Tuesday, 22 Jan

brought to you by the letters E N E R G Y

Hiromi day

housekeeping

Yep, you're still doing great!

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If you're behind, please see me after class

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- Refunding instructions are on the blog: any luck?

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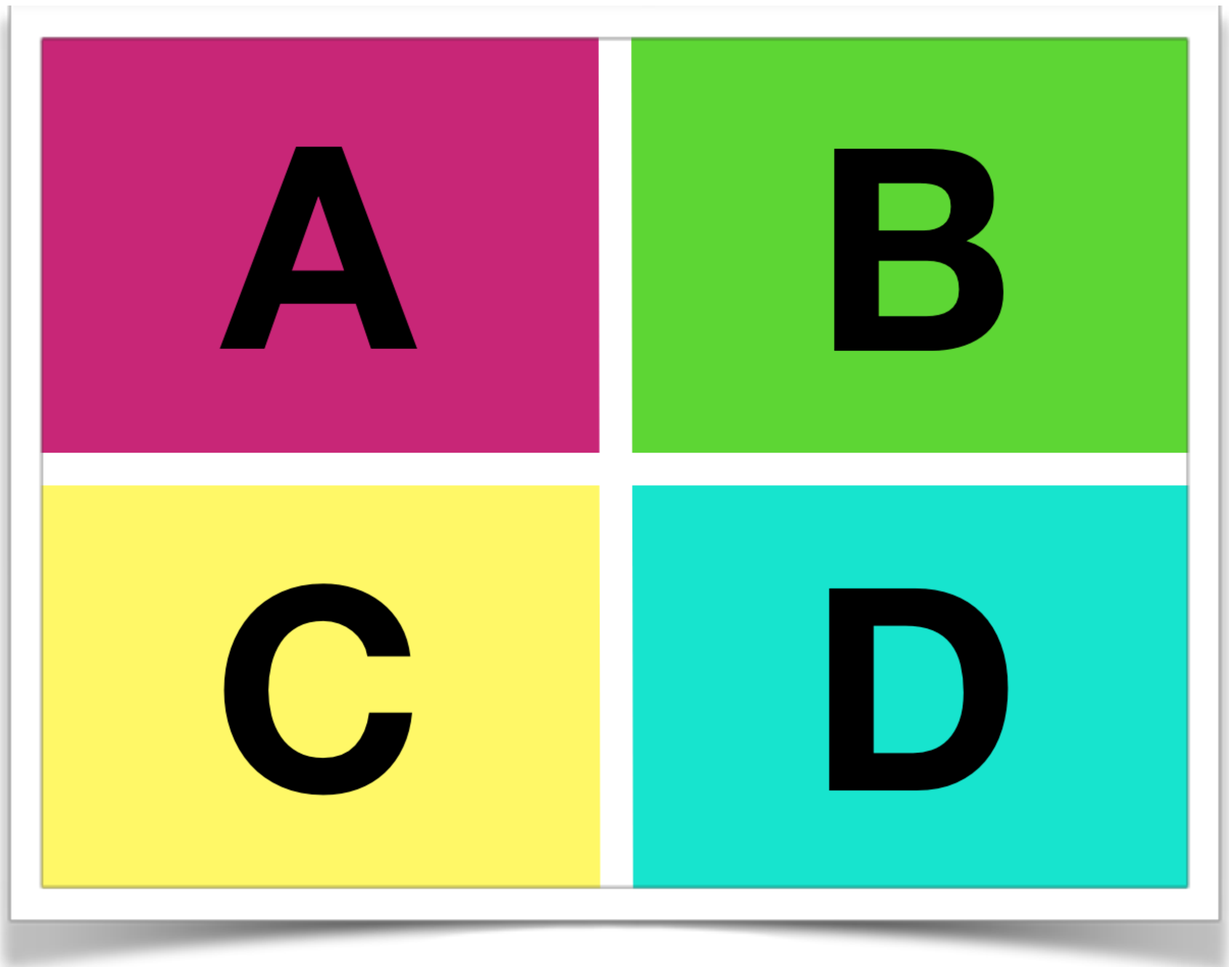
Remember, I'm out of town on thursday, so no class that day

"CAPER"* cards



The routine:

1. I ask a question with A B C D responses
2. You fold your card and put it on your forehead
3. Then you defend your answer to the person next to you
4. I might then ask a second time
5. "I don't know?" …show a blank square

Bring it to class or:

There's an app for that:

https://itunes.apple.com/us/app/capercard/id843445157?mt=8

https://play.google.com/store/apps/details?id=com.hexational.capercard&hl=en

* "Center for Astronomy & Physics Education Research"

summarize mechanics to this point

primary relationships	special

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speed and acceleration…	

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speed and acceleration... $x = vt$	

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speed and acceleration… $x = vt \quad v = at \quad x = \frac{1}{2}at^2$	$x = \frac{1}{2}gt^2$ near earth

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primary relationships	special
speed and acceleration... $x = vt \quad v = at \quad x = \frac{1}{2}at^2$	$x = \frac{1}{2}gt^2$ near earth
	$a_C = \frac{v^2}{R}$ centripetal, circular

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force	

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force $F = ma$	

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	$a_C = \frac{v^2}{R}$ centripetal, circular
force $F = ma$	$W = mg$ weight, near earth

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primary relationships

speed and acceleration... $x = vt \quad v = at \quad x = \frac{1}{2}at^2$

force $\quad F = ma$

special

$x = \frac{1}{2}gt^2$ near earth

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$W = mg$ weight, near earth

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momentum	

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primary relationships

speed and acceleration… $x = vt \quad v = at \quad x = \frac{1}{2}at^2$

force $F = ma$

momentum $p = mv$

special

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$a_C = \frac{v^2}{R}$ centripetal, circular

$W = mg$ weight, near earth

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momentum $p = mv$

energy

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primary relationships

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force $F = ma$

momentum $p = mv$

energy $K = \frac{1}{2}mv^2$

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conservation of momentum $p(1)_0 + p(2)_0 = p(1) + p(2)$

special

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conservation of mechanical energy

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energy $K = \frac{1}{2}mv^2 \quad U = mgy$

conservation of momentum $p(1)_0 + p(2)_0 = p(1) + p(2)$

conservation of mechanical energy $K_0 + U_0 = K + U$

special

$x = \frac{1}{2}gt^2$ near earth

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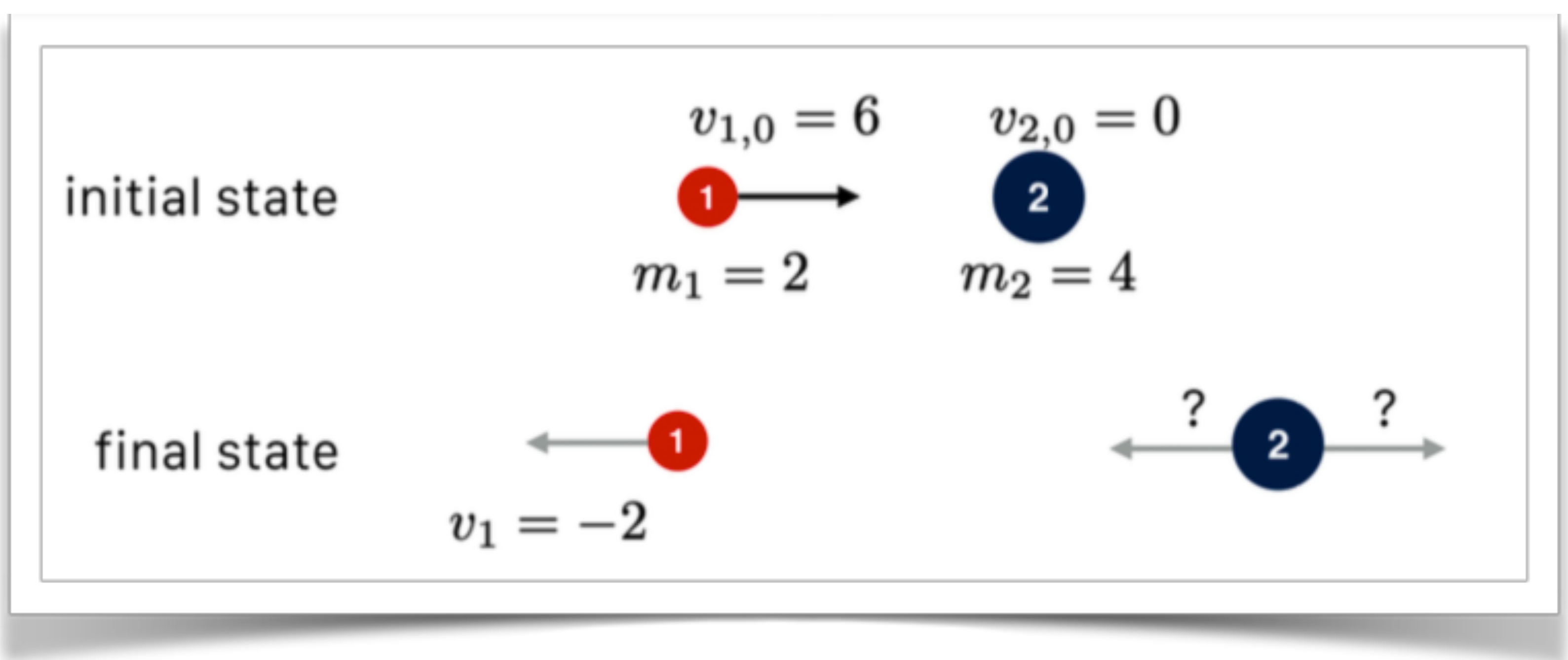
reading quiz

a word

project last time



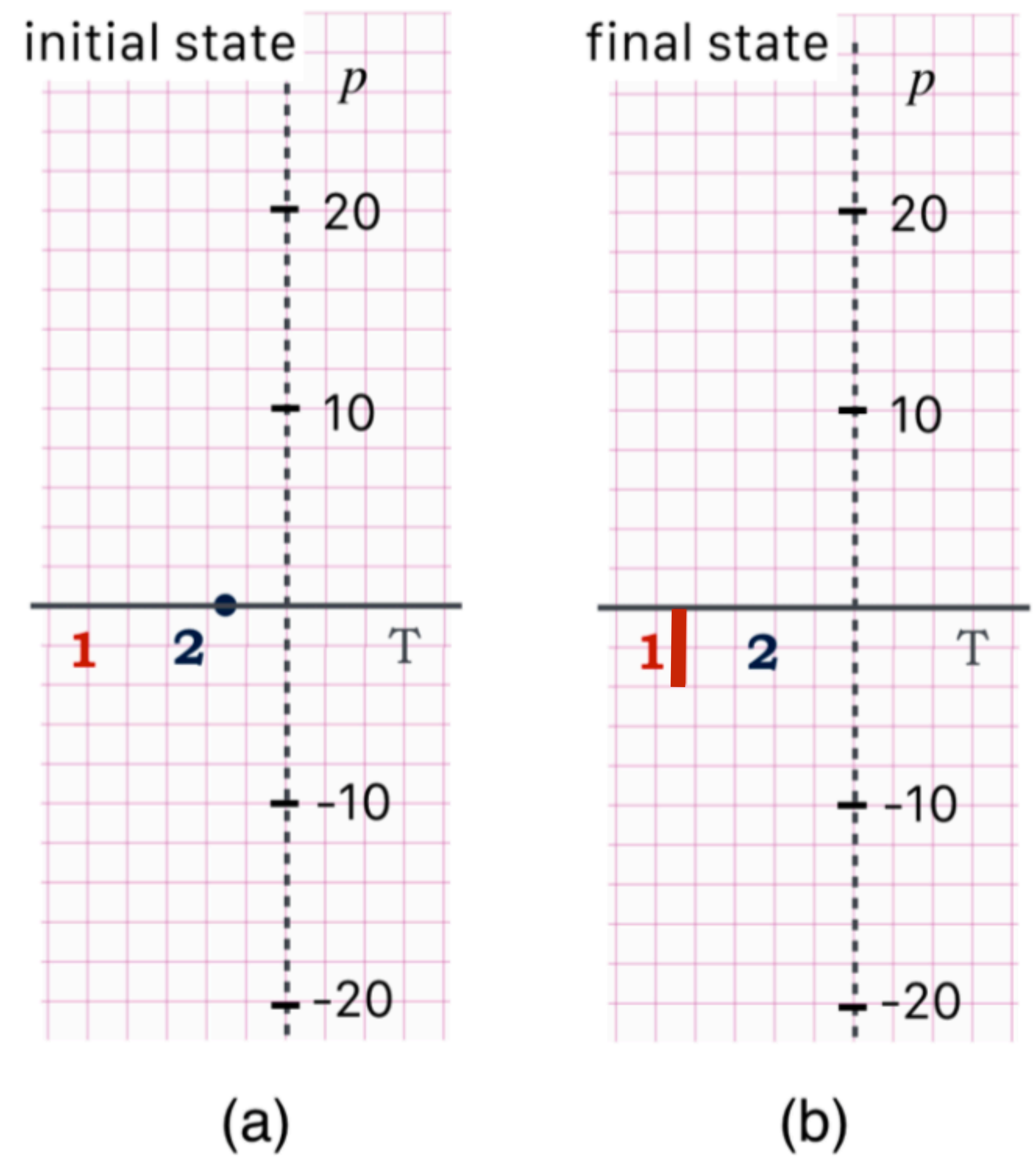
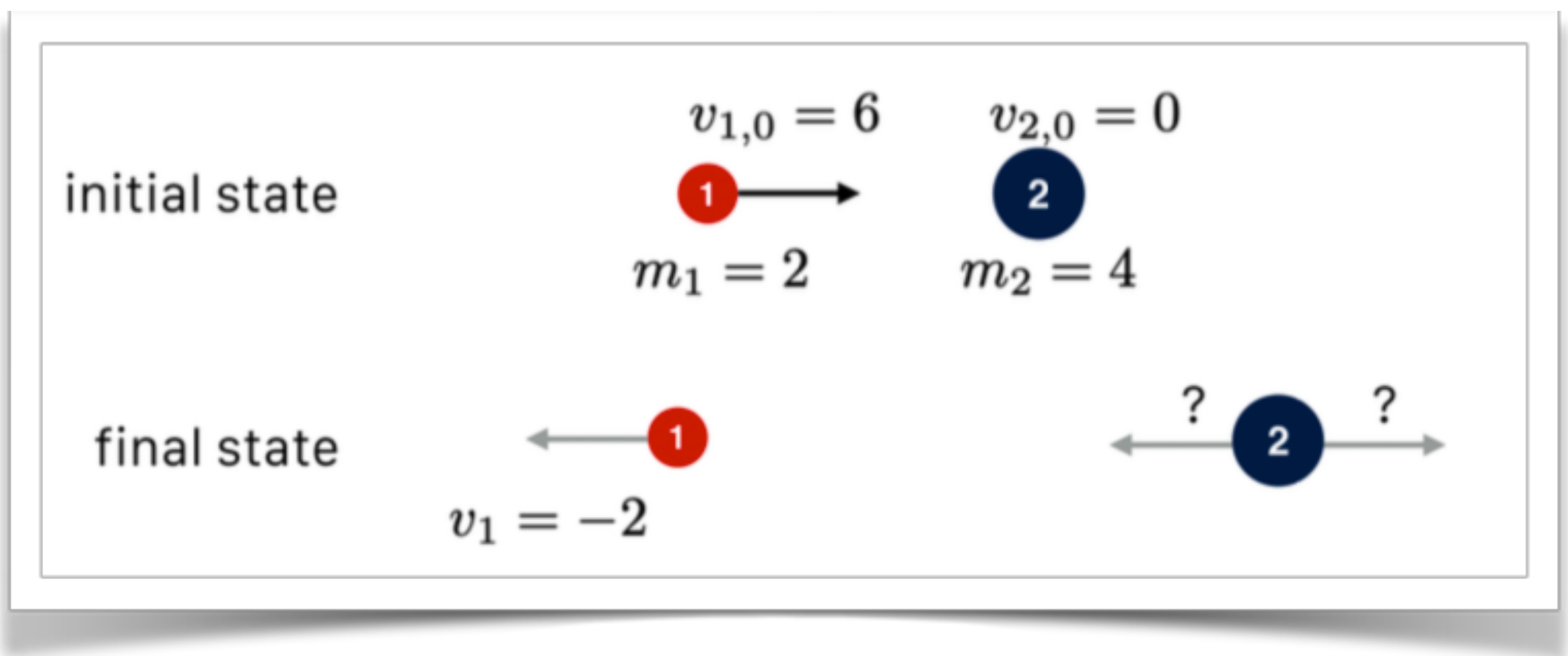
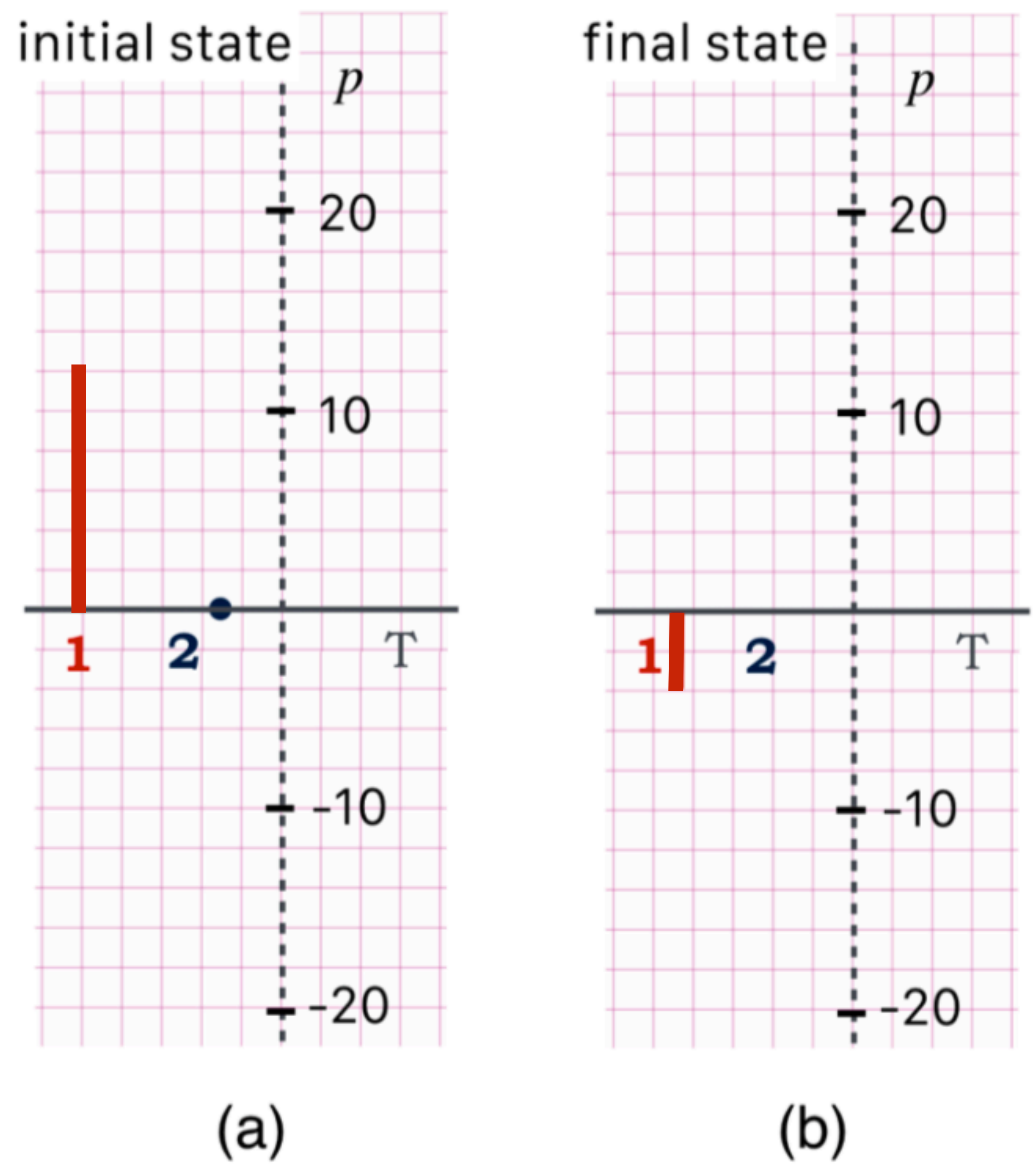


Figure 3: Momentum conservation using areas.

project last time





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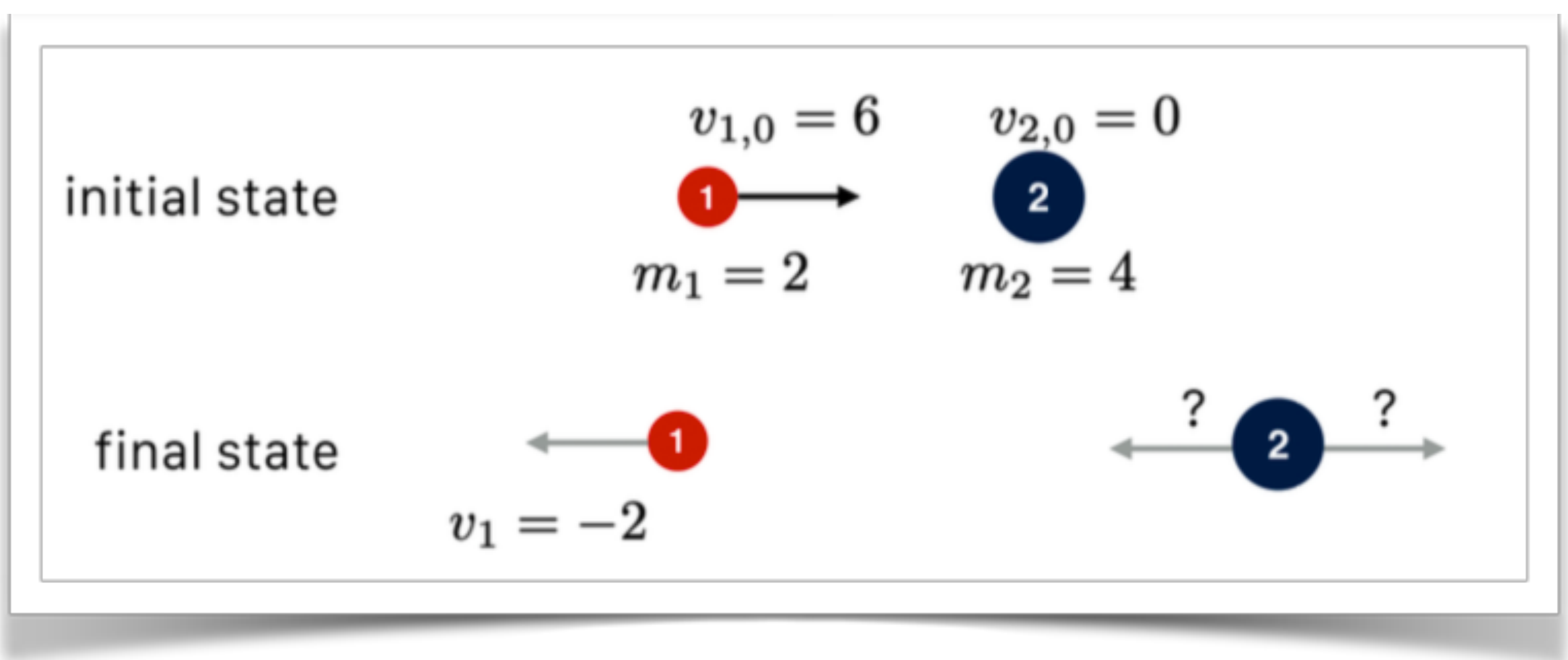

