

Title: Practice Tutorial

Code name: practice_tutorial

Date: July 12, 2023 Draft: Formatted after 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

VIMEO:

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<div style="padding:56.25% 0 0 0;position:relative;"><iframe src="https://player.vimeo.com/video/345069735?
badge=0&autoplay=0&player_id=0&app_id=58479" frameborder="0" allow="autoplay;
fullscreen; picture-in-picture" allowfullscreen style="position:absolute;top:0;left:0;width:100%;height:100%;"
title="IVET-Intro-1"></iframe></div><script src="https://player.vimeo.com/api/player.js"></script>
```

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.

FORMATTED TEXT:

This tutorial will guide you through a typical physics problem.

</p><p class="normTxt" >

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</p><p class="normTxt" >

Ready? Let's get started!

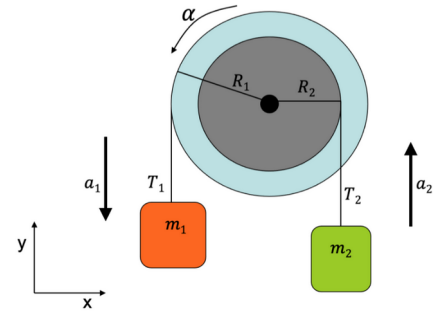
[Next page link: problem]

YouTube:

<https://youtu.be/YzycxckGE0g>

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 .



FORMATTED TEXT:

Two blocks ($m_1 = 1.0$ kg, $m_2 = 0.6$ kg) 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 $R_2 = 20$ cm).
Find the angular acceleration α of the pulley system and the tensions T_1 and T_2 .

[IMAGE: TR1-problem.png]

[Next page link: plan]

[No video]

[Same text and image as problem page]

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

VIMEO:

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badge=0&autoplay=0&player_id=0&app_id=58479" frameborder="0" allow="autoplay;
fullscreen; picture-in-picture" allowfullscreen style="position:absolute;top:0;left:0;width:100%;height:100%;"
title="IVET-Notes-Textbox"></iframe></div><script src="https://player.vimeo.com/api/player.js"></script>
```

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!

FORMATTED TEXT: [Same as TEXT]

QUESTION: [non-branching 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]

VIMEO:

<div style="padding:56.25% 0 0 0;position:relative;"><iframe src="https://player.vimeo.com/video/371247921?h=227b13d192&badge=0&autoplay=0&player_id=0&app_id=58479" frameborder="0" allow="autoplay; fullscreen; picture-in-picture" allowfullscreen style="position:absolute;top:0;left:0;width:100%;height:100%;" title="TRT1-Q1"></iframe></div><script src="https://player.vimeo.com/api/player.js"></script>

TEXT:

[Same text and image as problem page]

FORMATTED TEXT:

Two blocks ($m_1 = 1.0$ kg, $m_2 = 0.6$ kg) 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 $R_2 = 20$ cm).
 Find the angular acceleration α of the pulley system and the tensions T_1 and T_2 .

[IMAGE: TR1-problem.png]

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

FORMATTED QUESTION:

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

A. Newton's 2nd Law for translations: $\Sigma F = m a$

B. Conservation of Mechanical Energy

C. Newton's 2nd Law for rotations: $\Sigma \tau = I \alpha$ 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 |

VIMEO:

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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.

FORMATTED TEXT:

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

[Next page link: q2]

VIMEO:

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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.

FORMATTED TEXT: [Same as TEXT]

[Next page link: q1]

VIMEO:

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<div style="padding:56.25% 0 0 0;position:relative;"><iframe src="https://player.vimeo.com/video/371247504?h=4f92a280ad&badge=0&autoplay=0&player_id=0&app_id=58479" frameborder="0" allow="autoplay; fullscreen; picture-in-picture" allowfullscreen style="position:absolute;top:0;left:0;width:100%;height:100%;" title="TRT1-Q1-D"></iframe></div><script src="https://player.vimeo.com/api/player.js"></script>
```

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.

FORMATTED TEXT: [Same as TEXT]

[Next page link: q1]

VIMEO:

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<div style="padding:56.25% 0 0 0;position:relative;"><iframe src="https://player.vimeo.com/video/371247219?h=f623e923e2&badge=0&autoplay=0&player_id=0&app_id=58479" frameborder="0" allow="autoplay; fullscreen; picture-in-picture" allowfullscreen style="position:absolute;top:0;left:0;width:100%;height:100%;" title="TRT1-Q1-B"></iframe></div><script src="https://player.vimeo.com/api/player.js"></script>
```

