

Topics: Centripetal Force & Projectile Motion



You are driving in your car and you make a quick left hand turn, which way do you “feel pushed”?

- A. Left
- B. Right
- C. Something else



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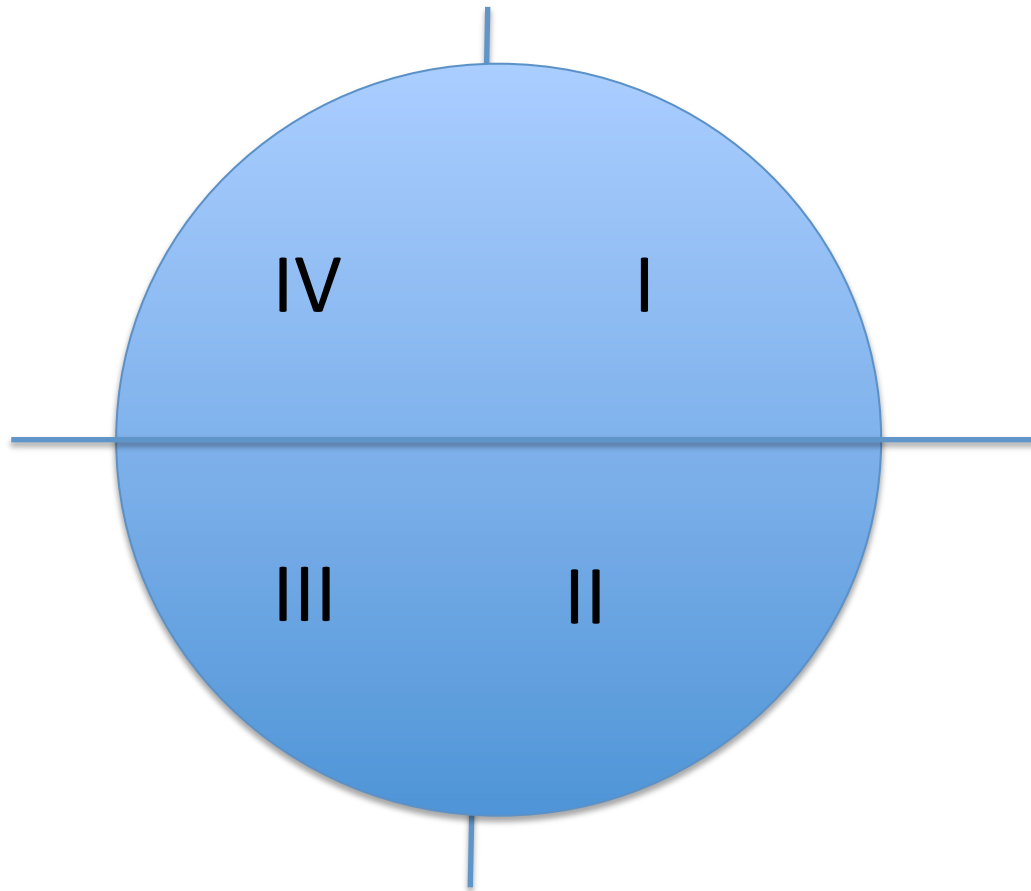
Announcements