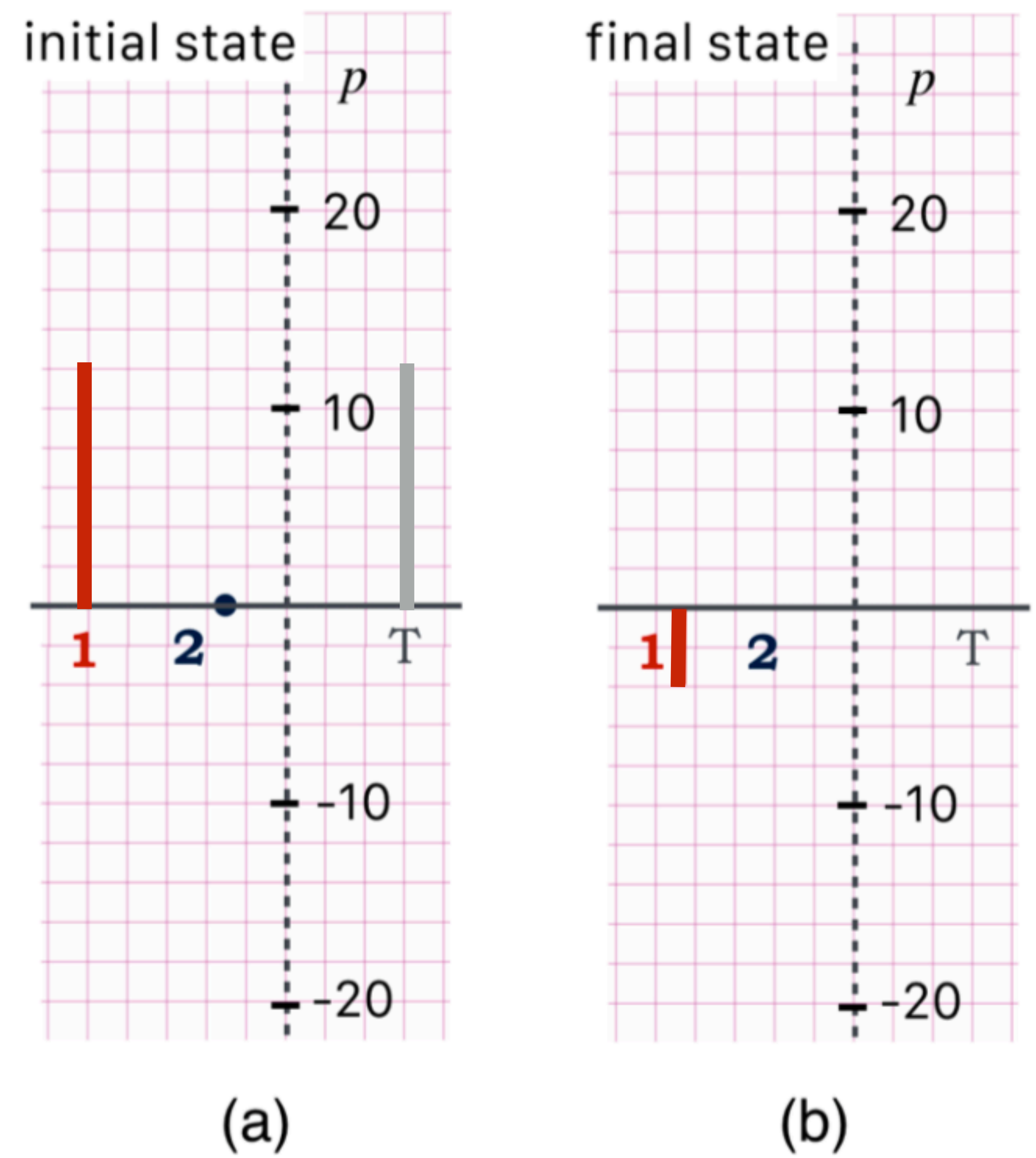

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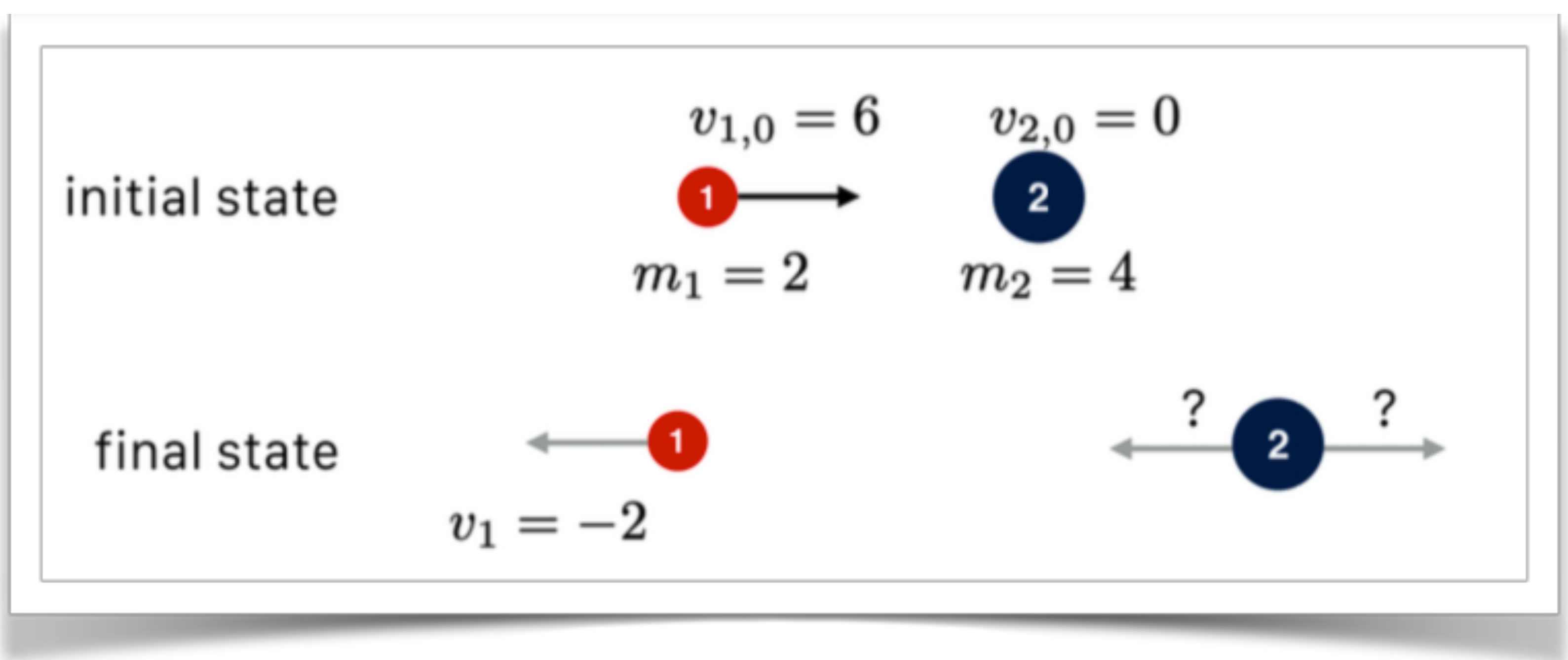

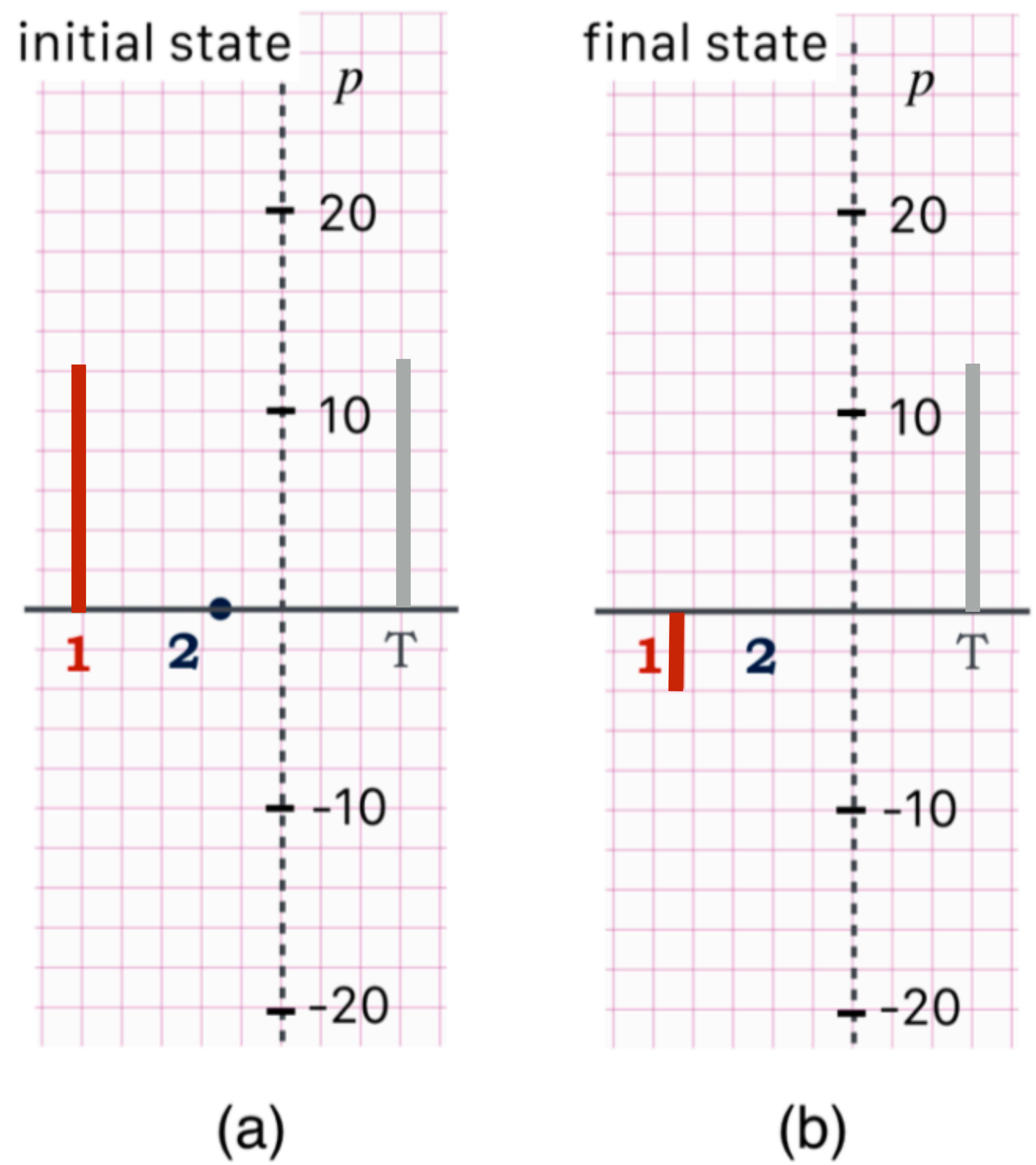

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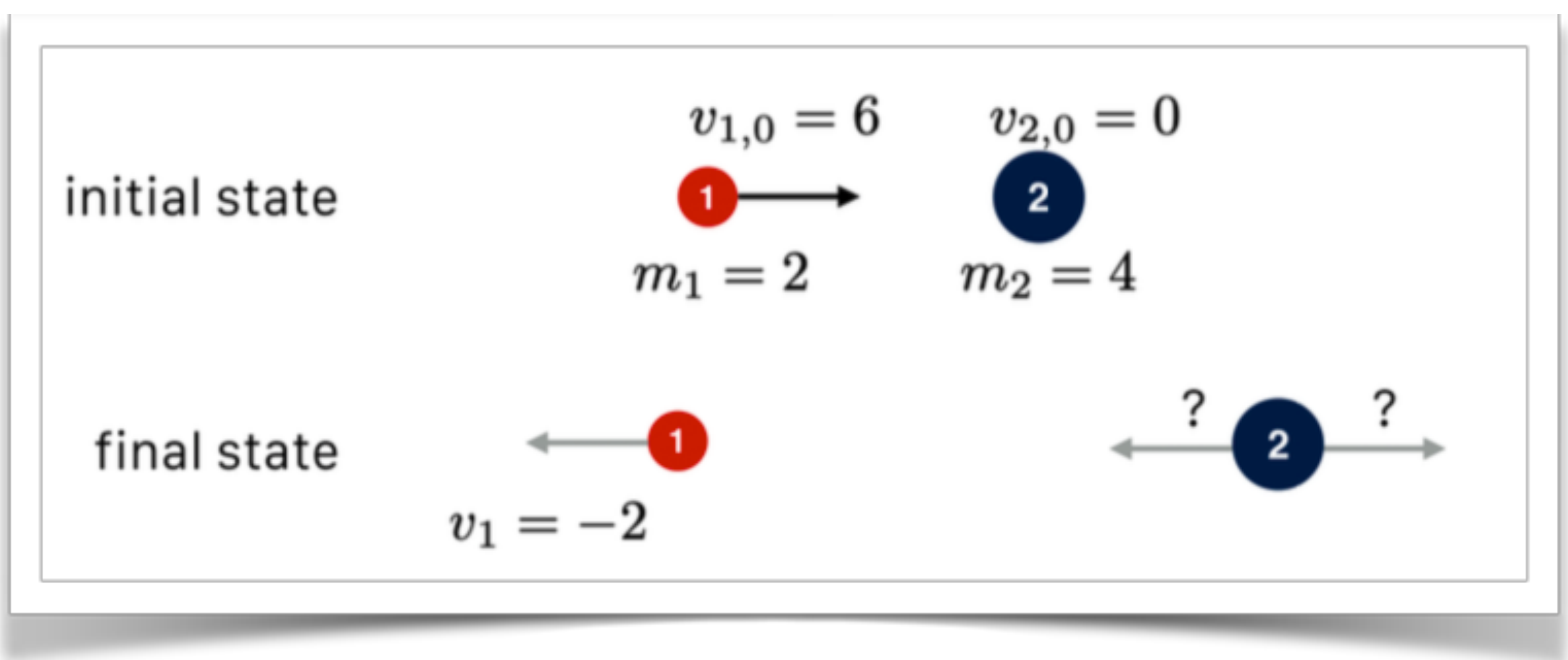

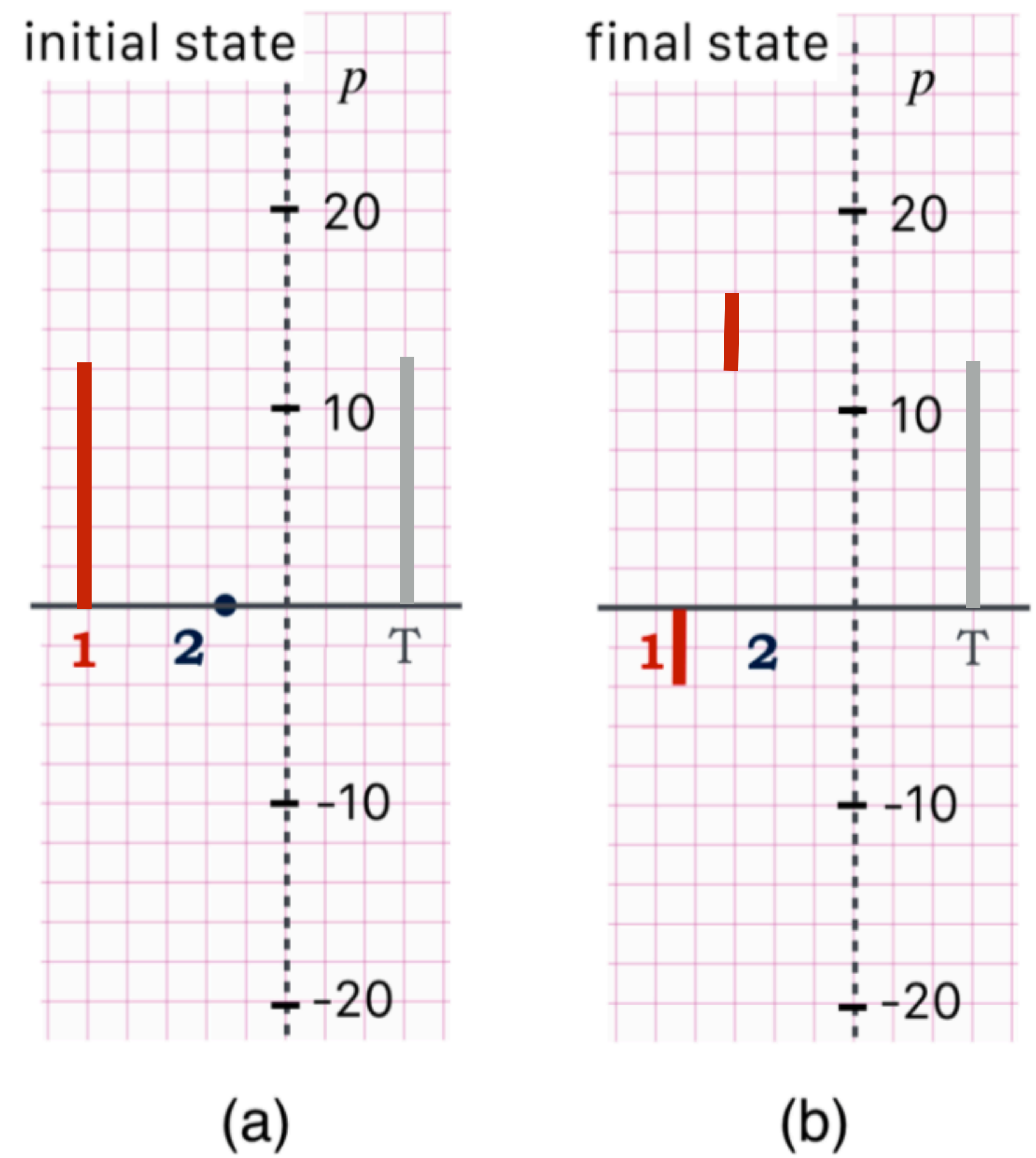

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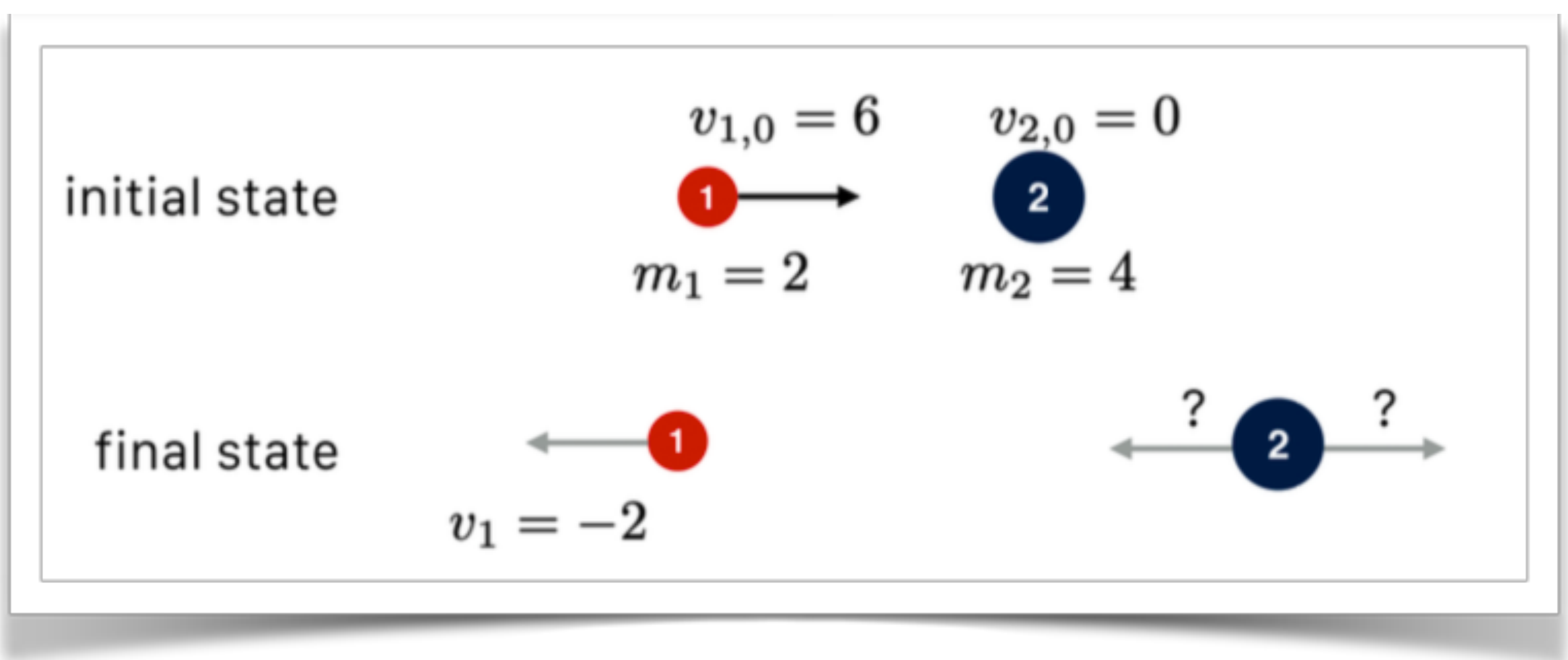

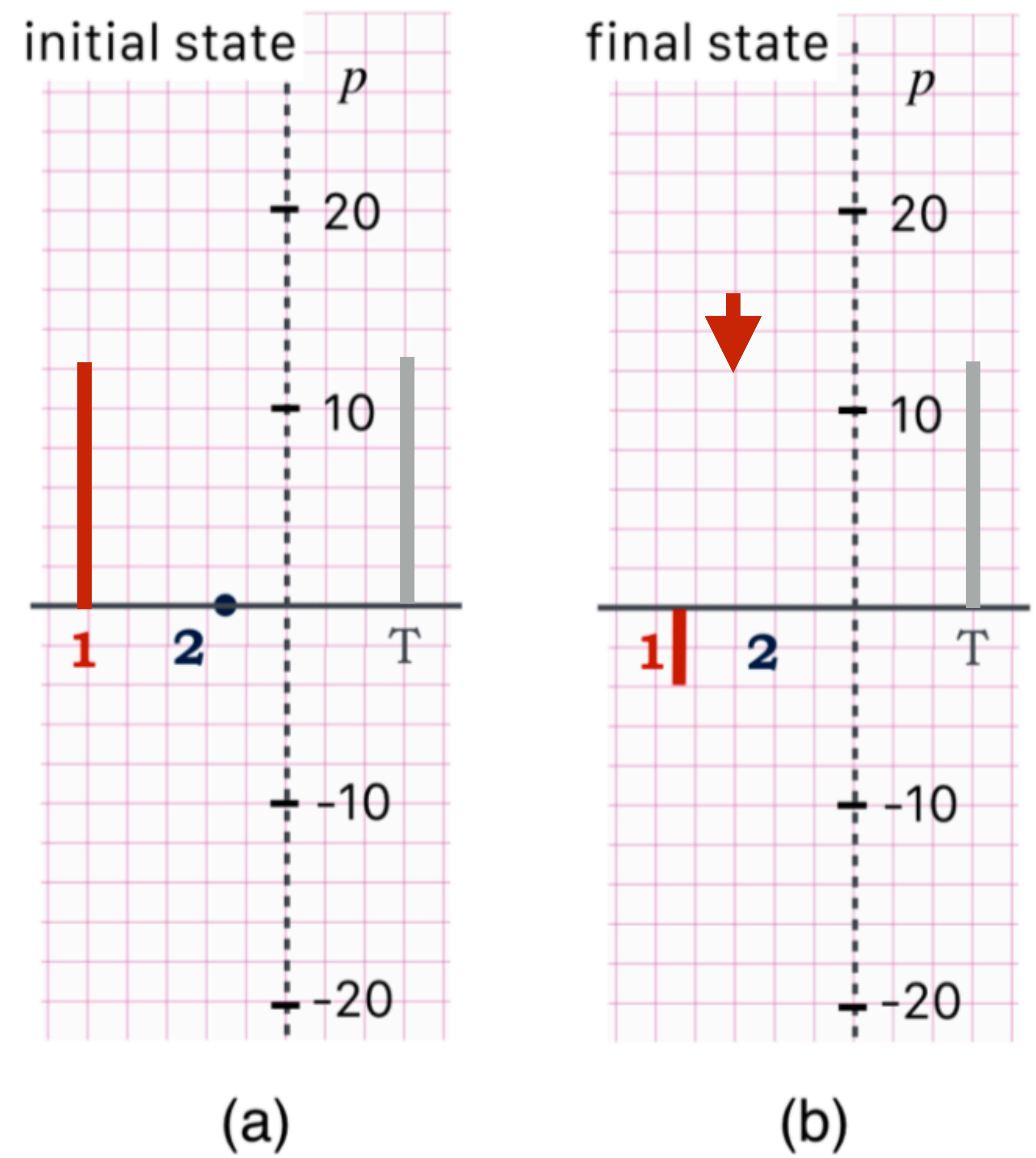

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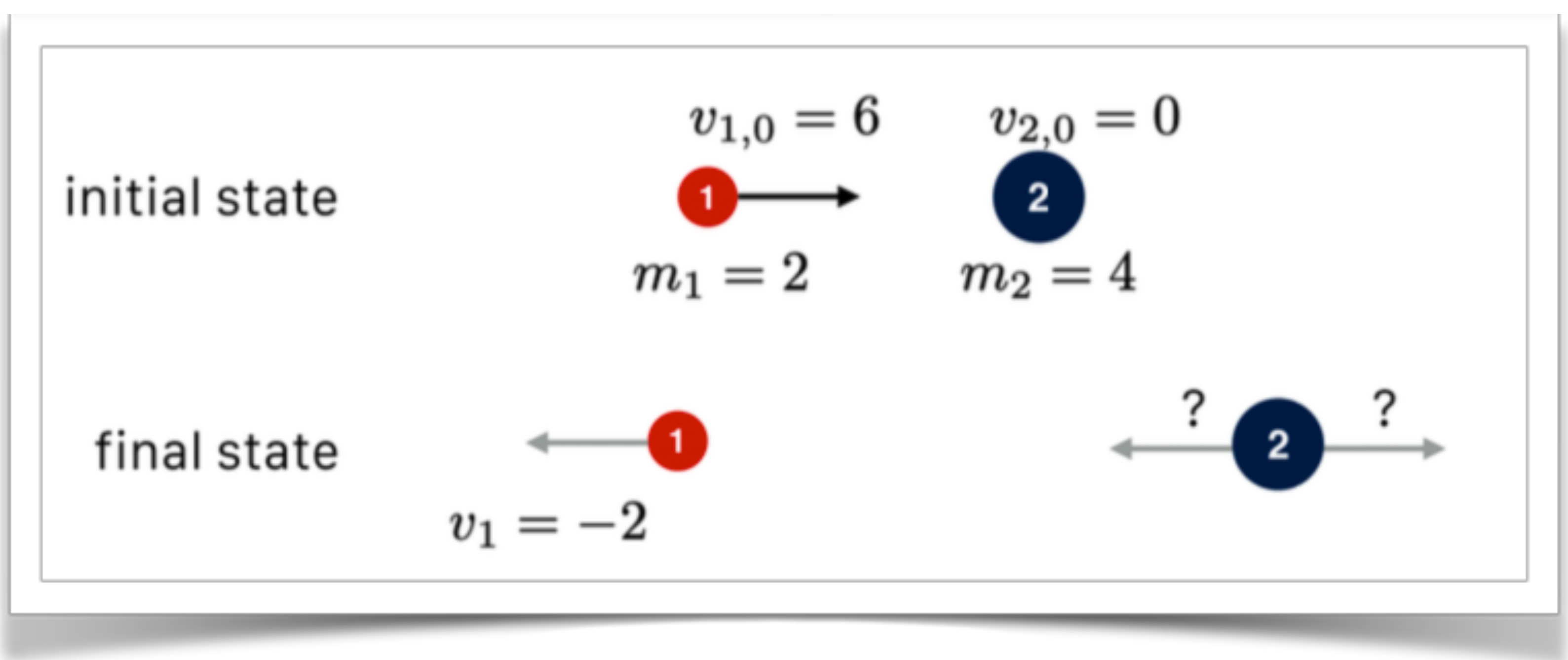

