

Derive a formula for the straight line which, at $x = 1$, is tangent to the curve below.

$$y = 5 + \left(7x - \frac{4}{x}\right)^2$$

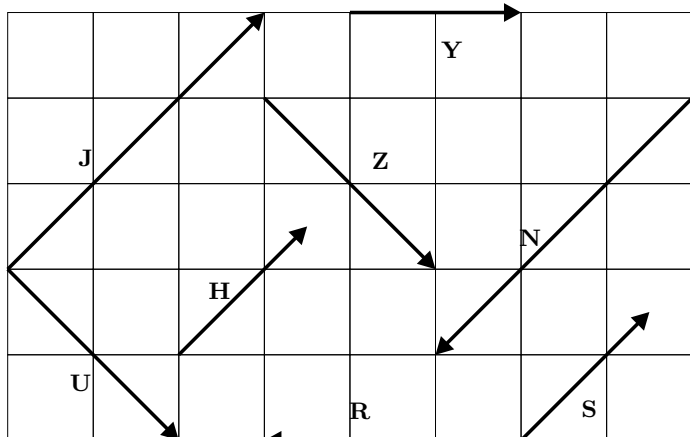
Use / for divide, * multiply, ^ power, and () if needed.

Tries 0/99

Calculate the slope of a straight line perpendicular to the tangent line above.

Tries 0/99

The labelled vectors below are drawn to scale.



For each of the statements select Greater than, Less than, or Equal to.

Choices: **Greater than, Less than, Equal to.**

1. $|\mathbf{S} \times \mathbf{H}|$ is ... 0.
2. $\mathbf{N} \cdot \mathbf{H}$ is ... 0.
3. $\mathbf{U} \cdot \mathbf{J}$ is ... 0.
4. The magnitude of \mathbf{J} ... that of \mathbf{N} .
5. $\mathbf{S} \cdot \mathbf{R}$ is ... 0.
6. $|\mathbf{Y} \times \mathbf{H}|$ is ... 0.

Tries 0/99

Six vectors are listed below. Rank them in order of increasing magnitudes, from smallest to largest, by selecting a rank from the pull down menu. The smallest is rank 1.

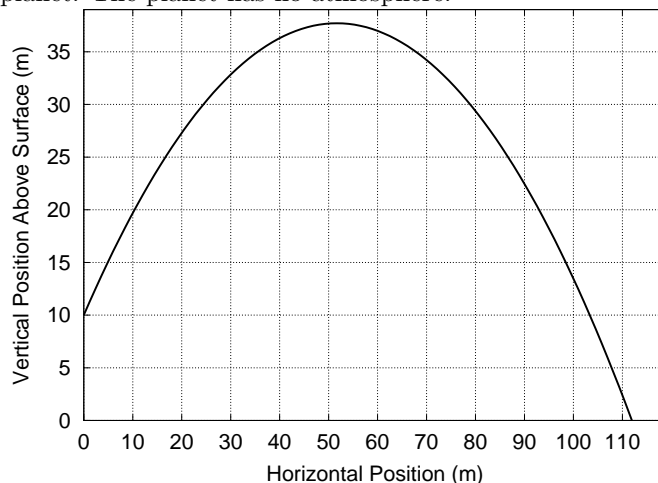
(Vectors of equal length have the same rank and then one rank is skipped. Example: 4 2 2 1 6 5)

Choices: **1, 2, 3, 4, 5, 6.**

1. Vector: $42\mathbf{j}$
2. Vector: $-42\mathbf{k}$
3. Vector: $26\mathbf{i} - 28\mathbf{j} - 12\mathbf{k}$
4. Vector: $32\mathbf{j} + 24\mathbf{k}$
5. Vector: $26\mathbf{i} + 33\mathbf{j}$
6. Vector: $29\mathbf{i} - 25\mathbf{j} - 17\mathbf{k}$

Tries 0/99

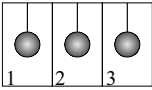
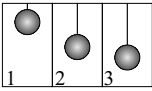
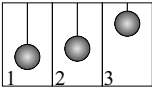
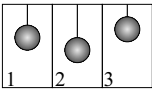
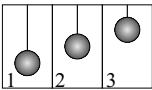
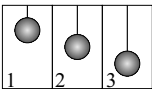
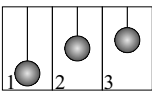
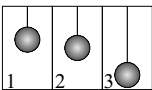
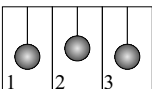
The trajectory of a rock thrown from a height with an initial speed of 20.1 m/s is shown in the figure below. Evaluate the magnitude of the gravitational field at the surface of the planet. The planet has no atmosphere.