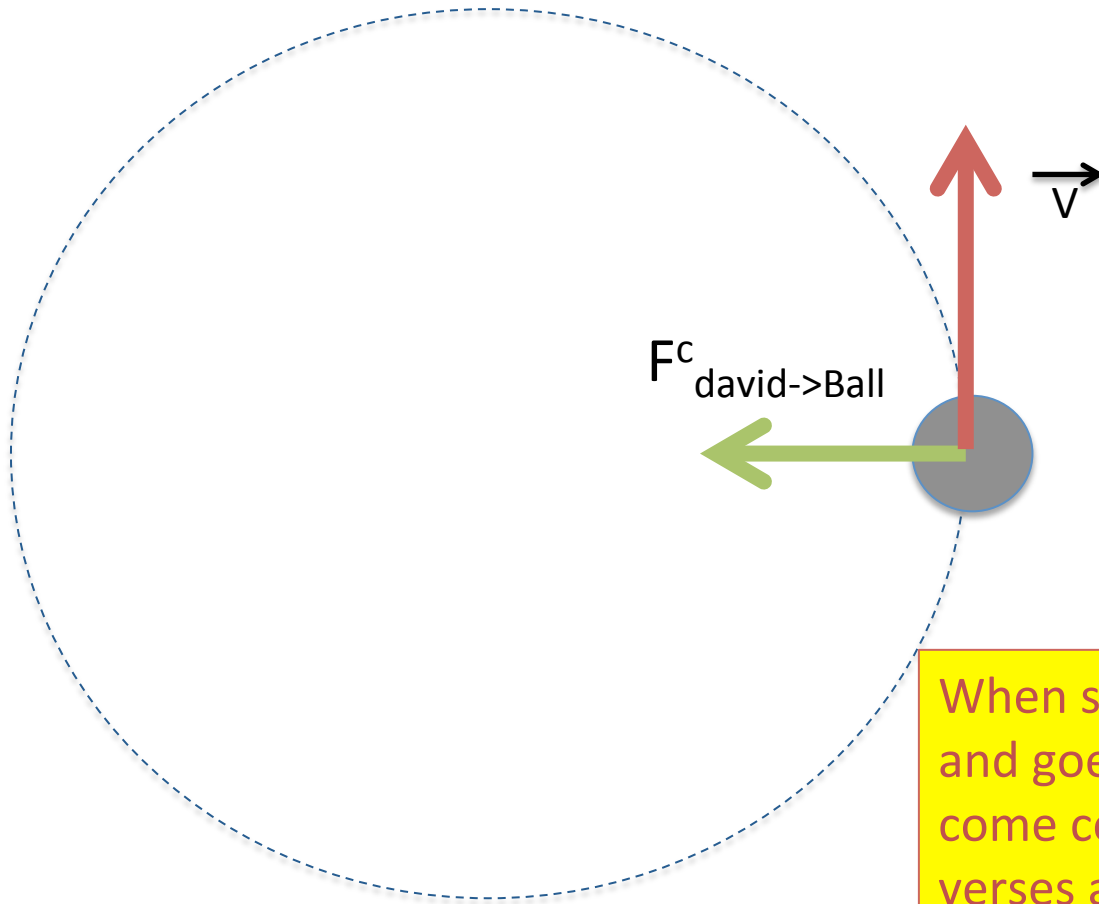
- LON-CAPA broke last night...reading question points and responses were lost. Ugh.
- Chapter 9 reading questions due tomorrow at midnight
- Chapters 8 & 9 homework due on Friday at midnight
 - Note: Homework on Ch9 material is spread over the next two weeks
- Next week we will circle back to section 8.3
 - Reading Questions on 8.3 & 9.5 (rotation) due 21st.
 - **Bring tutorial book to class on the 22nd!**

Reflections on MidSem Survey

- Thanks to those who responded!
- Homework feels way more difficult than anything else
 - Most people report spending 4-6 hrs per week outside of class studying; that's about right
 - I've adjusted the last couple of homeworks (Ch 5, Ch 6&7) to better represent my expectations
- A desire to see more practice problems
 - I've started uploading videos of myself solving problems to the YouTube channel; my goal is to upload at least one video per lecture

[http://paer.rutgers.edu/pt3/
experiment.php?topicid=5&exptid=56](http://paer.rutgers.edu/pt3/experiment.php?topicid=5&exptid=56)





What is the magnitude of the David's hit on the ball?

When someone is say driving in a car and goes through a round-about, how come centripetal force acts on the car verses another force. Where does the centripetal force come from?

