

Unit 5 - Week 4

Course outline

How does an NPTEL online course work?

Week 1

Week 2

Week 3

Week 4

- 4.1 Static Friction
- 4.2 Friction - Solving Problems
- Notes on friction
- Quiz : Assignment 4**
- Quiz : Practice Assignment 4
- Engineering Mechanics - Statics and Dynamics: Week 4 Feedback Form
- Assignment 4 solutions

Week 5

Week 6

Week 7

Week 8

Download Videos

Text Transcripts

Assignment 4

The due date for submitting this assignment has passed. **Due on 2020-02-26, 23:59 IST.**
 As per our records you have not submitted this assignment.

- The magnitude of the frictional force acting between two surfaces depends on the area of contact between those two surfaces. True or False? **1 point**
 True
 False
 Cannot be said
No, the answer is incorrect.
 Score: 0
 Accepted Answers: False
 False
- The frictional force acting between two surfaces is independent of the surface texture of the surfaces. True or False? **1 point**
 True
 False
 Cannot be said
No, the answer is incorrect.
 Score: 0
 Accepted Answers: False
 False
- The frictional force, irrespective of the geometry of the surfaces in contact with each other, can only act in a direction which is perpendicular to the direction of the normal reaction between the same two surfaces. True or False? **1 point**
 True
 False
 Cannot be said
No, the answer is incorrect.
 Score: 0
 Accepted Answers: True
 True
- A body is placed on an inclined plane and static friction is not enough to hold that body stationary on the inclined plane. As the body slides down the inclined plane its speed increases. The magnitude of kinetic friction acting on the body will also increase along with the increasing speed. True or False? **1 point**
 True
 False
 Cannot be said
No, the answer is incorrect.
 Score: 0
 Accepted Answers: False
 False
- A rectangular block of mass m is placed on a horizontal plane. A horizontal force of magnitude F is applied to the box. If the block remains stationary even after the application the force, then the coefficient of static friction (μ_s) is given by F/mg , where g is the acceleration due to gravity. True or False? **1 point**
 True
 False
 Cannot be said
No, the answer is incorrect.
 Score: 0
 Accepted Answers: Cannot be said
 Cannot be said
- A body of mass 1 kg is placed on a horizontal plane with a coefficient of friction of 0.5 . It is first accelerated in the positive x -direction to a value 5 m/s by applying a force of 6 N . The direction of the force is changed suddenly to negative x -direction at this instant, then the direction of the frictional force acting on the block will also change immediately. True or False? **1 point**
 True
 False
 Cannot be said
No, the answer is incorrect.
 Score: 0
 Accepted Answers: False
 False
- A uniform rod is slowly lowered from the upright position $\theta = 90^\circ$ by means of chord attached to its upper end and passing through a small fixed pulley. If the rod is observed to slip at its lower end at $\theta = 60^\circ$, determine the coefficient of static friction at the surface. **1 point**

