AP Physics C Summer Work

I'd like you to do some work on center of mass and momentum. Hopefully this work will help us get ahead on the units for the coming year and make things easier for us later. Please feel free to email me if you have any questions, issues, concerns, or you just want to share what cool things you are doing over the summer (tsengm@maryvale.com). I'll be checking email periodically, although my internet connection may be spotty at times. If I don't get back to you for a few days, it may be because I don't have internet.

I look forward to seeing you in the fall!!

Center of Mass

- Below are links to some google forms. In each form, there is a short embedded video for you to watch and questions for you to answer.
    - CM intro: https://docs.google.com/forms/d/e/1FAIpQLSe8ifbfq3msNb2ouaN0EwQEcjLrPJ-WJ4rkEA2bOCwo4_UqoA/viewform?usp=sf_link
    - CM calculation for system of particles: https://docs.google.com/forms/d/e/1FAIpQLSd16oewHWopUzpoMw6z5-uodpTA3lNt5dYfmoTH1-qz_dhgdg/viewform?usp=sf_link
    - CM calculation for irregularly shaped object: https://docs.google.com/forms/d/e/1FAIpQLScyenN6C0kUg295zhjSBeRuCeij0nlI6EPjXlX3SSrZHCRD_Q/viewform?usp=sf_link
    - CM demo: https://docs.google.com/forms/d/e/1FAIpQLSdDcyDNzR1jRensK_bsgu-W8sq-KiMRIFmnvGSTAX27LB5MYA/viewform?usp=sf_link
- Here are some problems for you:
    - Please go to Mastering and complete "7.8 CM".

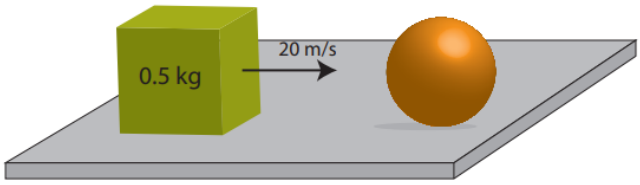
Momentum

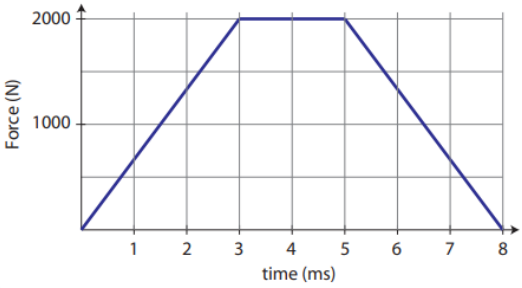
- Below are links to some google forms. In each form, there is a short embedded video for you to watch and questions for you to answer.
    - Introduction to Momentum: https://docs.google.com/forms/d/e/1FAIpQLSe54OICxPik9Z4AISHKez945t8ncTA5VlxUk7lYCKAtNxZ0LA/viewform?usp=sf_link
    - Force of Impact Equation Derivation: https://docs.google.com/forms/d/e/1FAIpQLSfY1V4ecW-UFv8EP-fS5wbbj16krpHfazL_daL2dmxWmitrrA/viewform?usp=sf_link
    - Calculating Force of Impact Stepping off Wall: https://docs.google.com/forms/d/e/1FAIpQLSeWZq9FHy9Y-t6gkh9Eb44-xjwPstbIGba_gcCXYhLJiPccbA/viewform?usp=sf_link

