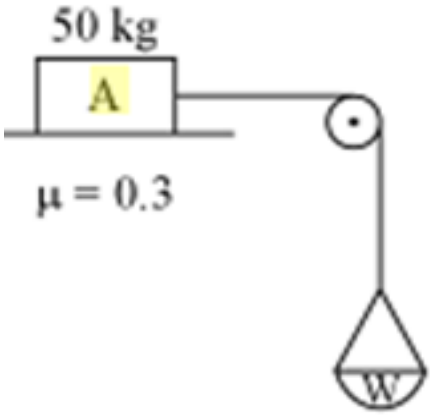
Block Friction: Problem 2

The block in the previous problem is to be pushed to the left by a force P_2 as shown in the figure. All conditions are same as the previous problem. Find P_2



Block Friction: Problem 3

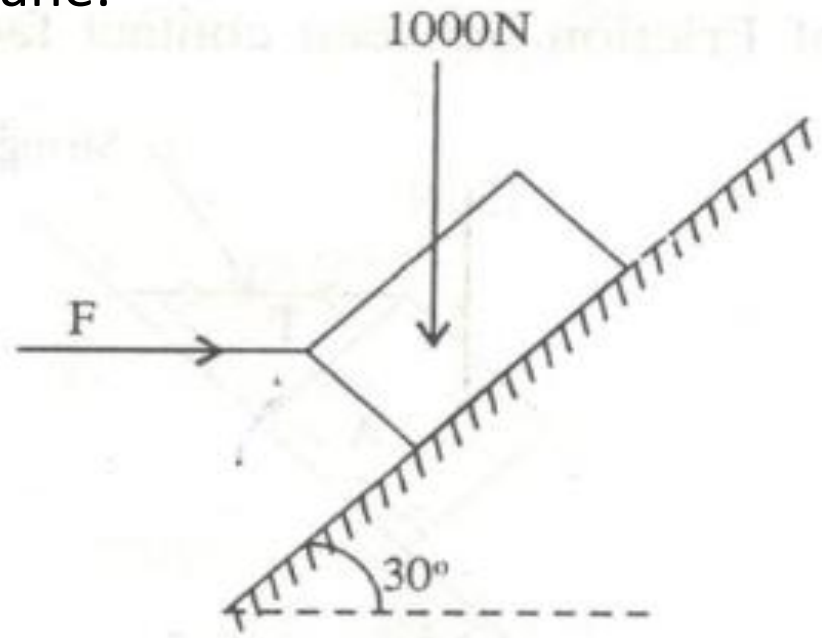
Weights are gradually increased in the pan suspended over a smooth pulley. If μ between the block A and the surface is 0.3,find the value of W at which motion would impend. The mass of the block A is 50kg.



Block Friction: Problem 4

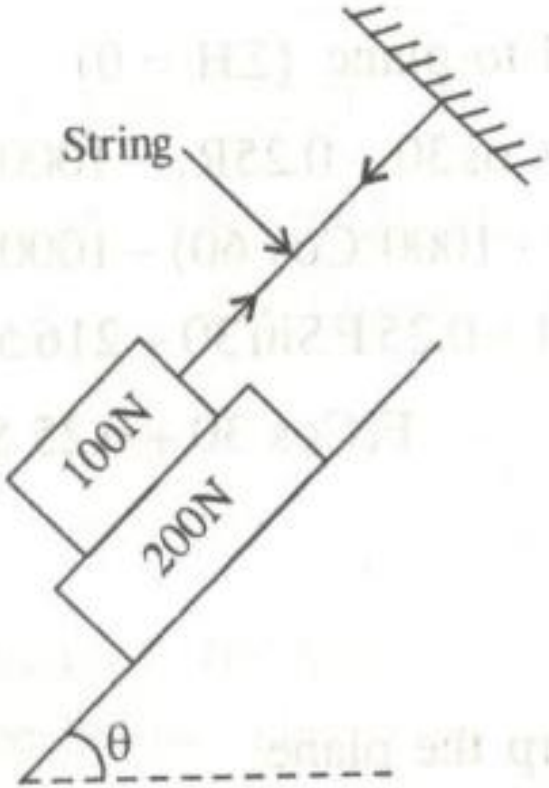
Example: A small block of 1000N is placed on a 30’ inclined with coefficient of friction of 0.25 as shown in
Figure. Determine the horizontal force to be applied for