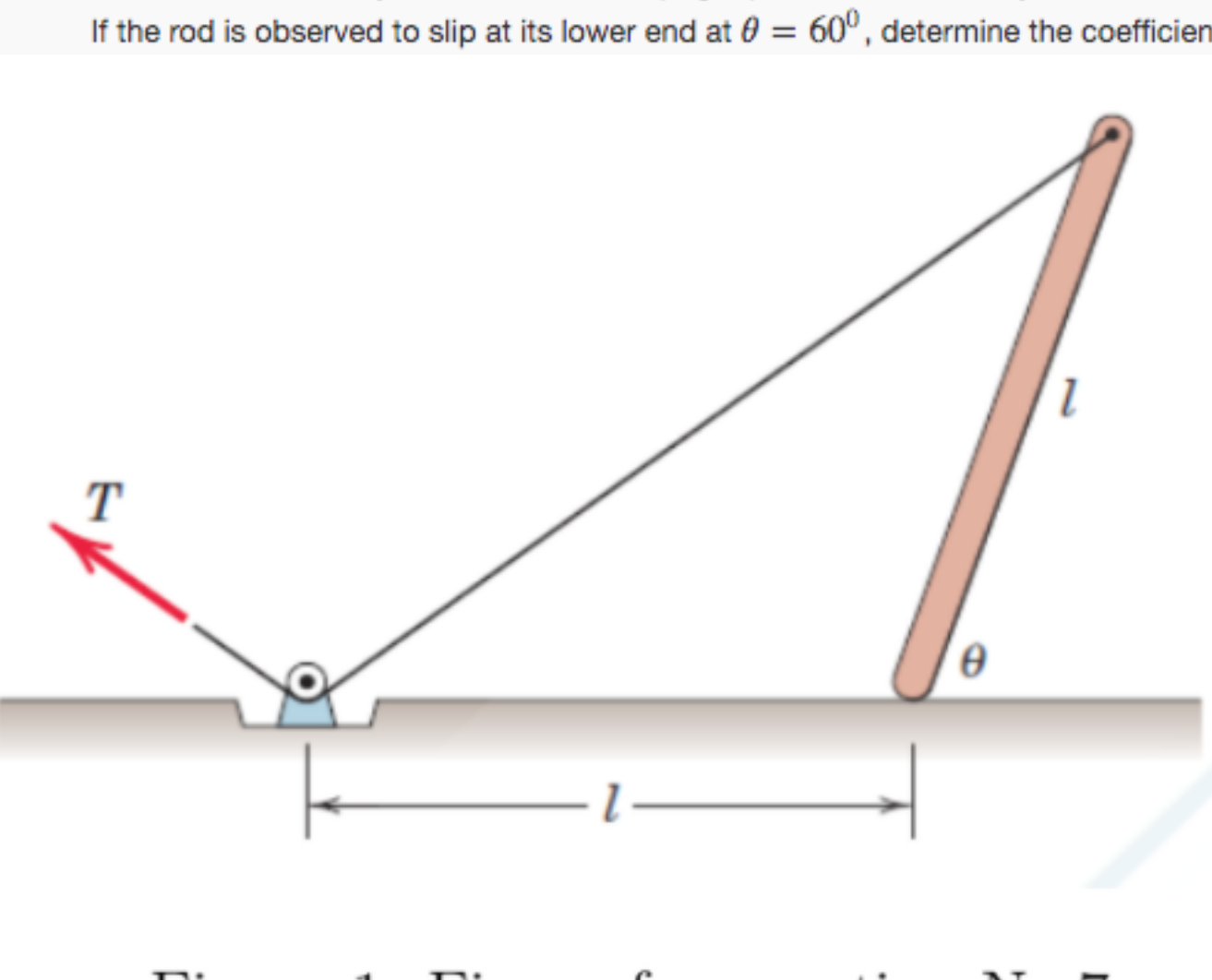


Figure 1: Figure for question No.7

No, the answer is incorrect.
 Score: 0
 Accepted Answers: 0.32,0.36
 (Type: Range) 0.32,0.36 **1 point**