- Impulse Introduction: https://docs.google.com/forms/d/e/1FAIpQLScYSua7lhJgvMB29JRitRhjAEQrYVecyNJcGKdJ27tgzsxtFQ/viewform?usp=sf_link
- Impulse Approximation: https://docs.google.com/forms/d/e/1FAIpQLSfEEcQblPisegUStdUIrO2ZI186G5LZBtXxhq6yzJey_vcWTA/viewform?usp=sf_link
- Introduction to Conservation of Momentum with Demo: https://docs.google.com/forms/d/e/1FAIpQLSd26n55QprcUex19h1-4SRhbw-oiNIH7z8Bk7g-Mg5aD2BcpQ/viewform?usp=sf_link
- Introductory Conservation of Momentum Explosion Problem: https://docs.google.com/forms/d/e/1FAIpQLSe9kgpHJvtAtVDrCCvozGpqWX6uPPwdRFOmtrEGj3Ip7DJT3Q/viewform?usp=sf_link
- Introduction to Elastic and Inelastic Collisions: https://docs.google.com/forms/d/e/1FAIpQLSc1283LsxffPEsMyPrZvRG40GZaGE7GH03D2tukEEo2wGQitA/viewform?usp=sf_link
- Introductory Perfectly Inelastic Collision Problem Demo: https://docs.google.com/forms/d/e/1FAIpQLSc8EBcHd10_8dWV4Z9mdXZ1MvklWhV69Z9IkVPT92zB6RWtsQ/viewform?usp=sf_link
- Introductory Elastic Collision Problem Demo. Please note that on the AP exam, you are generally ok if you just include between 2-4 significant figures in your numerical answers. You don't need to follow formal significant figures rules, which they discuss somewhat in this video. https://docs.google.com/forms/d/e/1FAIpQLSdQ-1YrgHzzLnBVFhTgEtVqZJV6WLNfQOOTEY8NEyLNNeI7uw/viewform?usp=sf_link
- Demonstrating Impulse is Area Under Force-Time Curve (Note that Mr. P briefly talks about calculus in this video. Don't worry about it right now.) https://docs.google.com/forms/d/e/1FAIpQLSeNz9BShg9-NXs4DnjdvMI3tqDXDXgFDQ2WFEpQb49vrG5HOQ/viewform?usp=sf_link
- Demo How Helmets Affect Impulse and Impact Force: https://docs.google.com/forms/d/e/1FAIpQLSeh-h9ctLlBr8JHwbn_NXWklUZW8hgOxRw3lmx9BAjaxHgdZw/viewform?usp=sf_link
- 2D Conservation of Momentum Example: https://docs.google.com/forms/d/e/1FAIpQLSewIQOm4ygrUg-0beP_GGZ5LrTZF0VzYcK2v21Anko3cpsaXw/viewform?usp=sf_link

- Here are some problems for you:
  1. Please go to Mastering and complete "7.1-7.3".
  2. Please also work on the 4 problems below.

7. A 0.5-kilogram block slides at 20 m/s on a smooth frictionless surface toward a stationary sphere, shown below left.



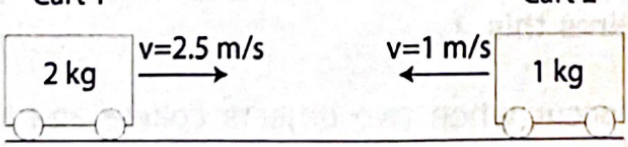


The sphere is half the volume of the block, but is eight times as dense. The block strikes the sphere at time t=0. A plot of the force exerted on the cube by the ball as a function of time is shown above right.

(a) What is the impulse applied to the block?

6.33 Q: Two billiard balls collide. Ball 1 moves with a velocity of 4 m/s, and ball 2 is at rest. After the collision, ball 1 comes to a complete stop. What is the velocity of ball 2 after the collision? Is this collision elastic or inelastic? The mass of each ball is 0.16 kg.

6.34 Q: Two carts of differing masses travel toward each other on a collision course as shown in the diagram below.



A) Determine the velocity of Cart 1 after the collision if Cart 2 moves to the right with a velocity of 2 m/s after the collision.

B) Is the collision elastic or inelastic?

2. A firecracker is launched with an initial velocity of 70 m/s at an angle of 73° with the horizontal. The firecracker explodes at its highest point, splitting into three equal pieces. One piece continues at its same horizontal speed, but moves vertically upward at 10 m/s immediately after the explosion. A second piece moves vertically downward at 10 m/s, but with a horizontal velocity of 30 m/s backward immediately after the explosion. Determine the speed of the remaining piece of the firecracker immediately following the explosion. Neglect air resistance.

(A) 0 m/s
(B) 10 m/s
(C) 70 m/s
(D) 90 m/s