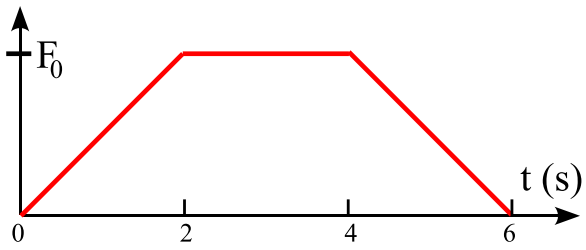
1 pt After landing, a jet airplane comes to rest uniformly (the acceleration is constant) in 11.5 seconds. The aircraft rolls 1063.75 m. What was the landing speed? (in km/hr)

1.A◯ 376.5 **B**◯ 500.8 **C**◯ 666.0
D◯ 885.8 **E**◯ 1178.1 **F**◯ 1566.9
G◯ 2083.9 **H**◯ 2771.6

You are correct. Your receipt is 498-1265

1 pt



Consider the graph of force, F, vs. time, t shown above. The hashmark on the vertical axis denotes a value F_0=30 N. Find the velocity of a 4.3-kg object as it moves from t = 0.0 to t = 6.0 s after starting at rest. *(in* `m/s`*)*

2.A◯ 5.04 **B**◯ 6.71 **C**◯ 8.92 **D**◯ 11.86
E◯ 15.78 **F**◯ 20.98 **G**◯ 27.91 **H**◯ 37.12

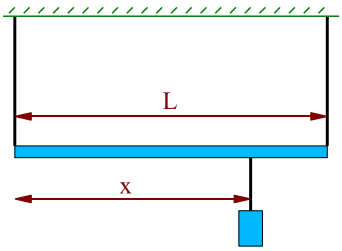
You are correct. Your receipt is 498-1363

1 pt A rock is dropped from outer space (initial velocity=0) at a radius R from Earth's center. It is recorded moving at a speed 8368 m/s when it strikes the surface of the Earth. What was R? (in m) (Ignore the air resistance felt during the last few miles of the approach to the planet) $R_{earth} = 6.38 \times 10^6$ m, $M_{earth} = 5.98 \times 10^{24}$ kg. *(in* `m`*)*

3.A◯ 4.75×10^6 **B**◯ 5.94×10^6 **C**◯ 7.42×10^6
D◯ 9.28×10^6 **E**◯ 1.16×10^7 **F**◯ 1.45×10^7
G◯ 1.81×10^7 **H**◯ 2.27×10^7

You are correct. Your receipt is 498-1371

1 pt



Two wires support a beam of length L=20 m and mass 330 kg as shown in the figure above. A box of mass 220 kg hangs from a wire which hangs from the beam a distance x=15 m away from the left edge of the beam. What is the tension in the RIGHT support wire? *(in* `N`*)*

4.A◯ 1062 **B**◯ 1540 **C**◯ 2233 **D**◯ 3237
E◯ 4694 **F**◯ 6806 **G**◯ 9869 **H**◯ 14311

You are correct. Your receipt is 498-1375

1 pt A figure skater is spinning with her arms and one leg extended as far as she can. She then pulls them in tight to her body. As her position contracts,

▷ her angular velocity _____.
5. **A**◯ decreases **B**◯ increases **C**◯ remains the same

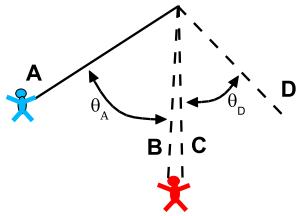
▷ her rotational kinetic energy _____.
6. **A**◯ decreases **B**◯ increases **C**◯ remains the same

▷ her angular momentum _____.
7. **A**◯ decreases **B**◯ increases **C**◯ remains the same

▷ her moment of inertia _____.
8. **A**◯ decreases **B**◯ increases **C**◯ remains the same

You are correct. Your receipt is 498-1379

1 pt



A vicious gorilla named Donkey Kong who is perched high in a tree spots the love of his life, a Spartan football player who, as luck would have it, has the same weight as Donkey Kong. Donkey Kong swings from a vine, beginning at an angle θ_A and sweeps up his football player when the vine is vertical. He then swings upwards to a final angle of θ_D. The points B and C refer to the instants just before and after he latches onto the linebacker.