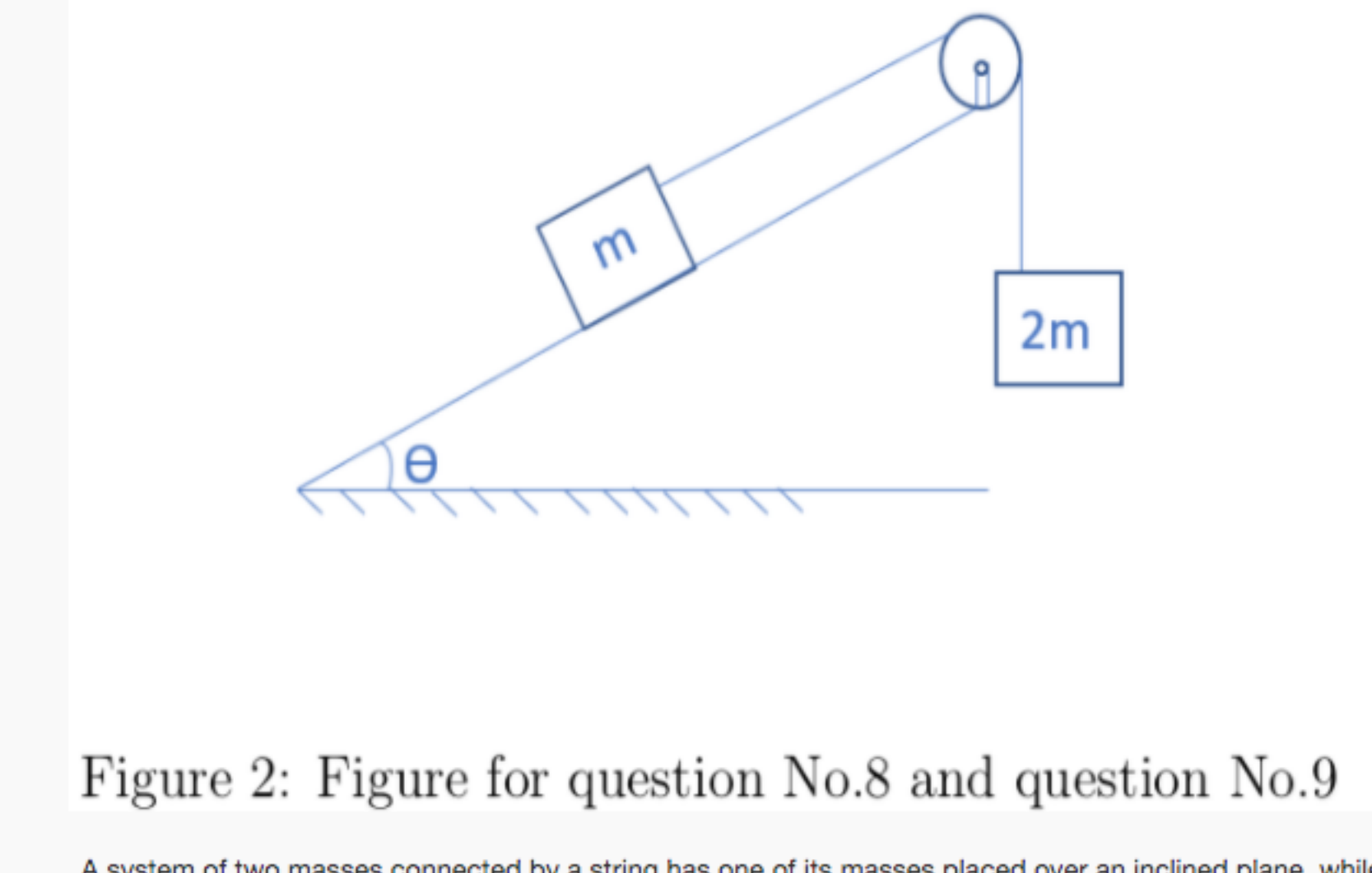


Figure 2: Figure for question No.8 and question No.9

A system of two masses connected by a string has one of its masses placed over an inclined plane, while the other mass hangs down with the string passing through a pulley fixed on the inclined plane. The inclined plane has an arrangement such that the angle of inclination θ of the plane can be varied if desired. If the angle of inclination is slowly increased until the block starts slipping on the plane, what is the minimum value of θ (in degrees) at which the slipping happens? The coefficients of static friction and kinetic friction are $\mu_s = \sqrt{3}$ and $\mu_k = 2/\sqrt{3}$ respectively for the block on the inclined plane

No, the answer is incorrect.
 Score: 0
 Accepted Answers: 27,33
 (Type: Range) 27,33 **1 point**

9) For the same system as in question 8, if a is the magnitude of the acceleration of the block after it just starts to slip on the inclined plane, what is the value of a/g ? (for example if a is $1.4g$ then register as 1.4) **1 point**

No, the answer is incorrect.
 Score: 0
 Accepted Answers: 0.14,0.20
 (Type: Range) 0.14,0.20 **1 point**