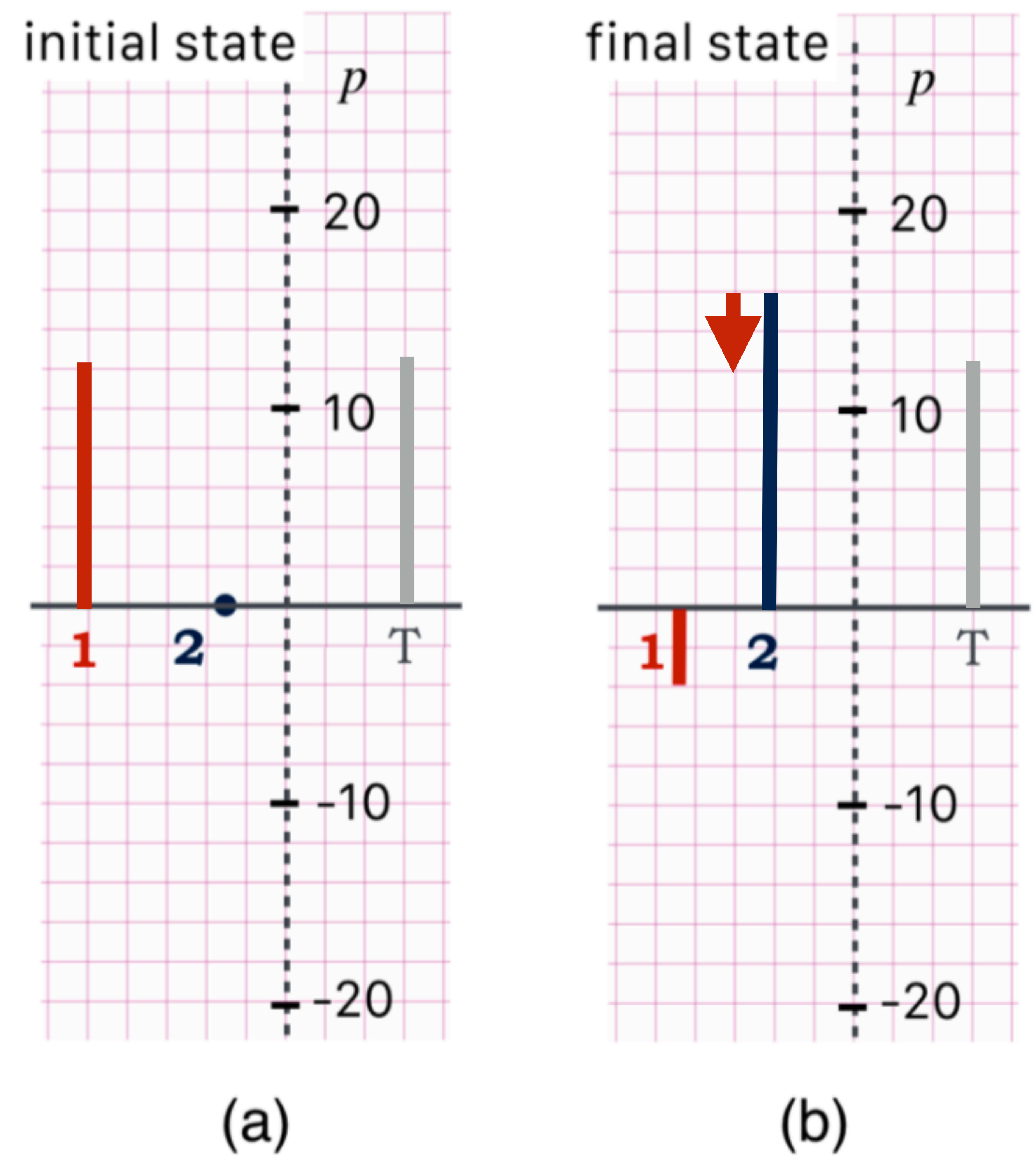

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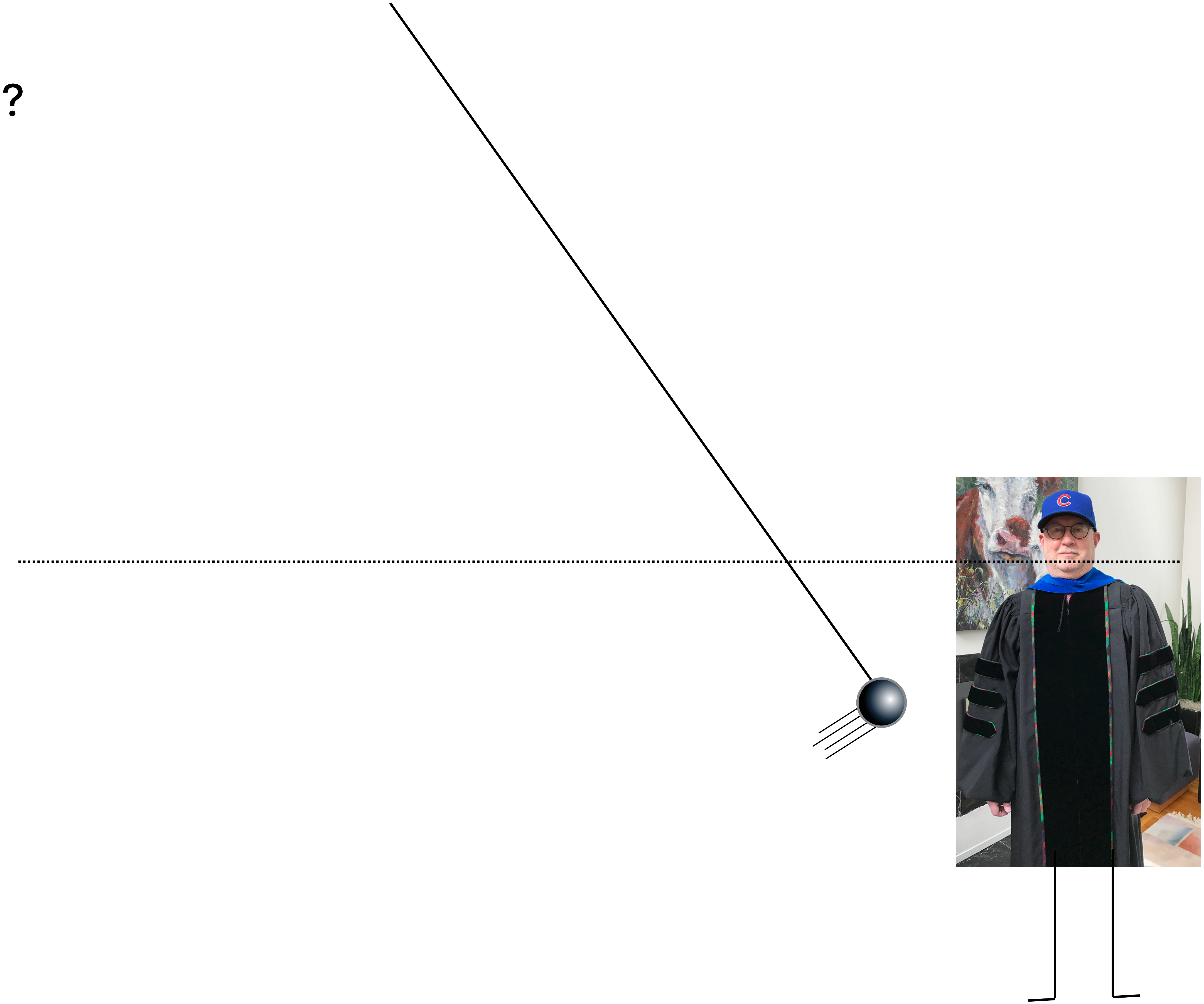
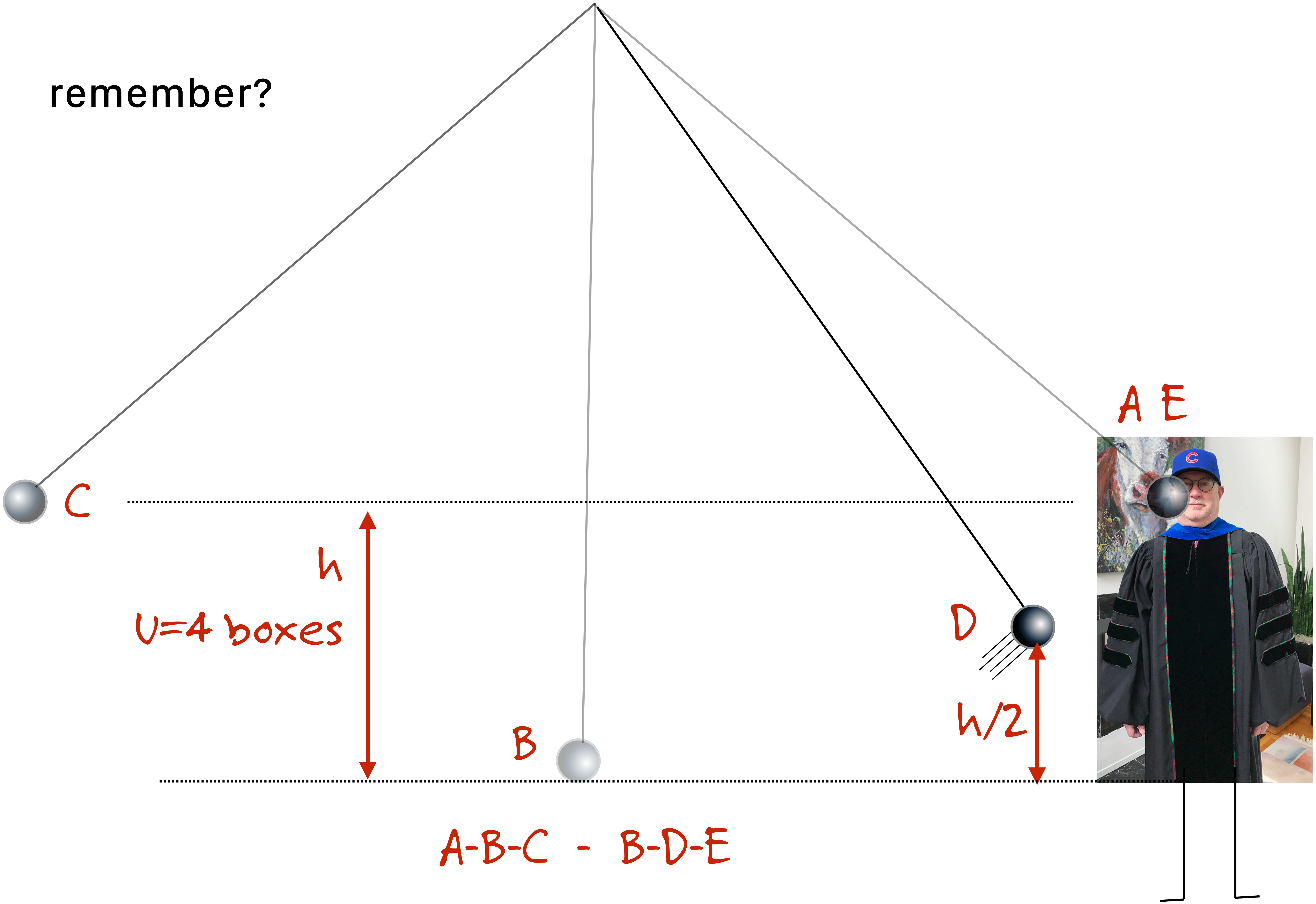
demonstrations

some questions for all of us

remember?



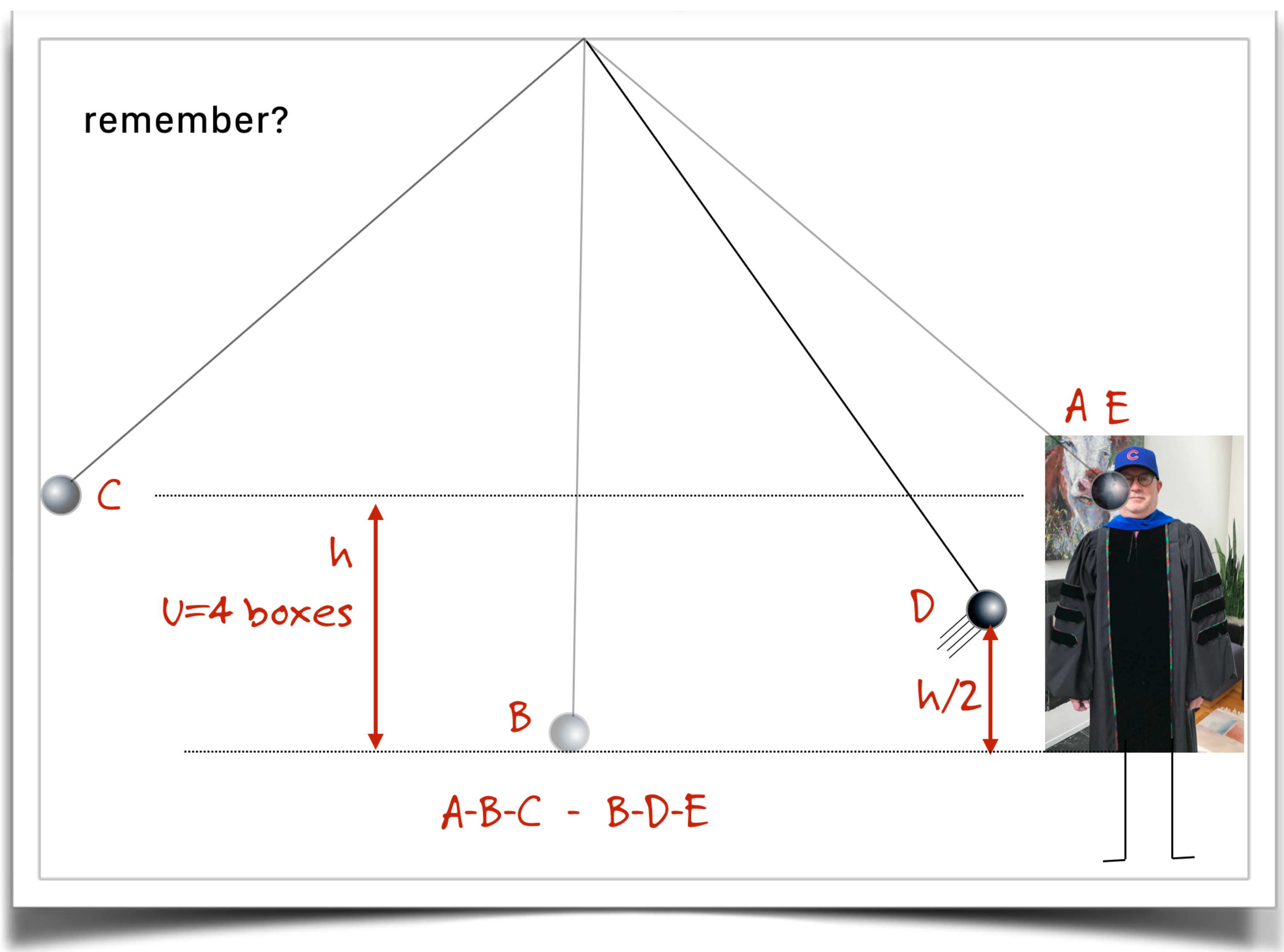
remember?



answer, defend

First time:

I let it drop at A



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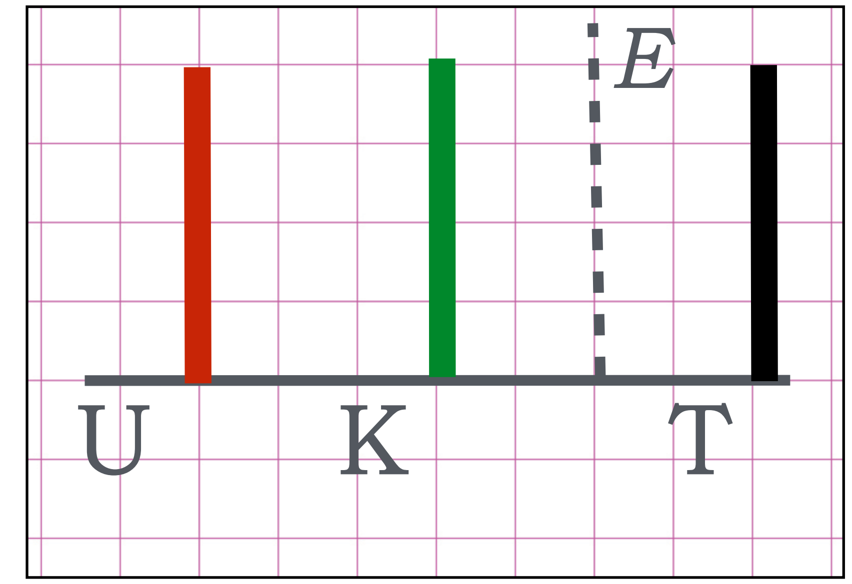
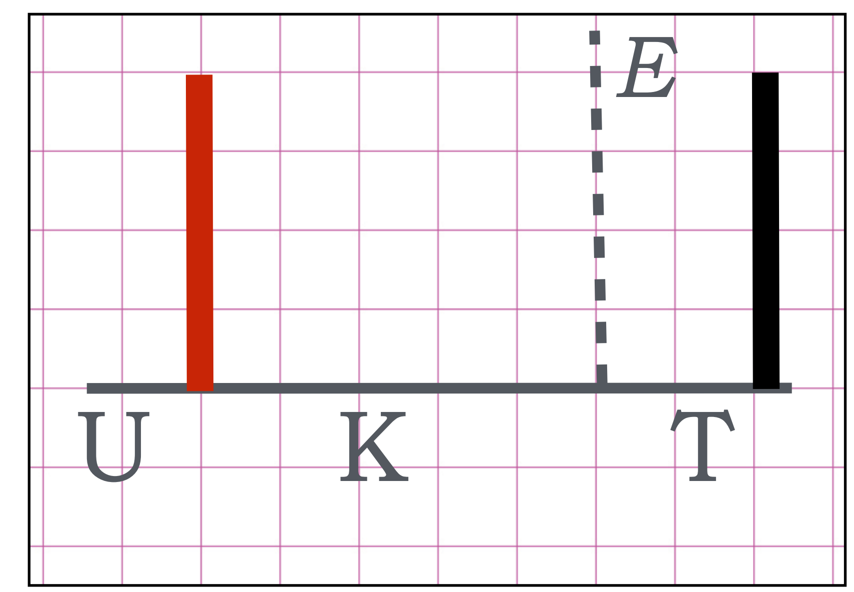
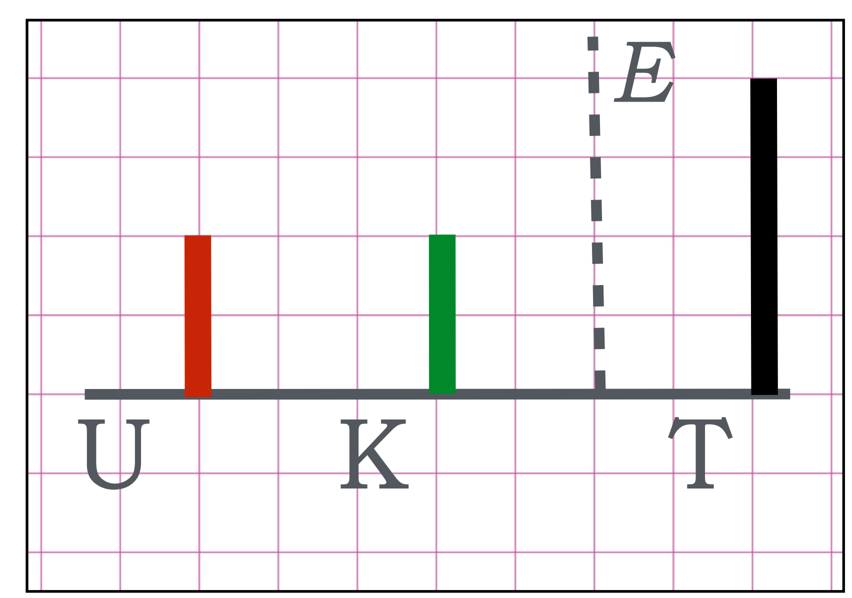
A



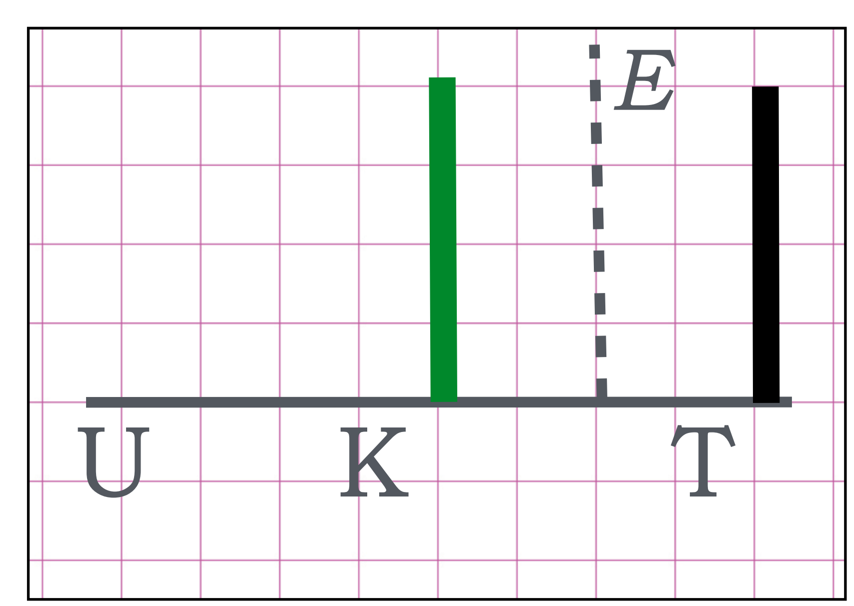
B



C



D



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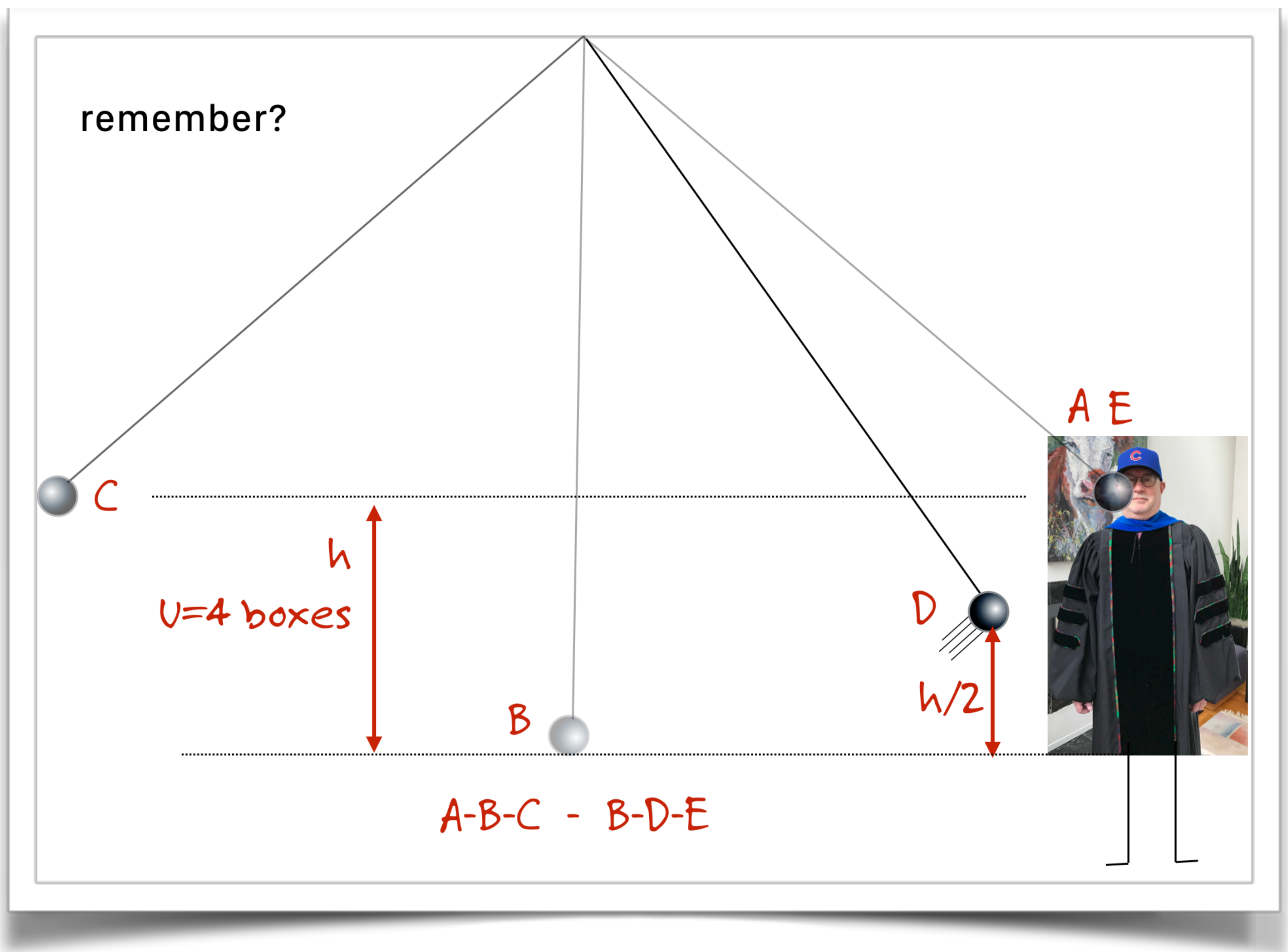
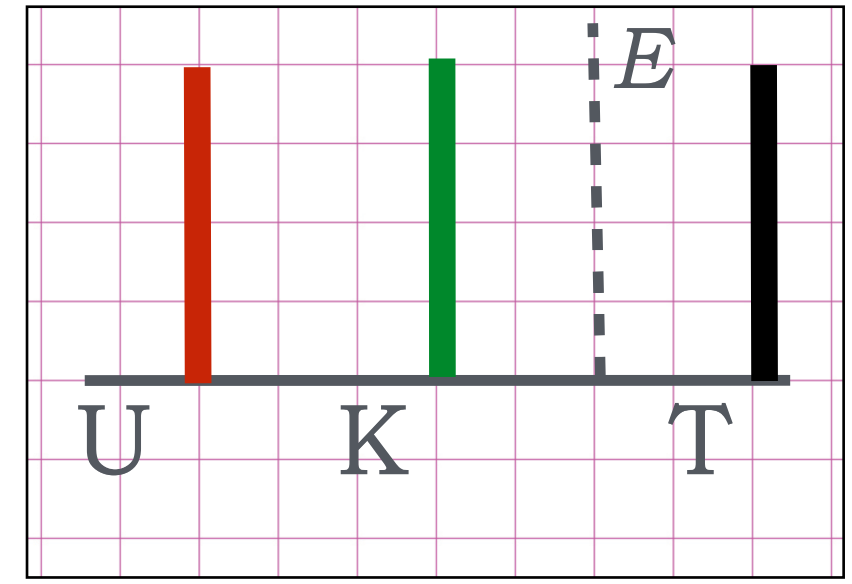


B on the way down is best described as:

A



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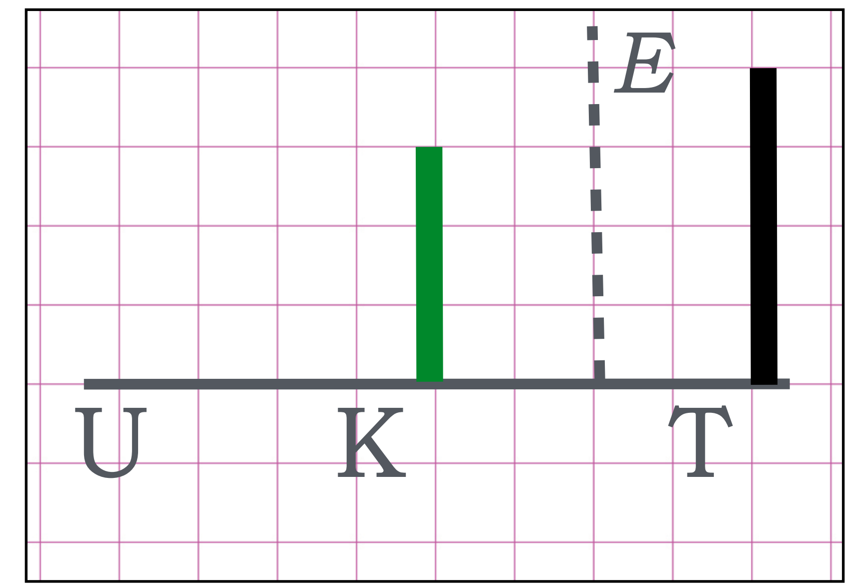

