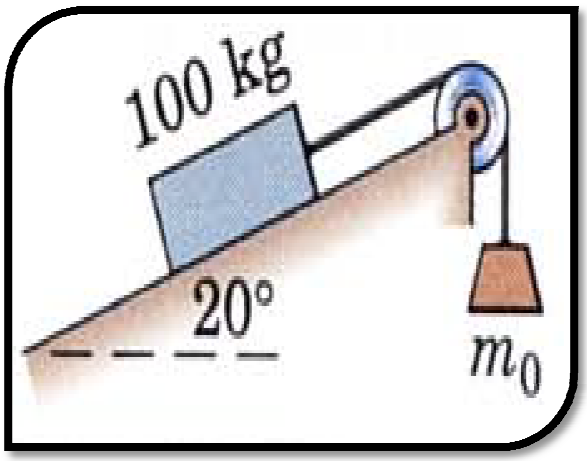
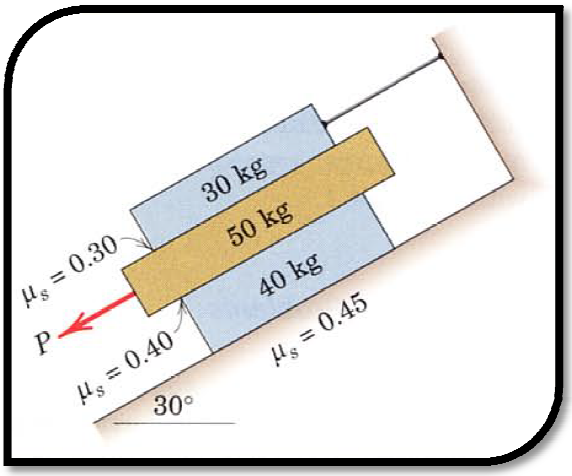
Tutorial no.: 3

Q.1:

Determine the range of values which the mass m_0 may have so that the 100-kg block shown in the figure will neither start moving up the plane nor slip down the plane. The coefficient of static friction for the contact surfaces is 0.30.





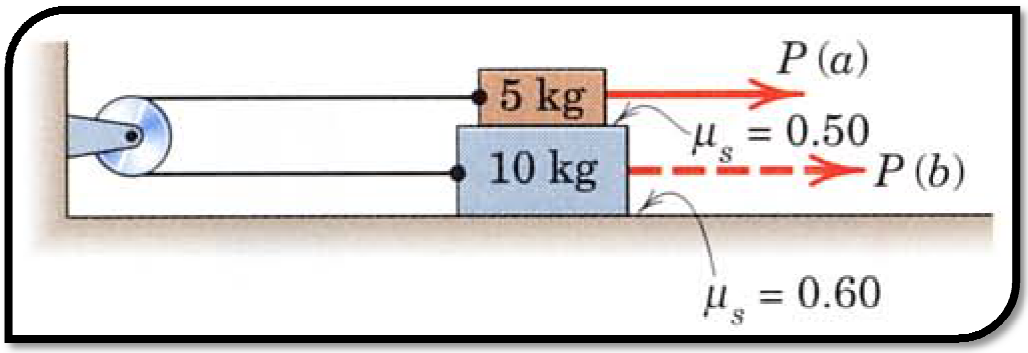
Q2:

The three flat blocks are positioned on the 30° incline as shown, and a force P parallel to the incline is applied to the middle block. The upper block is prevented from moving by a wire which attaches it to the fixed support. The coefficient of static friction for each of the three pairs of mating surfaces is shown. Determine the maximum value which P may have before any slipping takes place.

Q3:

The system of two blocks, cable, and fixed pulley is initially at rest. Determine the horizontal force P necessary to cause motion when (*a*) P is applied to the 5-kg block and (*b*) P is applied to the 10-kg block. Determine the corresponding tension T in the cable for each case.