10) A homogeneous block of mass m with the dimensions as given in the figure 3 is placed on a horizontal surface. The block is subjected to a horizontal force P acting at a height of h , which moves the block along the surface with constant velocity. Determine the greatest value h/b may have so that the block will slide without tipping over. The coefficients of static and kinetic friction are $\mu_s = 0.8$ and $\mu_k = 0.5$ respectively. **1 point**

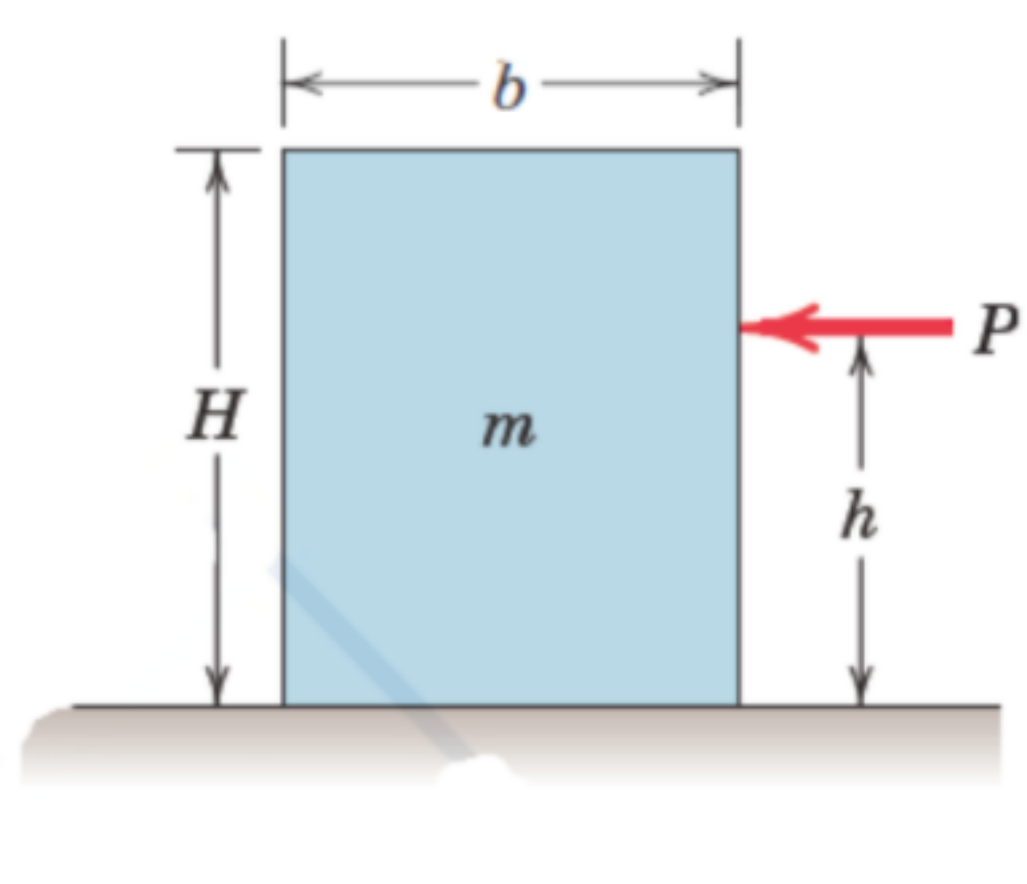


Figure 3: Figure for question No.10

No, the answer is incorrect.
 Score: 0
 Accepted Answers: 1
 (Type: Numeric) 1 **1 point**

11) A drum with inner hub is to be rolled up an inclined plane having an inclination of 30° at a steady speed without slipping by applying a force P as shown in the figure. What is the minimum coefficient of static friction μ_s required for this to happen? **1 point**

