

Title: Practice Tutorial

Code name: practice_tutorial

Date: July 2, 2023 Draft: Final before filming

Unspoken notes are in [square brackets]

IVET Page: [login](#)

[No video; this page is only for logging in. Use the default login page.]

[Next page link: intro]

IVET Page: [intro](#)

TEXT:

This tutorial will guide you through a typical physics problem.

The guidance you'll get will either be in written form or as videos.

The videos will often have more details and tips than the text version.

So click the options button now to make the choice you want to start with, and you can always change your choice at any time.

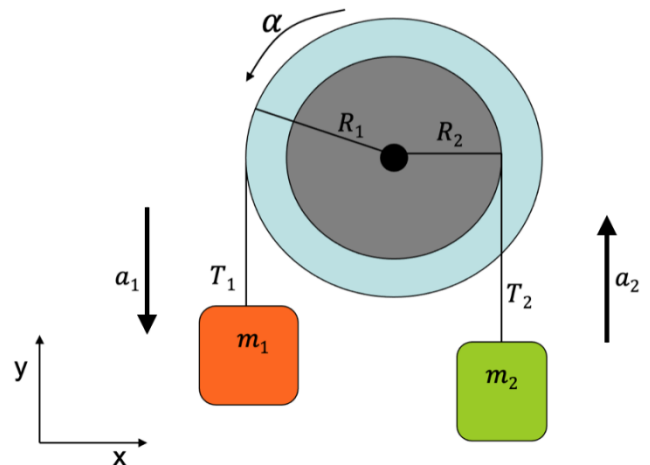
Also, this tutorial works best on a tablet, laptop, or desktop, but not as well on a smartphone.

[Next page link: problem]

IVET Page: [problem](#)

TEXT:

Two blocks $m_1=1.0$ kg and $m_2=0.6$ are hanging from a pulley as shown in the figure. The moment of inertia through the axis of rotation passing through the center of the pulley is $I=1.70$ kgm². The ropes are attached at two different distances from the center of the pulley $R_1=30$ cm and $R_2=30$ cm. Find the angular acceleration α of the pulley system and the tensions T_1 and T_2 .



[Next page link: plan]

IVET Page: [problemStatement](#)

[Same text and image as problem page]

[Next page link: none, because this is not a normal page.]

TEXT: [spoken in video only; no text option for this page]

Make sure you have a piece of paper and a pencil. Before you work through this tutorial, take a couple of minutes to write down your own plan to solve this problem. Summarize your plan by typing key words or phrases in the box below. Then proceed to the next page and work through each of the multiple-choice questions that will guide you through the problem-solving steps. Keep taking notes as you go through every step. You'll need those notes as the tutorial progresses!

QUESTION: [textbox]

Keep good notes as you go through this tutorial. You will need them. Briefly summarize your plan for solving the problem in the box below:

[Next page link: q1]

TEXT:

[Same text and image as problem page]

Q1. Which physics principle(s) should we use to solve this problem? Choose all that apply.

- A. Newton's 2nd law for translations $\Sigma \vec{F} = m\vec{a}$
- B. Conservation of Mechanical Energy
- C. Newton's 2nd law for translations $\Sigma \tau = I\alpha$ where τ is the torque about a chosen point

[Next page links for the multiple-select question]

Choice	Next Page
AC (correct)	q1a
A	q1b
C	q1c
Default (any other choice)	q1d

TEXT:

We will use both the translational and rotational forms of Newton's 2nd Law. The translational form $\Sigma \vec{F} = m\vec{a}$ will apply to the two blocks. The rotational form $\Sigma \tau = I\alpha$ will apply to the rotation of the pulley. We assume that the rope is massless, so Newton's 2nd Law is not needed for it.

[Next page link: q2]

TEXT:

It is true that we will need the translational form of Newton's 2nd Law for the blocks. However, the pulley stays in the same position and rotates. Go back to the question and try again.

[Next page link: q1]

IVET Page: q1c

[explanation for students who chose C]

TEXT:

It is true that we will need the rotational form of Newton's 2nd Law for the pulley. However, the blocks also move. Go back to the question and try again.

[Next page link: q1]

IVET Page: q1d

[explanation for students who made any other choice]

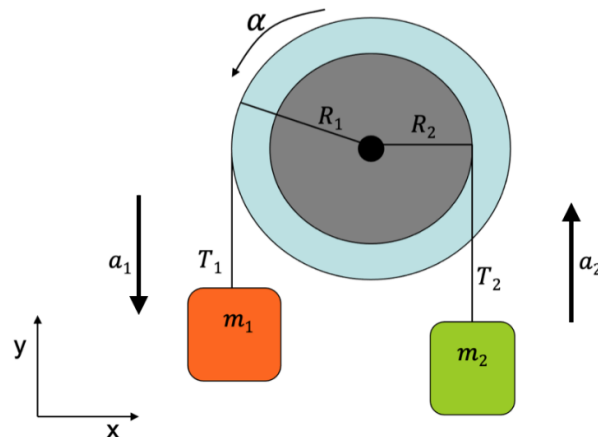
TEXT:

We are asked to find forces and angular accelerations. The Law of Conservation of Mechanical Energy will not be helpful, because these quantities do not appear explicitly in the equations for mechanical energy. Go back to the question and try again.

