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

$$y = 3 + \left(5x - \frac{3}{x}\right)^2$$

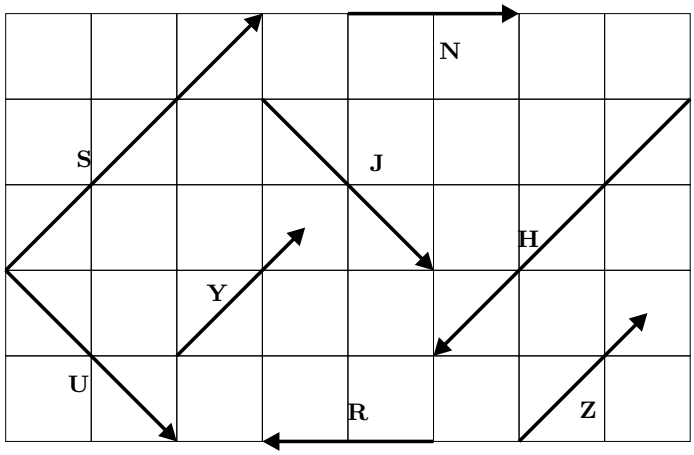
Use / for divide, * multiply, p̂ower, and ( ) if needed.

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. **U**·**S** is ... 0.
2. **H**·**Z** is ... 0.
3. The magnitude of **N** ... that of **R**.
4. **Z**·**R** is ... 0.
5. |**N**×**R**| is ... 0.
6. |**N**×**Y**| is ... 0.

Tries 0/99

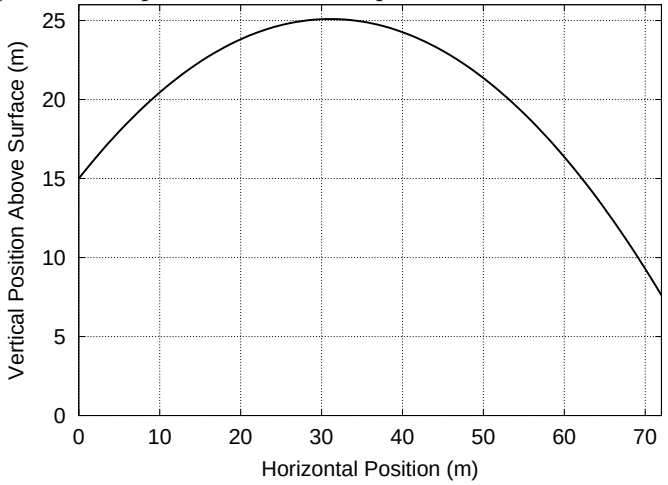
Six vectors are listed below. Rank them in order of increasing magnitudes, from smallest to largest, by selecting a rank from the pull down menu. The smallest is rank 1.
(Vectors of equal length have the same rank and then one rank is skipped. Example: 4 2 2 1 6 5)

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

1. Vector: -36**k**
2. Vector: 36**j**
3. Vector: 24**i**+26**j**
4. Vector: -14**i**-23**j**-23**k**
5. Vector: -17**i**-18**j**-22**k**
6. Vector: 19**j**+27**k**

Tries 0/99

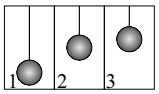
The trajectory of a rock thrown from a height with an initial speed of 16.5 m/s is shown in the figure below. Evaluate the magnitude of the gravitational field at the surface of the planet. The planet has no atmosphere.



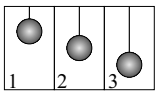
Tries 0/99

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 75 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.

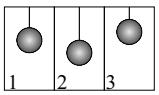
Choices: **Greater than**, **Less than**, **Equal to**, **Cannot tell**.

1. 

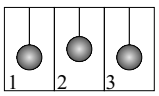
The tension T is .... Mg

2. 

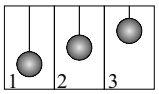
The tension T is .... Mg

3. 

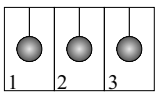
The tension T is .... Mg

4. 

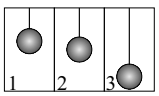
The tension T is .... Mg

5. 

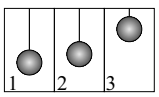
The tension T is .... Mg

6. 

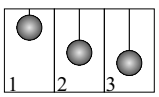
The tension T is .... Mg

7. 

The tension T is .... Mg

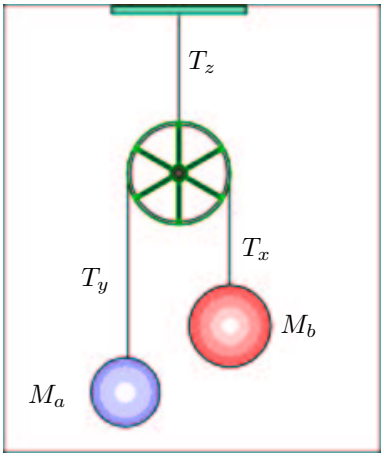
8. 

The tension T is .... Mg

9. 