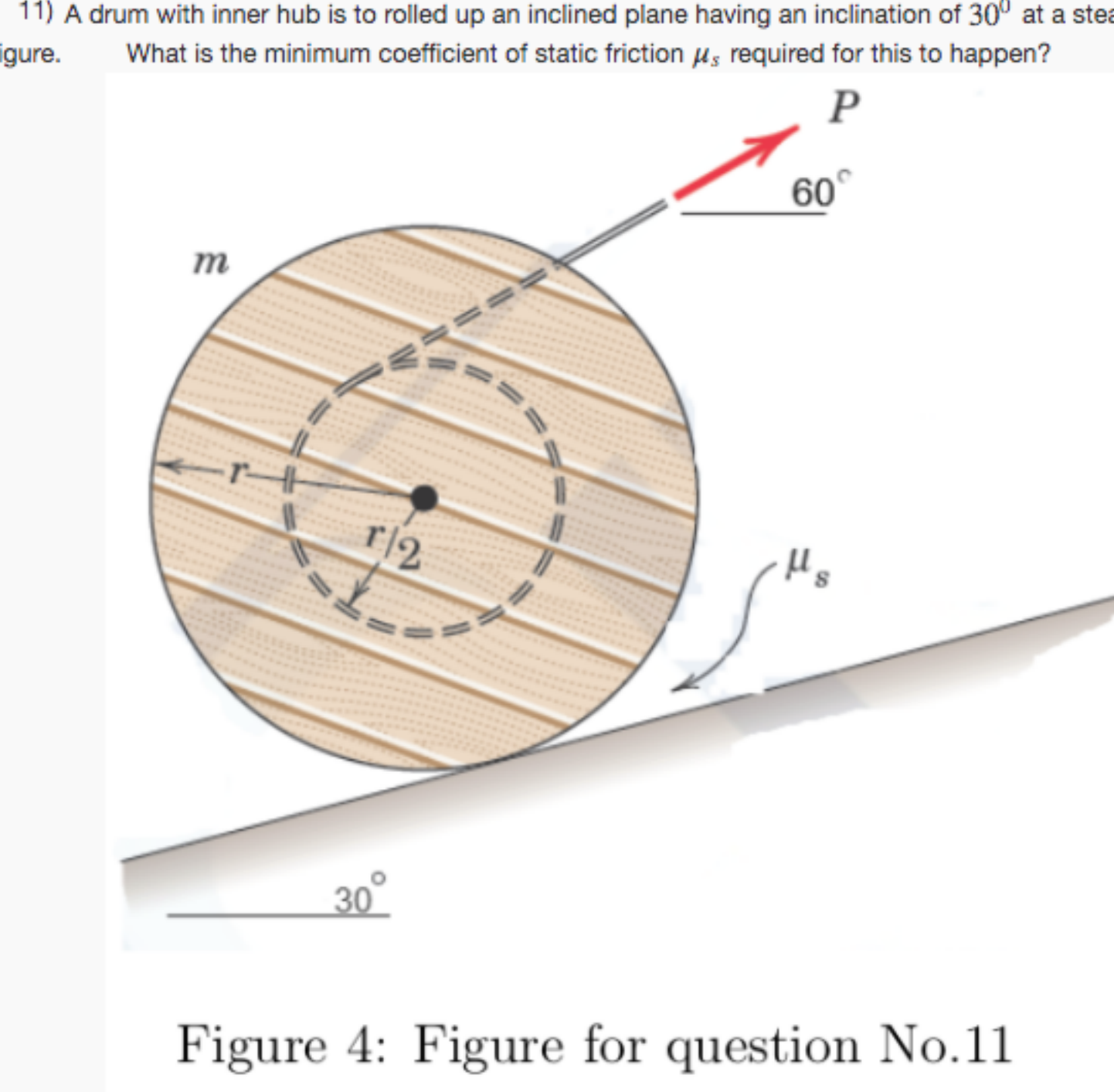


Figure 4: Figure for question No.11

No, the answer is incorrect.
 Score: 0
 Accepted Answers: 0.25,0.28
 (Type: Range) 0.25,0.28 **1 point**

12) If the coefficient of static friction at A is $\mu_s = 0.4$ and collar at B is smooth so that it offers only horizontal force to the pipe, determine the minimum distance x (in meters) so that the bracket can support the mass without slipping. Neglect mass of the bracket **1 point**