▷ The mechanical energy (kinetic+potential) of Donkey Kong at "A" is _____ the mechanical energy of the gorilla+linebacker at "D".
9. **A**◯ greater than **B**◯ less than **C**◯ equal to

▷ The mechanical energy (kinetic+potential) of Donkey Kong at "B" is _____ the mechanical energy of the gorilla+linebacker at "C".
10. **A**◯ greater than **B**◯ less than **C**◯ equal to

▷ Donkey Kong's momentum at "B" is _____ the momentum of the gorilla+linebacker at "C".
11. **A**◯ greater than **B**◯ less than **C**◯ equal to

▷ The mechanical energy (kinetic+potential) of Donkey Kong at "A" is _____ the mechanical energy of the gorilla at "B".
12. **A**◯ greater than **B**◯ less than **C**◯ equal to

You are correct. Your receipt is 498-1473

1 pt An immersion heater has a power rating of 1300 watts. It is used to heat water for coffee. How many minutes are required to heat 14.11 liters of water from room temperature (20°C) to 90°C?

13. **A**◯ 30 **B**◯ 40 **C**◯ 53 **D**◯ 70
E◯ 94 **F**◯ 125 **G**◯ 166 **H**◯ 221

You are correct. Your receipt is 498-1383

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1 pt If 1.0 cubic meters of a building material weighs 6.5×10^4 N. If a column of the material collapses under its own weight if the column is taller than 882 m, what is the compression strength (in Pa) of this material? (the maximum pressure that can be withstood by the material)

14. **A**◯ 7.78×10^6 **B**◯ 1.04×10^7 **C**◯ 1.38×10^7
D◯ 1.83×10^7 **E**◯ 2.44×10^7 **F**◯ 3.24×10^7
G◯ 4.31×10^7 **H**◯ 5.73×10^7

You are correct. Your receipt is 498-1387

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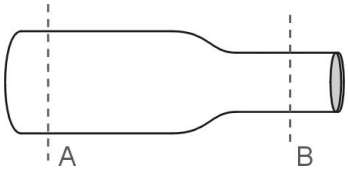
1 pt



An incompressible fluid moves through the pipe shown above from RIGHT to LEFT. The pipe narrows from a diameter of 5 cm at "A" to a diameter of 3 cm at "B". (Assume non-viscous laminar flow)

▷ Then density of the fluid at "A" is _____ the density of the fluid at "B".

15. **A**◯ equal to **B**◯ greater than
C◯ less than

▷ The amount of fluid that passes "A" in one second is _____ the amount of fluid that passes "B" in one second.

16. **A**◯ equal to **B**◯ greater than
C◯ less than

▷ The pressure at "A" is _____ the pressure at "B".

17. **A**◯ equal to **B**◯ greater than
C◯ less than

▷ The speed of the fluid at "A" is _____ the speed of the fluid at "B".

18. **A**◯ equal to **B**◯ greater than
C◯ less than

You are correct. Your receipt is 498-1391

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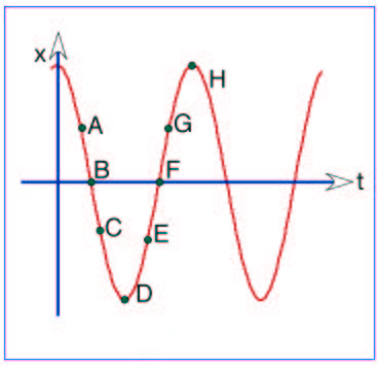
1 pt



The curve represents an object in simple harmonic motion. Match the points on the curve to the velocity and acceleration of the object.

▷ The velocity is negative, and the acceleration is negative.

19. **A**◯ Point A **B**◯ Point B **C**◯ Point C
D◯ Point D **E**◯ Point E **F**◯ Point F
G◯ Point G **H**◯ Point H

▷ The velocity is positive, and the acceleration is positive.

20. **A**◯ Point A **B**◯ Point B **C**◯ Point C
D◯ Point D **E**◯ Point E **F**◯ Point F
G◯ Point G **H**◯ Point H

▷ The velocity is positive, and the acceleration is zero.

21. **A**◯ Point A **B**◯ Point B **C**◯ Point C
D◯ Point D **E**◯ Point E **F**◯ Point F
G◯ Point G **H**◯ Point H

▷ The velocity is negative, and the acceleration is zero.

