Hi Students,

Let’s try to make the best of things the next few weeks. For the next few weeks, I need you to occasionally work on this packet when you get some downtime. You are not required to complete this during your time away from school, but it will be due by the end of the year. Hopefully, this will keep you on pace despite the time away from school. Do not procrastinate and wait until the last week of school. Work on it at home, drop by when you get back during homeroom hours, and use my course resources to help you complete the packet.

This packet will be available in class on Monday, and on my website ([www.nickaugustine.org](http://www.nickaugustine.org)) for your convenience. You may also contact me by email (naugustine@nbcusd.org) if you have any questions or concerns. My goal is not to overwhelm you with materials, but to reinforce the curriculum during your downtime. Be there for your families and support your community safely during your time away from school, but also take a few minutes each day to review some course content and plan ahead for your finals. Finally, I will leave you with a fun cartoon that I really enjoy.

Take Care,

Mr. A



**Review of Physics Formulas**

**5 Step Example:**

**How much force is needed to make a 150kg object accelerate at a rate of 3 m/s2 ?**

Known: mass= 150kg, acceleration= 3 m/ s2

Need to know: Force (Newtons)

Formula: F= m x a

Apply: F= 150kg x 3 m/ s2

Check Work: 150kg x 3 m/ s2 = 450kg/ m/ s2

**Answer= 450N**

**The 5 Step Process**

* What do you know?
* What do you need to know?
* What formula will you use?
* Apply the formula.
* Check your work and apply your units.

**Units**

Mass= kilograms (kg)

Force= Newtons (N)

Work= Joules (J)

Acceleration= m/s2 (meters/seconds²)

Gravity = 9.8 m/s2 (meters/second²)

Power= watts (w)

Distance= meters (m)

Time= seconds (s)

**Formulas**

 

***W (Work)* = F x d (Work = Force x distance)**

***F (Force)* = W /d (Force =Work /time)**

***F (Force)* = ma (Force =mass x acceleration)**

***M (Mass)* =d x V (Mass=Density x Volume)**

***a (acceleration)* =F /m (acceleration = Force /mass)**

***d (distance )*= W/F (distance = Work/Force)**

***P (Power)* = W/t (Power = Work /time**

**\*Weight and Mass are proportional**

2x the mass= 2x the weight ½ the mass= ½ the weight

**Word Problems- Use formulas to answer the 5 step questions below.**

1. What is the acceleration of Christina, who has a mass of 55kg, when she launches off a bridge with 500N of force? Gravity is measured at 9.8m/s².
2. How much force is needed to make Erik (45kg) and his bike (55kg) accelerate at a rate of 12 m/s2?
3. A force of 2000 Newtons is used to propel Zach along the cafeteria floor a distance of 70 meters. How much work was done?
4. It took 50 joules of work to push Nick’s chair 25 meters across the floor. How much force was applied to the chair?

**Word Problems- Use formulas to answer the questions below.**

1. Jesse pushed a 1200kg stalled car in the parking lot. How much force was applied to move the car with gravity measured at 9.8m/s²? How much work was completed if Jesse pushed the car 500m?

1a 6a

2a 7a

3a 8a

4a 9a

5a 10a

1. A trolley car is used to move ***100 passengers*** ***every 60 seconds*** from the base of a ***100 meter hill*** to the top. The average passenger's mass is ***70 kg***. Determine the power needed to move this number of passengers in this amount of time.

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| **Force and MotionBy Sharon Fabian** |    |  |

**Force and motion** describe everyday things that are happening all the time. Hundreds of times every day, you use force and motion. Did you just pick up a pencil? -- force and motion. Did you turn a page? -- force and motion. Raise your hand? Kick the desk in front of you? Pack your backpack? All of these are examples of force and motion. Out on the playground you can see even bigger and better examples of force and motion. Climbing, jumping, running, chasing, throwing, and sliding all use force and motion. Force and motion are also parts of a complicated branch of science, called physics. Now that you know what force and motion are, the next thing that you should know are some definitions.

