PhysH308

Continued review of Newtonian Mechanics

Ted Brzinski, Sept 5, 2024

General problem solving tips

Getting started!

- Use the whiteboards! (I should have more next week) — communal workspace makes for effective collaboration
    - For the digital whiteboards, consider a (free) vibe pro account to work on multiple devices, save your boards. You can always export a pdf.
- Write down what you know, and what you are trying to find.
- Draw pictures! — free body diagrams, graphs, etc will help you organize your thinking whenever applicable.

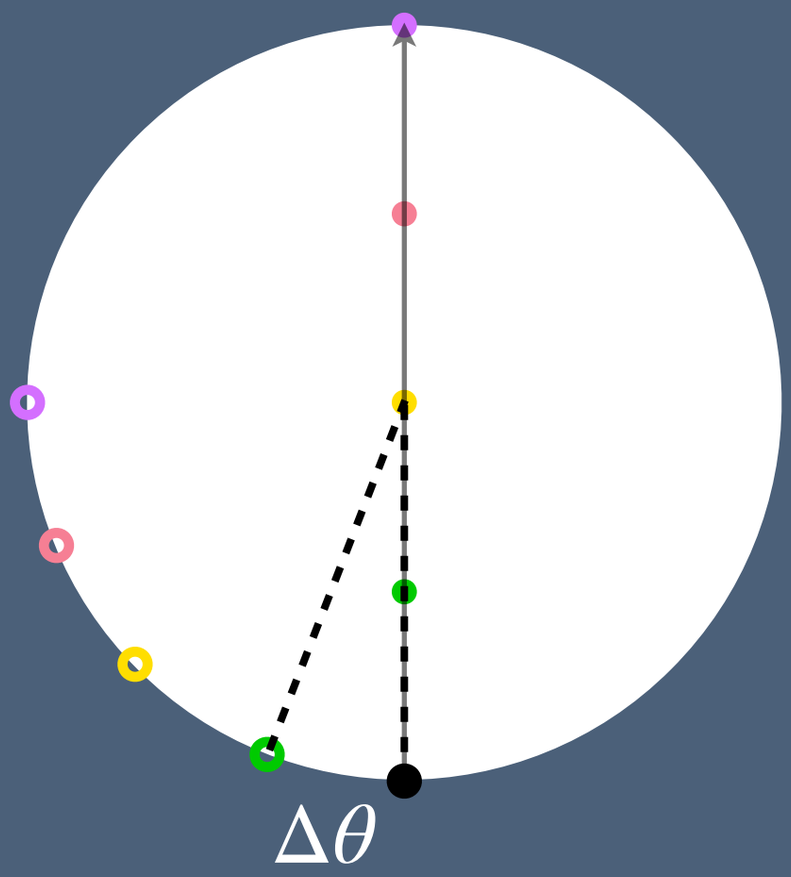
Ex: drawing pictures

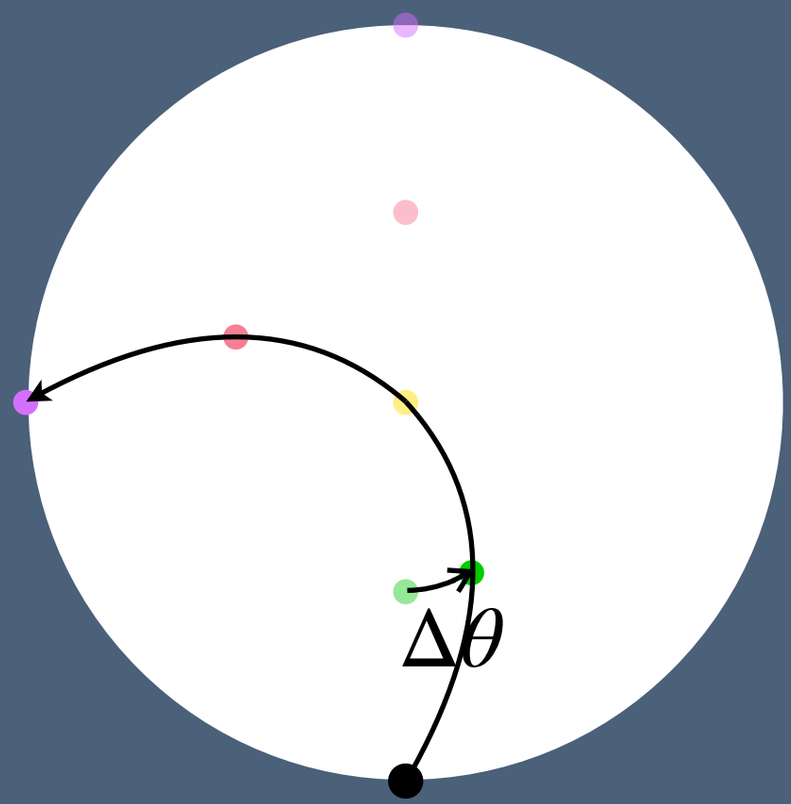
1.27

Lab frame

Rotating frame

t= 0, 1/4, 1/2, 3/4, 1





General problem solving tips

Check your answer

- Dimensional analysis! What are the units of your solution? Do they match? A ratio of an area to a time is *not* an acceleration.
- Check limits, special cases, etc (e.g., for the book problem, what if $\theta = 90°$?)
- Check against your physical intuition and contextual knowledge (e.g., does the answer scale realistically with other variables)

Plan for today

Mathstravaganza+continuing your work

- I should be finishing this by 10:10ish
- 10:10-10:20:
  - Discuss with your group which problem you will present (5 mins)
