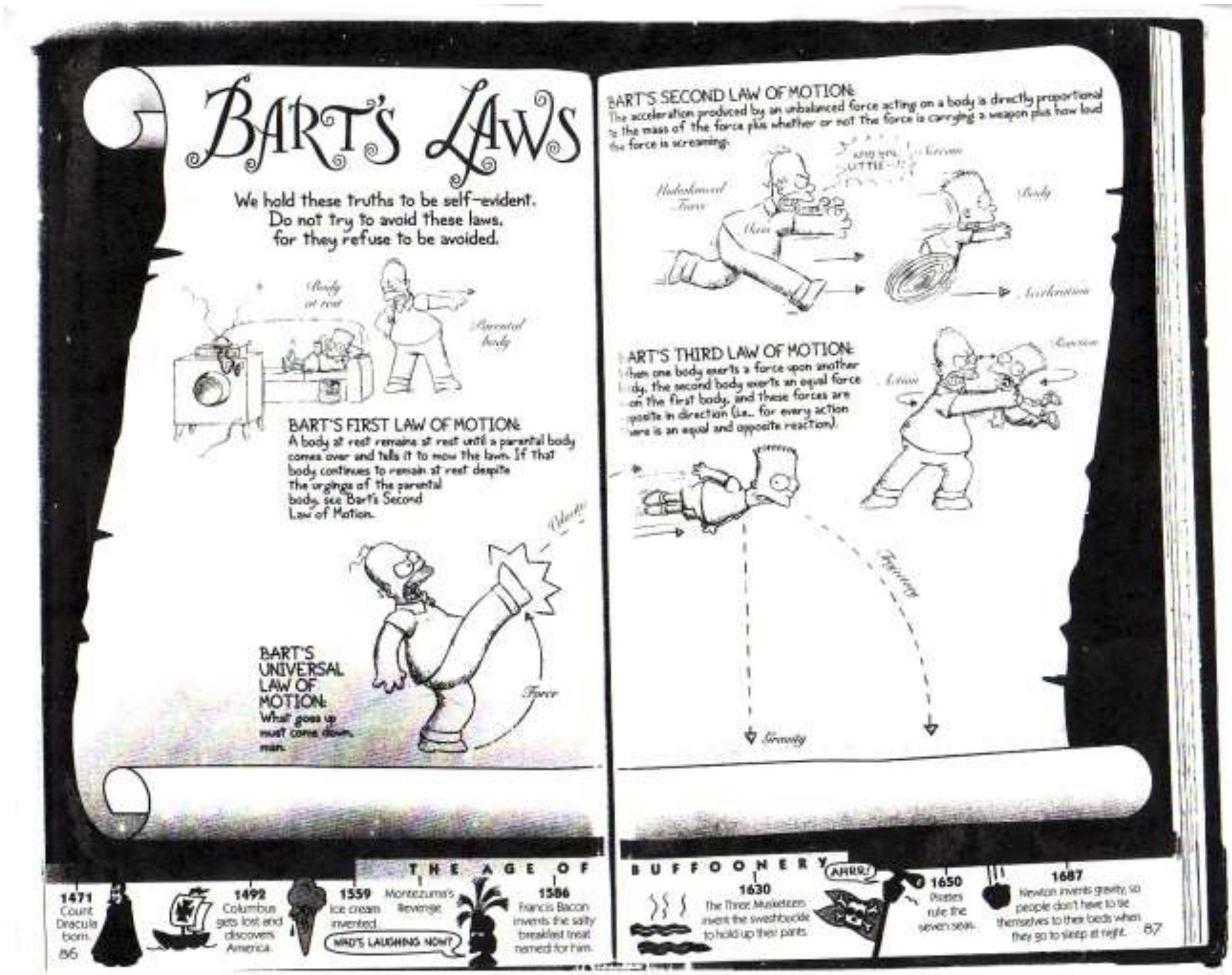
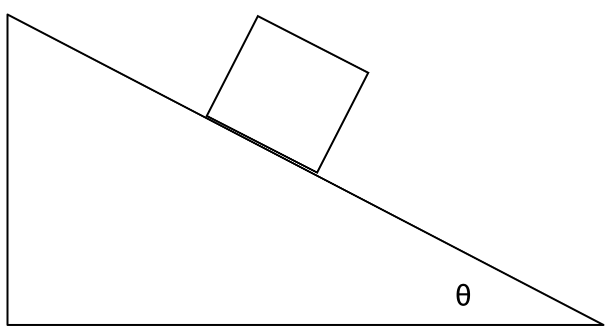
AP Physics C

Name ______________________________

Inclined Planes Problems



1.



a. A block of mass m=2 kg sits on an incline as shown in the diagram above. If the angle $\theta=30^0$, what is the block's acceleration down the incline if there is no friction?

$a = 4.9\ m/s^2$

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b. What is the minimum coefficient of friction necessary in order to keep the block in place due to static friction?

$\mu = 0.58$

c. Assume now that the coefficient of kinetic friction between the block and the incline is μ_k. Write a complete expression, using Newton's Laws, for an expression for the acceleration of the block down the incline. Do NOT plug in any numbers at this point.

$a = g\sin\theta - \mu g\cos\theta$

d. Assume the coefficient of kinetic friction between the block and the incline is μ_k=.15. Calculate the acceleration of the block down the incline.

$a = 3.6\ m/s^2$

e. A group of eager physics students want to determine the coefficient of kinetic friction between the same block and a different incline with the same angle of elevation. The students place the block at a HEIGHT of 1 meter from the ground. From rest, it slides down the incline in t=1.5 seconds. From this data, calculate the coefficient of kinetic friction between the block and the incline.

$\mu = 0.37$

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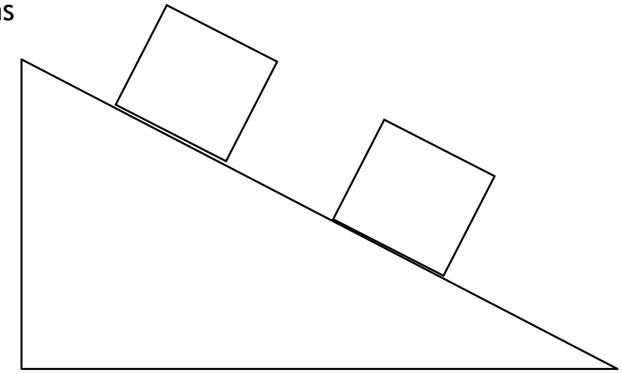

2. Two blocks of mass m_1=1 kg and m_2=2 kg are placed on a 30^0 incline. The coefficients of friction between m_1, m_2, and the incline are .1 and .2, respectively.
   a. Determine the acceleration of each block down the incline.

a = 4.05 m/s^2

a = 3.20 m/s^2

   b. If a light string is attached between the masses, and m_1 is closer to the bottom of the incline, what is the acceleration of the blocks?

a = 3.49 m/s^2

   c. If m_2 is closer to the bottom of the incline, what is the acceleration of the blocks?

   d. In which case is there more tension in the rope? Calculate this tension.

T = 0.56 N