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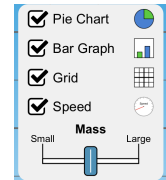
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Energy Skate Park Simulation

Go to <https://phet.colorado.edu/en/simulations/energy-skate-park-basics> and click the Play button.

1. Select the picture that says “Intro.” Turn on all the checkboxes on the upper right part of the screen. Place your skater at the beginning of the track and allow him to move on the track a few times. What do you notice about the height of the skater at the beginning and end of motion? Why do you think this is?



2. What pattern do you notice for the kinetic and potential energies of the skater (the blue and green lines in the bar graph)?
3. What is your skater doing when she has the most kinetic energy? Explain why this makes sense given the formula $KE = \frac{1}{2}mv^2$.
4. Where does your skater have the most potential energy? Explain why this makes sense given the formula $PE = mgy$.
5. Explain how your skater obeys the Law of Conservation of Energy ($\Sigma E_0 = \Sigma E$).

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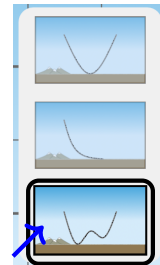
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6. So, conservation of energy means that the total energy does not change. But when the skater was sitting on the ground, she had no energy. So where did the energy come from? Think about the equation $\Sigma E_0 + W_{NC} = \Sigma E$.

7. Some things to try... (Don't need to write anything; just think about it)

- (a) Change the track to the, "W," shaped track (see image to the right). Put your skater on the track and let them go. How did (or didn't) her total energy change?
- (b) Increase or decrease the mass of your skater. What changes (or doesn't change) about her total energy?



8. Click on the "friction" picture at the bottom of the app. Turn the bar graph and pie chart back on. Start your skater in motion again.

- (a) What do you notice about the motion of your skater after turning on friction?



- (b) If energy is conserved, then where does the total energy go since she eventually stops at the lowest point?

- (c) Is friction a conservative force? Explain using evidence from the simulation.

9. When you are finished with everything else, click on "Playground" mode at the bottom of the app. Create a track that has a loop in it. Play with the settings to investigate how energy is conserved in this case. *You do not need to write anything down for this question.*