22. **A**◯ Point A **B**◯ Point B **C**◯ Point C
D◯ Point D **E**◯ Point E **F**◯ Point F
G◯ Point G **H**◯ Point H

You are correct. Your receipt is 498-1473

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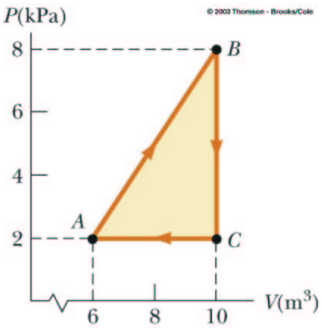
1 pt



A gas is taken through the cyclic process described by the figure above. How much work (in J) was done by the gas during the expansion from A to B.

23. **A**◯ 4000 **B**◯ 8000 **C**◯ 12000 **D**◯ 16000
E◯ 20000 **F**◯ 24000 **G**◯ 28000 **H**◯ 32000

You are correct. Your receipt is 498-1477

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1 pt A snowball is launched horizontally from the top of a rectangular building with an initial velocity of 13 m/s. If the snowball is in the air for 4.23 s, how tall was the building? (in m)

24. **A**◯ 70.24 **B**◯ 87.80 **C**◯ 109.75
D◯ 137.18 **E**◯ 171.48 **F**◯ 214.35
G◯ 267.93 **H**◯ 334.92

You are correct. Your receipt is 498-1367

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1 pt A piano emits sound waves with frequencies that range from a low of about 28 Hz to a high of about 4,200 Hz. What is the shortest wavelength of sound produced by a piano? (in cm)(The speed of sound in air is approximately 343 m/s.)

25. **A**◯ 3.35 **B**◯ 4.18 **C**◯ 5.23 **D**◯ 6.53
E◯ 8.17 **F**◯ 10.21 **G**◯ 12.76 **H**◯ 15.95

You are correct. Your receipt is 498-1465

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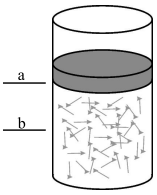
1 pt



A massive piston traps a fixed amount of helium gas as shown. After being brought to point (a) the system equilibrates to room temperature. Weight is then added ADIABATICALLY compressing the gas to half of its original volume (b).

▷ the pressure P_b _____ P_a.
26. **A**◯ greater than **B**◯ less than
C◯ equal to

▷ The temperature T_b _____ T_a.
27. **A**◯ greater than **B**◯ less than
C◯ equal to

▷ The internal energy U_b _____ U_a.
28. **A**◯ greater than **B**◯ less than
C◯ equal to

▷ The entropy of the gas at "b" is _____ the entropy of the gas at "a".
29. **A**◯ greater than **B**◯ less than
C◯ equal to

You are correct. Your receipt is 498-1469

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1 pt

Two sounds have intensities $3.5 \cdot 10^{-3}$ and $2.5 \cdot 10^{-7}$ W/m^2. What is the magnitude of the difference in intensity levels between the two sounds in dB?

30. **A**◯ 19.72 **B**◯ 28.59 **C**◯ 41.46
D◯ 60.12 **E**◯ 87.17 **F**◯ 126.40
G◯ 183.28 **H**◯ 265.76

You are correct. Your receipt is 498-1473

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1 pt An airplane is on course to move due east (relative to the earth) despite a wind of 53 m/s which is blowing from the north. The plane is observed to have a ground speed of 140.3 m/s. What would the speed of the plane be if there were no wind? (in m/s)

31. **A**◯ 11.1 **B**◯ 16.1 **C**◯ 23.4 **D**◯ 33.9
E◯ 49.2 **F**◯ 71.3 **G**◯ 103.4 **H**◯ 150.0

You are correct. Your receipt is 498-1377

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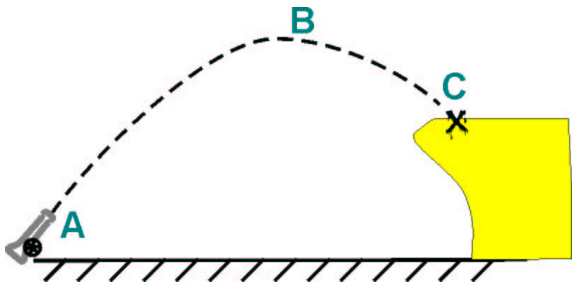
1 pt Consider a projectile which strikes a target as shown below. Ignore all forces except gravity. Point A refers to a point just beyond the muzzle of the cannon, B refers to the highest point in the trajectory and C refers to a point just before landing on the cliff.