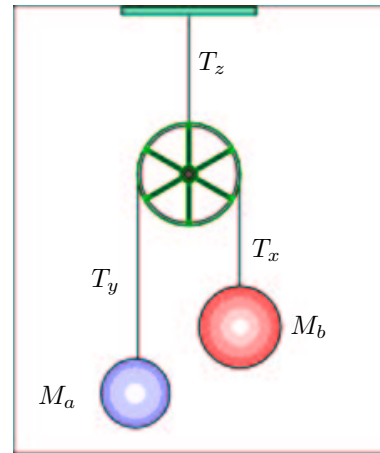
Tries 0/99

A wrecking ball of mass M is suspended by a thin cable (of negligible mass). The ball's position is recorded by a flash camera three times at intervals of 65 ms. For each of the sequences illustrated below, the tension remains constant. Indicate whether the tension in the cable, T , is Greater than, Less than, or Equal to the weight of the ball, Mg , or whether one Cannot tell.

Choices: **Greater than, Less than, Equal to, Cannot tell.**

1.  The tension T is Mg
2.  The tension T is Mg
3.  The tension T is Mg
4.  The tension T is Mg
5.  The tension T is Mg
6.  The tension T is Mg
7.  The tension T is Mg
8.  The tension T is Mg
9.  The tension T is Mg

Tries 0/99



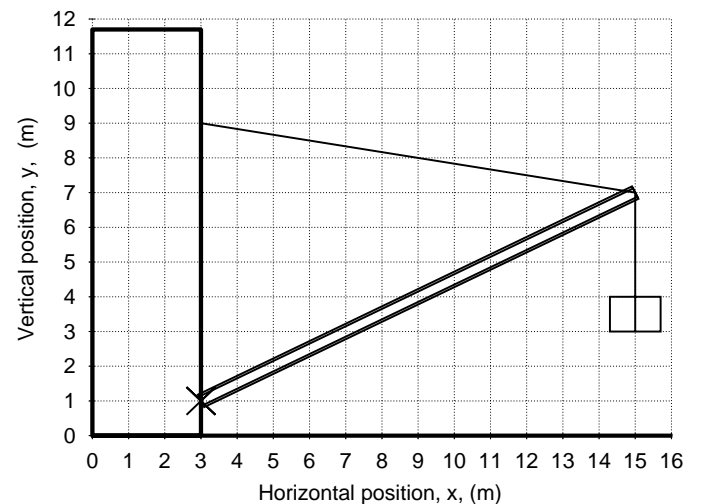
A frictionless, massless pulley is attached to the ceiling, in a gravity field $g = 9.81 \text{ m/s}^2$. Mass M_b is greater than mass M_a . The tensions T_x , T_y , T_z , and the constant g are magnitudes. (Select a response for each statement.) Motion of Masses on a Pulley.

Choices: **Greater than, Less than, Equal to, True, False.**

1. $M_a * g + M_b * g$ is T_z
2. The magnitude of the acceleration of M_b is that of M_a .
3. The center-of-mass of M_b and M_a accelerates.
4. T_y is T_x
5. $T_y + T_x$ is T_z
6. T_y is $M_a * g$.

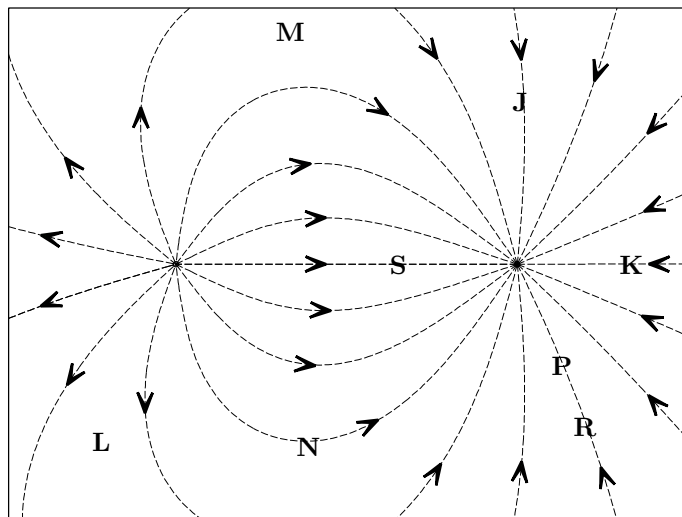
Tries 0/99

A crate with a mass of 163.5 kg is suspended from the end of a uniform boom with a mass of 88.7 kg. The upper end of the boom is supported by a cable attached to the wall and the lower end by a pivot (marked X) on the same wall. Calculate the tension in the cable.