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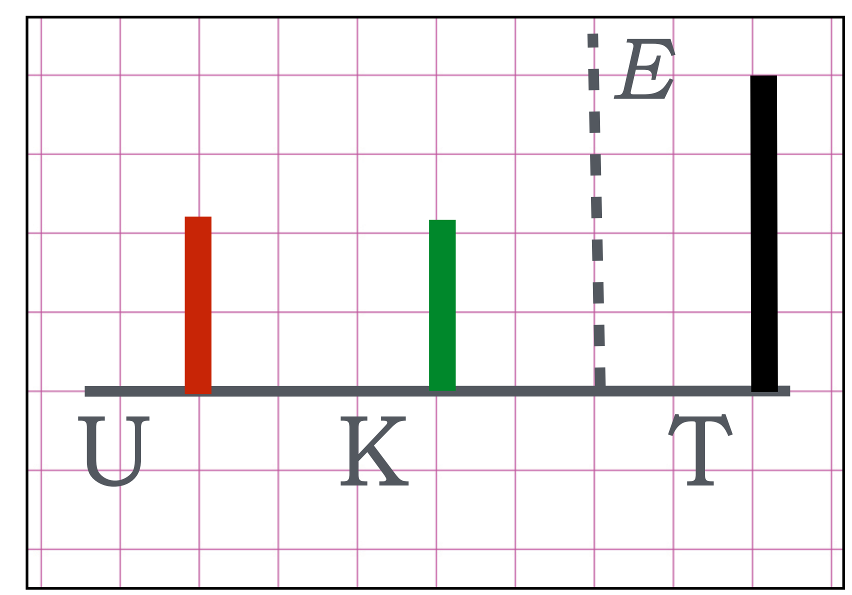
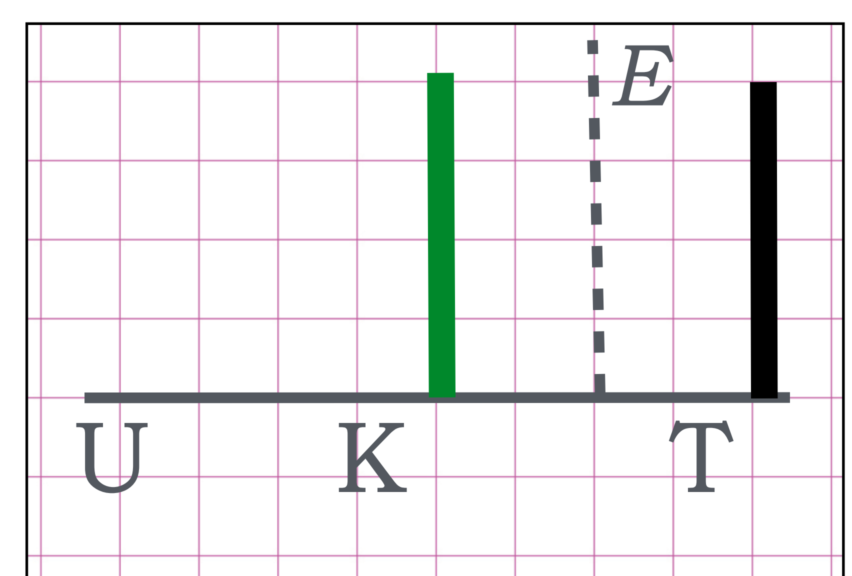


D



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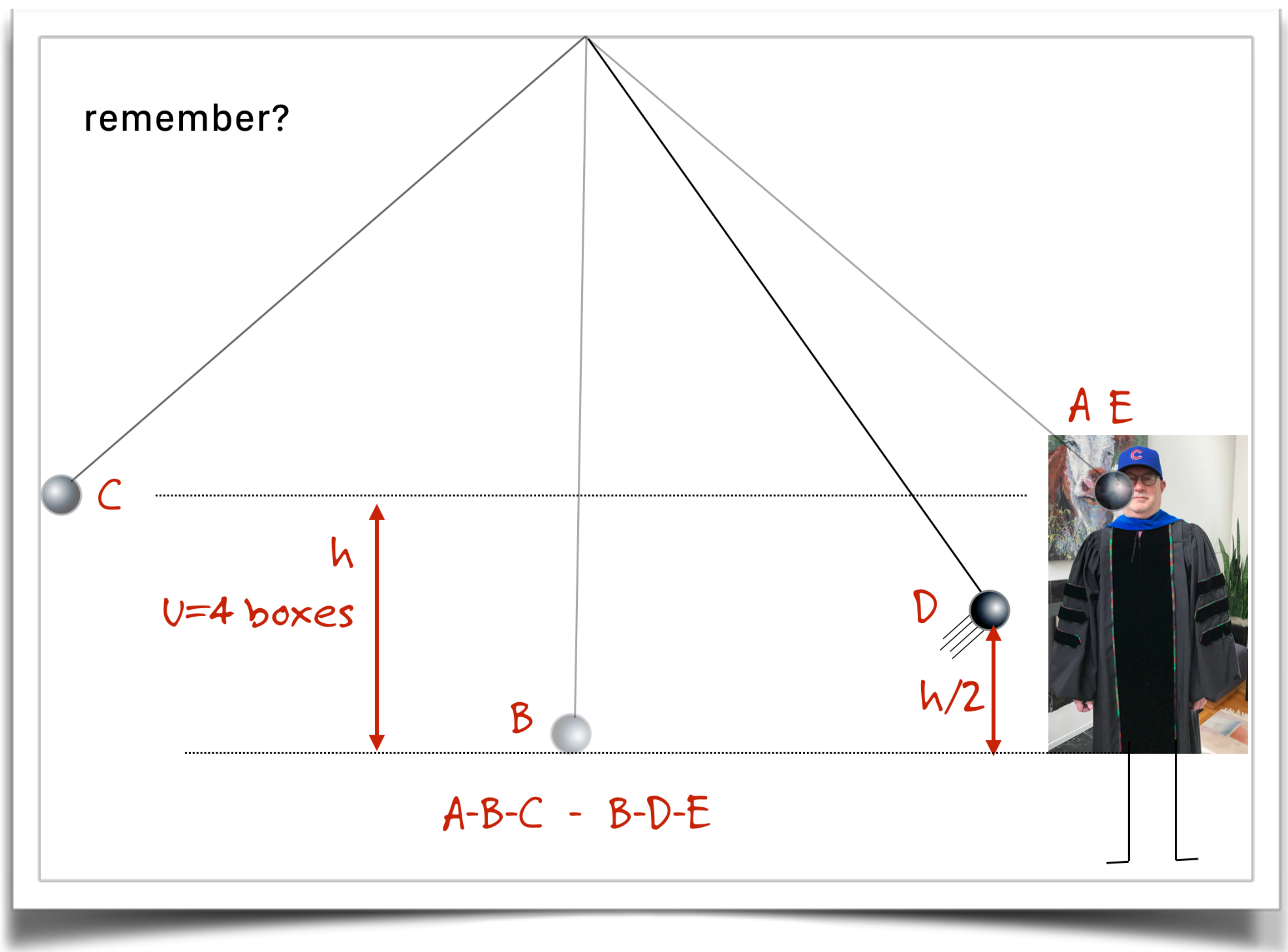

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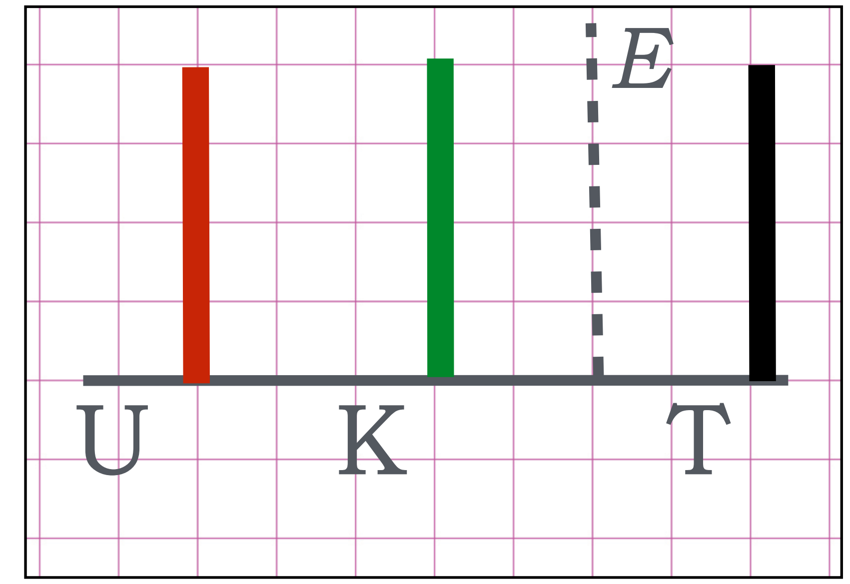
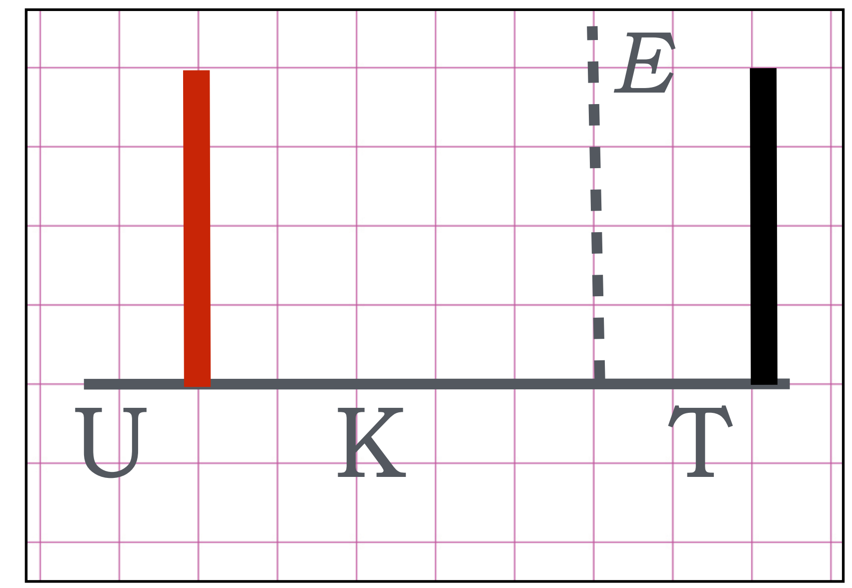


B



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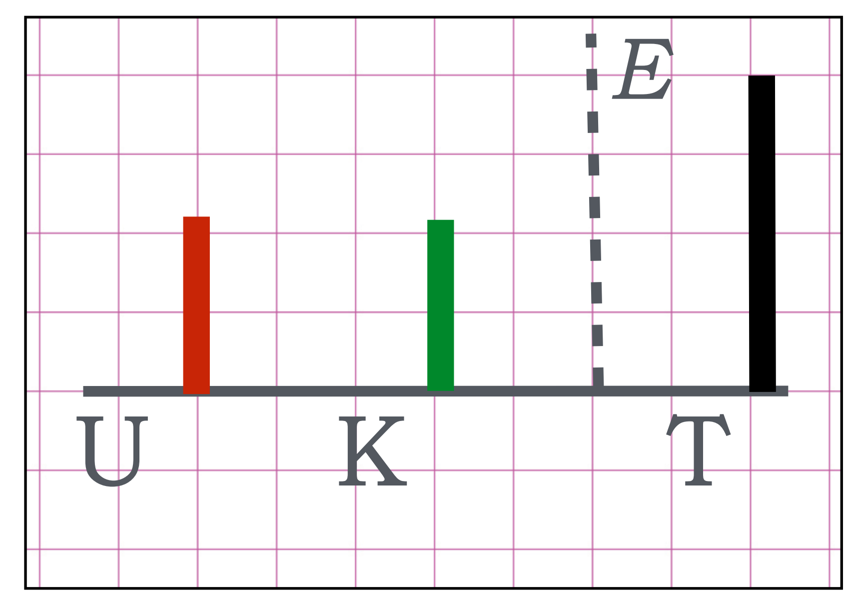

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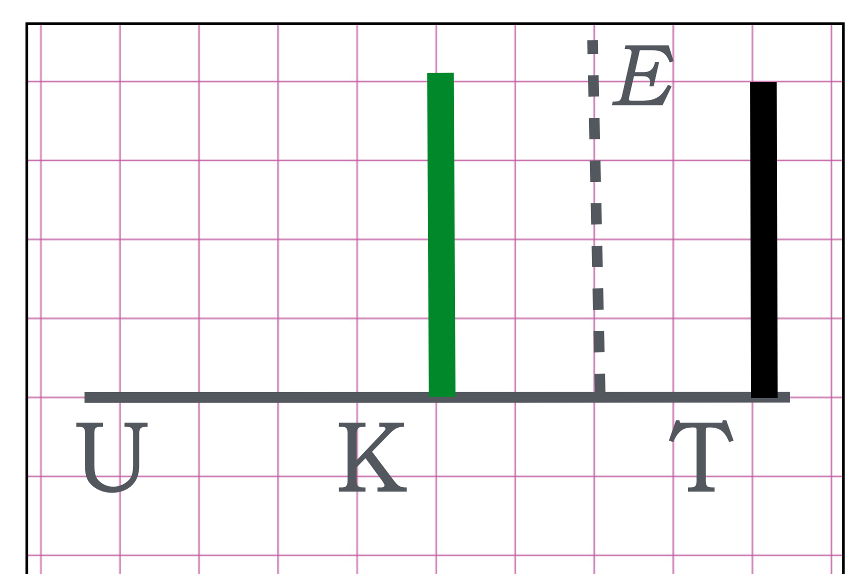

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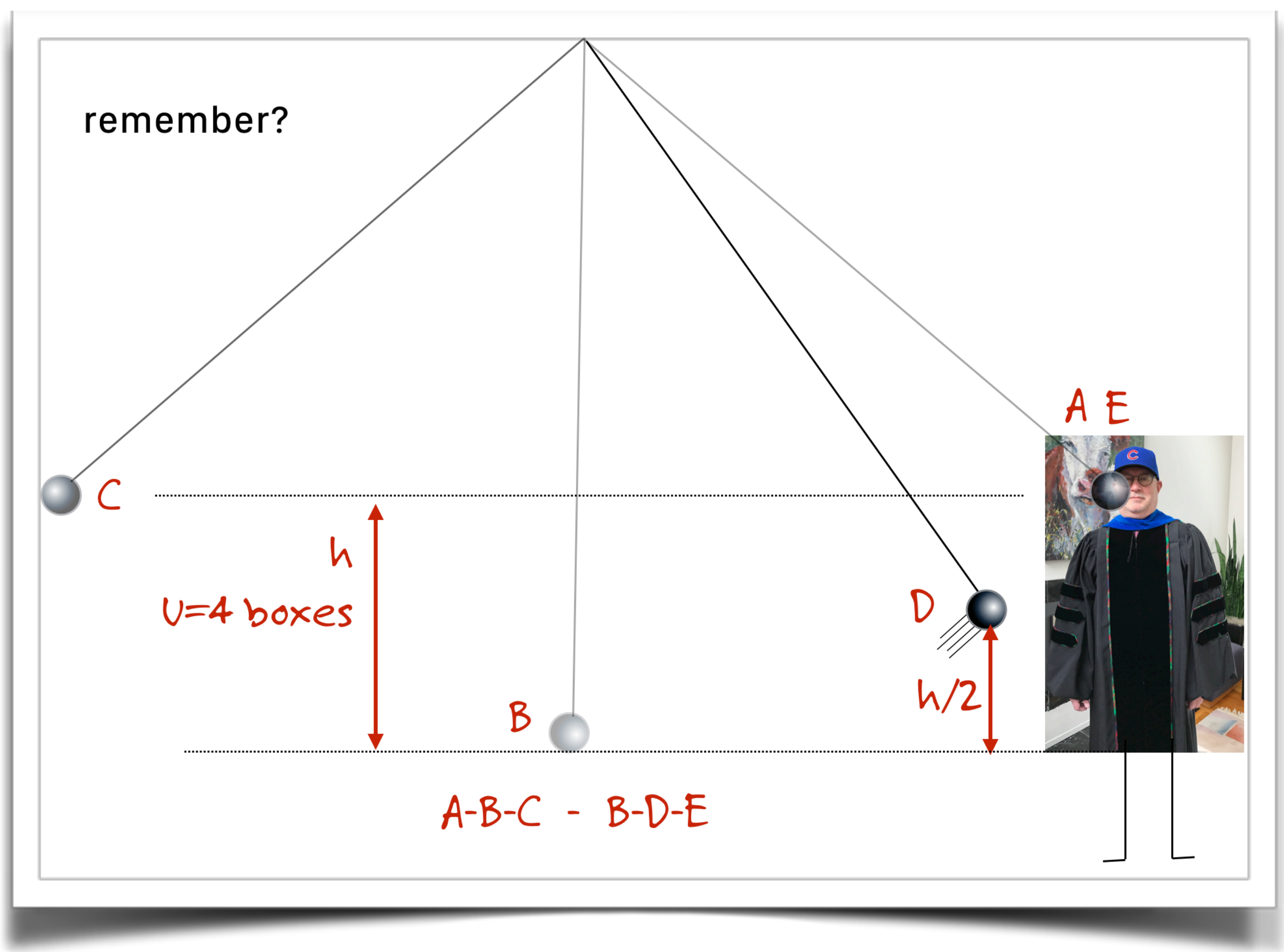
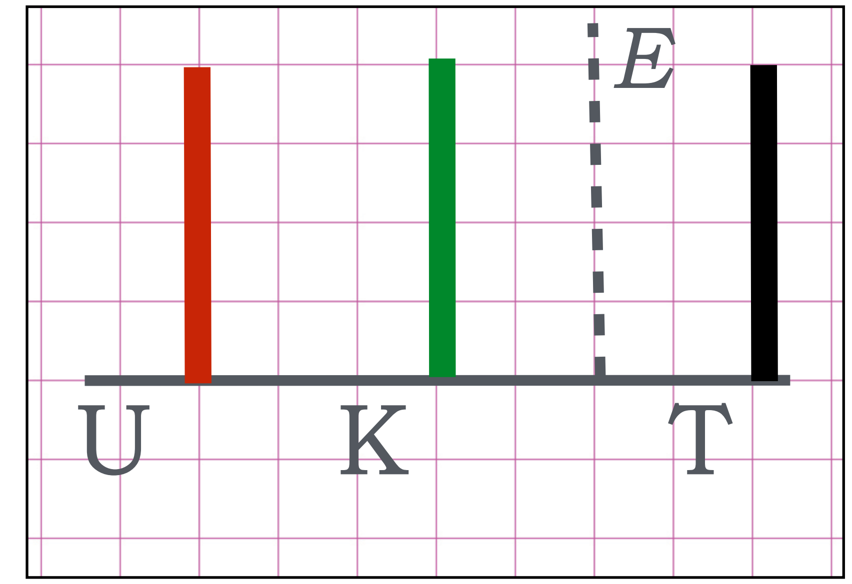
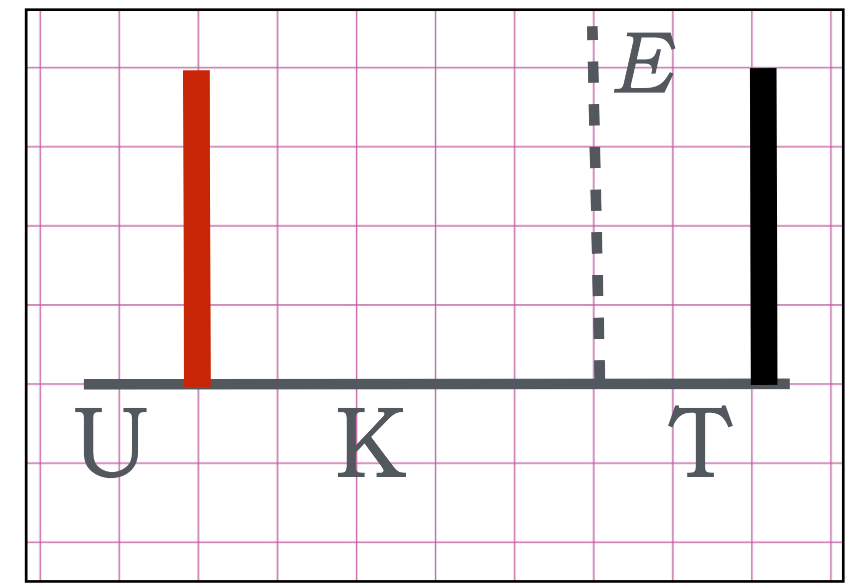


D on the way back is best described as:

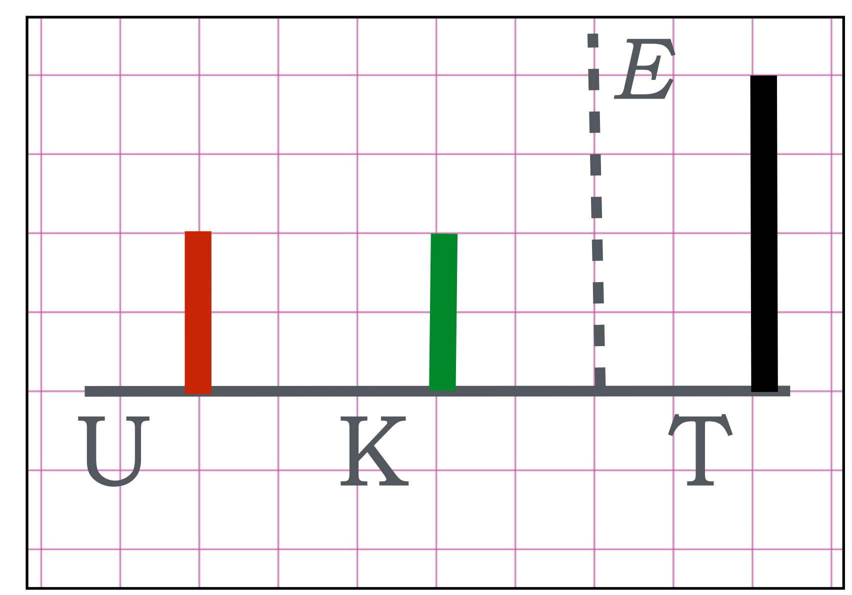
A



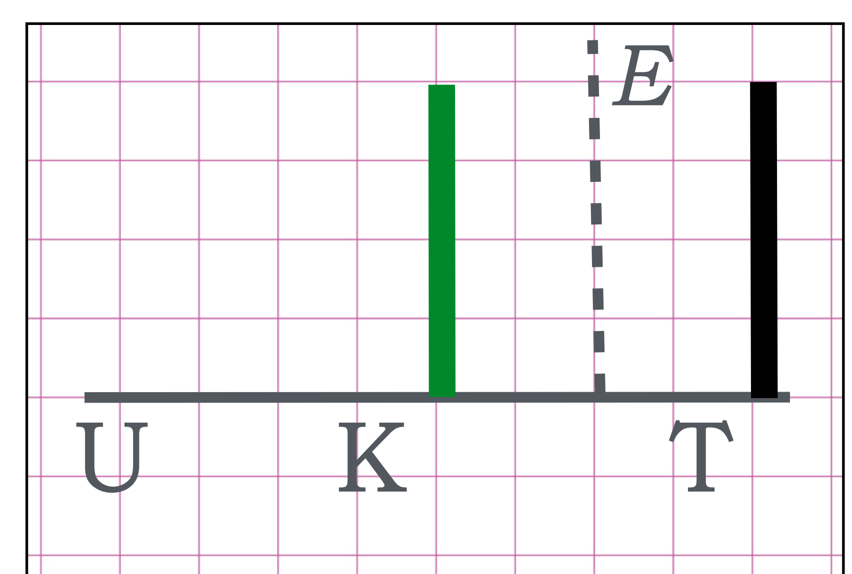
B



C



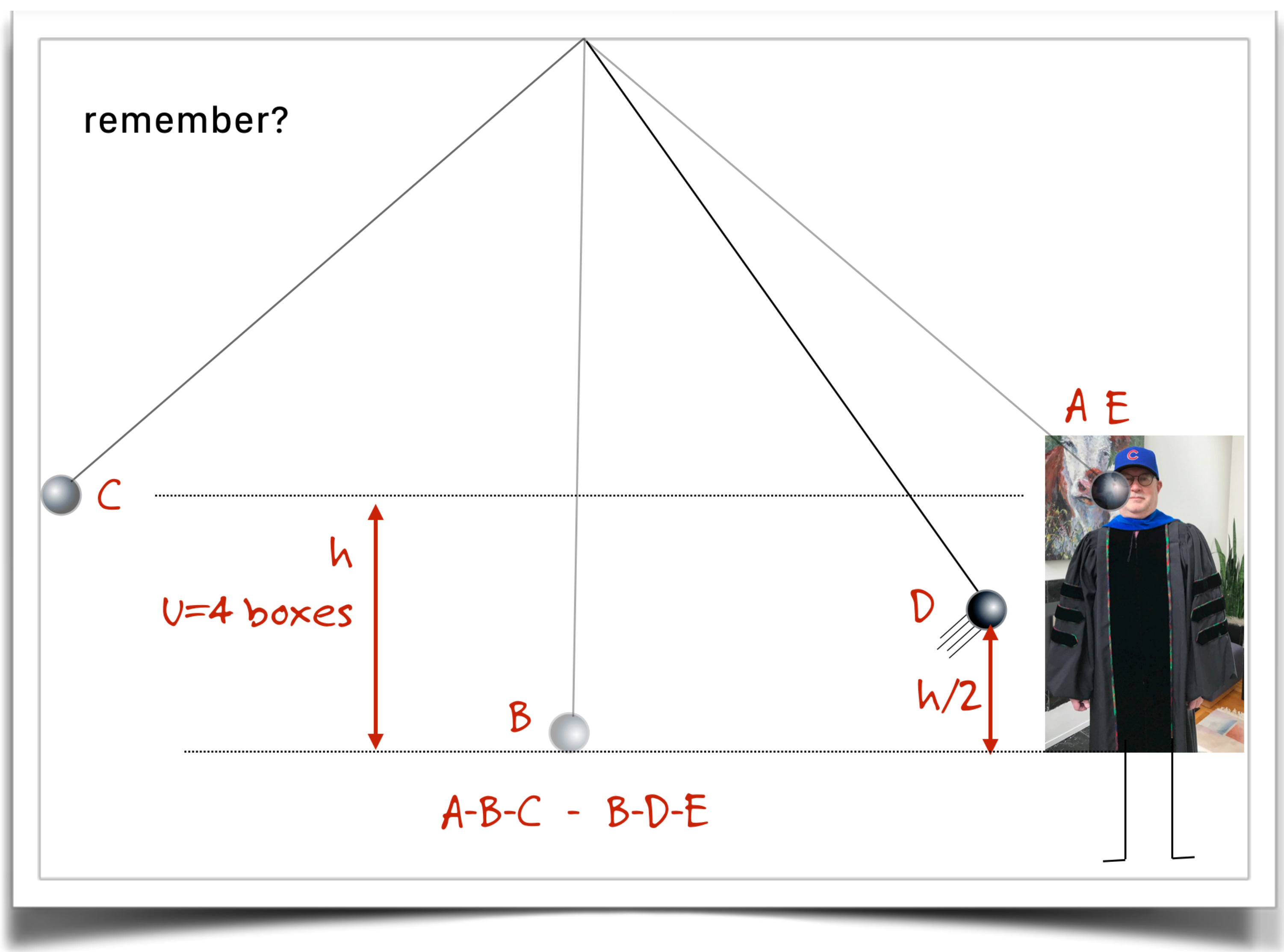
D



answer, defend

Second time:

I **shoved it** at A so K = 1 box @A



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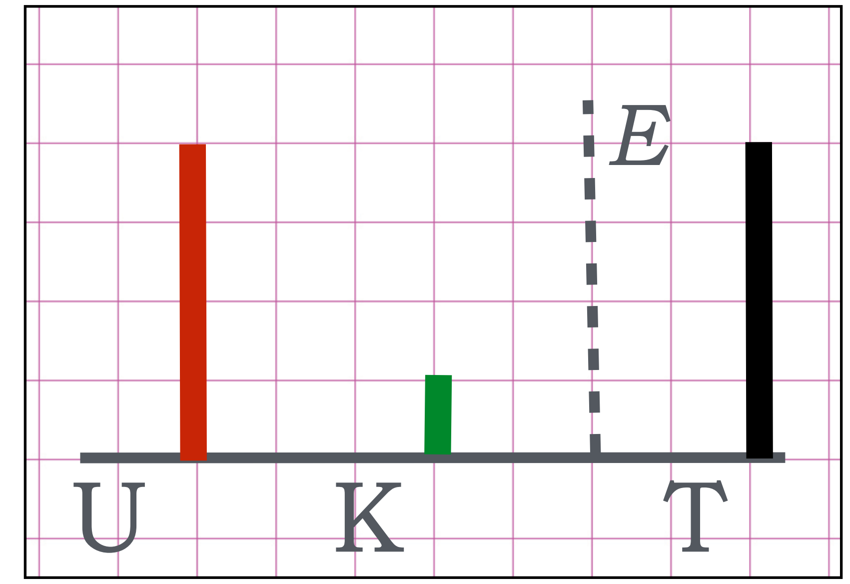
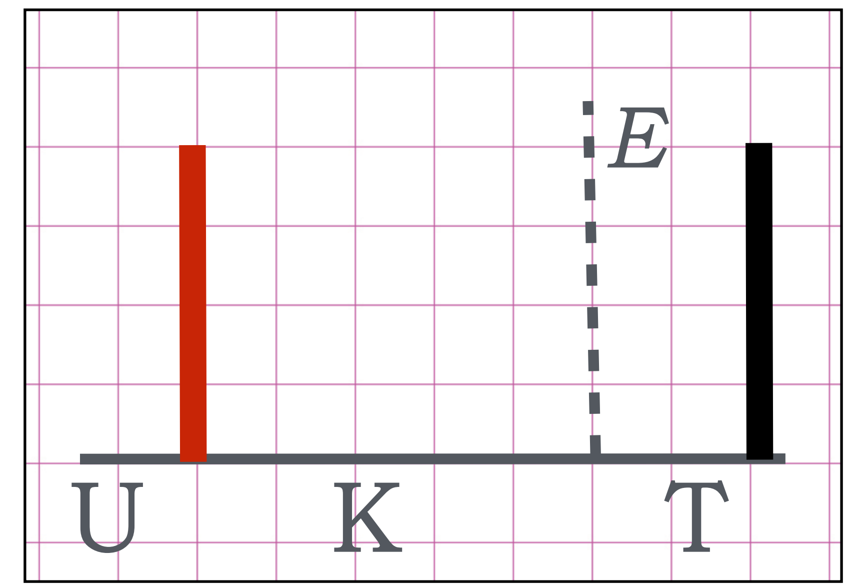


B



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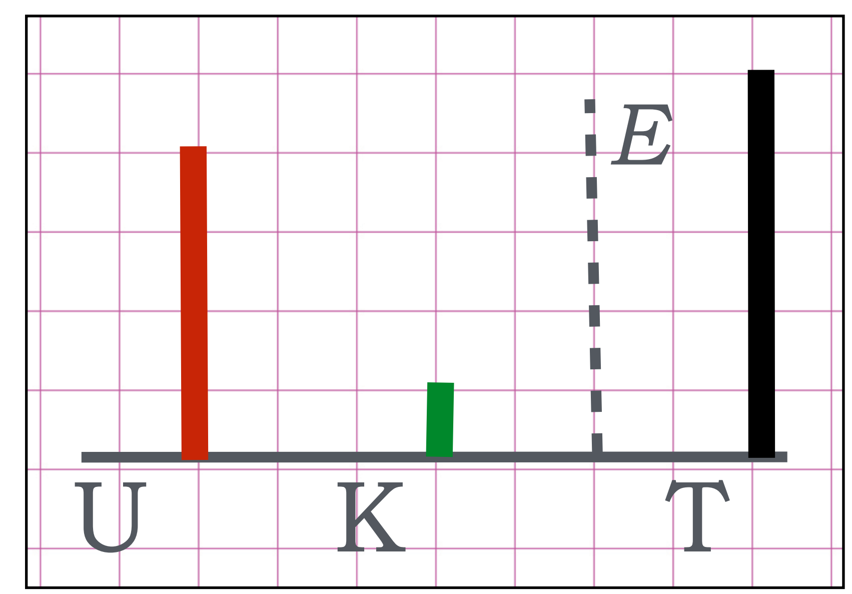
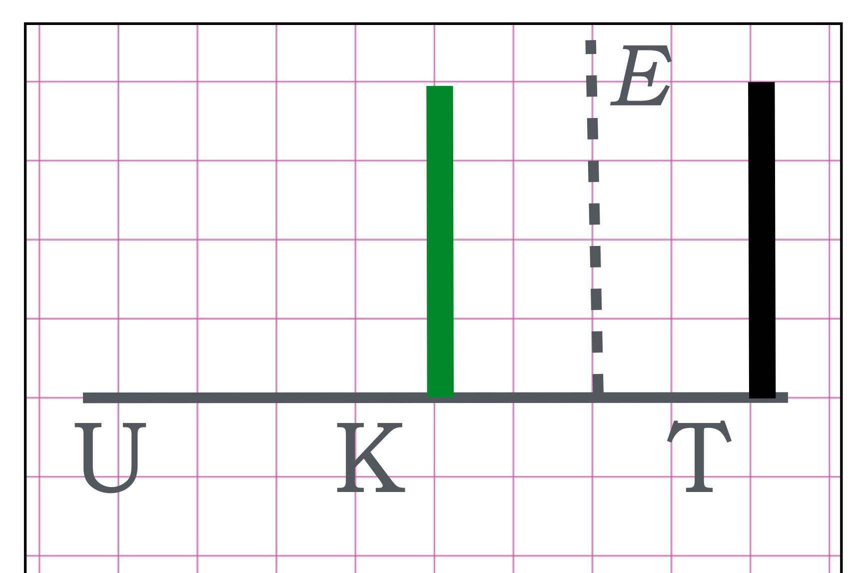


D



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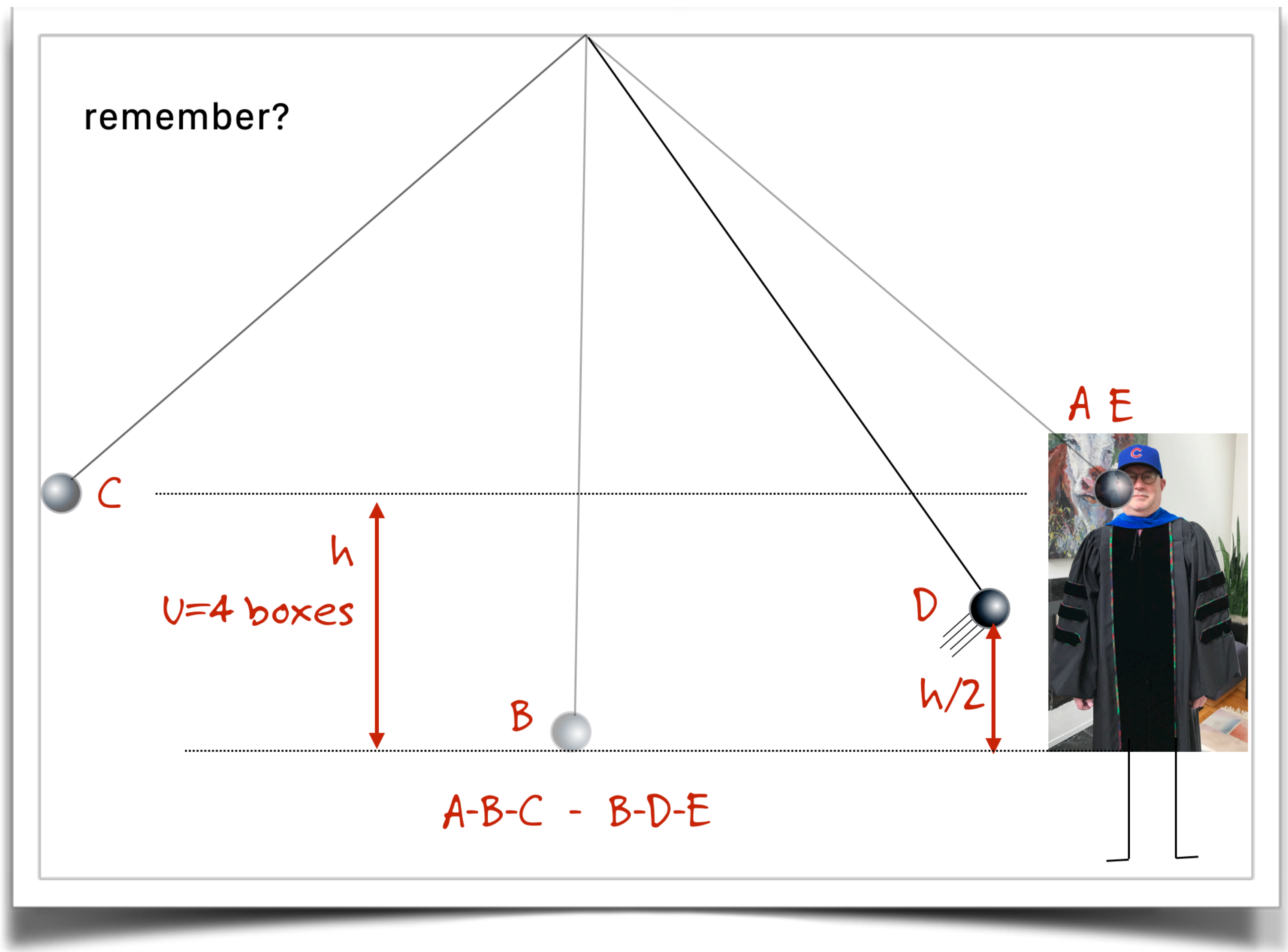

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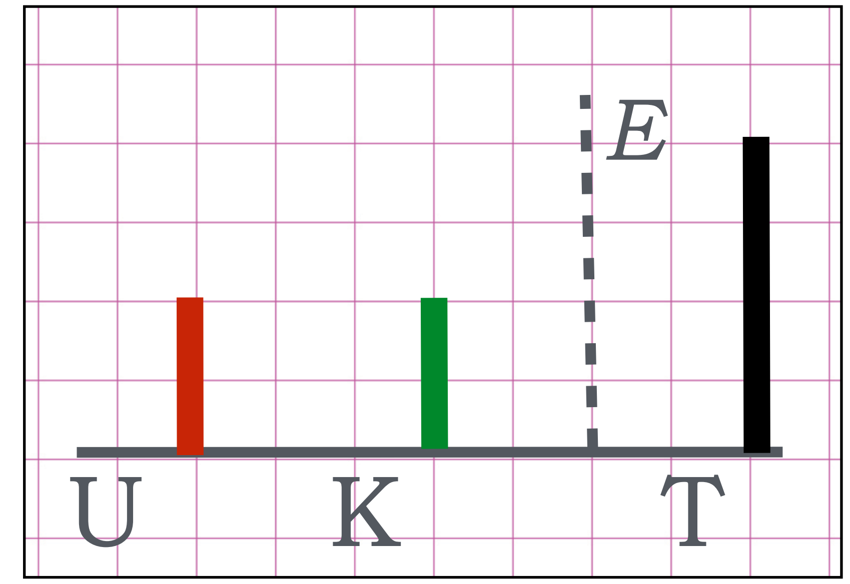
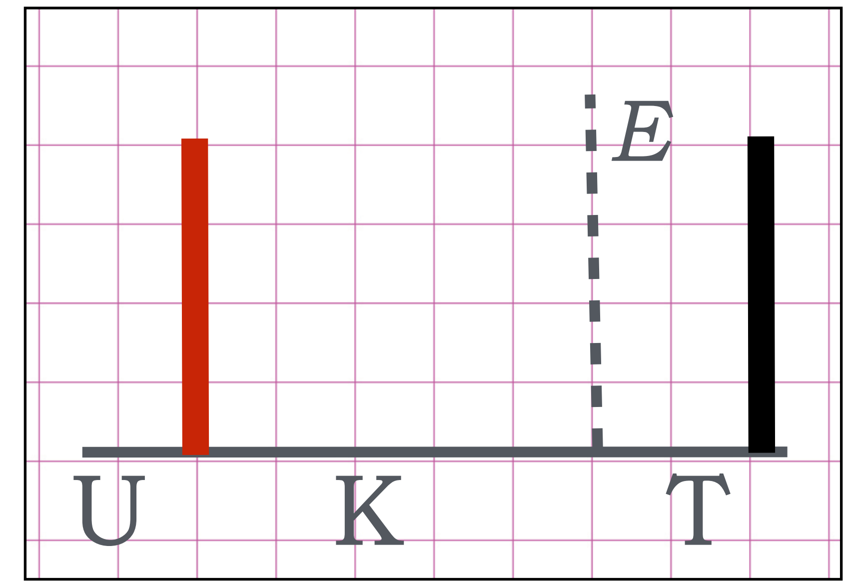


B



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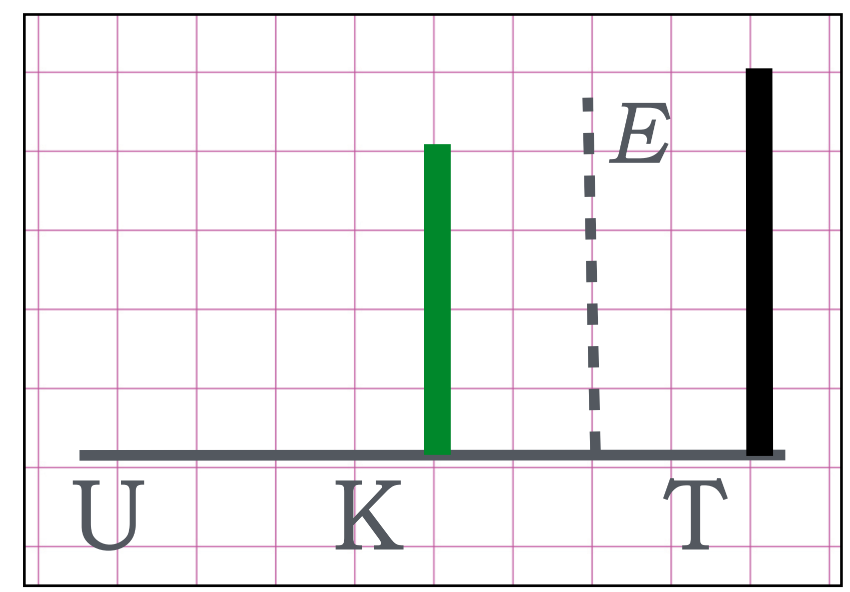
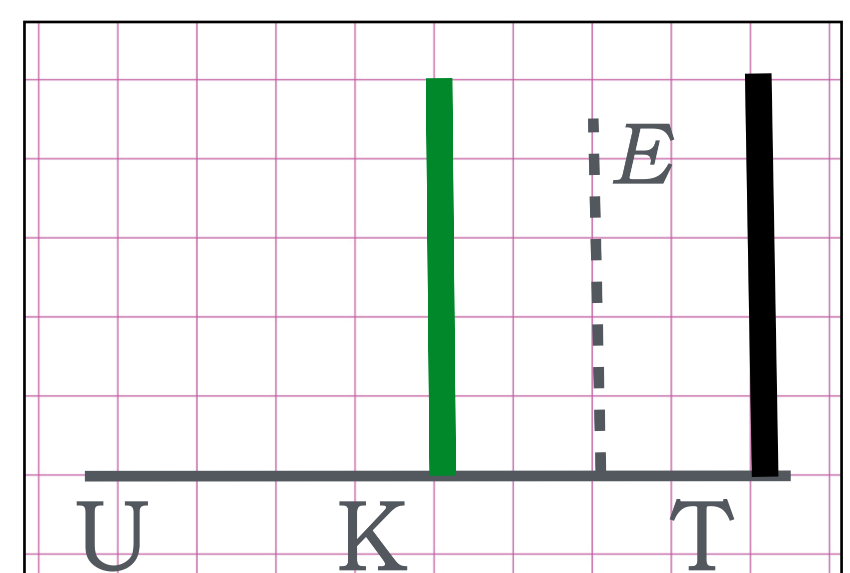


D



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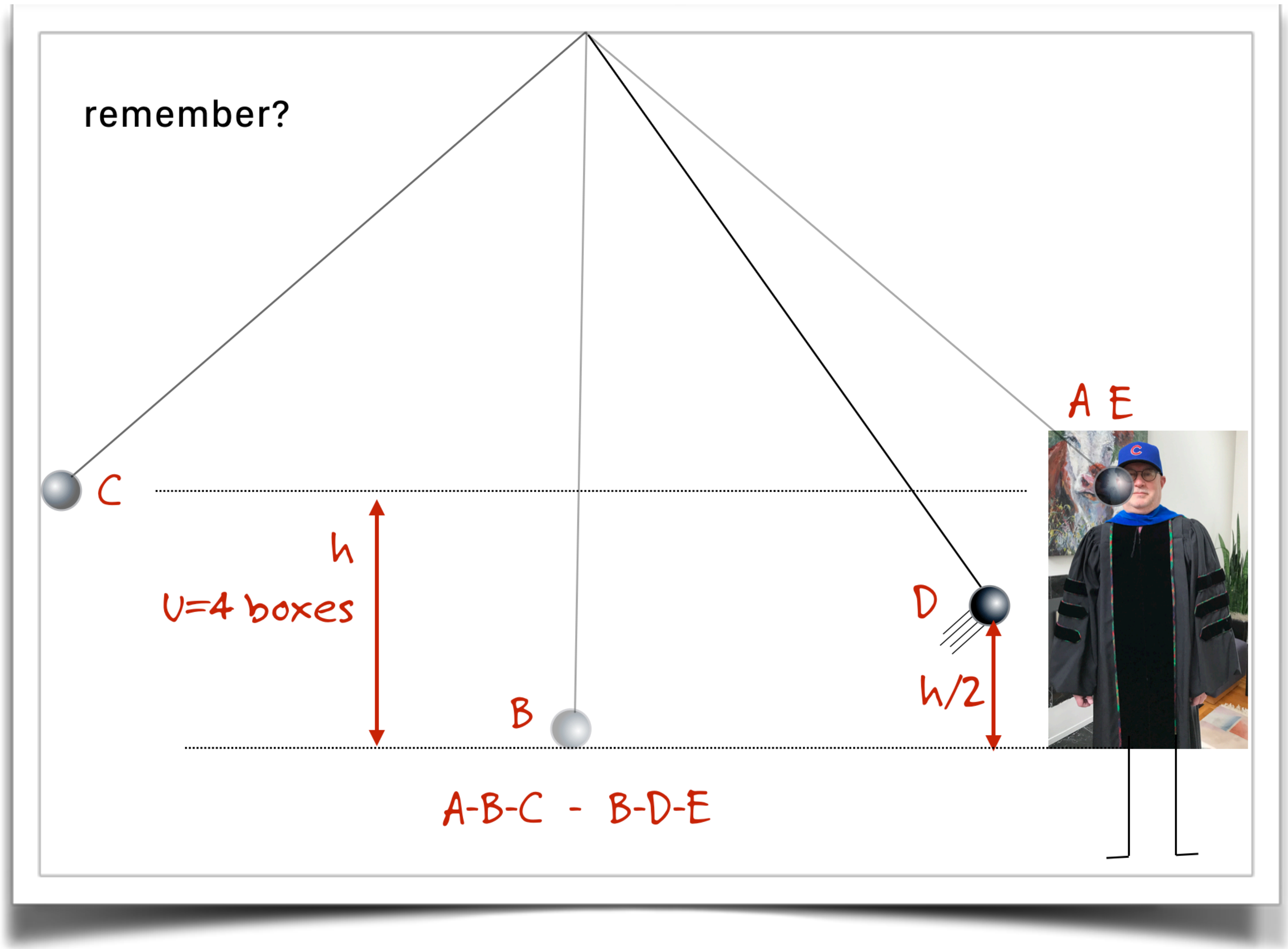
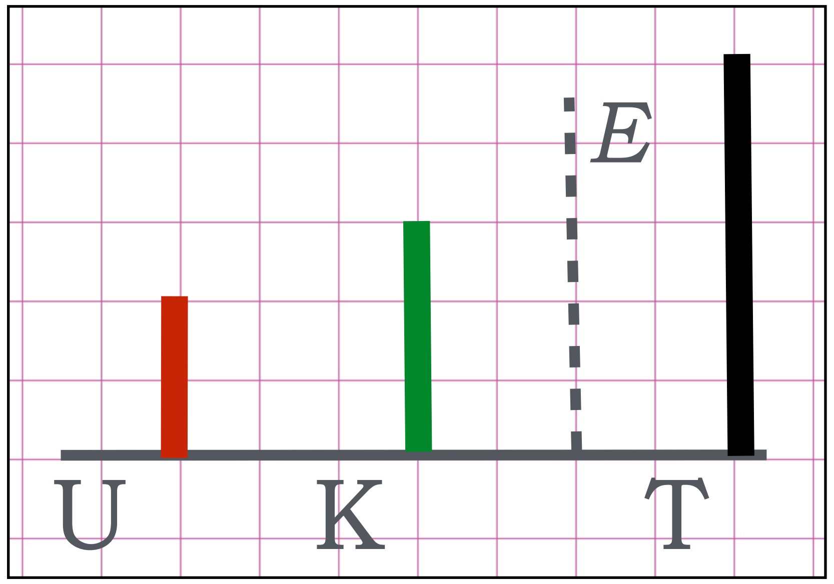
I **shoved it** at A so K = 1 box @A

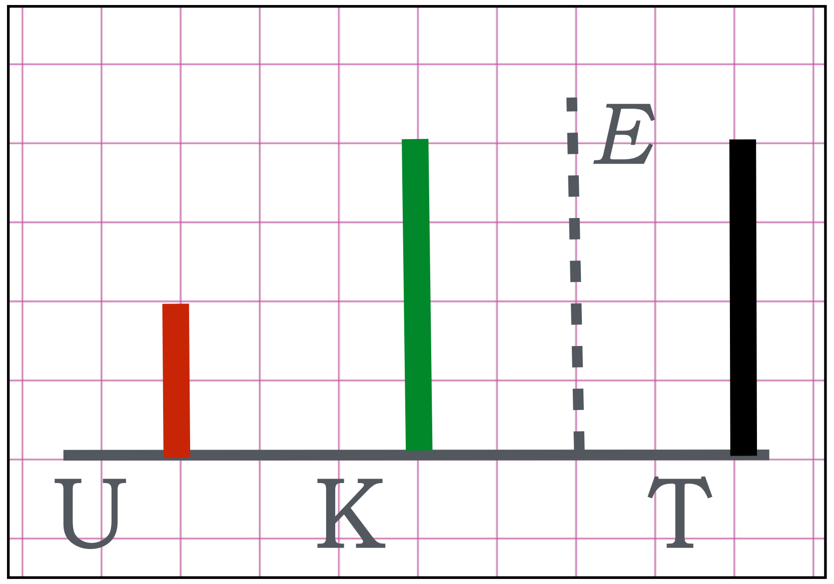


D on the way back is best described as:

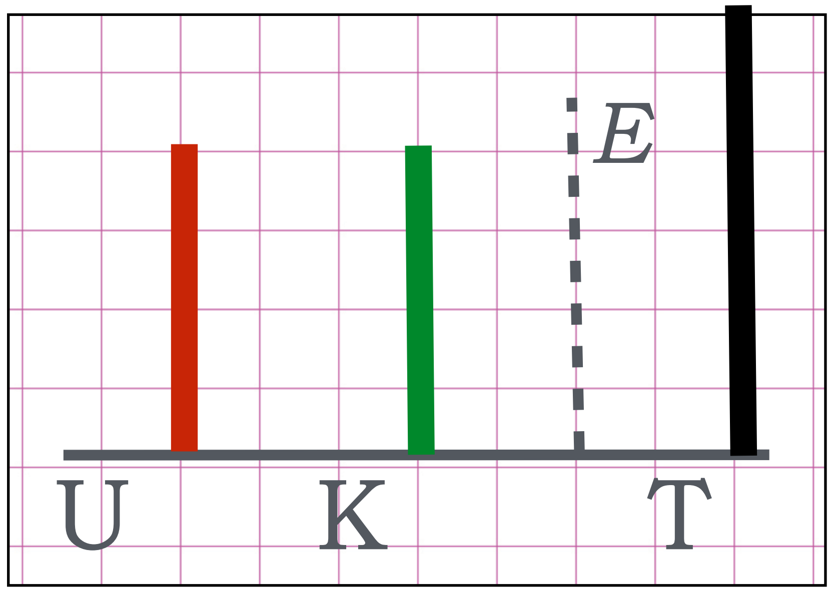
A



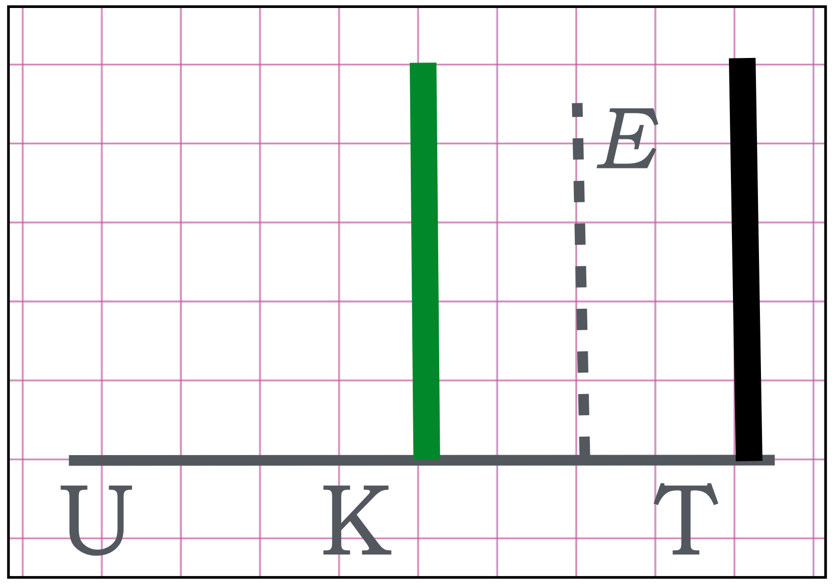
B



C



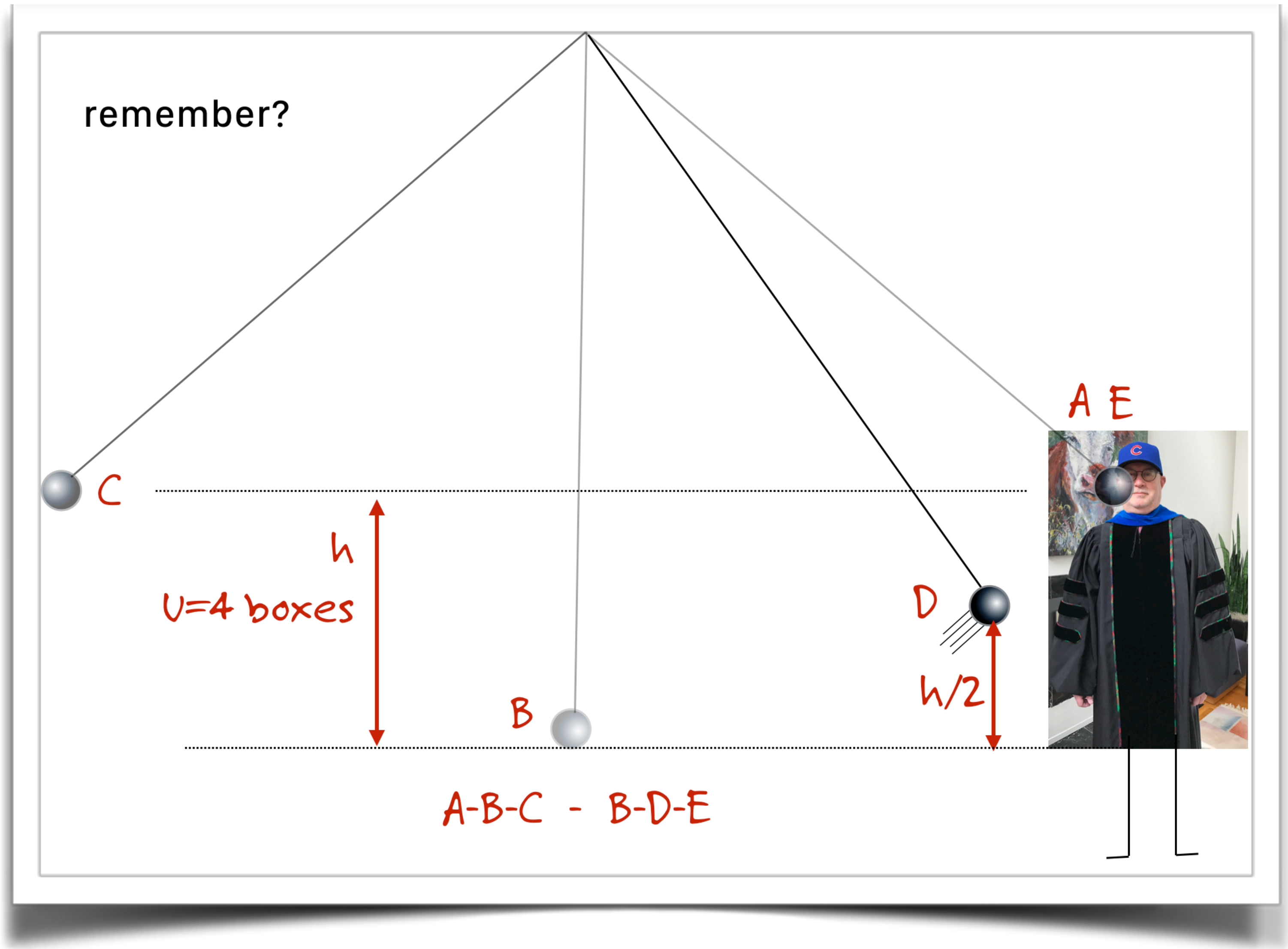
D



answer, defend

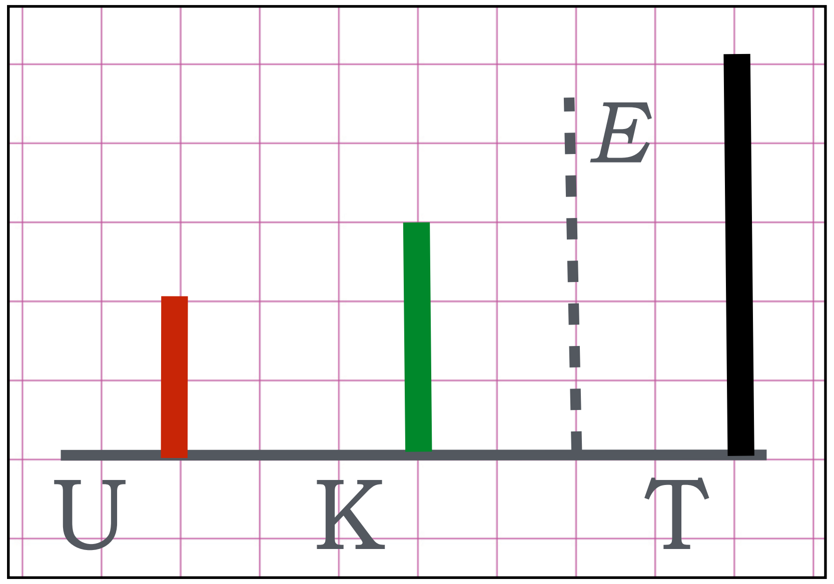
Second time:

I **shoved it** at A so K = 1 box @A

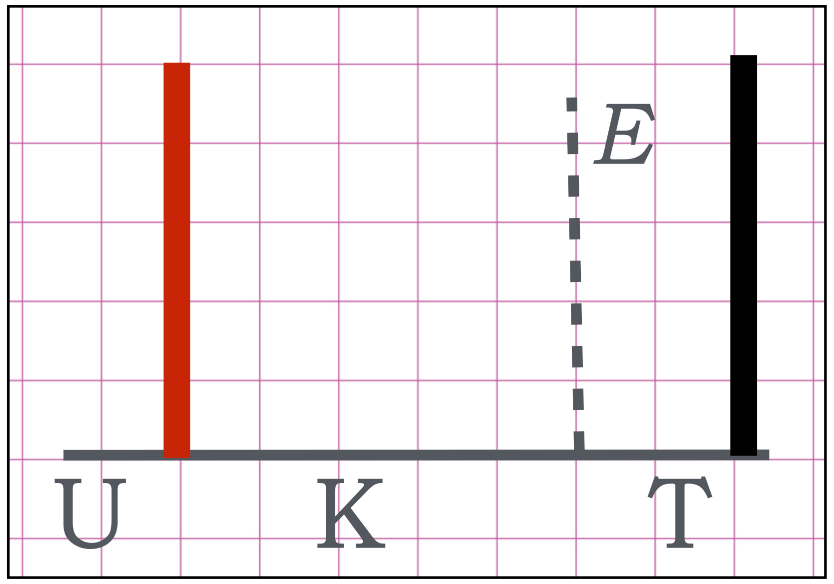


E on the way back is best described as:

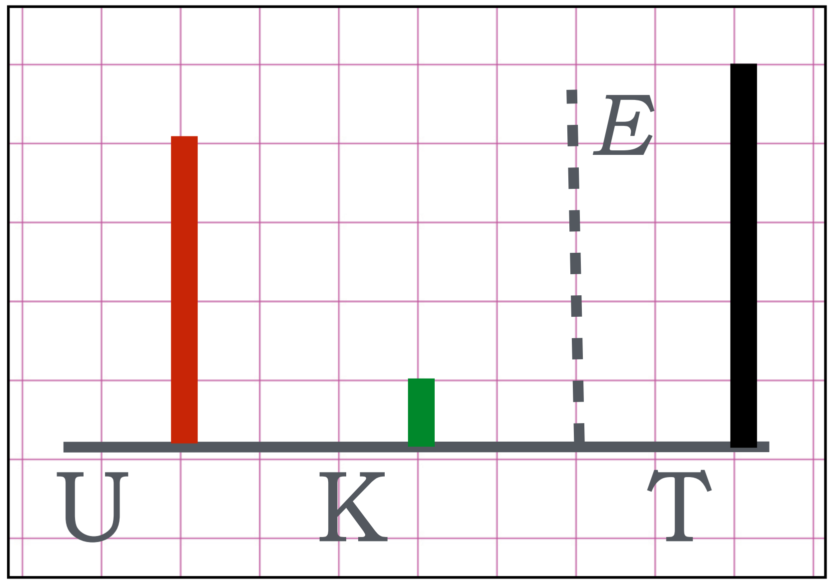
A



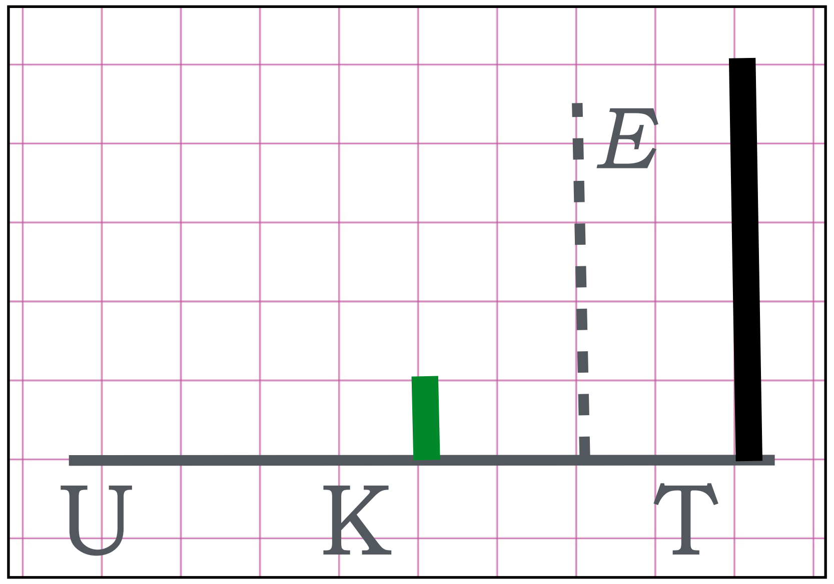
B



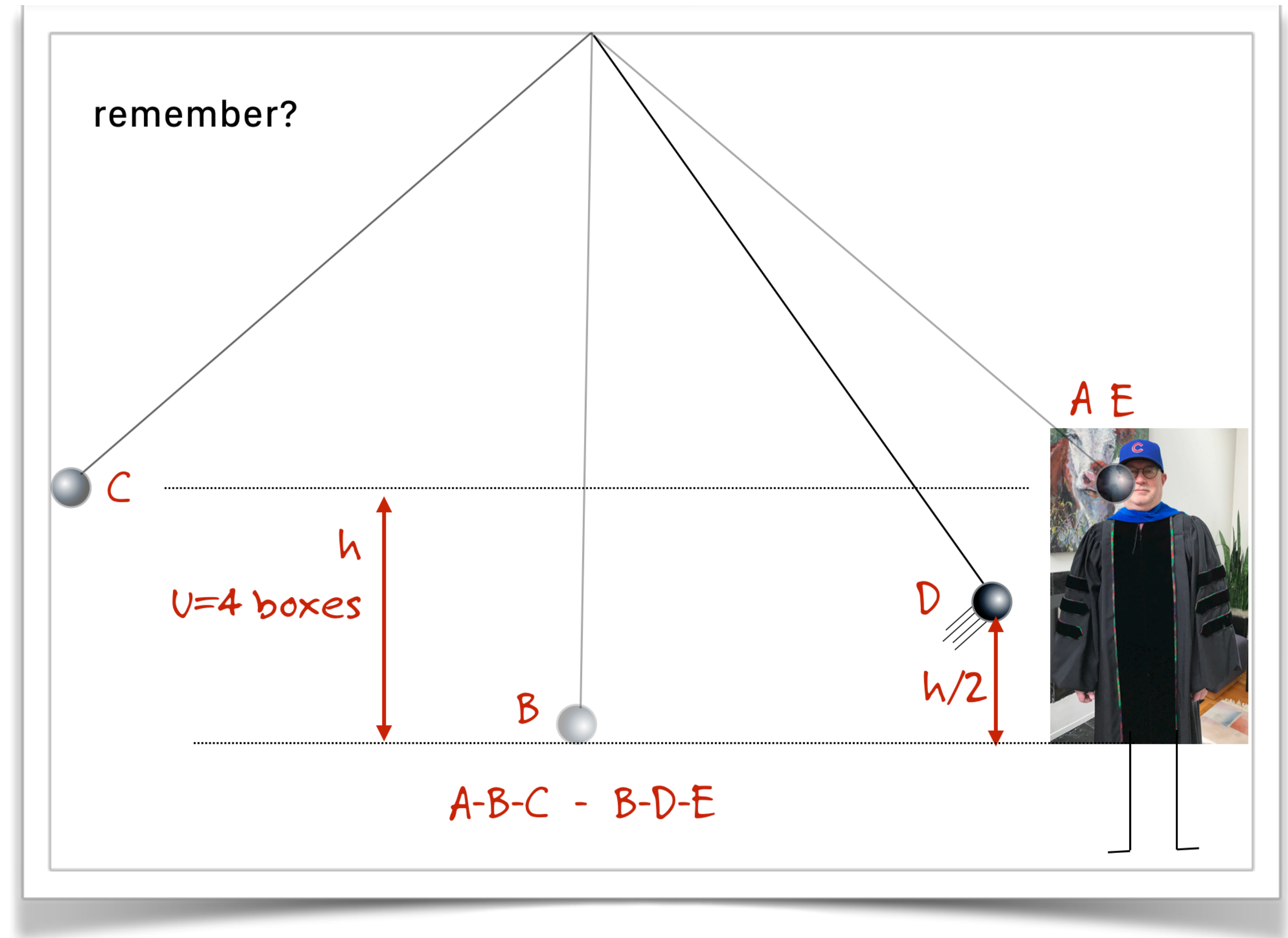
C



D

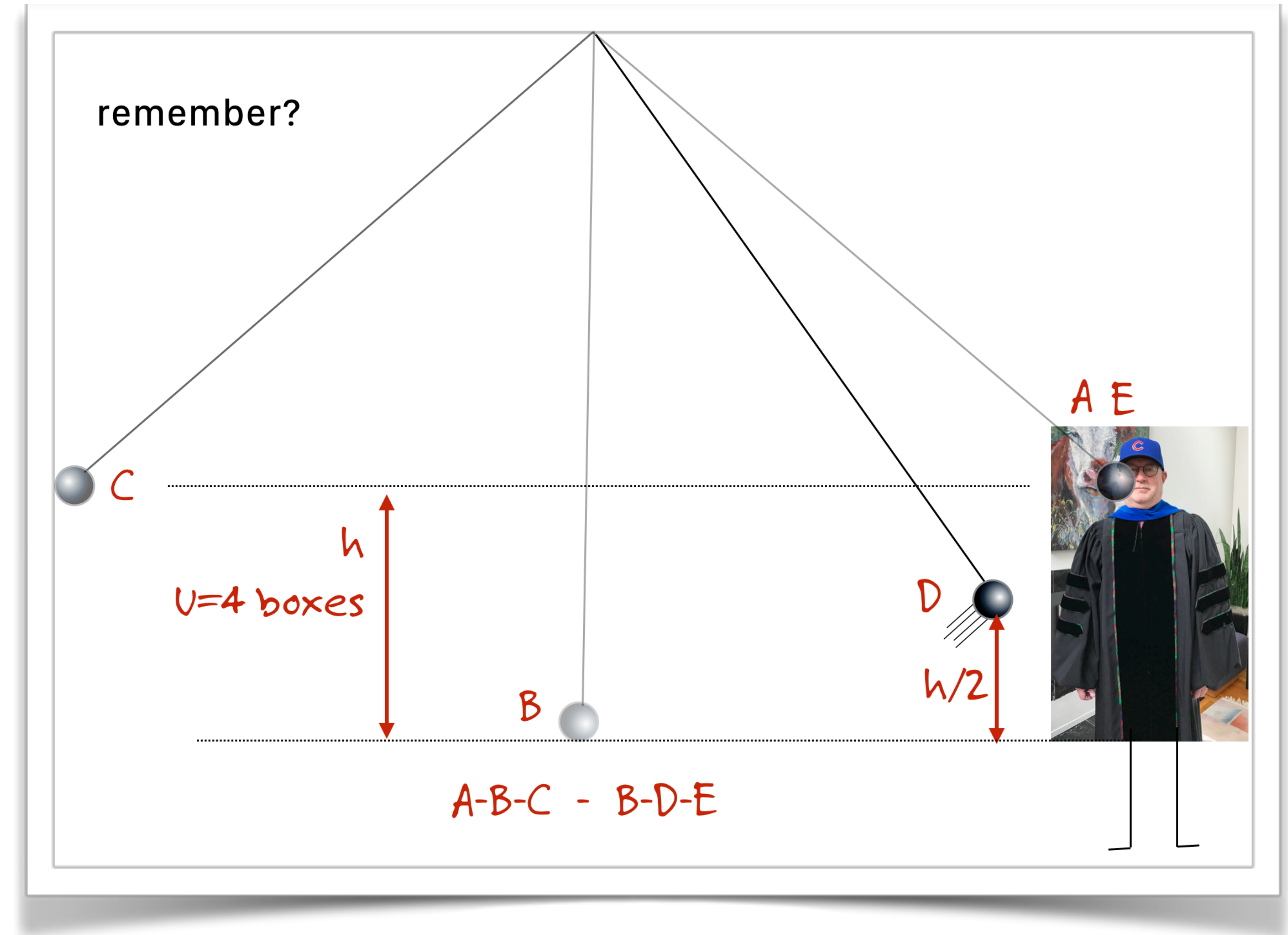


at each point along the path



$$K_A + U_A = K_B + U_B = K_C + U_C = K_D + U_D = K_E + U_E = E$$

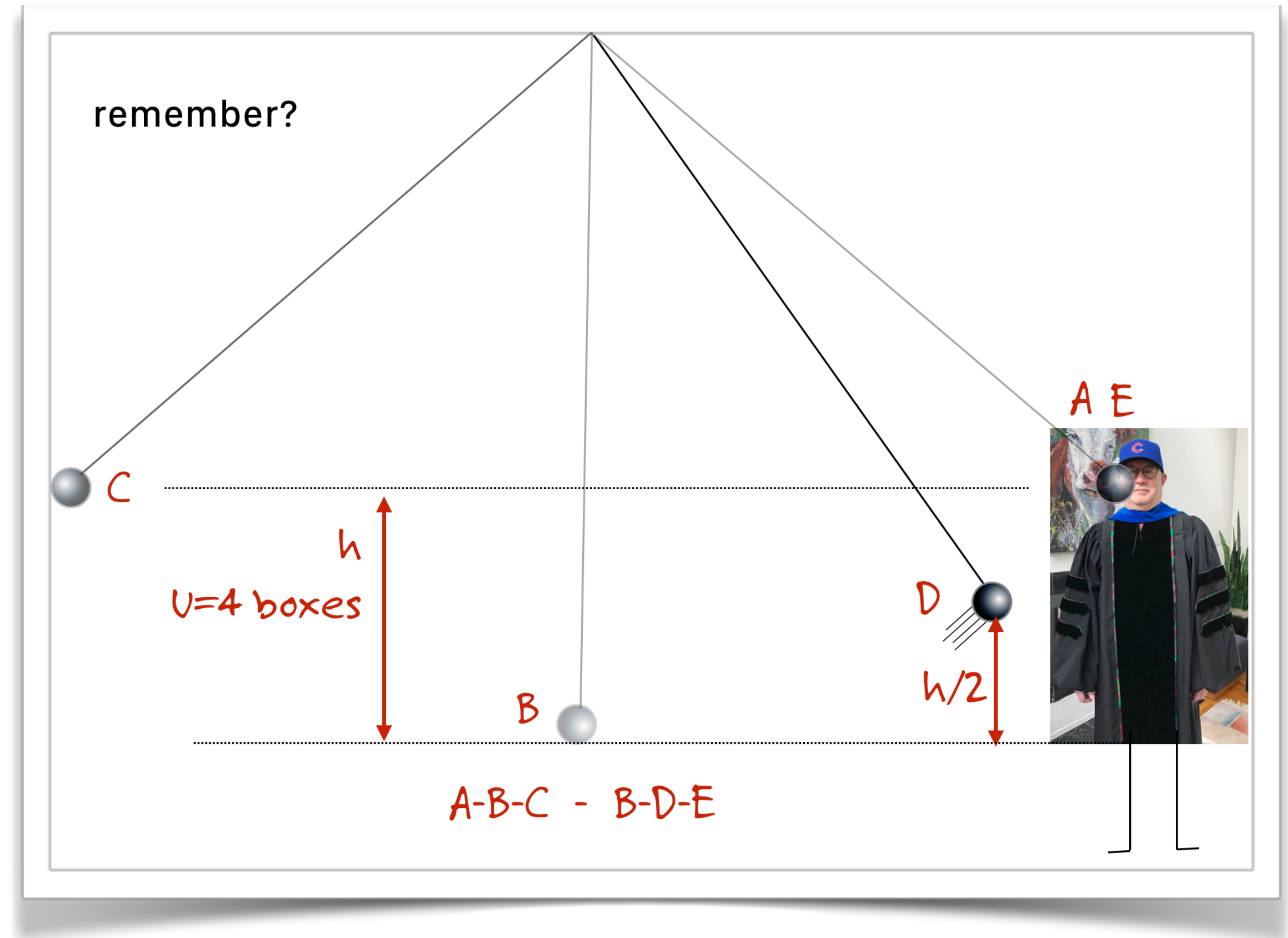
at each point along the path



the first attempt:

$$K_A + U_A = K_B + U_B = K_C + U_C = K_D + U_D = K_E + U_E = E$$

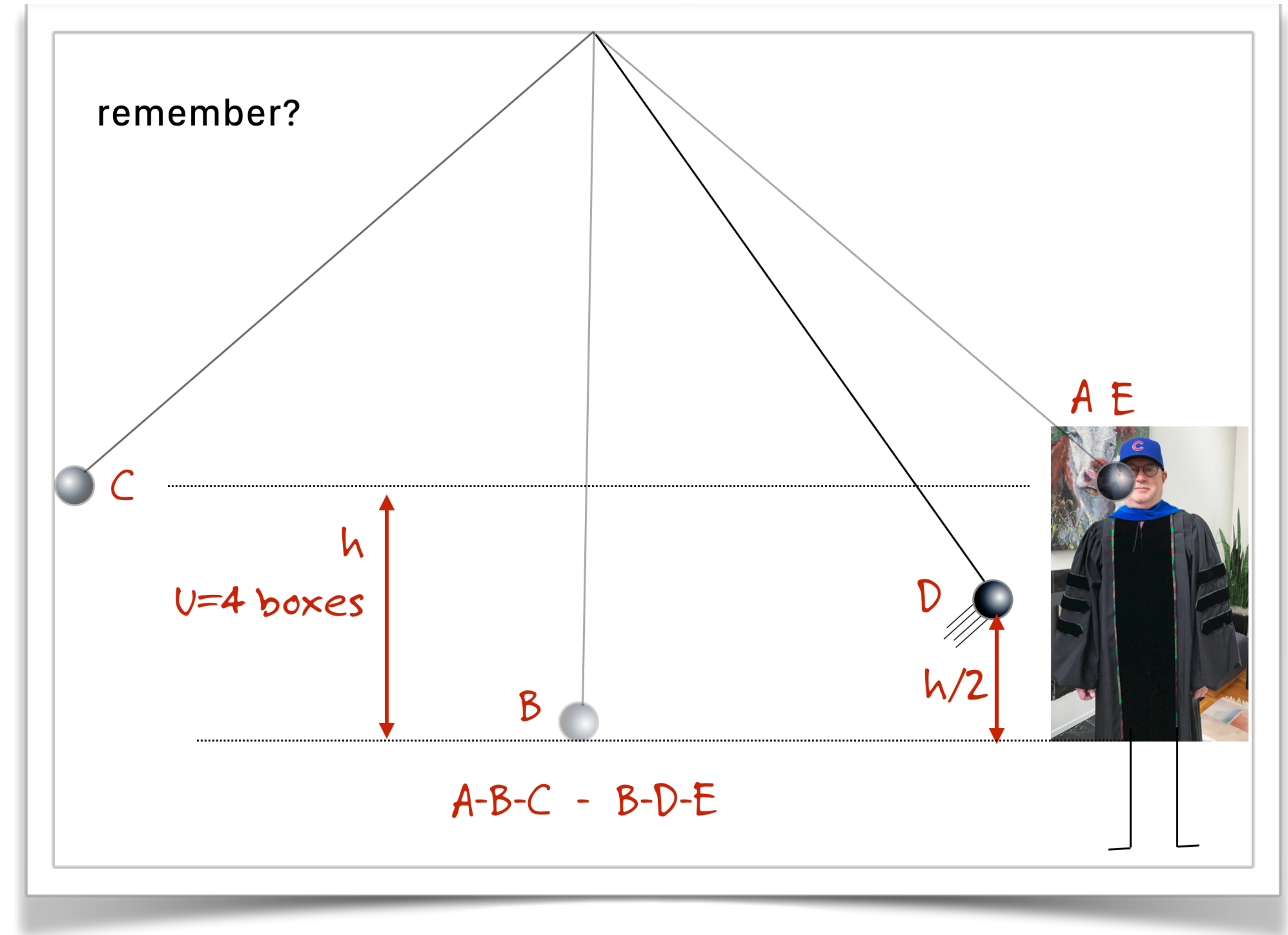
at each point along the path



the first attempt:

$$\cancelto{0}{K_A} + U_A = K_B + U_B = K_C + U_C = K_D + U_D = K_E + U_E = E$$

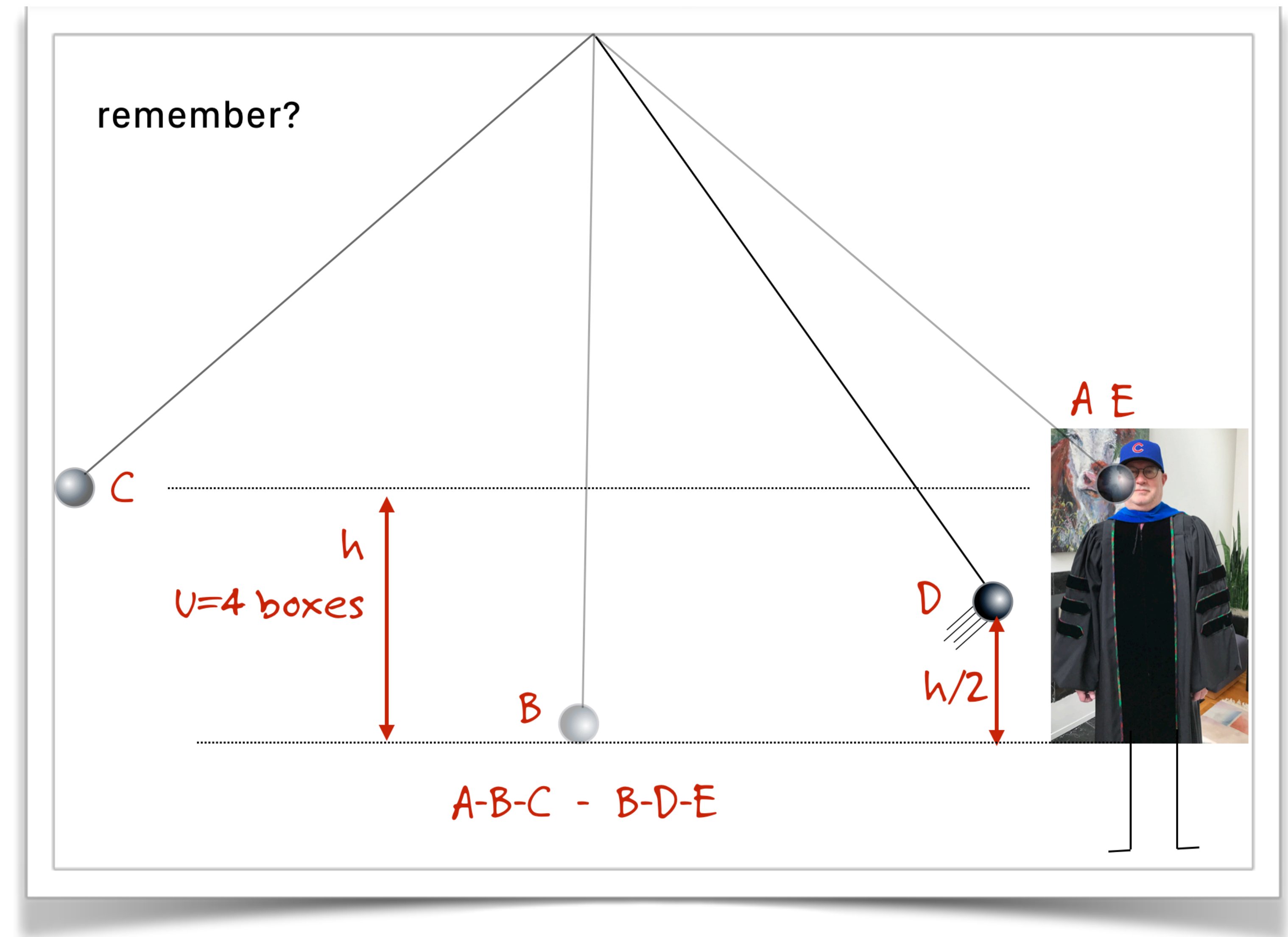
at each point along the path



the first attempt:

$$\cancelto{0}{K_A} + U_A = K_B + \cancelto{0}{U_B} = K_C + U_C = K_D + U_D = K_E + U_E = E$$