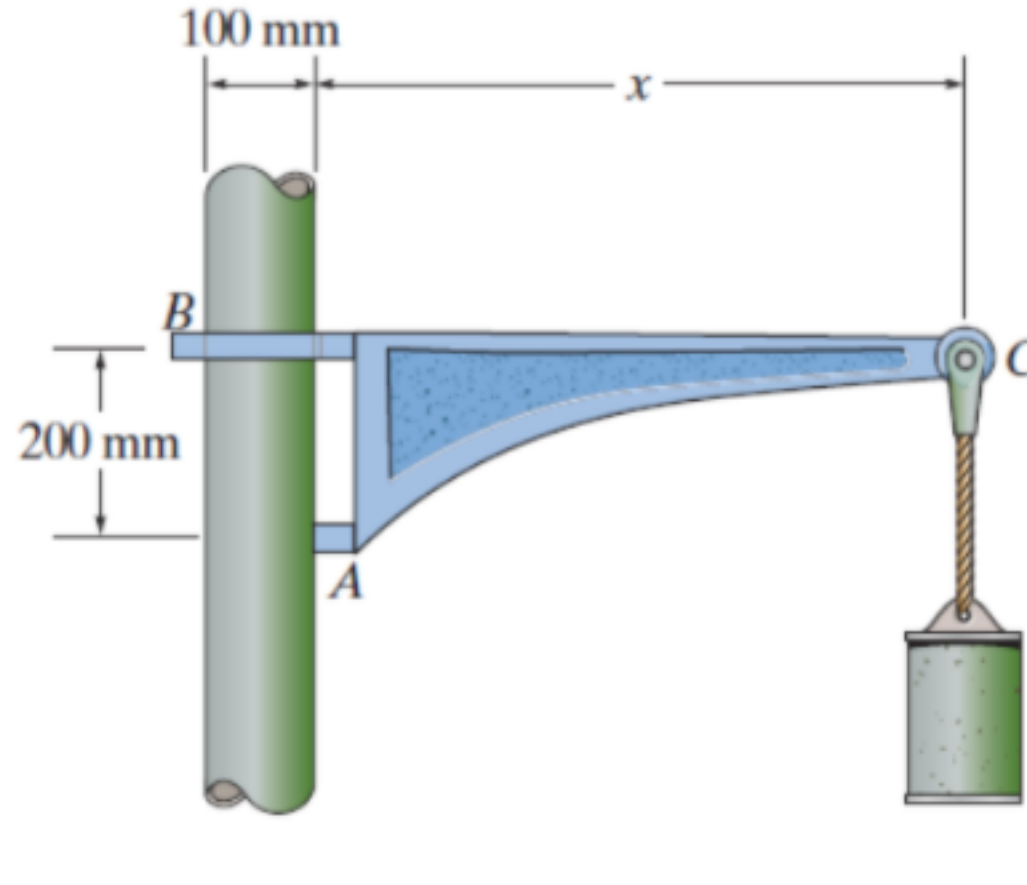


Figure 5: Figure for question No.12

0.5
 1
 2
 2.5
No, the answer is incorrect.
 Score: 0
 Accepted Answers: 0.5
 0.5 **1 point**

13) Find the maximum height h in meters to which the girl can walk up the slide without supporting herself by rails or her left leg. The coefficients of static and kinetic friction between girls shoe's and the slide are $\mu_s = 0.8$ and $\mu_k = 0.6$ respectively. The slide is 3 meters long along x -direction. **1 point**