[Next page link: q1]

IVET Page: q2

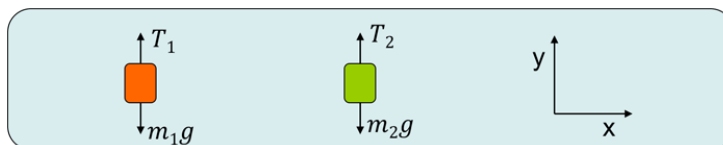
TEXT:



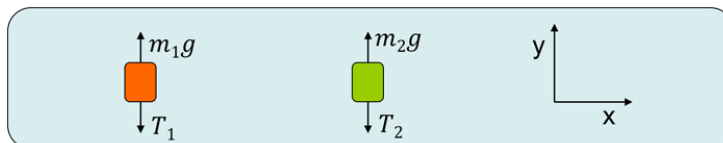
Whenever we use Newton's Second Law to solve a problem, we should always draw a free body diagram for each object.

Q2. Which one of the following pairs of free-body diagrams correctly depicts all of the forces acting on blocks 1 and 2?

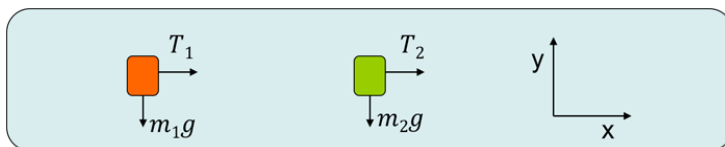
A



B



C

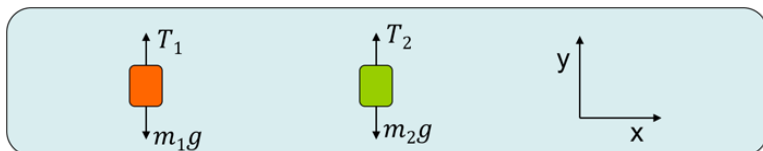


[Next page links: A: q2a, B: q2b, C: q2c]

IVET Page: q2a

[hint for students who selected A; Correct]

TEXT:



Yes, these diagrams correctly depict all of the forces acting on the two blocks.

[Next page link: q3]

IVET Page: q2b

[hint for students who selected B]

TEXT:

The force of gravity (with magnitude given by the weight $W = mg$) acts in the negative y-direction on both blocks. Also, when a rope is attached to an object, the tension force acting on the object is directed away from the object along the rope.

[Next page link: q2]

IVET Page: q2c

[hint for students who selected C]

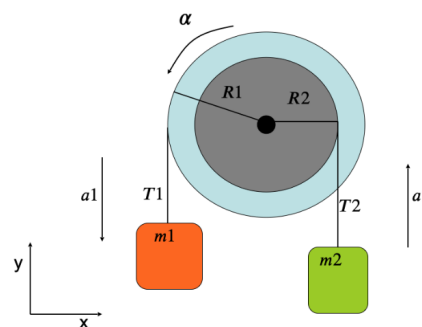
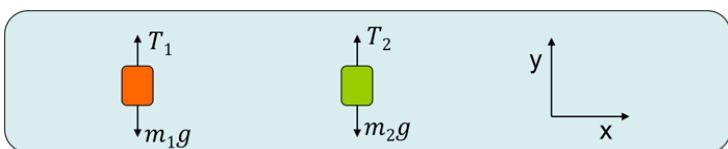
TEXT:

There are no forces acting in the positive or negative x-direction on either block.

[Next page link: q2]

IVET Page: q3

TEXT:



Q3. Which one of the following expressions is a correct statement from Newton's 2nd Law for the forces acting on block 1 parallel to the y-direction?

A: $T_1 = m_1 a_1$

$$\text{B: } T_1 - m_1 g = -m_1 a_1$$

$$\text{C: } T_1 - m_1 g = 0$$

[Next page links: A: q3a, B: q3b, C: q3c]

IVET Page: q3a

[Choice A]

TEXT:

The force of tension is not the only force acting upon block 1. Please check the free-body diagram and try again.

[Next page link: q3]

IVET Page: q3b

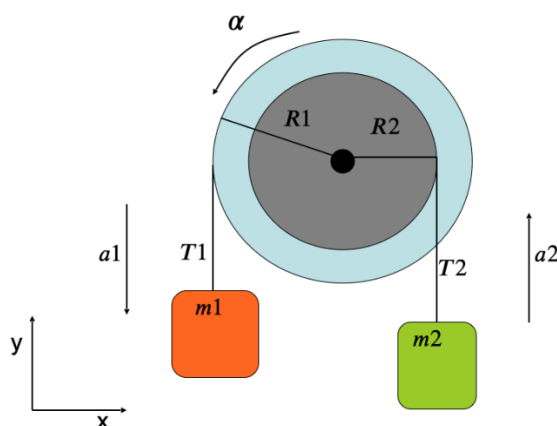
[Choice B; Correct]

TEXT:

Using Newton's 2nd Law and the free-body diagram for block 1, we find:

$$\Sigma F_y = T_1 - m_1 g = -m_1 a_1$$

Using the convention in the diagram in the original problem statement, block 1 is accelerating downwards so we use $-a_1$ for its acceleration.



[Next page link: chooseSummary]

IVET Page: q3c

[Choice C]

TEXT:

The blocks and pulley are not in static equilibrium, therefore:

$$\Sigma F_y \neq 0$$

[Next page link: q3]

IVET Page: chooseSummary

[TEXT-ONLY PAGE]

Do you want to see a video summary of what we have done so far, or would you rather continue with the tutorial?

- A. Watch a video summary.
- B. Continue with the tutorial.

[Next page links: A: summary, B: whatLearned]

IVET Page: summary [VIDEO-ONLY PAGE]

[use video summary of the whole problem-solving process]

[Next page link: whatLearned]

IVET Page: whatLearned

[no video on this page; text box asking what the student learned]

[Use the default whatLearned page]

[Next page link: completion]

IVET Page: completion

[no video on this page; pre-defined page with completion certificate]

[Use the default completion page]