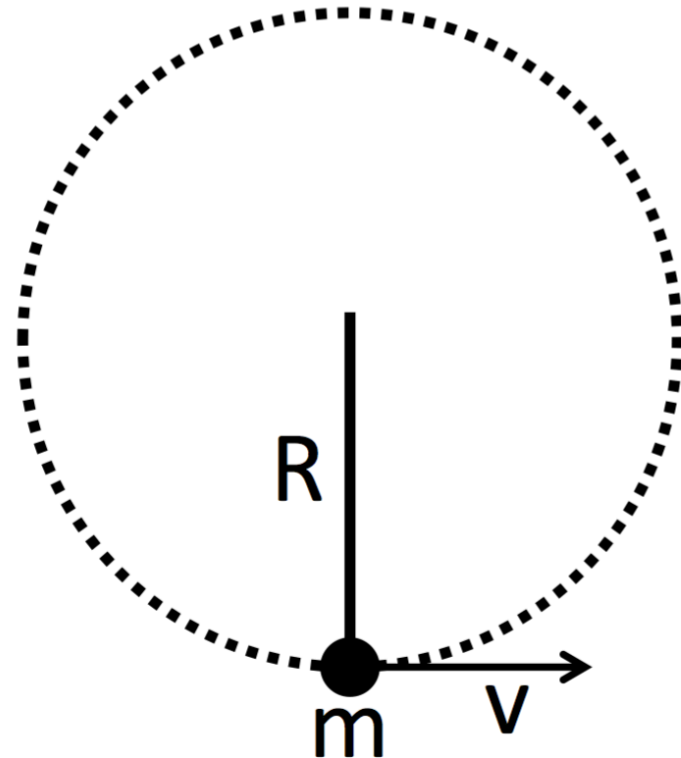
Centripetal Force

- When objects are moving in a circle, the net force toward the center is often referred to as a “centripetal force” (force toward the center)
- What is unique is the acceleration that is required for the path to be actually circular (Penny demo!) $a = v^2/r$
- There’s also this term “centrifugal force” (away from center)
 - This is result of change of reference frame



A rock (mass, m) is swung in a vertical circle (radius, R) on the Earth. At the bottom of the swing, the rock is moving at a speed v . True or false, at this location the force exerted on the rock by the rope is equal to mv^2/R .

- A. True
- B. False



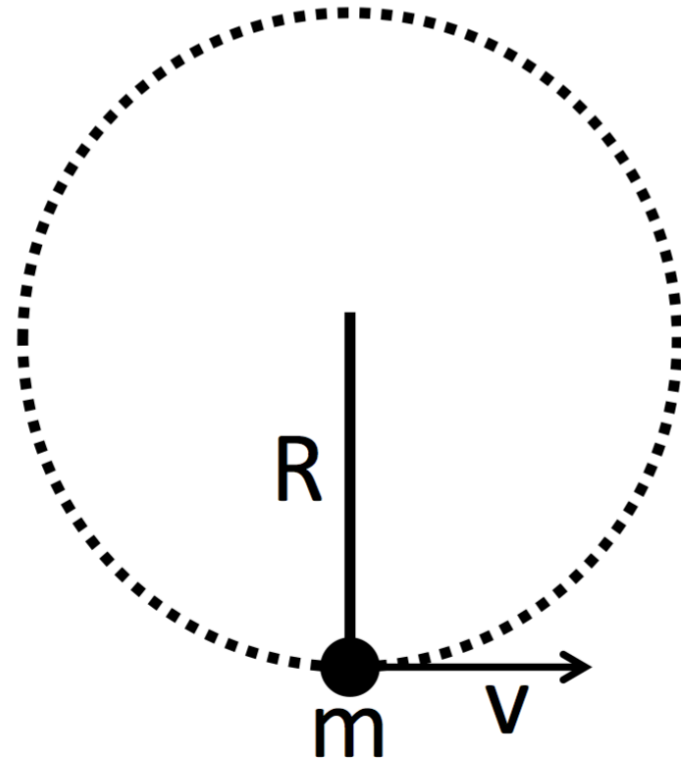


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B. False

The sum of the forces at this point are $F^T - F^g$ which is equal to mv^2/R , so the F^T is actually $mg + mv^2/R$



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This is a result of centrifugal force (or the force that I feel as a result of the centripetal force).



You are riding a fast going merry-go-round, which way do you “feel pushed”?



- A. Inward
- B. Outward
- C. Something else

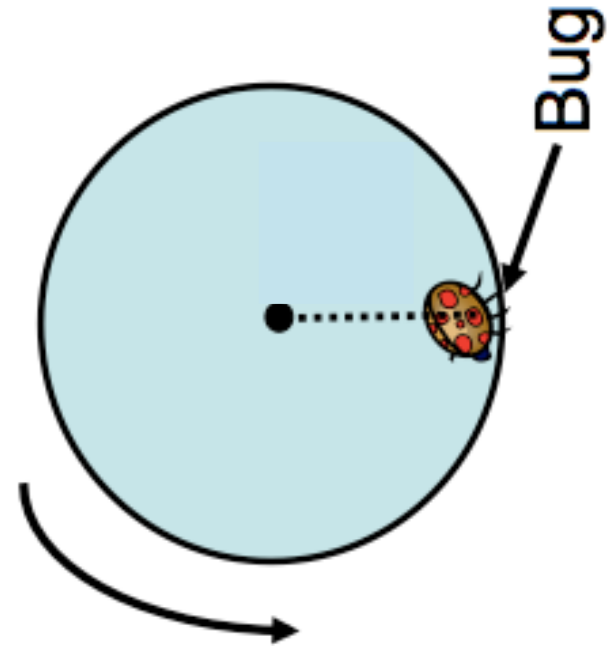
RQ: What is the highest amount of centripetal force...a human can experience before dying?