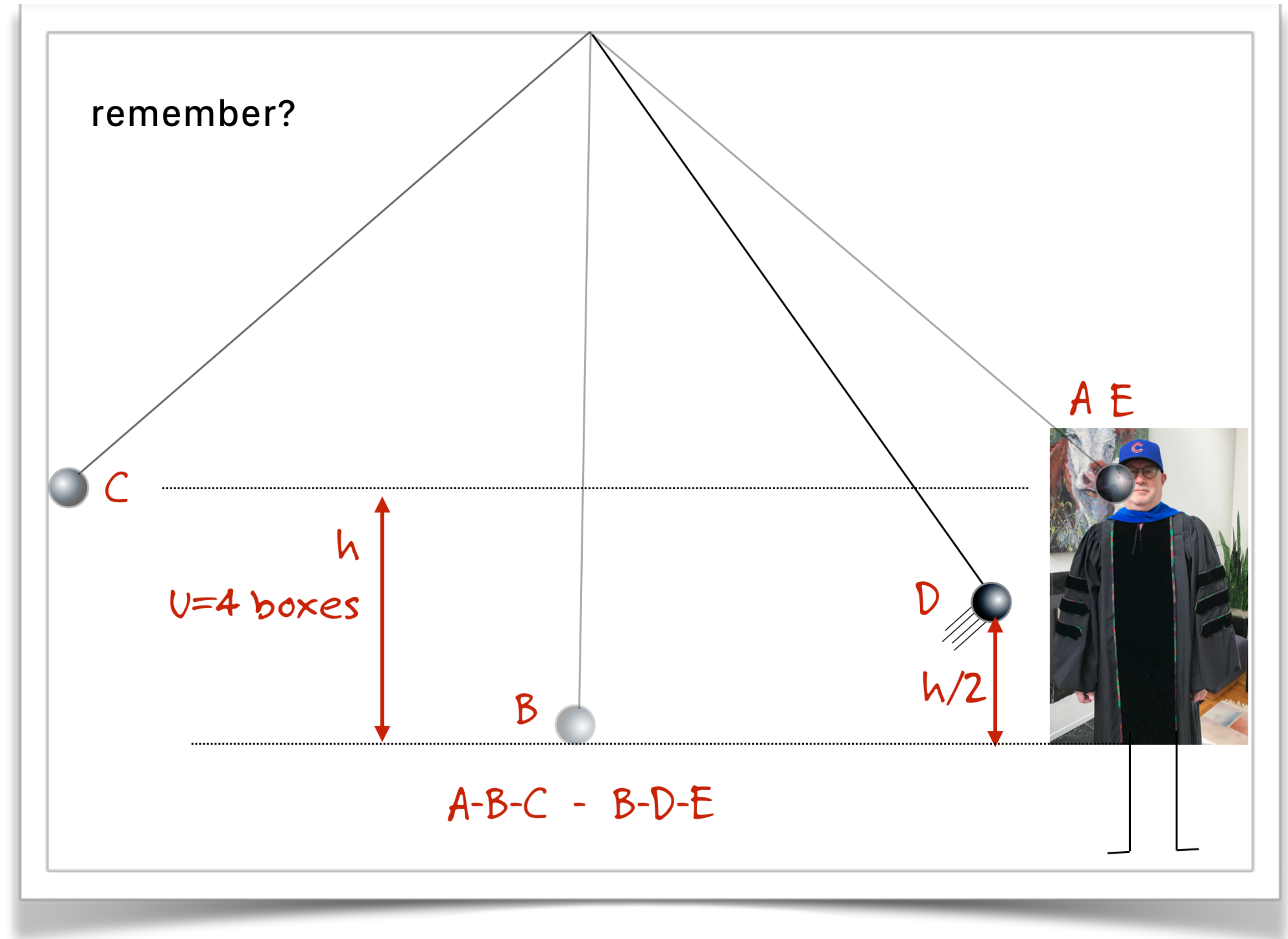
at each point along the path



the first attempt:

$$\cancelto{0}{K_A} + U_A = K_B + \cancelto{0}{U_B} = \cancelto{0}{K_C} + U_C = K_D + U_D = K_E + U_E = E$$

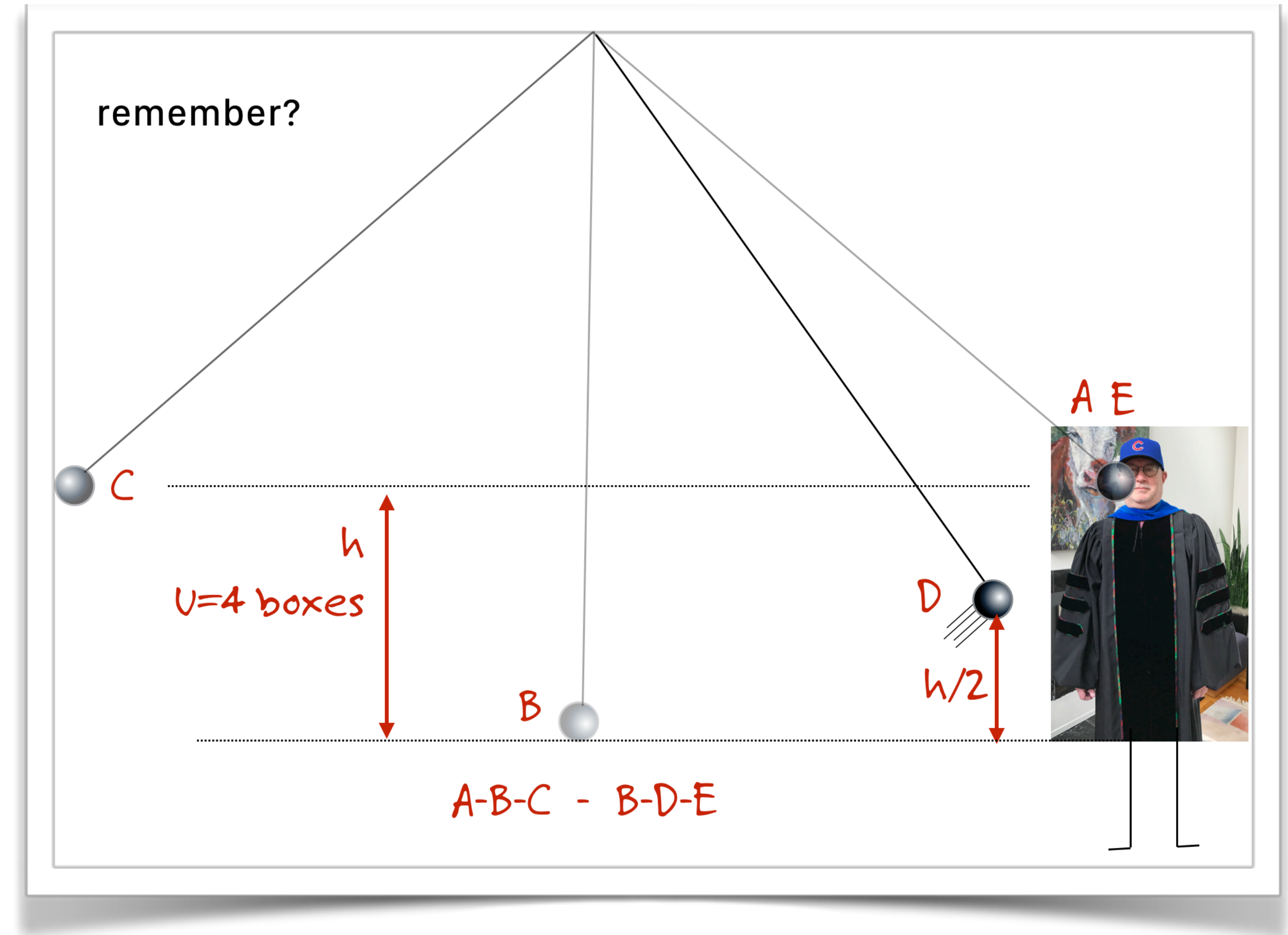
at each point along the path



the first attempt:

$$\cancelto{0}{K_A} + U_A = K_B + \cancelto{0}{U_B} = \cancelto{0}{K_C} + U_C = K_D + U_D = \cancelto{0}{K_E} + U_E = E$$

at each point along the path

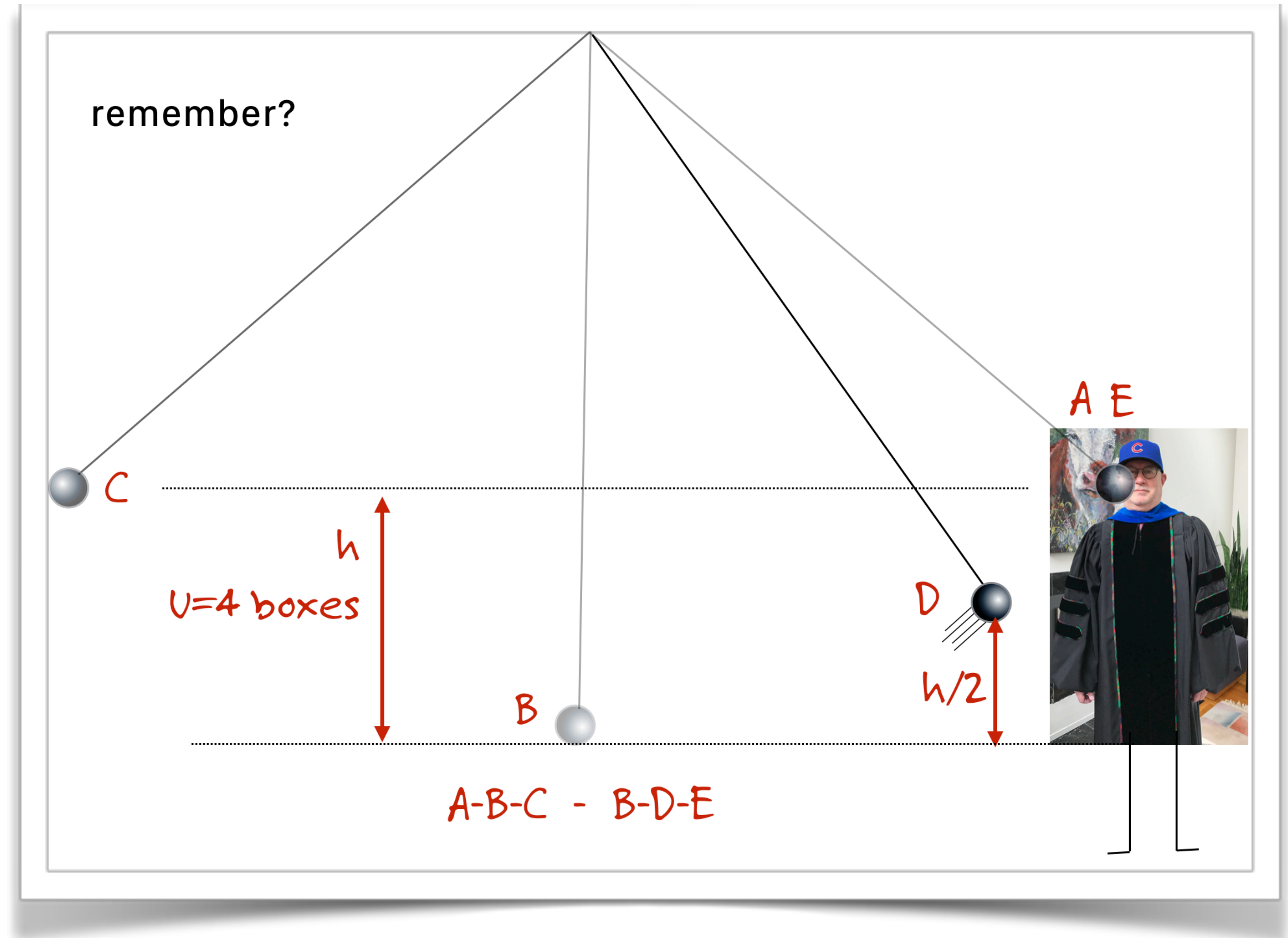


the first attempt:

$$\cancelto{0}{K_A} + U_A = K_B + \cancelto{0}{U_B} = \cancelto{0}{K_C} + U_C = K_D + U_D = \cancelto{0}{K_E} + U_E = E$$

the second attempt:

at each point along the path



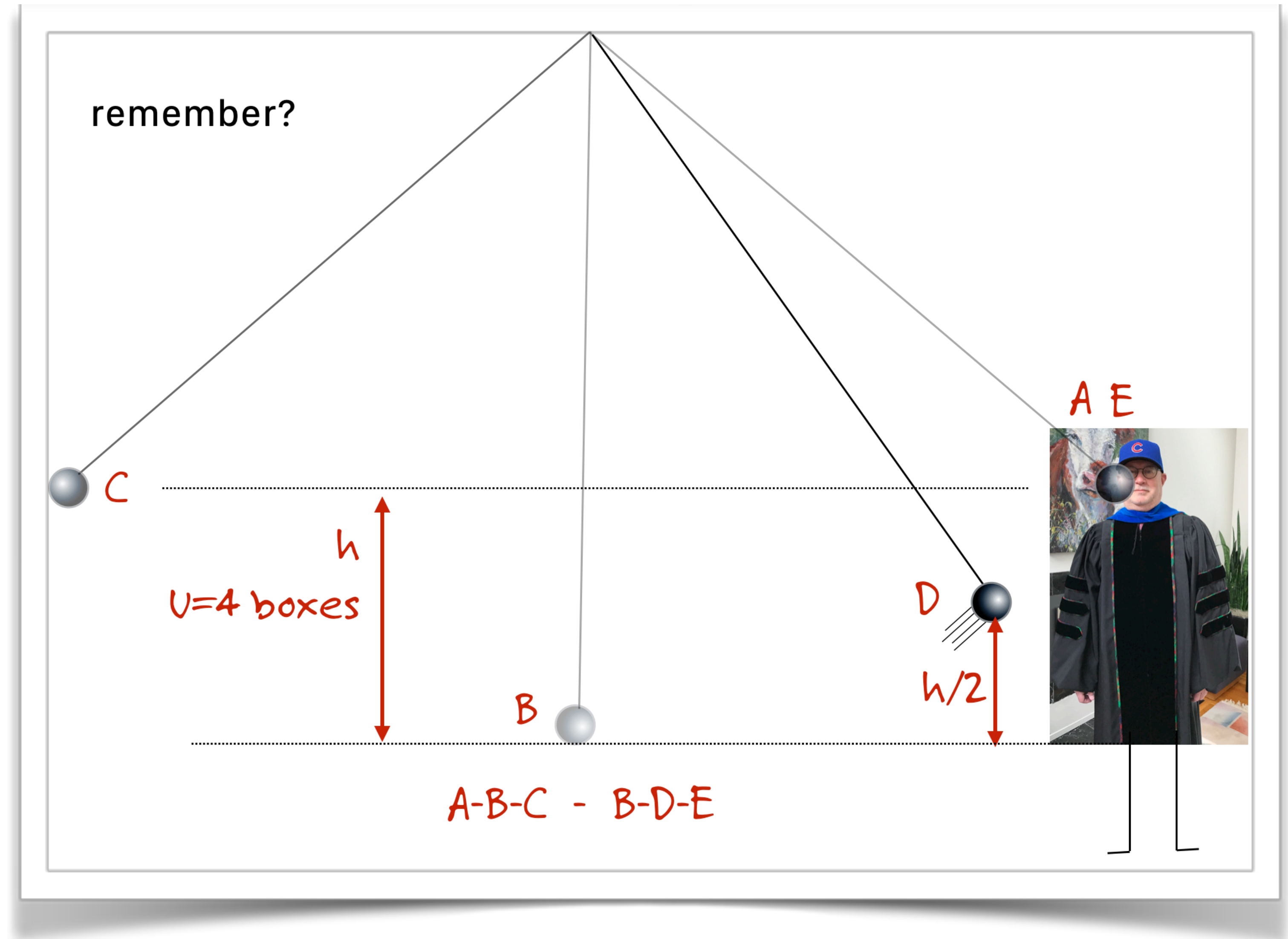
the first attempt:

$$\cancelto{0}{K_A} + U_A = K_B + \cancelto{0}{U_B} = \cancelto{0}{K_C} + U_C = K_D + U_D = \cancelto{0}{K_E} + U_E = E$$

the second attempt:

$$K_A + U_A = K_B + U_B = K_C + U_C = K_D + U_D = K_E + U_E = E$$

at each point along the path



the first attempt:

$$\cancelto{0}{K_A} + U_A = K_B + \cancelto{0}{U_B} = \cancelto{0}{K_C} + U_C = K_D + U_D = \cancelto{0}{K_E} + U_E = E$$

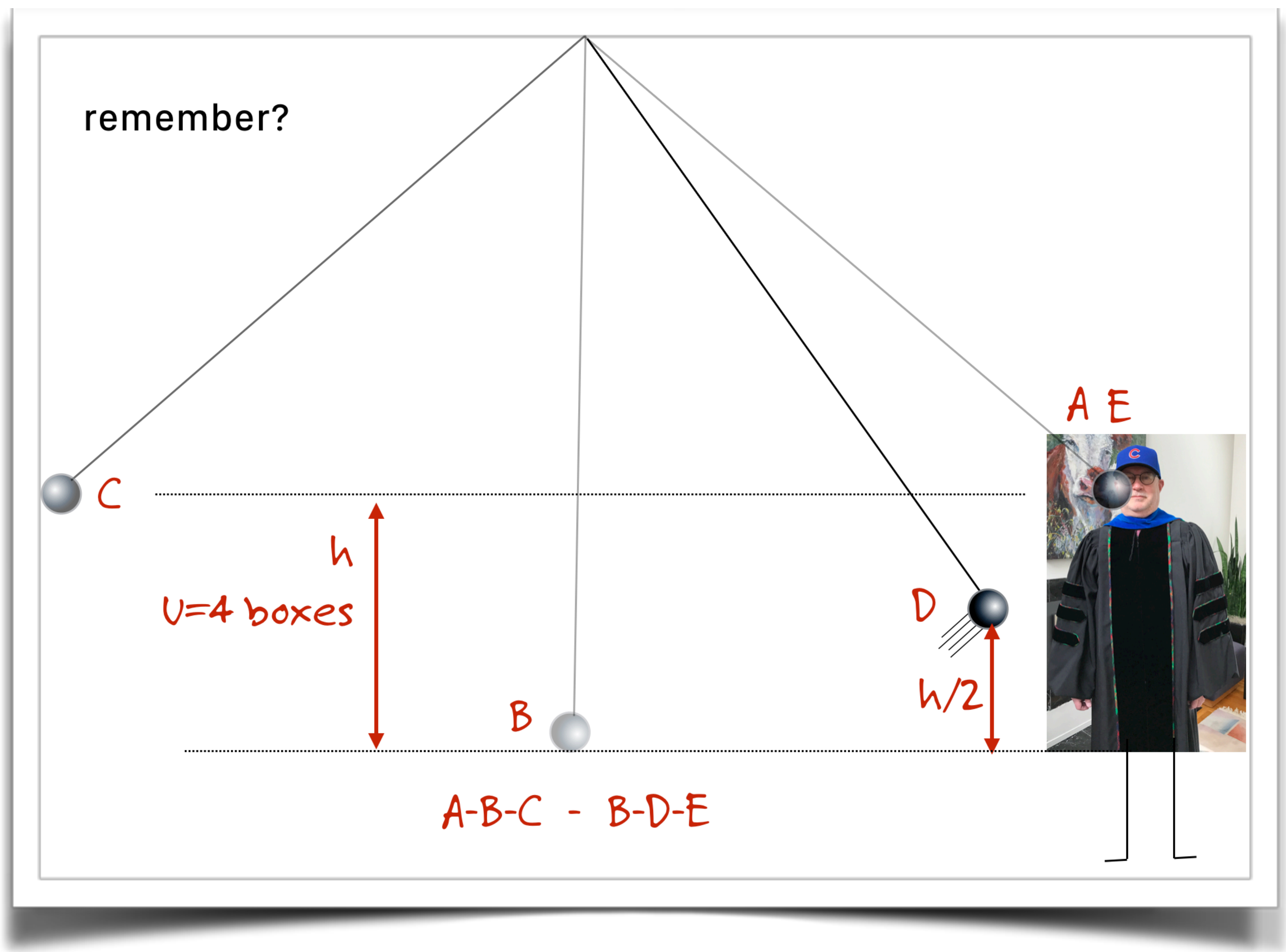
the second attempt:

$$K_A + U_A = K_B + \cancelto{0}{U_B} = K_C + U_C = K_D + U_D = K_E + U_E = E$$

answer, defend

Second time:

I **shoved it** at A so K = 1 box @A



After the ball reaches
E on the way back

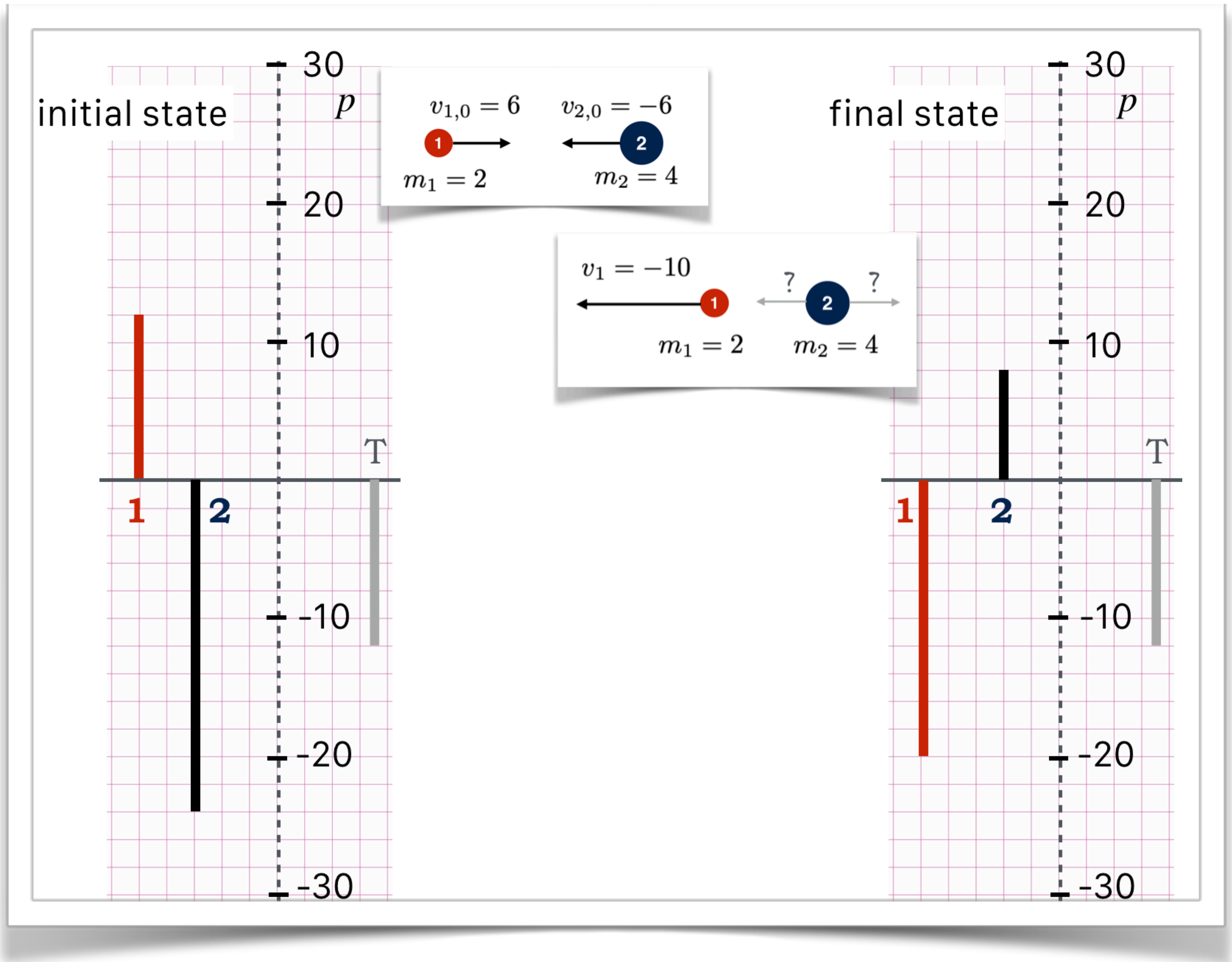
A its potential energy is gone

B it rises above E

C it starts back down at E

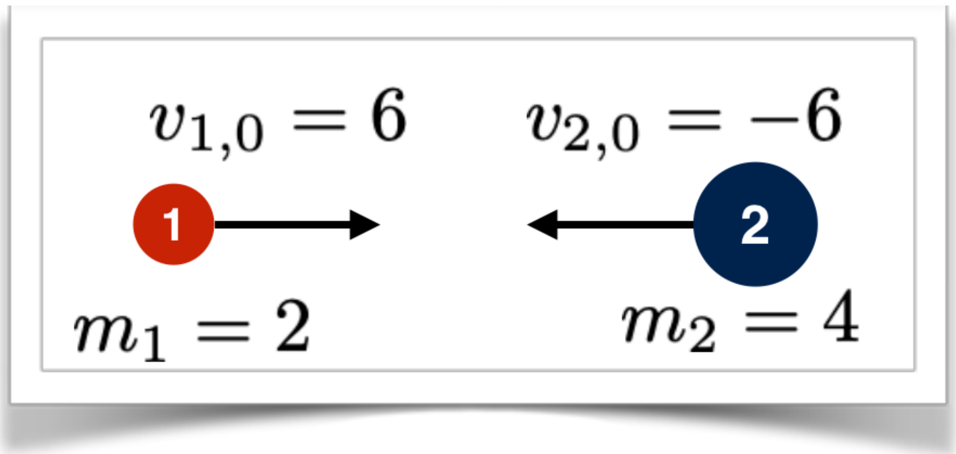
D it's kinetic energy is gone

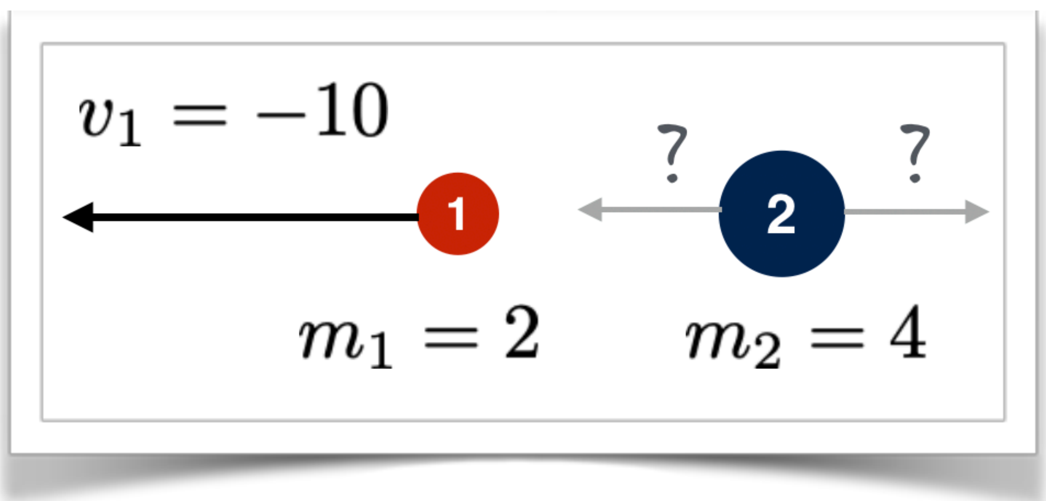
Remember this from last week?



