• Walk-In tutoring at Broward Hall
• Private-Appointment, one-on-one tutoring at Broward Hall
• Walk-In tutoring in LIT 215
• Supplemental Instruction
• Video resources for Math and Science classes at UF
• Written exam reviews and copies of previous exams

The teaching center is located in the basement of Broward Hall:

You can learn more about the services offered by the teaching center by visiting https://teachingcenter.ufl.edu/
1. A freshman at UF is standing on the DNA bridge. He throws a piece of rock vertically up in the air with a speed of 9.8 m/s. Assuming the height of the bridge to be 9.8 m from 13th street, which runs beneath the bridge, how long would it take for the rock to hit the street? Air resistance is negligible.
   A. 2.7 s  B. 5.4 s  C. 1.3 s  D. 3.5 s  E. 6.1 s

2. A crate of mass $m = 100.0$ kg is pushed at constant speed up a smooth ramp ($\theta = 30^\circ$) by a horizontal force $F$. What is the magnitude of the normal force (in N) on the crate due to the ramp?

   ![Diagram of crate on ramp](image)

   A. 1127 N  B. 1697 N  C. 1960 N  D. 1132 N  E. 566 N

3. Two spherical balls are traveling towards each other in a straight line. Their velocities are shown in the figure. The mass of ball A is 10 kg and the mass of ball B is 8 kg. They collide in a perfectly inelastic collision. After the collision a force acts on the system of two balls (now stuck together) to bring them to rest. What is the minimum force required to bring both balls to rest in 2 seconds?

   ![Diagram of balls colliding](image)

   A. 16 N  B. 22 N  C. 10 N  D. 5 N  E. 6 N

4. A track is mounted on a large wheel that is free to turn with negligible friction about a vertical axis as shown in the figure. A toy train of mass $m$ is placed on the track and, with the system initially at rest, the train's electrical power is turned on. The train reaches speed 0.15 m/s with respect to the track. What is the angular speed of the wheel if its mass is 1.1m and its radius is 0.43 m? (Treat the wheel as a hoop, and neglect the mass of the spokes and hub.)

   ![Diagram of train and wheel](image)

   A. 0.07 rad/s  B. 0.35 rad/s  C. 0.17 rad/s  D. 0.38 rad/s  E. 0.14 rad/s
5. In the figure, a solid ball of radius $r << R$ and mass $m$ is released with some initial velocity along the track from height $h = 2.5R$, and travels completely around the loop without falling off. If $R = 2$ m, what is the minimum initial velocity for this to be possible? (Ignore point Q)

A. 3.11 m/s   B. 1.56 m/s   C. 0 m/s   D. 2.76 m/s   E. 2.37 m/s

6. An object of mass $m$ is initially held in place at radial distance $r = 3R_e$ from the center of Earth, where $R_e$ is the radius of Earth. Let $M_e$ be the mass of Earth. A force is applied to the object to move it to a radial distance $4R_e$, where it again is held in place. The velocity of the object is constant during the trip. Calculate the work done by the applied force during the move by integrating the force magnitude.

A. $\frac{GmM_e}{12R_e}$   B. $\frac{GmM_e}{6R_e}$   C. $\frac{GmM_e}{2R_e}$   D. $\frac{GmM_e}{3R_e}$   E. $\frac{GmM_e}{18R_e}$

7. In the figure, two blocks ($m = 1.8$ kg and $M = 10$ kg) and a spring ($k = 200$ N/m) are arranged on a horizontal, frictionless surface. The coefficient of static friction between the two blocks is 0.40. You pull the blocks to a certain distance and release them. During the resulting simple harmonic motion, the smaller block is on the verge of slipping over the larger block. If the blocks were released at time $t = 0$ and position $+x_m$, what is the equation of the blocks motion?

A. $x(t) = 0.23\cos(4.1t)$ meters   B. $x(t) = 0.23\cos(4.5t)$ meters   C. $x(t) = 0.035\cos(4.1t)$ meters   D. $x(t) = 0.035\cos(4.5t)$ meters   E. $x(t) = 0.035\cos(17t)$ meters
8. A nylon guitar string has a linear density of 7.20 g/m and is under a tension of 150 N. The fixed supports are distance D = 90.0 cm apart. The string is oscillating in the standing wave pattern shown in the figure with amplitude 2 cm. What is the equation of the standing wave?

A. \( y(x,t) = 0.02 \sin(3.5x) \cos(1200t) \) meters
B. \( y(x,t) = 0.02 \sin(0.6x) \cos(206t) \) meters
C. \( y(x,t) = 0.04 \sin(3.5x) \cos(1200t) \) meters
D. \( y(x,t) = 0.02 \sin(10.5x) \cos(1510t) \) meters
E. \( y(x,t) = 0.02 \sin(10.5x) \cos(66t) \) meters

9. Two isotropic sound sources, S1 and S2, both emit sound waves with the same initial phase and frequency 480 Hz. If the distance between the two sources is 2 m, how many points are there along the circle shown in the figure where no sound can be heard from the two sources? (Take the speed of sound in air to be 343 m/s)

A. 4  B. 8  C. 10  D. 12  E. 16

10. A French submarine and a U.S. submarine move toward each other during maneuvers in motionless water in the North Atlantic. The French sub moves at speed \( v_F = 14 \) m/s and the U.S. sub at \( v_{US} = 19 \) m/s. The French sub sends out a sonar signal (sound wave in water) at \( 1.000 \times 10^3 \) Hz. Sonar waves travel at 1519 m/s. What frequency is detected by the French sub in the signal reflected back to it by the U.S. sub?

A. \( 2.32 \times 10^3 \) Hz
B. \( 1.05 \times 10^3 \) Hz
C. \( 1.35 \times 10^3 \) Hz
D. \( 1.03 \times 10^3 \) Hz
E. \( 2.72 \times 10^3 \) Hz