TEXT:

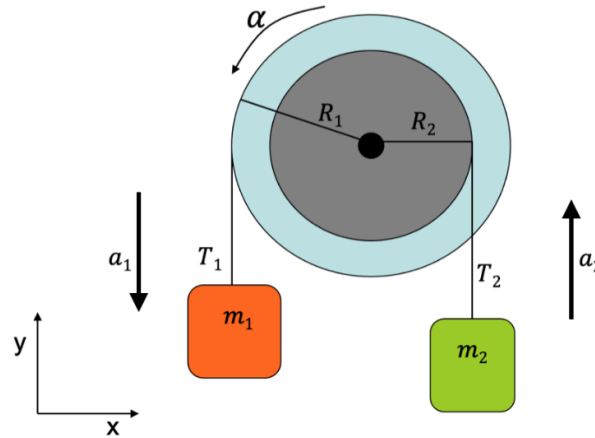
We are asked to find forces and angular accelerations. The Law of Conservation of Mechanical Energy will not be helpful, because these quantities do not appear explicitly in the equations for mechanical energy. Go back to the question and try again.

FORMATTED TEXT: [Same as TEXT]

[Next page link: q1]

VIMEO:

<div style="padding:56.25% 0 0 0;position:relative;"><iframe src="https://player.vimeo.com/video/371248662?h=2f272e6ef9&badge=0&autoplay=0&player_id=0&app_id=58479" frameborder="0" allow="autoplay; fullscreen; picture-in-picture" allowfullscreen style="position:absolute;top:0;left:0;width:100%;height:100%;" title="TRT1-Q2"></iframe></div><script src="https://player.vimeo.com/api/player.js"></script>

TEXT:

[IMAGE: q2.png]

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

FORMATTED TEXT: [Same as TEXT]

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

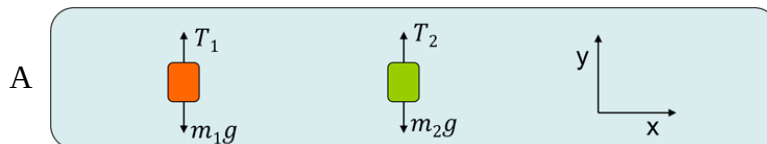


IMAGE:
Q2-ANS-A.png

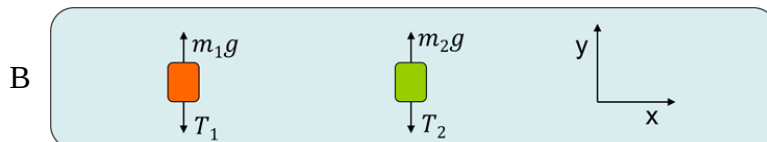


IMAGE:
Q2-ANS-B.png

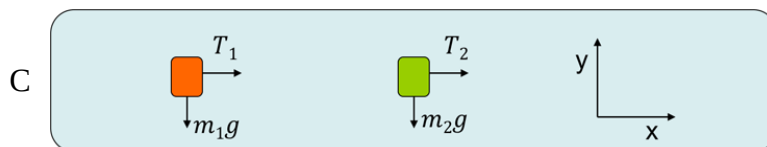


IMAGE:
Q2-ANS-C.png

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

VIMEO:

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```

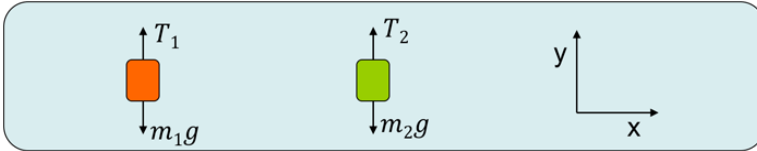
TEXT:

IMAGE: Q2-ANS-A.png

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

FORMATTED TEXT: [Same as TEXT]

[Next page link: q3]

VIMEO:

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<div style="padding:56.25% 0 0 0;position:relative;"><iframe src="https://player.vimeo.com/video/371248152?h=a506f87a3c&badge=0&autoplay=0&player_id=0&app_id=58479" frameborder="0" allow="autoplay; fullscreen; picture-in-picture" allowfullscreen style="position:absolute;top:0;left:0;width:100%;height:100%;" title="TRT1-Q2-B"></iframe></div><script src="https://player.vimeo.com/api/player.js"></script>
```

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.

FORMATTED 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]

VIMEO:

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<div style="padding:56.25% 0 0 0;position:relative;"><iframe src="https://player.vimeo.com/video/371248282?h=8161627f36&badge=0&autoplay=0&player_id=0&app_id=58479" frameborder="0" allow="autoplay; fullscreen; picture-in-picture" allowfullscreen style="position:absolute;top:0;left:0;width:100%;height:100%;" title="TRT1-Q2-C"></iframe></div><script src="https://player.vimeo.com/api/player.js"></script>
```