We usually measure the acceleration you experience in these situations. A typical person can undergo 5g of acceleration before passing out.

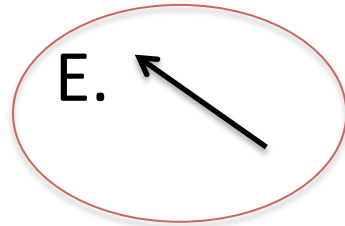
Reading Question

If a object is moving in a circle and is also accelerating does this mean there is no centripetal force? or is there now a larger force?

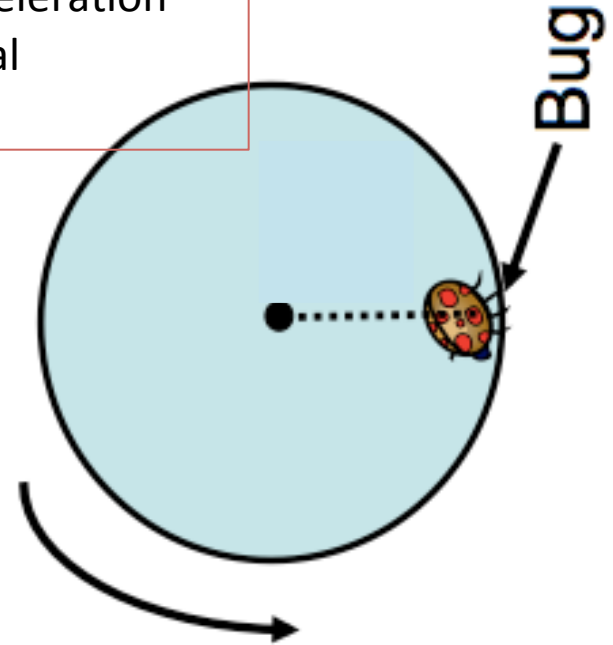
A ladybug is clinging to the rim of a spinning wheel which is spinning CCW and is speeding up. At the moment shown, when the bug is at the far right, what is the approximate direction of the ladybug's acceleration?



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It's the combination of a centripetal acceleration and a tangential acceleration.