  - Write the problem on the front whiteboard, along with the math concept reviewed
  - Share the solution within your group (5 mins)
- 10:20 - 11:00 (3-4 min/group): share with the class
  - State what math you've reviewed
  - Outline how you use that math in your solution
- The rest of class - work on the problems from Tuesday

One problem not from the book

2.4. **Keeping a book up** *

A book of mass M is positioned against a vertical wall. The coefficient of friction between the book and the wall is μ. You wish to keep the book from falling by pushing on it with a force F applied at an angle θ with respect to the horizontal ($-\pi/2 < \theta < \pi/2$), as shown in Fig. 2.10.

(a) For a given θ, what is the minimum F required?
(b) For what θ is this minimum F the smallest? What is the corresponding minimum F?
(c) What is the limiting value of θ, below which there does not exist an F that keeps the book up?

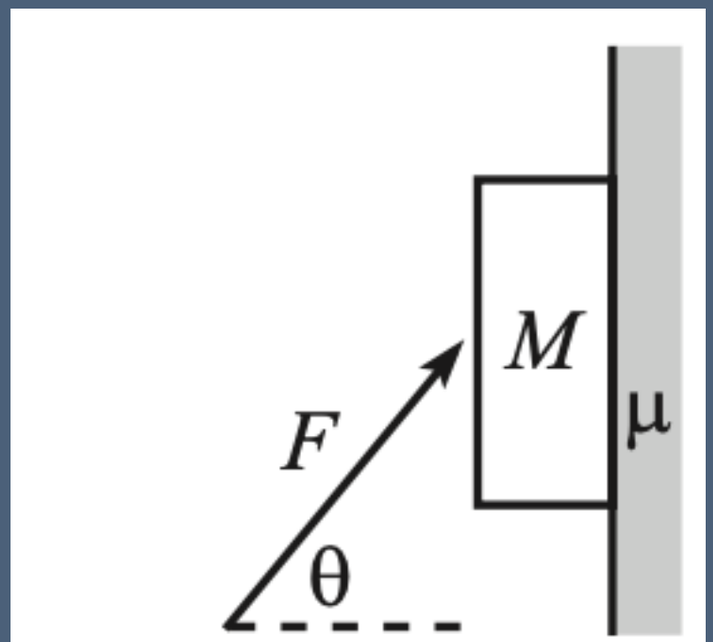


Fig. 2.10

2.23. **Keeping a book up** **

The task of Problem 2.4 is to find the minimum force required to keep a book up. What is the maximum allowable force, as a function of θ and μ? Is there a special angle that arises? Given μ, make a rough plot of the allowed values of F for $-\pi/2 < \theta < \pi/2$.

From David Morin's Introduction to Classical Mechanics
These slides will be posted later today.