now let's do the energetics

answer, defend





The initial kinetic energies of 1 & 2 are:

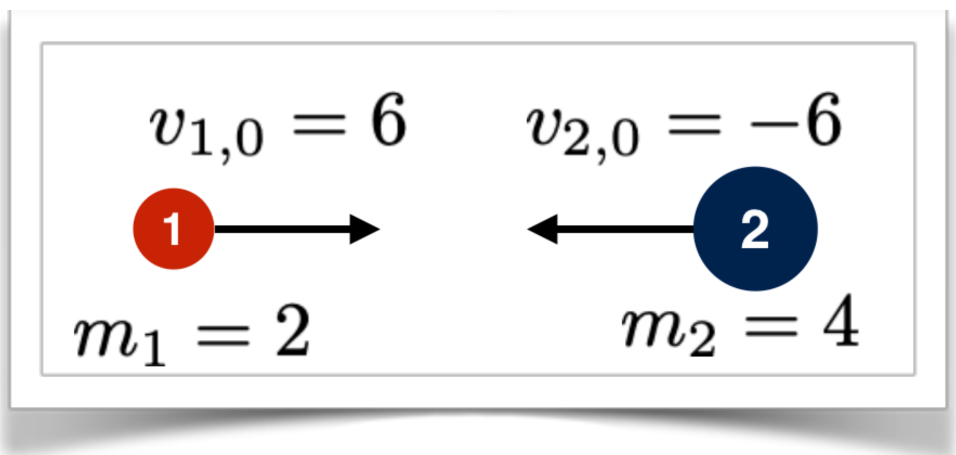
A 72 & 36

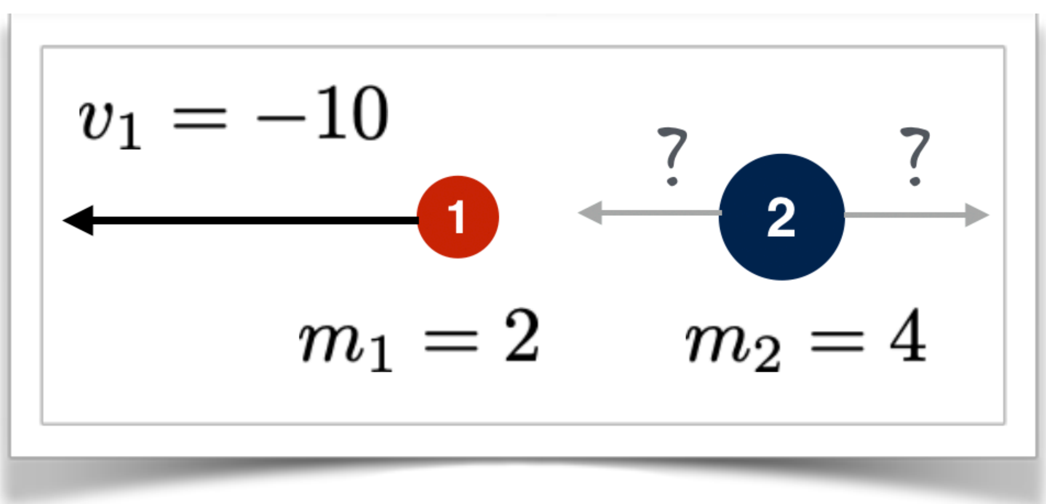
B 12 & -24

C 36 & 72

D 72 & 144

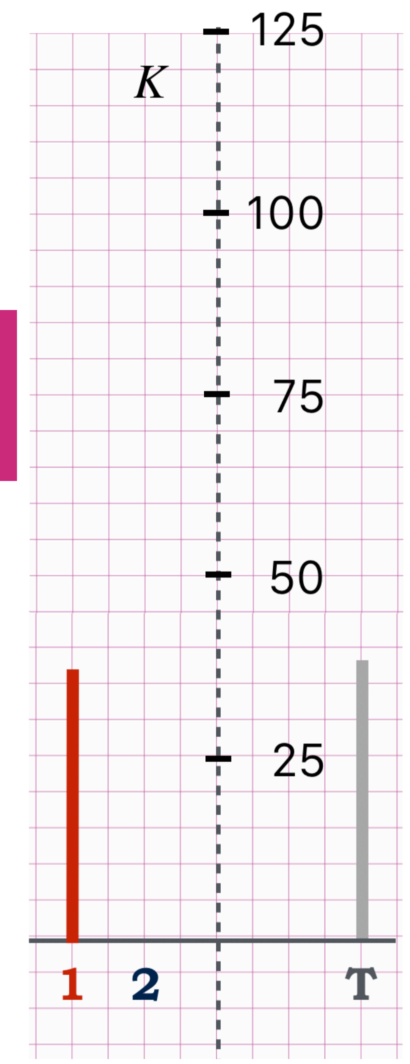
answer, defend



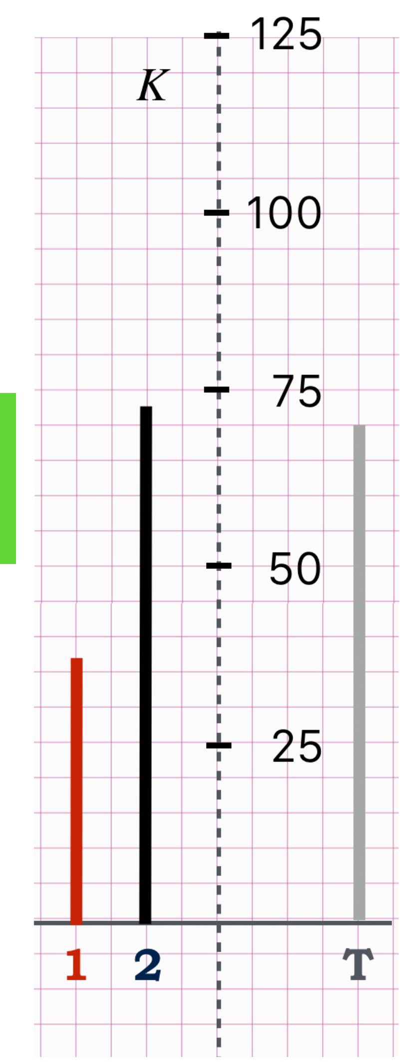


Which best represents the kinetic and total energies in the initial state?

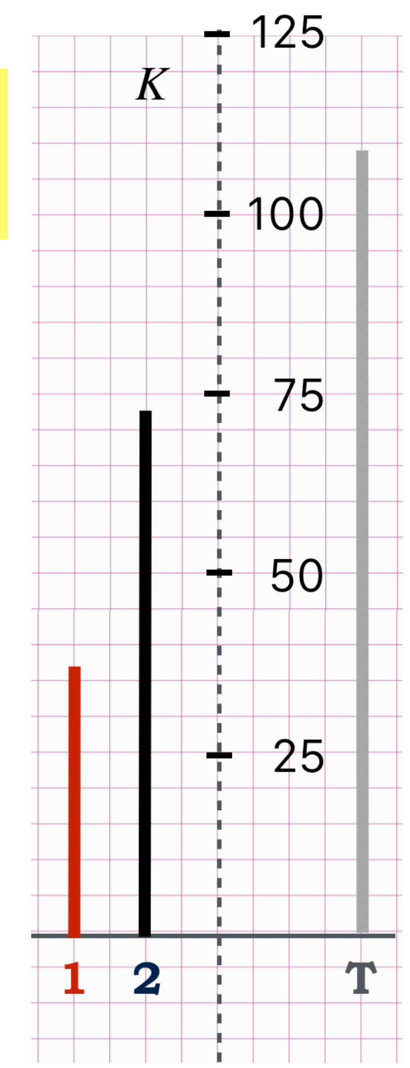
A



B

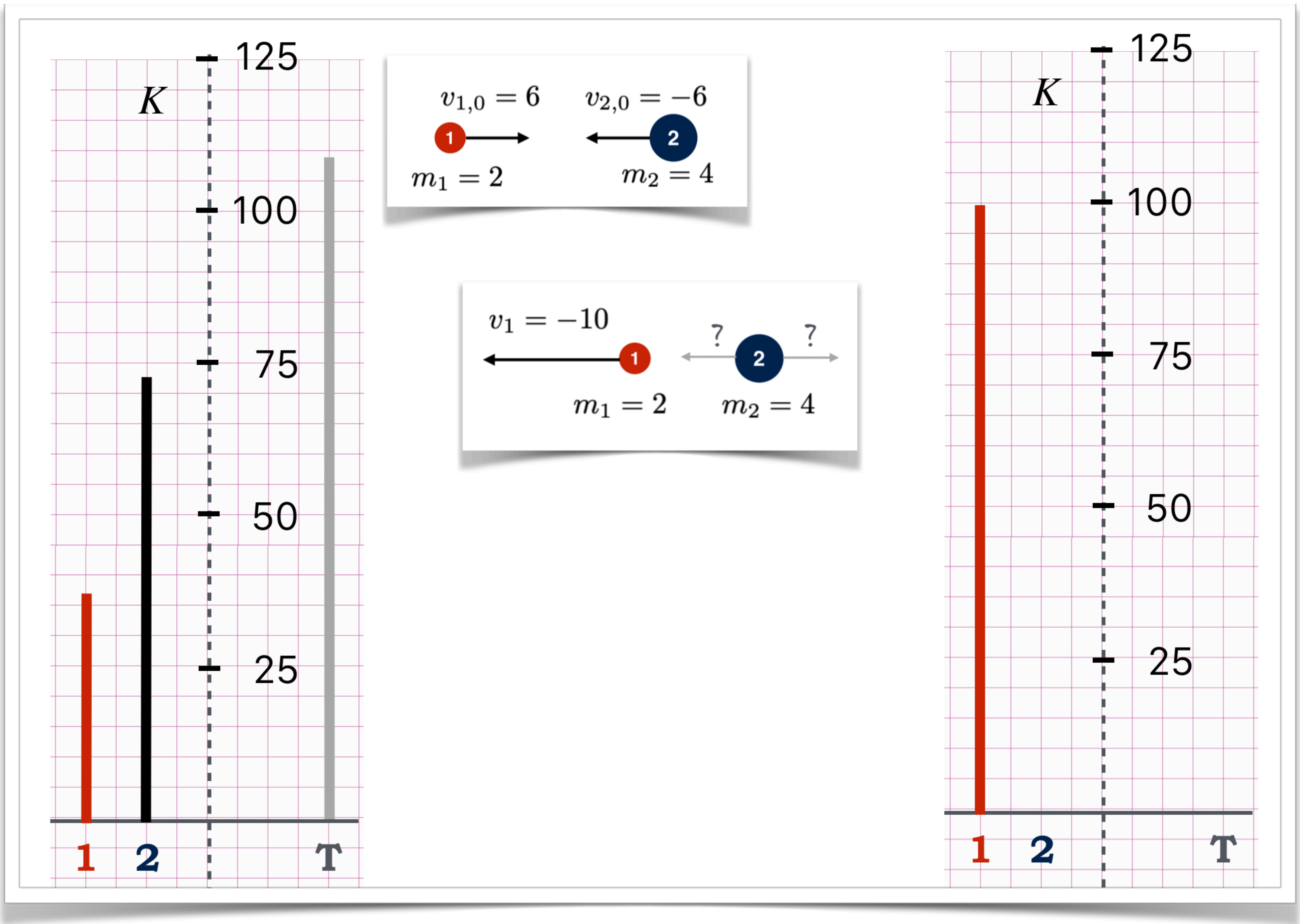


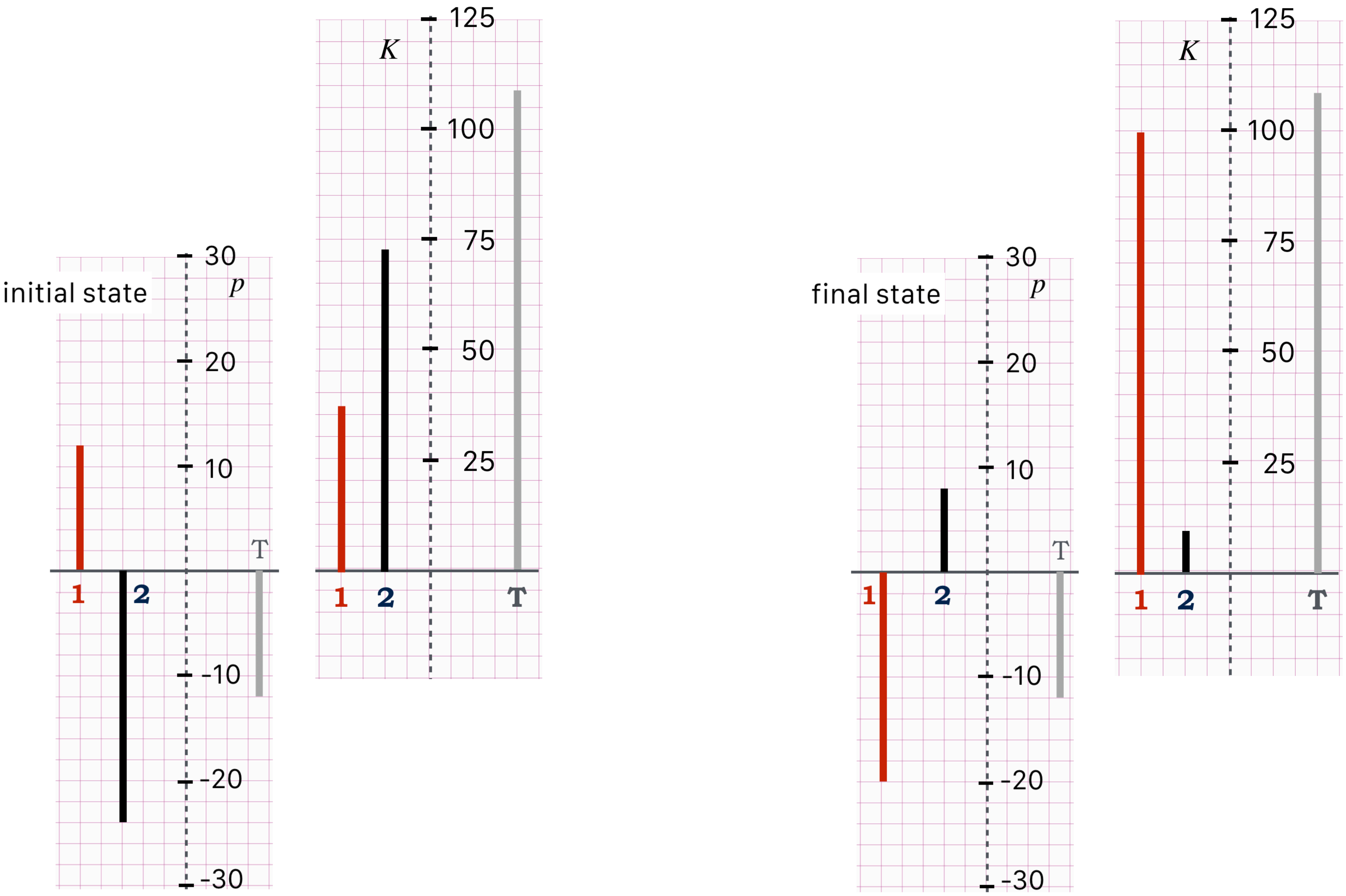
C



answer, show me

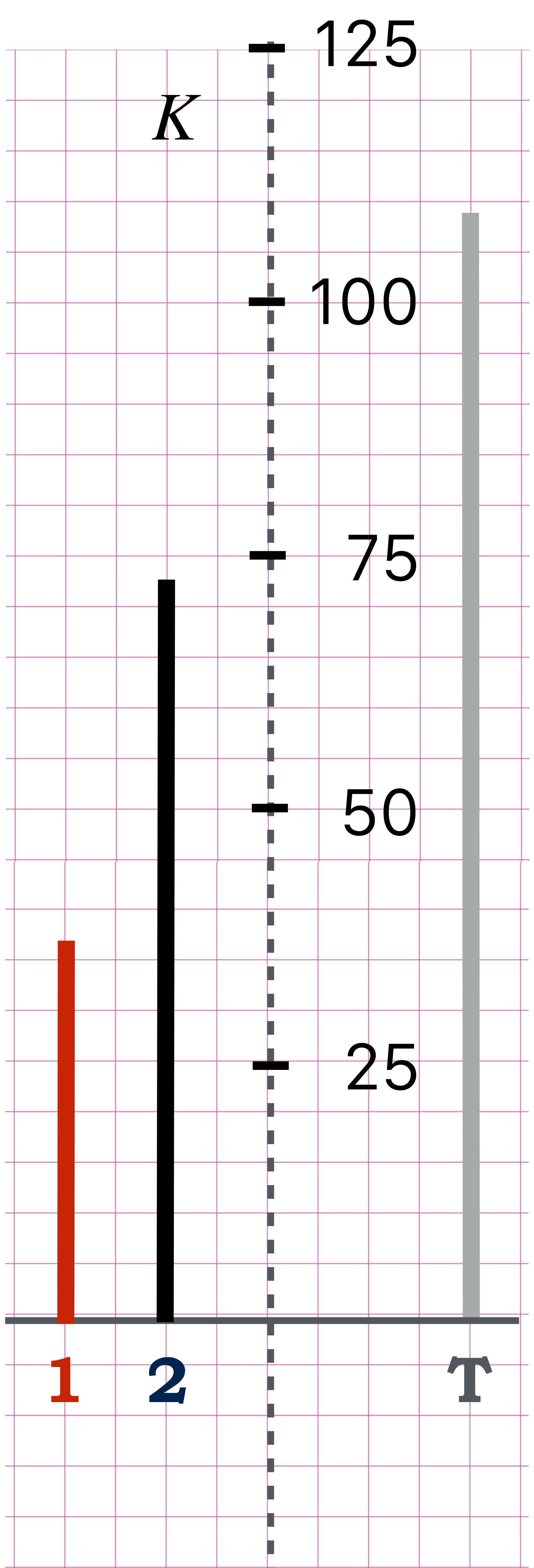
Draw the energies on your sheet!



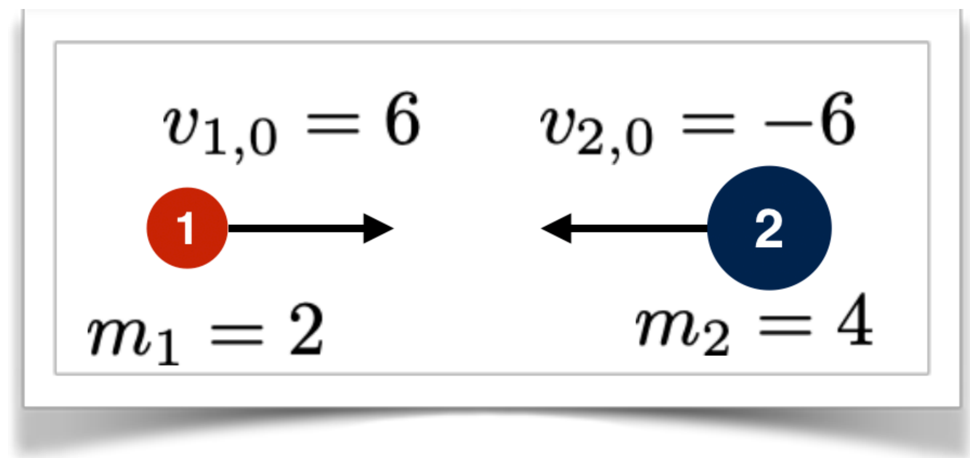


initial state
p
30
20
10
-10
-20
-30
1
2
T
K
125
100
75
50
25
1
2
T
final state
p
30
20
10
-10
-20
-30
1
2
T
K
125
100
75
50
25
1
2
T

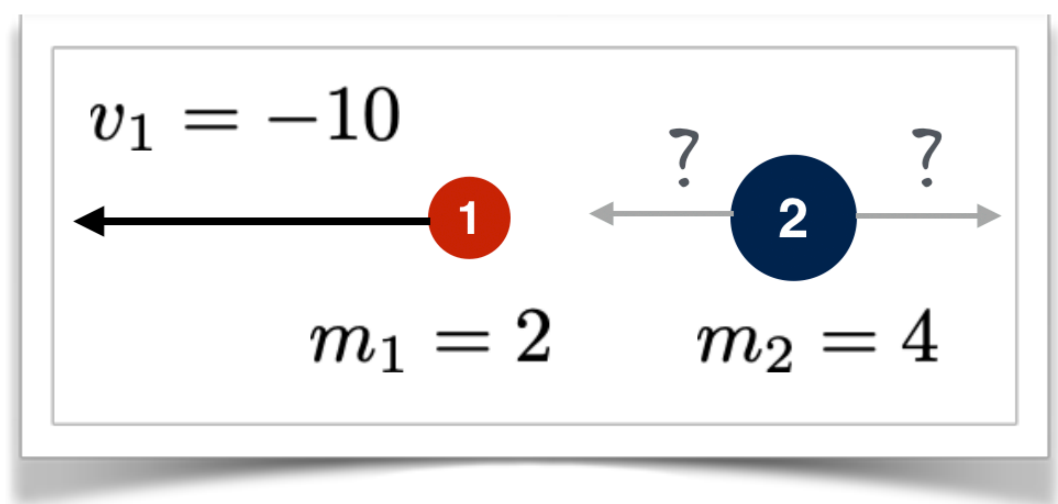
projects



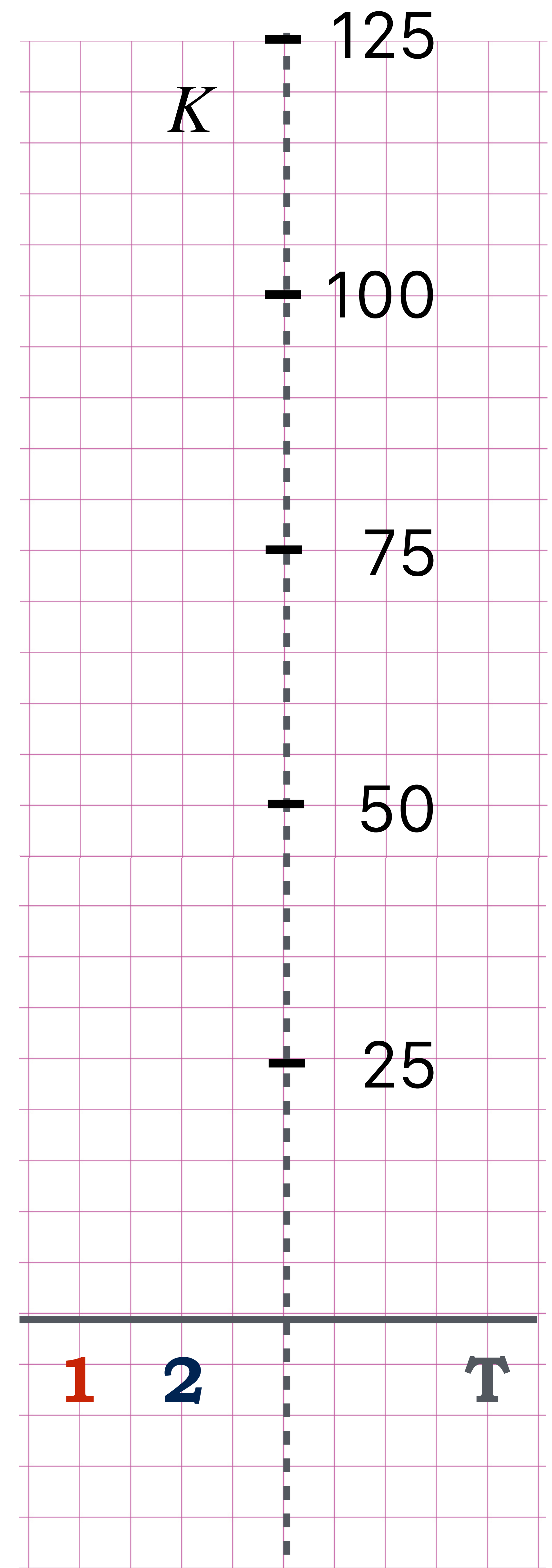
K
125
100
75
50
25
1
2
T



$v_{1,0} = 6$
$v_{2,0} = -6$
1
2
$m_1 = 2$
$m_2 = 4$



$v_1 = -10$
?
?
1
2
$m_1 = 2$
$m_2 = 4$



K
125
100
75
50
25
1
2
T