

Name: _____

DISC: _____

Score: ____ / 20

Instructions:

- Do your own work.
- Answer the questions below in the space provided.
- Make sure you show all your work and any equations that you use.
- Please place a box around your answers.
- Remember to give the correct units with all numerical answers

Q1

Q2

Q3

Q4

10

10

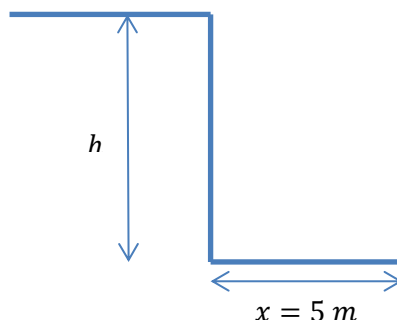
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5

1. You throw a ball from off of a cliff with an angle $\theta = 45^\circ$. The ball has an initial velocity of 2 m/s and reaches the ground after traveling $x = 5 \text{ m}$. Let the x-direction be horizontal and the y-direction be vertical.

- a. Draw a picture of the path you expect the ball to take to the ground. *Include the coordinate system.*

Picture:



- b. Now let's work on the motion of the ball.

Acceleration:

Direction:

 v_x v_y :

- What is the acceleration of the ball?
- What is the direction of the acceleration?
- What is the x-component of the ball's initial velocity (v_{0x})?
- What is the y-component of the ball's initial velocity (v_{0y})?

- c. Now we want to find the distance h . Select the equations you could use to calculate h (select all correct equations).

Choice (1 pts):

- $x(t) = x_0 + v_{0x}t + \frac{1}{2}a_x t^2$
- $y(t) = y_0 + v_{0y}t + \frac{1}{2}a_y t^2$
- $v_x^2 = v_{0x}^2 + 2 a_x \Delta x$
- $v_y^2 = v_{0y}^2 + 2 a_y \Delta y$

- d. How much time does it take the ball to reach the ground?

Solution (2 pts):

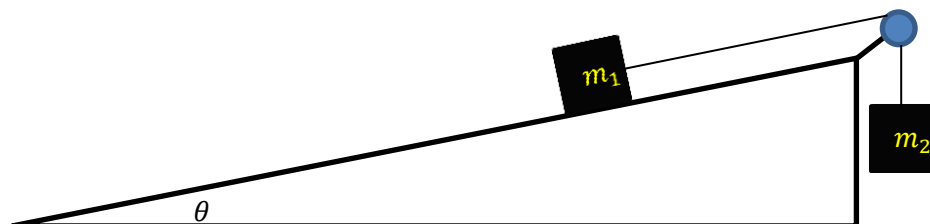
- e. What is the height, h , of the cliff?

Solution (2 pts):

2. A block of mass m_1 is in contact with a *frictionless* ramp. The angle between the ramp and the floor is $\theta = 15^\circ$. It is connected to a second block of mass m_2 by a massless cord over a frictionless pulley as shown in the diagram.

- a. Select a coordinate system and complete the free-body diagram. *Include your coordinate system(s) on the diagram.* (Hint: Will it be easier to give each block its own coordinate system?)

Diagram (2pts):



- b. Let's consider the motion of the blocks (Hint: $F_{net} = ma = \sum F$):

- i. Can this system be in equilibrium?
- ii. Use Newton's laws to describe the forces on m_1 .

- iii. Use Newton's laws to describe the forces on m_2 .

Equilibrium:

F_1 :

F_2 :

- c. If the system is in *equilibrium*, what is the ratio $\frac{m_1}{m_2}$?

Solution (5 pts):