The tension T is .... Mg

Tries 0/99



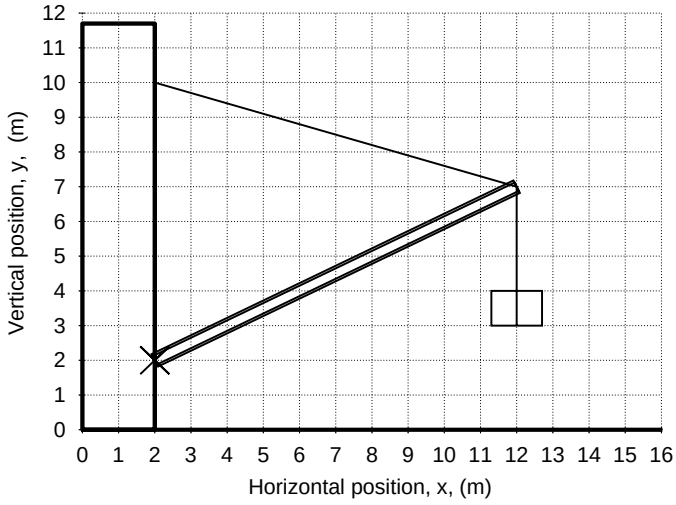
A frictionless, massless pulley is attached to the ceiling, in a gravity field $g = 9.81$ m/s^2. Mass M_b is greater than mass M_a. The tensions T_x, T_y, T_z, and the constant g are magnitudes. (Select a response for each statement.) Motion of Masses on a Pulley.

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

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

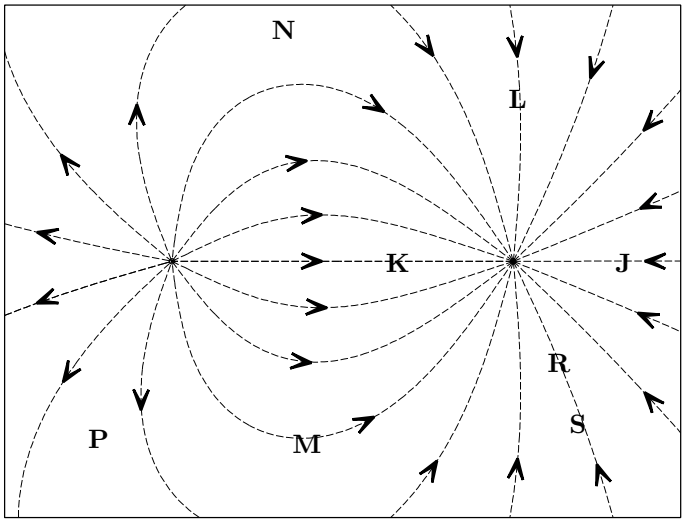
Tries 0/99

A crate with a mass of 189.5 kg is suspended from the end of a uniform boom with a mass of 87.1 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.



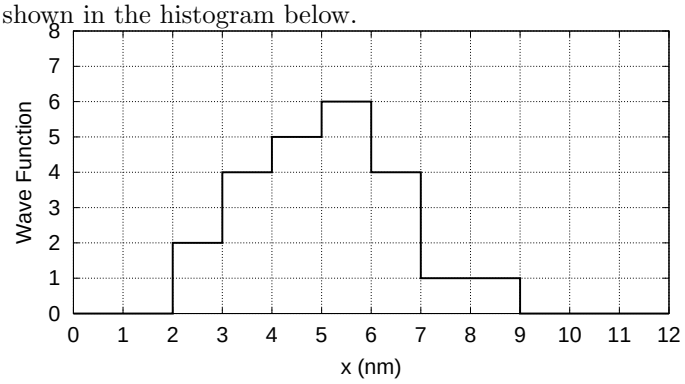
Select a response for each statement below. (Use 'North' towards top of page, and 'East' to the right)

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

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

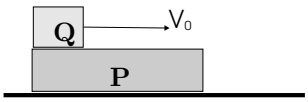
Tries 0/99

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=9.00 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 decreasing.
4. The speed of body P is increasing.
5. The final velocity of the two bodies is equal.
6. The final speed of P depends on the friction coefficient μ.

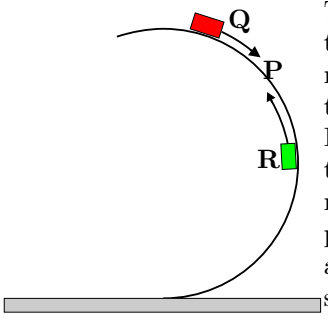
Tries 0/99

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. The final speed of Q ____ if M_Q and M_P are both doubled.
2. The final speed of Q ____ M_P increases.
3. For the same initial relative velocity, T ____ if M_Q decreases.
4. For the same initial relative velocity, T ____ if μ increases.
5. T ____ if the initial relative velocity 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 magnitude of the force the hoop applies on R ____ during its motion.
2. The speed of R ____ during its motion.
3. The radial component of the acceleration of R ____ during its motion.
4. The magnitude of the aceleration of Q ____ 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 greater 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 Q from point P to the ground is ____ that of R

Tries 0/99