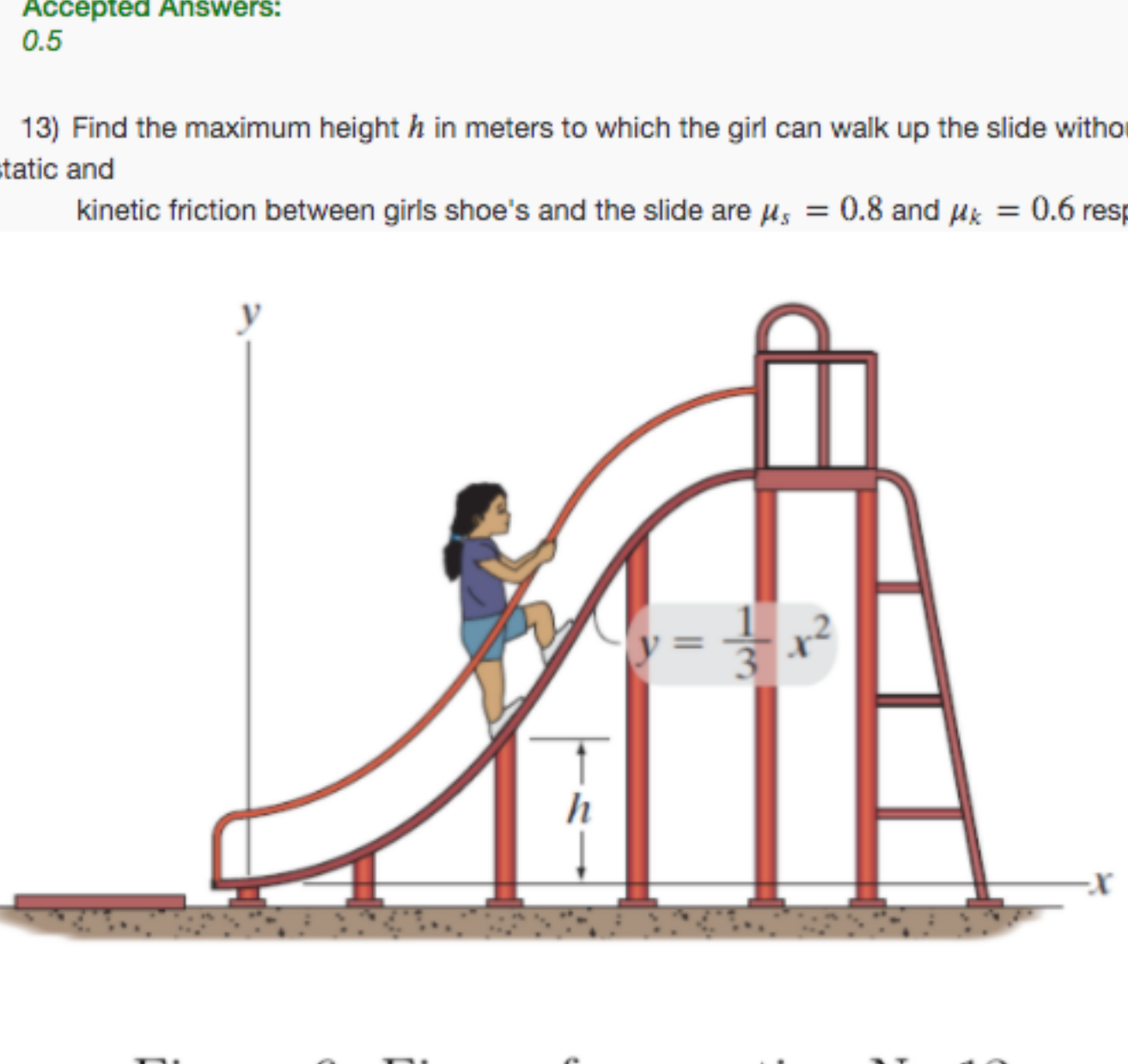


Figure 6: Figure for question No.13

0.9
 1.2
 3
 Depends on the speed at which the girl ascends the slide
No, the answer is incorrect.
 Score: 0
 Accepted Answers: 1.2
 1.2 **1 point**

14) The blocks A,B and C have masses respectively 5 kg , 2.5 kg and 1.5 kg respectively. The coefficient of static friction between A and B is $\mu_1 = 0.3$, between B and C is $\mu_2 = 0.4$ and between C and ground is $\mu_3 = 0.35$. Determine the minimum horizontal force P in N required to cause an impending motion.(Take $g = 10\text{ m/s}^2$) **1 point**

