STRENGTH in NUMBERS
tutoring and test prep

STRENGTH IN NUMBERS BRIDGE CLASS

PHYSICS: PRINCIPLES OF FORCE AND MOTION

TEXTBOOK – *PHYSICS,* 6TH EDITION, BY GIANCOLI.

Physics is the study of forces and how they cause or impede motion. A typical physics question might ask something like, "a ball is thrown upwards at a speed of 15 meters per second. How high does it fly before it starts to come back down?" This class will explore the different principles governing forces, motion, and how these two are related. Along the way, we will deal with many different ways of analyzing motion and forces, including gravity, acceleration, momentum, and electricity.

Physics is very mathematical, and in particular uses a fair bit of algebra and geometry. (You can learn physics using calculus, but we don't do that in this class.) You'll need to know how to work with equations, especially linear equations, quadratics, and proportions. If this isn't your strongest suit, we can spend time going over these topics as we go along. In particular, there is a math topic toward the beginning of the class that you probably haven't seen before called "trigonometry," which is very important—and which we will spend a good amount of time covering.

Since in physics you will be solving for physical quantities based on known relationships between them, almost all questions will involve knowing when to apply certain equations. When we solve a momentum problem or an energy problem or a kinematics problem or a gravitation problem, you will need to know how to apply certain equations. There is also a good amount of reading involved in successfully solving physics problems, however, especially knowing what certain signal phrases mean. Basically, you should expect lots and lots of word problems. If you model things successfully, though, most physics problems will turn into pure math questions pretty quickly.

The table below gives an idea of what topics we will be covering. Homework problem numbers will be assigned at the time of the class, since what you need to practice should be obvious based on your demonstrated needs. In most cases (perhaps all cases), problems assigned will be odd-numbered so that you can check your answers in the back of your textbook. **It is normal to get questions wrong several times** when you are first learning a new topic, so don't despair if you get something wrong. If you can't figure out your mistake, we can spend time during the next class going over it. Don't worry about making mistakes. The only way not to make mistakes is not to try, and we both know that's a bad idea.

Class number	Topics	Textbook section(s)
1	Units; conversions and dimensional analysis; vectors	1.5, 1.6, 1.8, 3.1
2	Vectors cont'd; introduction to kinematics	2.2, 2.3, 2.4
3	One-dimensional kinematics	2.5, 2.7; ch. 2 review
4	Two-dimensional kinematics with vectors	3.3, 3.4, 3.5
5	Two-dimensional kinematics cont'd	3.6, 3.7, ch. 3 review
6	Dynamics and forces; Newton's Laws of Motion; free-body diagrams	4.1, 4.2, 4.3, 4.4, 4.5

Class number	Topics	Textbook section(s)
7	Normal force and gravity; free-body diagrams cont'd; friction and inclines	4.6, 4.7, 4.8, ch. 4 review
8	Work and energy; conservation of energy	6.1, 6.3, 6.4, 6.6, 6.7, ch. 6 review
9	Momentum; conservation of momentum; impulse	7.1, 7.2, 7.3, 7.4
10	Elastic, inelastic, and totally inelastic collisions; momentum in multiple dimensions	7.5, 7.6, 7.7, ch. 7 review
11	Kinematics of circular motion; dynamics of circular motion; banked curves	5.1, 5.2, 5.3
12	Law of universal gravitation; satellites and weightlessness	5.6, 5.8, ch. 5 review
13	Torque; statics	8.4, 9.1
14	Intro to static electricity; electric fields; Coulomb's law	16.1, 16.5, 16.7
15	Units for electricity; voltage; electrical circuits; resistors	17.1, 17.2, 18.2, 19.2
16	Optics; ray diagrams; refraction; Snell's law	23.2, 23.3, 23.4, 23.5, 23.7

If you find that a concept is difficult for you to understand, please speak up. We can take time away from other topics to address ones you need to spend more time on—even if we need to skip some material, it is better to learn some material well than to learn all material poorly. The idea here is for you to build confidence and familiarity with these concepts, so you can deal with them more easily during your physics class in school. It's an achievable goal! I'm looking forward to working toward it together.