1. The impending motion down the plane and
2. The impending motion up the plane.



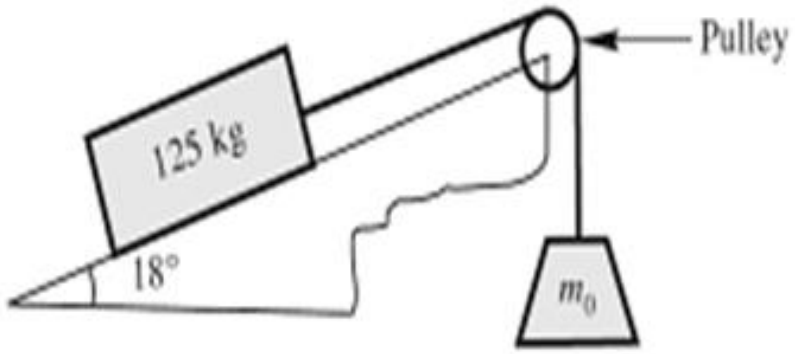
Block Friction: Problem 5

Example: What should be the value of angle $'\theta'$ so that motion of the block 200N impends down the plane take $\mu = 0.3$ For all contact surface. Figure shown below.



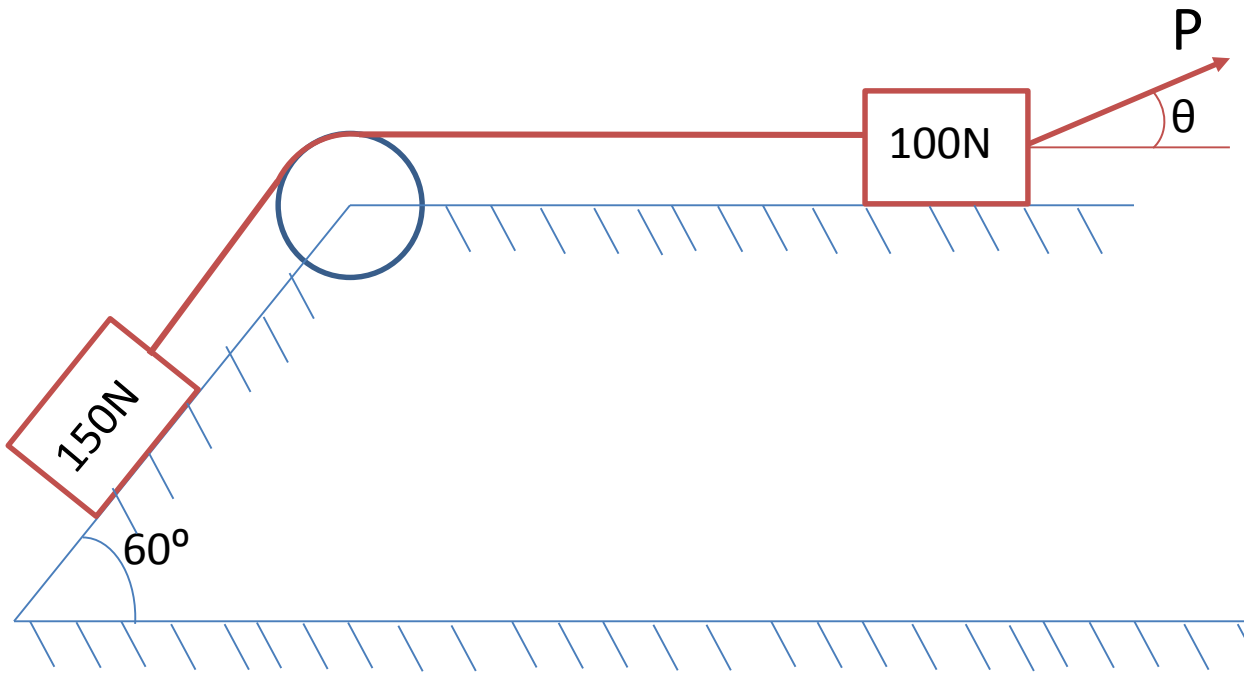
Block Friction: Problem 6

Determine the range of mass 'm_0' so that 125kg block shown in the fig will neither start moving up the plane nor slip down the plane.
Take μ_s =0.25.