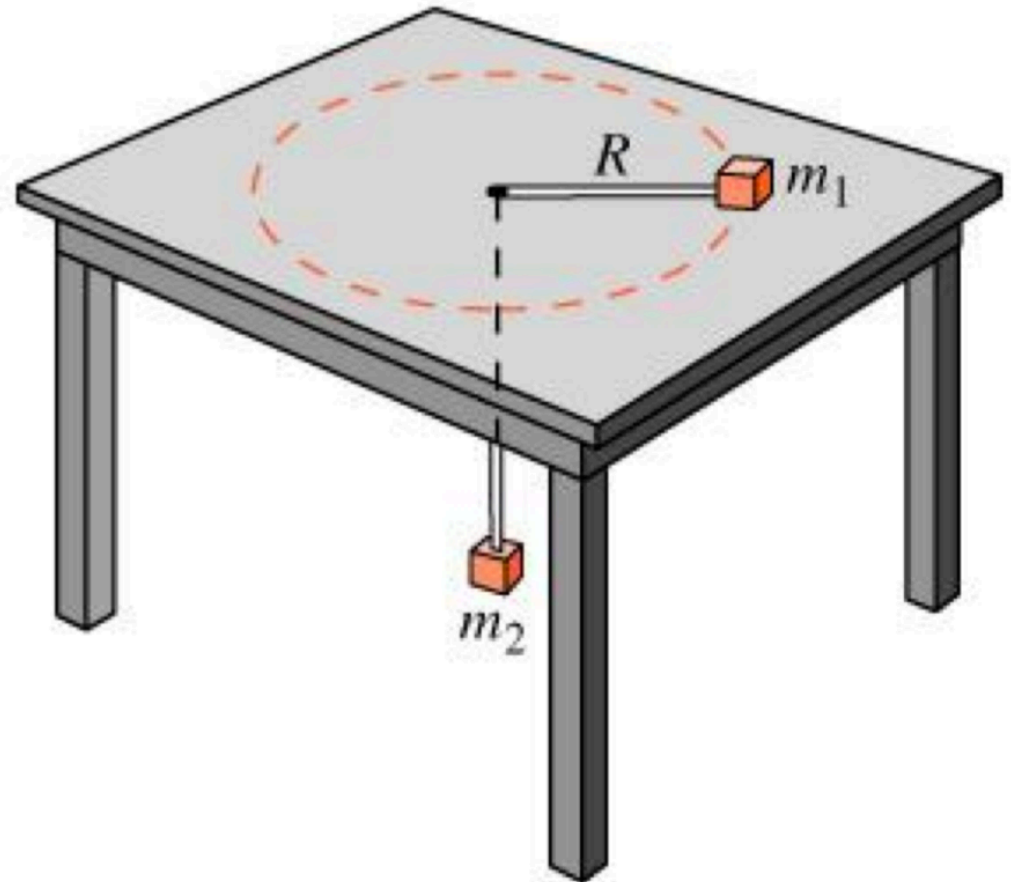
Circular Motion

- There's a component of the acceleration that is always toward the center in order for the motion to be circular
- There's another that is present if the motion increases/decreases
 - Comes from Newton's second law

Example: Uniform Circular Motion

An object (mass, m_1) slides on a horizontal frictionless table. It is tied to an object of mass m_2 , which is under the table. The string is fed through a hole in the table.

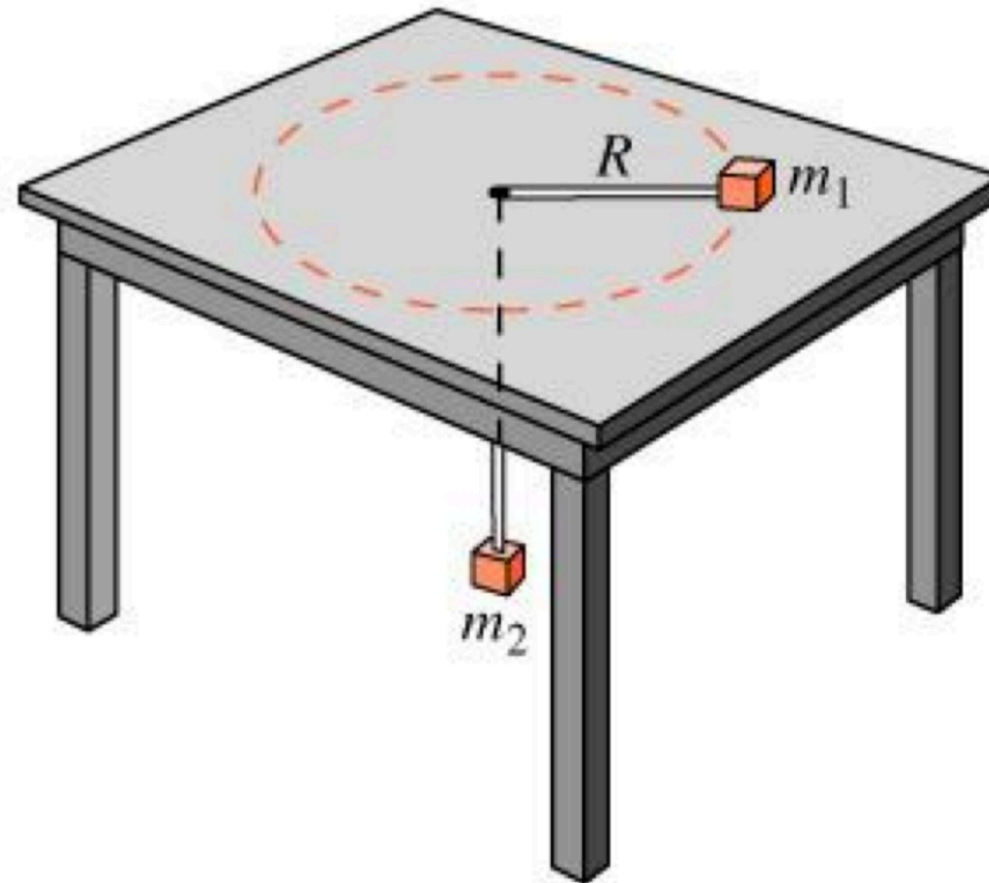
What is the speed needed to keep the mass from falling down?



