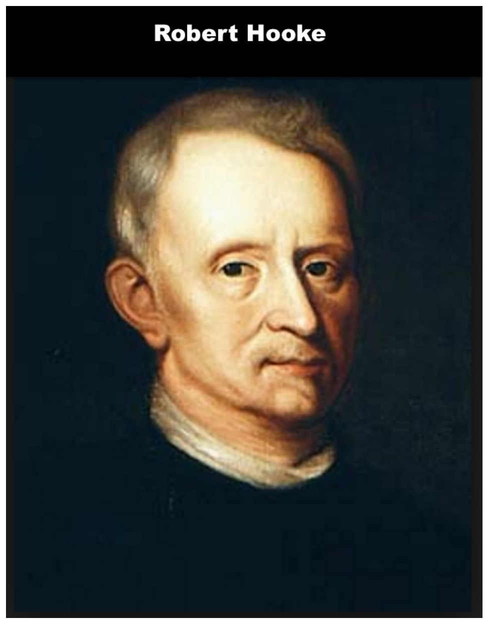
Booklet # 45



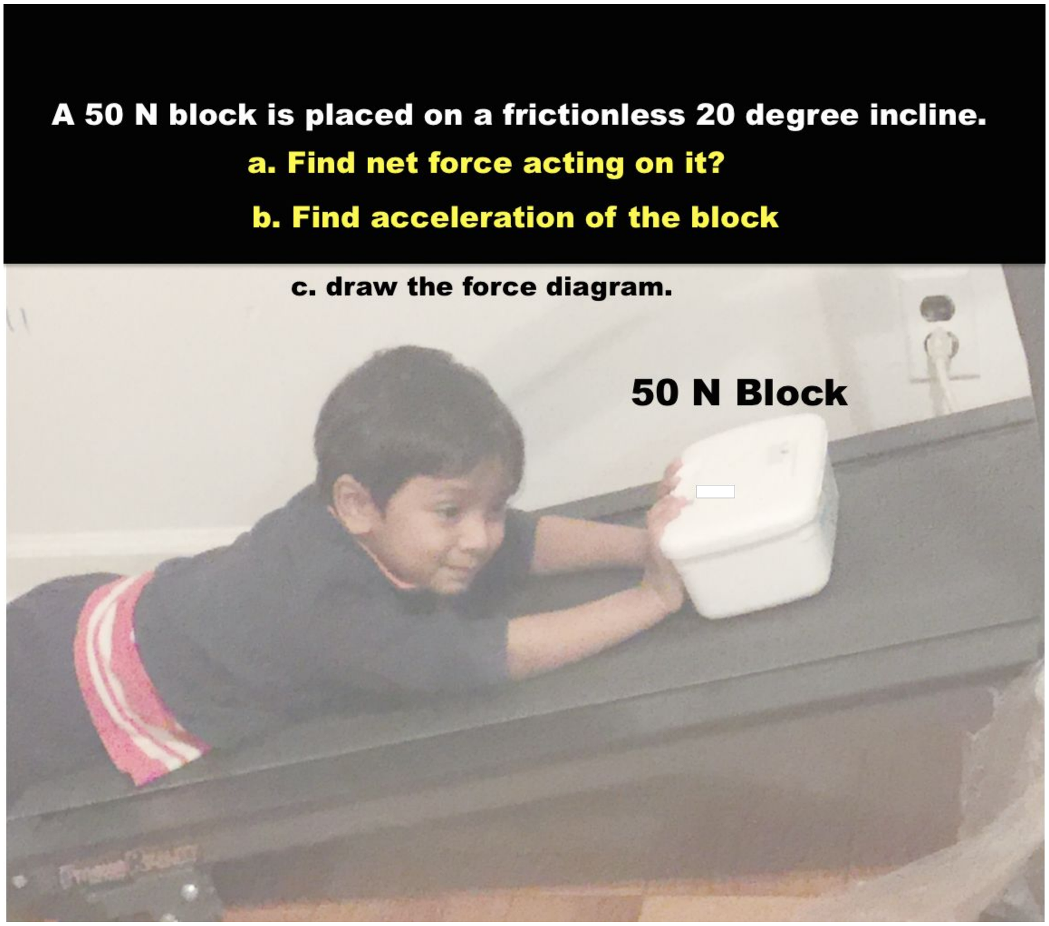
Unit: Work || Topic: Hooke's Law
Date: Dec 14, 2015 || Name:

1	Do now
10 mins	1. Steven has applied 10 N of force on Kenneth for 10 meter. Calculate how much work has Steven done on Kenneth? Explain your answer. 2. Irene has applied 10 N of force on Jared for 10 meter. Calculate how much work has Irene done of Jared? Explain your answer. 3. Carlos has applied 10 N of force on the box and has walked 5 meters to the west. Calculate how much work he has done (Be careful)? Explain your answer.