TEXT:

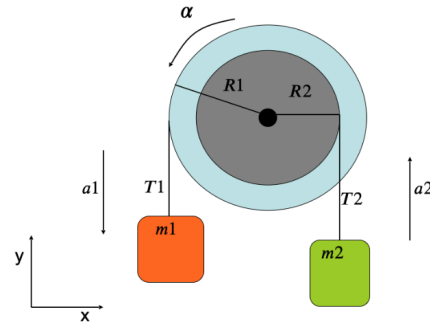
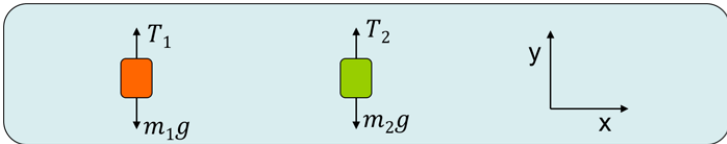
There are no forces acting in the positive or negative x-direction on either block.

FORMATTED TEXT: [Same as TEXT]

[Next page link: q2]

VIMEO:

<div style="padding:56.25% 0 0 0;position:relative;"><iframe src="https://player.vimeo.com/video/371249295?h=933b7e568f&badge=0&autoplay=0&player_id=0&app_id=58479" frameborder="0" allow="autoplay; fullscreen; picture-in-picture" allowfullscreen style="position:absolute;top:0;left:0;width:100%;height:100%;" title="TRT1-Q3"></iframe></div><script src="https://player.vimeo.com/api/player.js"></script>

TEXT:

[IMAGE: Q2-ANS-A.png change width to 300px]

[IMAGE: q2.png change width to 300px]

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: $T_1 = m_1 a_1$
- B: $T_1 - m_1 g = -m_1 a_1$
- C: $T_1 - m_1 g = 0$

FORMATTED QUESTION:

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: $T_{1} = m_{1} a_{1}$
- B: $T_{1} - m_{1} g = -m_{1} a_{1}$
- C: $T_{1} - m_{1} g = 0$

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

VIMEO:

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```

TEXT:

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

FORMATTED TEXT: [Same as TEXT]

[Next page link: q3]

VIMEO:

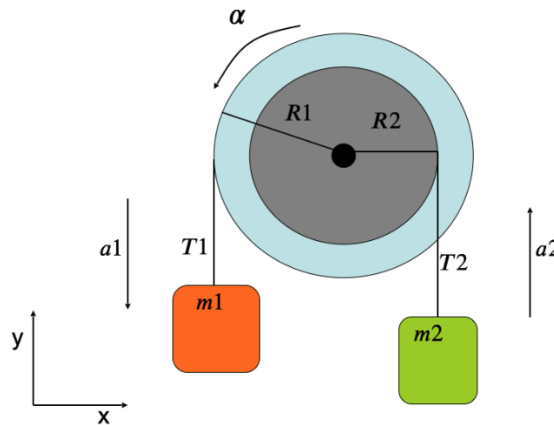
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```

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.

**FORMATTED TEXT:**

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

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

[IMAGE: q2.png]

[Next page link: chooseSummary]

VIMEO:

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```

TEXT:

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

$$\Sigma F_y \neq 0$$

FORMATTED TEXT:

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

</p><p class="normTxt" style="text-align:center;">

Σ F_y ≠ 0

[Next page link: q3]

TEXT: [none; remove the "page_content" paragraph]

[Branching multiple-choice (radio button) question]

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]

VIMEO:

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<div style="padding:56.25% 0 0 0;position:relative;"><iframe src="https://player.vimeo.com/video/371246510?h=1a0cf5e6e2&badge=0&autoplay=0&player_id=0&app_id=58479" frameborder="0" allow="autoplay; fullscreen; picture-in-picture" allowfullscreen style="position:absolute;top:0;left:0;width:100%;height:100%;" title="TRT1-summary-2"></iframe></div><script src="https://player.vimeo.com/api/player.js"></script>
```

[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]

[Next page link: none; end of vignette]