Block Friction: Problem 7

Example: Determine the least value of the force P to cause motion to impend rightwards. Assume the co-efficient of friction under the blocks to be 0.2 and pulley to be frictionless.

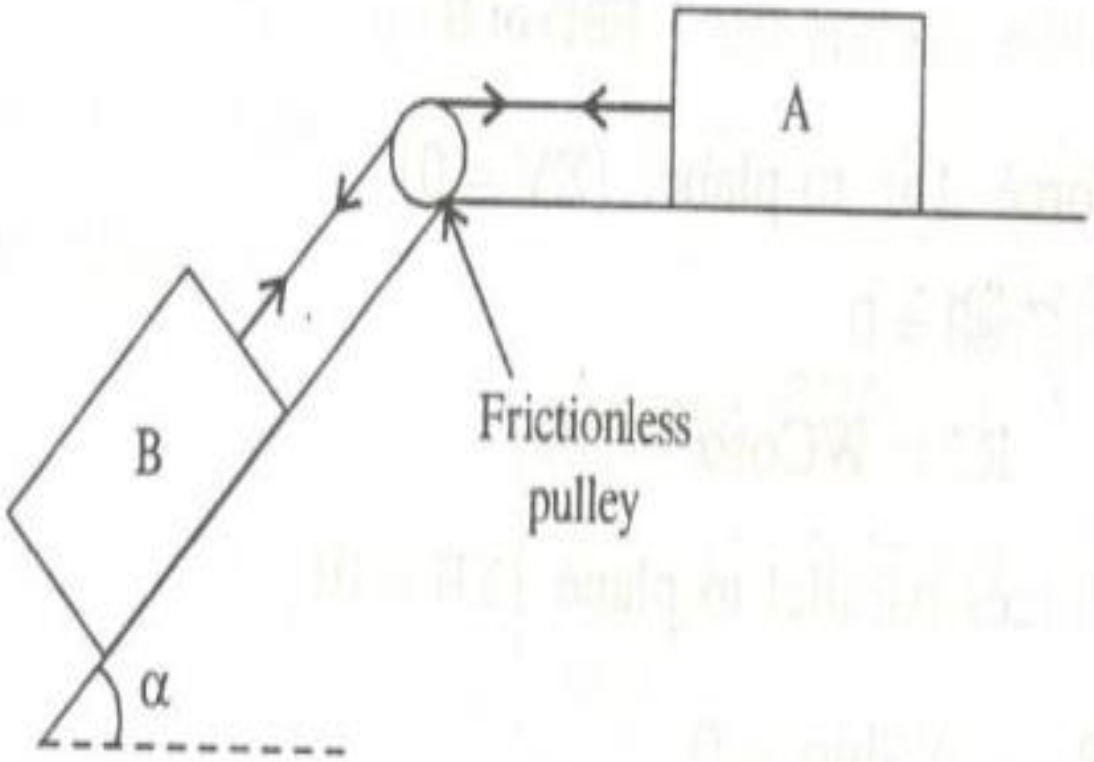


Θ = 11.31°

P=161.88N

Block Friction: Problem 8

Example: Two blocks A and B weighing W1 and W2 are connected as shown in figure. If W1=W2 And if μ is the coefficient of friction for all contact surfaces. Find the angle of inclination of Inclined plane α at which the motion of the system will impend



Summary

- Friction is the force resisting the relative motion of solid surfaces, fluid layers and material elements sliding against each other
- Based on the concept of friction, the sliding problems are solved