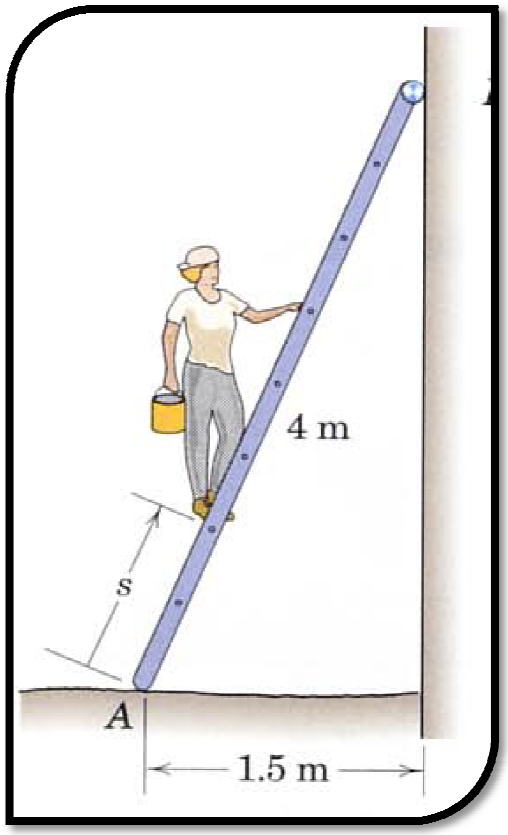
Ans. (*a*) $P = 137.3$ N, $T = 112.8$ N
(*b*) $P = 137.3$ N, $T = 24.5$ N



Q4:

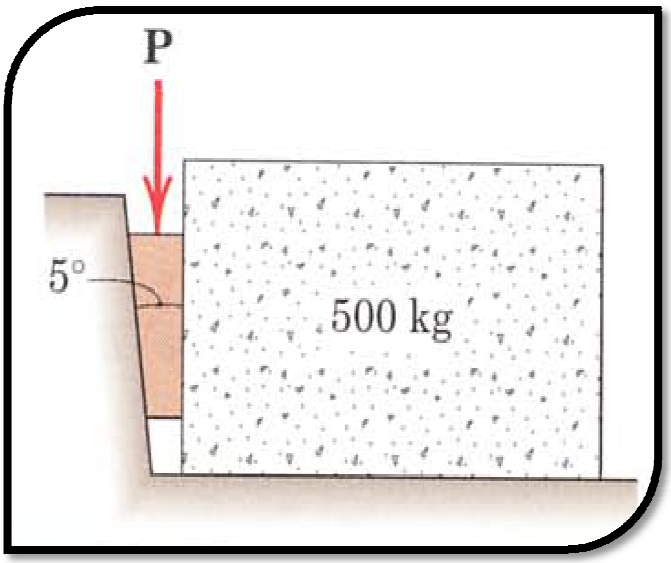
Determine the distance s to which the 90-kg painter can climb without causing the 4-m ladder to slip at its lower end A. The top of the 15-kg ladder has a small roller, and at the ground the coefficient of static friction is 0.25. The mass center of the painter is directly above her feet.

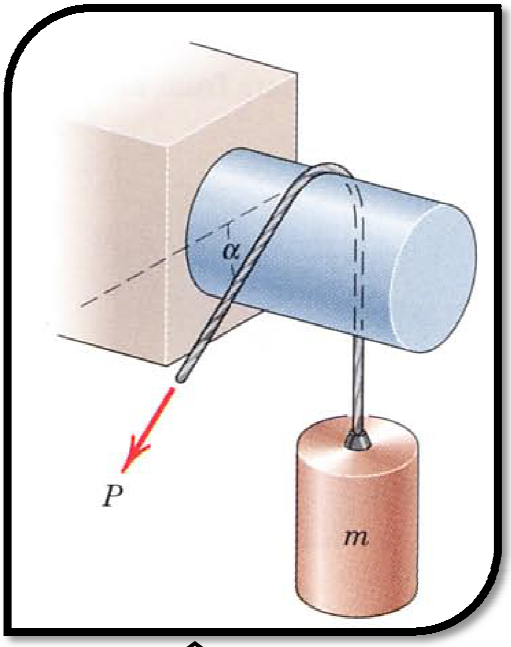
Ans. $s = 2.55$ m



Q5:

The horizontal position of the 500-kg rectangular block of concrete is adjusted by the 5° wedge under the action of the force **P**. If the coefficient of static friction for both pairs of wedge surfaces is 0.30 and if the coefficient of static friction between the block and the horizontal surface is 0.60, determine the least force P required to move the block.





Q6:

For a certain coefficient of friction μ and a certain angle α, the force P required to raise m is 4 kN and that required to lower m at a constant slow speed is 1.6 kN. Calculate the mass m.

Ans. $m = 258$ kg