2	**Let's go over Do-now.** **https://www.youtube.com/watch?v=bf_Ot8MbaZg** 1. Steven has applied 10 N of force on Kenneth for 10 meter. Calculate how much work has Steven done on Kenneth? Explain your answer. 2. Irene has applied 10 N of force on Jared for 10 meter. Calculate how much work has Irene done of Jared? Explain your answer. 3. Carlos has applied 10 N of force on the box and has walked 5 meters to the west. Calculate how much work he has done (Be careful)? Explain your answer.

3	
	

Mr. Bari and Isaac have done some work this morning. Calculate the followings:
(a) Total Work performed (b) Find force of Friction (c) How much work is used to
overcome the friction? (d) Find the remaning work (e) Find the velocity of
the box?
m = 5 kg
—F=100 N

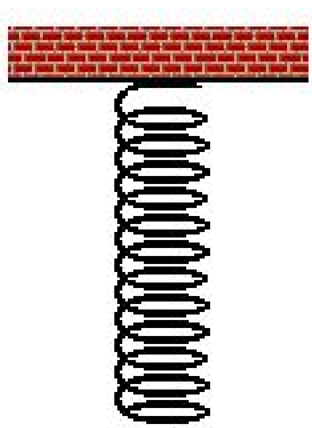
4	Inclined plane
	

5

Motion of a Mass on a Spring

We will begin our discussion with an investigation of the forces exerted by a spring on a hanging mass.

Consider the system shown below with a spring attached to a support. The spring hangs in a relaxed **unstretched** position.



A coiled spring in its relaxed position.

If you were to hold the bottom of the spring and pull **downward**, the spring would **stretch**.

If you were to pull with just a little force, the spring would **stretch** just a little bit. And if you were to pull with a much greater force, the spring would stretch a much greater extent.

Exactly what is the quantitative relationship between the amount of **pulling force** and the amount of **stretch**?

To determine this quantitative relationship between the amount of **force** and the amount of **stretch**, objects of known **mass** could be attached to the **spring**.

For each object which is added, the amount of **stretch** could be measured. The force which is applied in each instance would be the **weight** of the object.

A regression analysis of the force-stretch data could be performed in order to determine the quantitative relationship between the **force** and the amount of **stretch**. The data table below shows some representative data for such an experiment.

Mass (kg)	Force on Spring (N)	Amount of Stretch (m)
0.000	0.000	0.0000
0.050	0.490	0.0021
0.100	0.980	0.0040
0.150	1.470	0.0063
0.200	1.960	0.0081
0.250	2.450	0.0099
0.300	2.940	0.0123
0.400	3.920	0.0160
0.500	4.900	0.0199

By plotting the force (X axis) -stretch (y axis) data and performing a linear regression analysis, the quantitative relationship or equation can be determined. The plot is shown below.

The fact that the regression constant is very close to **1.000** indicates that there is a *strong fit* between the equation and the **data points**.

	This relationship between the **force** applied to a spring and the amount of **stretch** was first discovered in 1678 by English scientist **Robert Hooke**. The amount that the spring **extends** is proportional to the amount of **force** with which it pulls. $$F_{spring} = -k \cdot x$$ where **Fspring** is the force exerted upon the spring, **x** is the amount that the spring stretches relative to its relaxed position, and **k** is the spring constant. The units on the spring constant are Newton/meter (N/m). The negative sign in the above equation is an indication that the direction that the spring **stretches** is opposite the direction of the ***force*** which the spring exerts.

Below materials are For regents students only

6	**Calculus # 1 (Differentiation) Review: (power rule, product rule, quotient rule and chain rule)**

	Intro to Calculus # 2 : Integration
	1. Find the area under the curve y= x^2 from x = 0 to x = 4 2. under the curve y= x^3 from x = 1 to x = 3 (then from x = -2 and x= 2)

	3. under the curve $y= x^2 -2x + 8$ from $x = 1$ to $x = 2$