Tries 0/99

The electric field from two charges in the plane of the paper is represented by the dashed lines and arrows below.



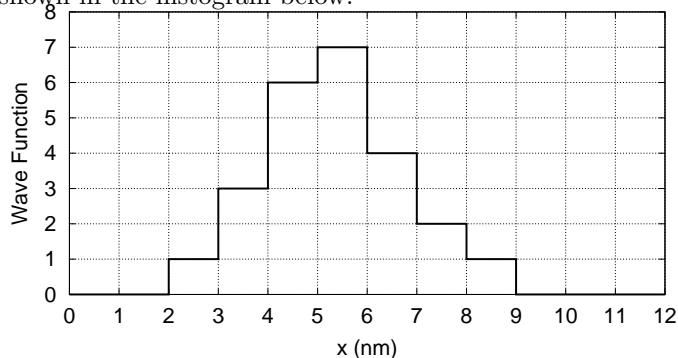
Select a response for each statement below. (Use 'North' towards top of page, and 'East' to the right)

Choices: **North, South, East, West, Greater than, Less than, Equal to, True, False.**

1. The magnitude of the charge on the right is that on the left.
2. The force on a (+) test charge at J is directed
3. The force on a (+) test charge at M is zero.
4. The force on a (-) test charge at N is directed
5. The sign of the charge on the left is negative.
6. The magnitude of the E-field at R is than at P.
7. The force on a (-) test charge at K is directed

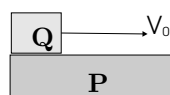
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The wave function of a particle constrained to the x-axis is shown in the histogram below.



Calculate the probability that the particle will be found between $x=5.00$ and $x=8.00$ nm.

Tries 0/99



Body Q is sliding on top of body P with coefficient of friction μ . The arrow in the figure illustrates the relative velocity of Q with respect to P. Both are traveling in the $+x$ direction. Assume that there is no friction between P and the ground and that Q remains on top of P.

A.

Choices: **True, False.**

1. Body P exerts a horizontal force on body Q, to the right.
2. The direction of the acceleration of P is to the right.
3. The speed of body Q is increasing.
4. The speed of body P is increasing.
5. The final velocity of Q with respect to the ground is zero.
6. The final speed of the Q does not depend on the value of friction coefficient μ .

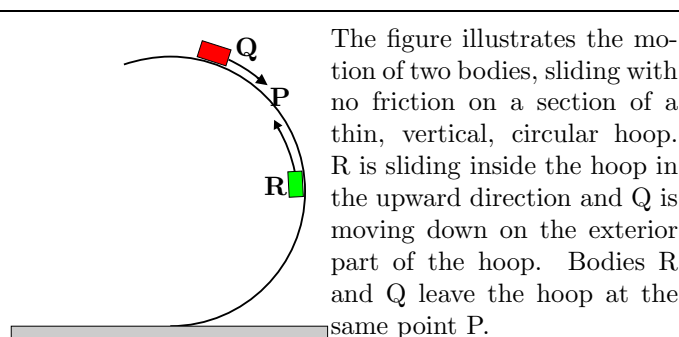
Tries 0/99

B. In the following, T is the time for Q to reach its final velocity, M_Q is the mass of Q and M_P is the mass of P.

Choices: **increases, decreases, is unchanged.**

1. For the same initial relative velocity, T _____ if M_P decreases.
2. T _____ if the initial relative velocity decreases.
3. For the same initial relative velocity, T _____ if μ increases.
4. The final speed of Q _____ if M_Q and M_P are both doubled.
5. The final speed of Q _____ M_Q increases.

Tries 0/99



The figure illustrates the motion of two bodies, sliding with no friction on a section of a thin, vertical, circular hoop. R is sliding inside the hoop in the upward direction and Q is moving down on the exterior part of the hoop. Bodies R and Q leave the hoop at the same point P.

Part A. While the bodies are still in contact with the hoop:

Choices: **increases, decreases, doesn't change.**

1. The speed of R _____ during its motion.
2. The magnitude of the acceleration of Q _____ during its motion.
3. The magnitude of the force the hoop applies on Q _____ during its motion.
4. The radial component of the acceleration of R _____ during its motion.

Tries 0/99

Part B. From the break away point P and on.

Choices: **greater than, smaller than, equal to, True, False.**

1. A higher break away point P would correspond to a smaller break away speed for R at P. _____
2. Body R leaves the hoop at point P with a speed which is _____ that of Q at P.
3. The travel time of R from point P to the ground is _____ that of Q

Tries 0/99