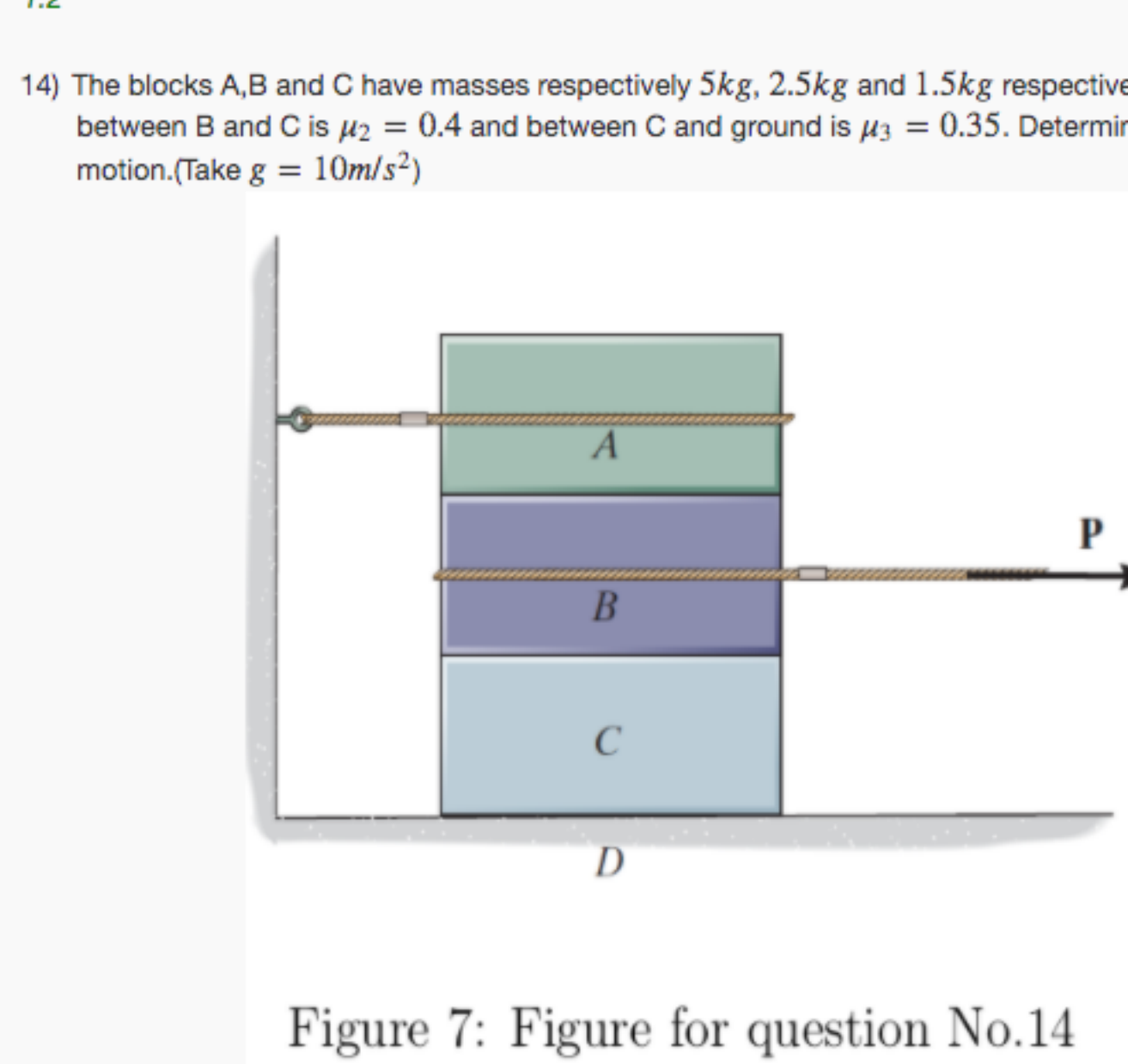


Figure 7: Figure for question No.14

45
 47.5
 31.5
 None of the above
No, the answer is incorrect.
 Score: 0
 Accepted Answers: 45
 45 **1 point**