

**IB PHYSICS & AP PHYSICS**

Name: \_\_\_\_\_

Period: \_\_\_\_\_ Date: \_\_\_\_\_

I loved you yesterday, I love you still, I always  
have... and I always will

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## Valentine's Day Practice



1. Josh loved Sam and wanted to give her a Valentine's Day card afterschool. But afterschool Sam went home first so she had a 15 second head start on Josh. Assuming the their velocity was constant, Sam walking 2 m/s and Josh running at 4 m/s, how long will it take Josh to reach Sam?

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2. James wanted to drop a box of valentine's chocolates onto Sarah's head from the 2nd floor of main building as a surprise. If the height of Sarah is 5'6 and the height of from the floor to the drop height is 3 yards how fast will the box of chocolate be traveling when it hits Sarah on the head? Assuming the arrow was launched from the ground.

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3. Cupid wanted to shoot an arrow at Sarah to make her fall in love with Tom. Cupid is standing 50 m away from Sarah who is 5'4. What is the angle in which Cupid needs to aim his bow and hit Sarah on the forehead if the starting velocity of the arrow is 50 m/s? Assume Cupid and Sarah is the same height.

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4. Mr. Smith wanted to attract more students to his physics class. If the distance between the biology class and physics class is 50 meters and Mr. Smith had a mass of 120lbs. How much mass does Mr. Smith need to increase in order to attract the biology students with a force equal to  $1.36 \text{ m/s}^2$  ?

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5. Jack really liked this girl named Prussia, but can never seem to get enough attraction to keep her in his orbit. So Jack prepared this amazing plan to attract her with his gravity. Jack weighs 145lbs and Prussia walks by Jack from the distance of 4 m and travels at 3m/s. How many hotdogs does Jack have to eat in order to have enough attraction to keep her in orbit? (Each hotdog has a mass of .1kg).

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6. Joshua Wassermann hated this girl named Pam. She never brushes or showers and Josh is forced to sit by her due to Mr. Smith's seating arrangements. Josh thought it was a good idea to use a pulley system to pull her away from him. A pulley rests on top of the ceiling and is attached to Pam's chair. Pam has a mass of 140 kg and the chair has a mass of 15lbs. How much work does Josh have to use to lift Pam 15 ft. off the floor? Josh muscles can only supply 40 watts of power so he has to use a winch to help him lift her. What is the minimum amount of winch power will Josh need in order to lift Pam in 3 seconds?

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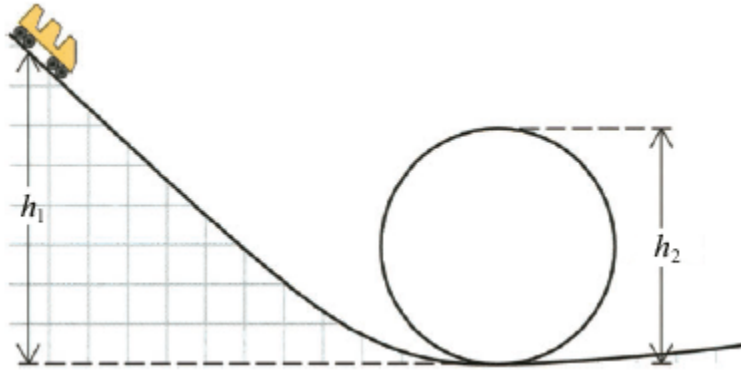
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8. Jessica loved roller coasters, so Jake had an idea to build a roller coast to impress her. The following is the roller coaster design.



If the track of  $h_1$  makes a 32 degrees angle with the ground and the roller coaster had a mass of 1200kg what is the minimum height of  $h_1$  does the roller coaster have to be in order for the coaster to clear  $h_2$  which is 12m high? Assume the entire track has a kinetic coefficient of friction of .32 (tricky and hard, hint: change distance into function of height) \*friction only applies up till the loop, so the loop track is frictionless\*

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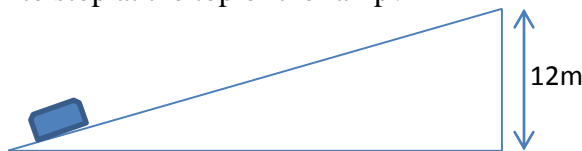


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9. At the bottom of the coaster the roller coaster breaks will kick in while the coaster rides into the loading ramp. Shown below. Assuming the coaster has a mass of 1200kg and the height of the ramp is 12m. The distance of the ramp is 50m and has an angle of 30 degrees. If the coaster was traveling 25 m/s what is the coefficient of kinetic friction for the coaster to stop at the top of the ramp?




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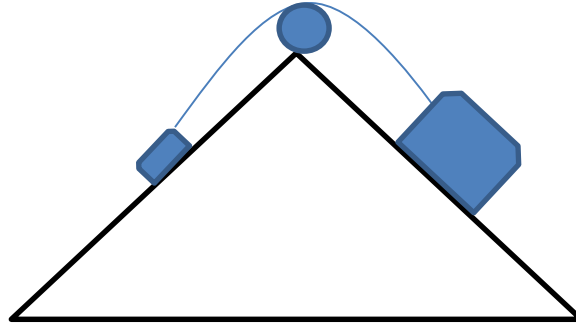


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10. Two masses are placed on two sides of an isosceles triangle, the leg angles are 40 degrees each. If the coefficient of kinetic friction between the triangle and either of the blocks are .68 and accelerates  $6\text{m/s}^2$  to the right, what is the mass of the larger block if the smaller block has a mass of 5kg? Assume the masses are connected by a massless rope on a frictionless pulley.



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