▷ The magnitude of the vertical component of the velocity at A is ____ the magnitude of the vertical component of the velocity at C
32. **A**◯ greater than **B**◯ less than
C◯ equal to

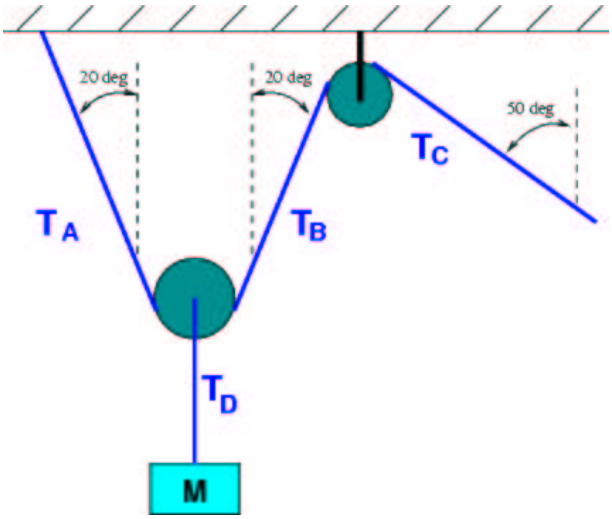
▷ The horizontal component of the velocity at A is ____ than the horizontal component of the velocity at B.
33. **A**◯ greater than **B**◯ less than
C◯ equal to

▷ The acceleration at A is ____ the acceleration at C.
34. **A**◯ greater than **B**◯ less than
C◯ equal to

▷ The vertical component of the velocity at B is ____ zero.
35. **A**◯ greater than **B**◯ less than
C◯ equal to

You are correct. Your receipt is 498-1381

1 pt



Consider the pulley system above which is holding the mass M in equilibrium. Assume each pulley is massless.

▷ T_A is _____ T_C.
36. **A**◯ equal to **B**◯ greater than
C◯ less than

▷ T_D is _____ Mg
37. **A**◯ equal to **B**◯ greater than
C◯ less than

▷ $T_A + T_B$ is _____ T_D
38. **A**◯ equal to **B**◯ greater than
C◯ less than

▷ T_A is _____ T_D
39. **A**◯ equal to **B**◯ greater than
C◯ less than

You are correct. Your receipt is 498-1385

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1 pt A drunk driver strikes a parked car. During the collision the cars become entangled and skip to a stop together. Each car has a total mass of 790 kg. If the cars slide 16.5 m before coming to rest, how fast was the drunk driver going? (in m/s) The coefficient of sliding friction between the tires and the road is 0.45.

40.**A**◯ 24.14 **B**◯ 27.28 **C**◯ 30.82 **D**◯ 34.83
E◯ 39.36 **F**◯ 44.48 **G**◯ 50.26 **H**◯ 56.79

You are correct. Your receipt is 498-1389

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1 pt The launching mechanism of a toy gun consists of a spring whose spring is compressed a distance 4.5 cm before launching. If the maximum height to which the gun can launch a 20-g projectile is 25 m, what is the spring constant? (in N/m)

41.**A**◯ 2210 **B**◯ 2585 **C**◯ 3025 **D**◯ 3539
E◯ 4141 **F**◯ 4844 **G**◯ 5668 **H**◯ 6632

You are correct. Your receipt is 498-1375

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1 pt A train speeds around a curve with a radius of curvature of 1.41 km. If the acceleration experienced by the passengers is to be less than 0.1 g, find the maximum acceptable speed. (in km/hr)
DATA: g = 9.81 m/s^2

42.**A**◯ 85.7 **B**◯ 107.1 **C**◯ 133.9 **D**◯ 167.4
E◯ 209.2 **F**◯ 261.5 **G**◯ 326.9 **H**◯ 408.6

You are correct. Your receipt is 498-1379

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1 pt Some asteroid named "Briggie" has been discovered revolving around the Sun on a circular orbit with at a radius of 2.86E+11 m. What is the period of Briggie's orbit? (in years)
DATA: The radius of Earth's orbit is 1.50E+11 m.

43.**A**◯ 2.10 **B**◯ 2.63 **C**◯ 3.29 **D**◯ 4.11
E◯ 5.14 **F**◯ 6.42 **G**◯ 8.03 **H**◯ 10.03

You are correct. Your receipt is 498-1383