Example: Uniform Circular Motion

Where do we start?

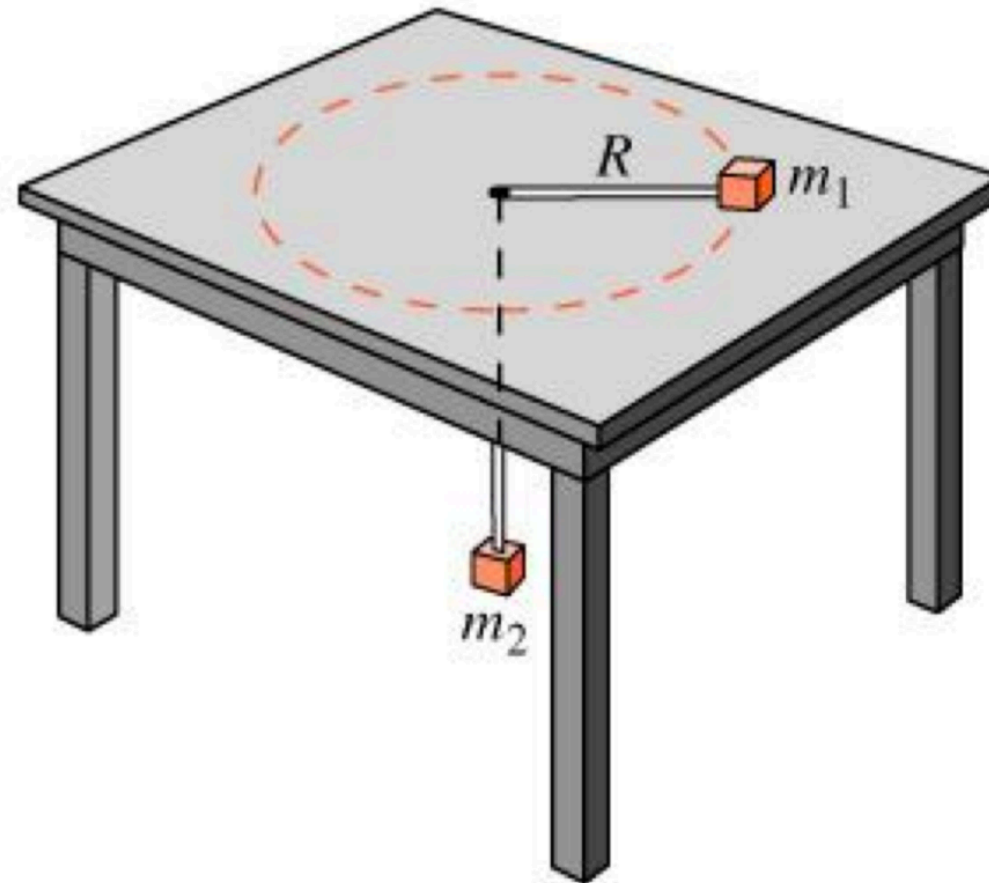
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- B. Use the circular motion equations
- C. Draw the free body diagram
- D. Something else



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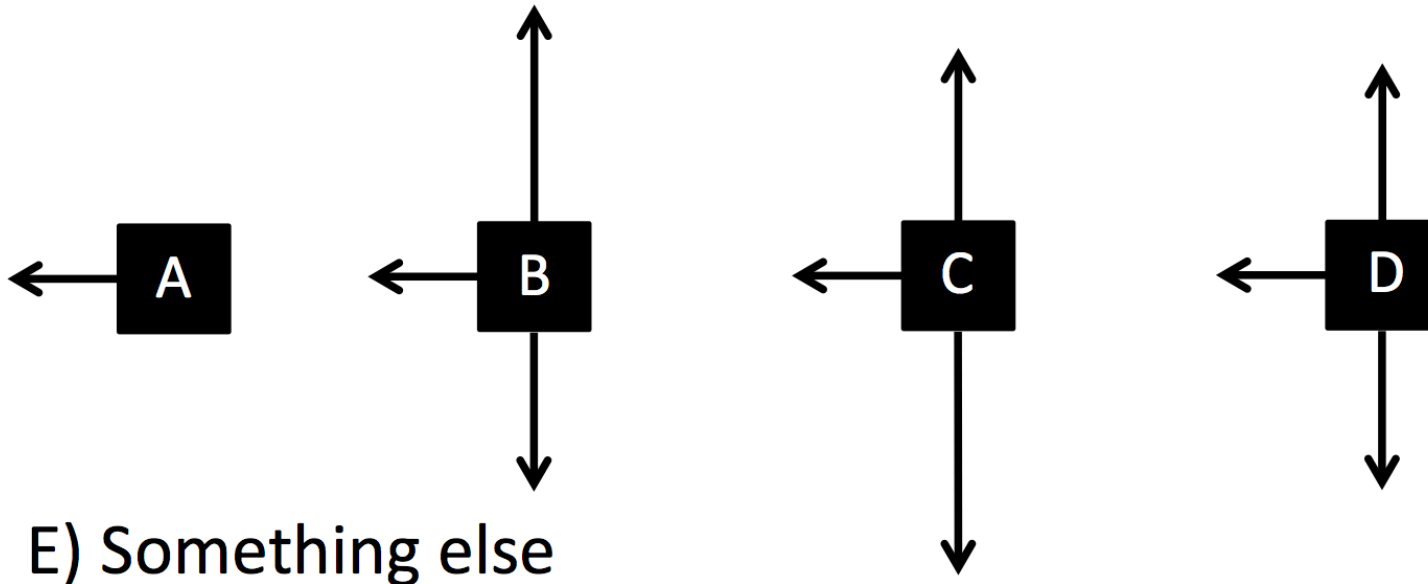
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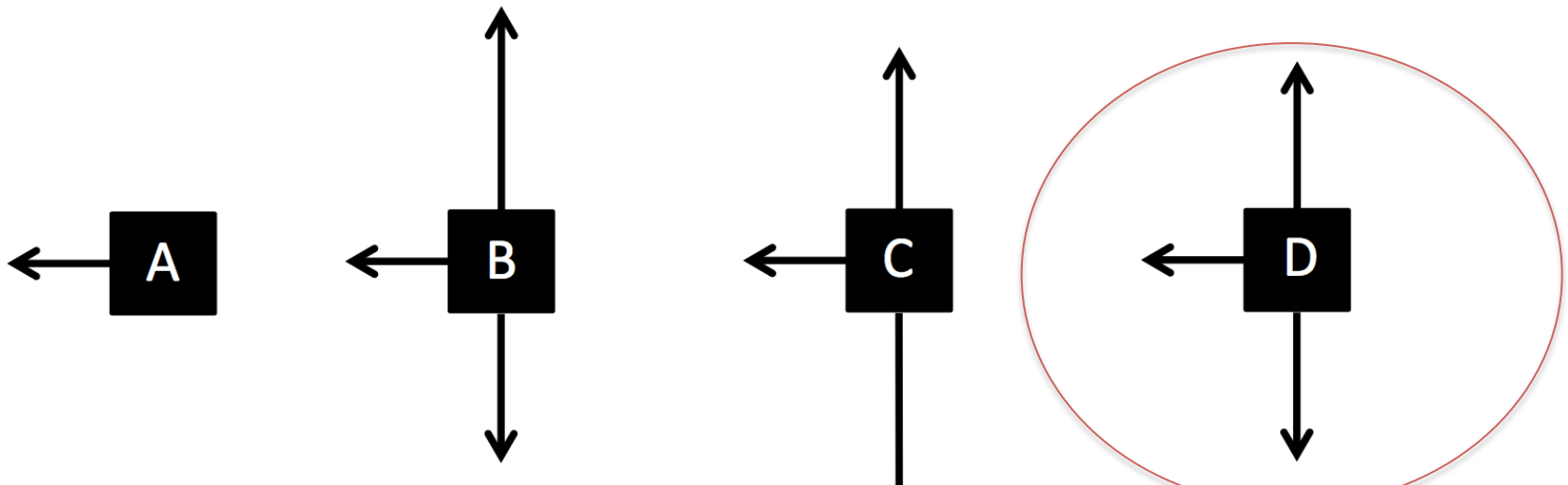
Which is the correct FBD for mass 1 (on the table)?

(Note: I've left the labels off)



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E) Something else

See the solution for this problem on the YouTube channel:

<https://www.youtube.com/user/lbcphysics>