The scientific definition of **force** is a push or a pull. When you throw a baseball, you are pushing it through the air. When you pick up a baseball bat you are pulling it up from the ground. When you hit the ball, you use both pushing and pulling motions. Motion is another word with a scientific meaning.  **Motion** means moving something from one place to another. When you used force to swing the bat and hit the baseball, they both moved from one place to another. That's what motion is. In fact, the word motion is a form of the word move.

Let's stick with our baseball example for a little bit longer. Some kids can hit a baseball harder than others can. You could say that their baseball travels at a faster rate.  **Speed** is a scientific term that means the rate of motion, or how fast something travels. OK, enough about baseball. Now think about rocks. Why can you throw a little pebble farther than you can throw a huge boulder? The boulder is heavier; it has more weight.

The Earth's gravity causes everything on Earth to have weight.  **Gravity** is a force that pulls everything toward the center of the Earth. Gravity is holding both the pebble and the boulder down, at the same time that you are trying to throw them. Gravity is a force acting against your force. Gravity's force is stronger on heavier objects. That's why it is not too hard to throw the pebble, but very hard to throw the boulder.  **Weight** is the measure of gravity's force. Since gravity is holding the boulder with more force than the pebble, the boulder has more weight. Force, motion, speed, gravity, and weight -- everyday words with special meanings in the science called physics.

**Questions**

1. What is the measure of gravity’s force?
2. Speed b) weight c) force d) motion
3. A measurement of movement is called \_\_\_\_\_\_\_\_\_\_\_.
4. gravity b) weight c) speed d) force
5. T / F Throwing a Frisbee is an example of force and motion.
6. T / F Climbing a hill is an example of force and motion.

**How Does a Yo-Yo Work?
By Sharon Fabian**

Somehow the words *yo-yo* and*physics* just don't seem to go together, but they do. Because if you want to know how a yo-yo works, the answer, in a word, is physics. The explanation for what makes a yo-yo go up and down, sleep, and do tricks is all based on concepts from physics. These concepts include kinetic energy, potential energy, and momentum.

There have been several kinds of yo-yos through the years. Each new kind of yo-yo used more ideas from physics to make it work better. Old style yo-yos had their strings tied securely to their axles. Newer yo-yos had their strings looped loosely around their axles. Even newer, automatic yo-yos have a built-in mechanism that make them come back up automatically.

Once you wind up the string of a yo-yo, any kind of yo-yo, and hold it in your hand, it has potential energy. In fact, it has not one, but two kinds of potential energy. It has potential energy because it can drop down, and it also has potential energy because it can unwind. When you let go of the yo-yo, gravity pulls it down. It is also forced to rotate because the string is fastened to your finger and also wound around the yo-yo's axle. As it drops, the yo-yo's potential energy changes to kinetic energy, the energy of motion.

One other thing happens while the yo-yo is dropping. It builds up momentum. Just as it has two kinds of energy, the yo-yo also builds up two kinds of momentum. It builds linear momentum, which is the momentum to keep going straight up and down, and it also builds angular momentum, which is the momentum to keep rotating. Going up and down, a yo-yo continually cycles between having potential energy and having kinetic energy.

Of course, a yo-yo will eventually stop, and that is because friction slows it down a little bit more on each trip up and down its string. Newer yo-yos, with the string looped loosely around the axle, have less friction. Also, since they are not tied tightly, they are not forced to roll back up once they hit the end of their string. That is why newer yo-yos can "sleep," which means that they keep spinning on the end of their string. They can even be made to roll along the floor at the end of their string like a dog on a leash. That is the yo-yo trick known as "walk the dog."

The newest yo-yos called automatic yo-yos have a built in clutch. The clutch releases the yo-yo's axle when the yo-yo is spinning quickly and then grips it when the spinning slows down. This makes the yo-yo roll back up automatically. There are other innovations that help yo-yos to perform more smoothly, too. Some yo-yos are made with most of the weight on the outside rims. This helps to keep them balanced longer. These yo-yos can sleep for a longer time so they can be used to do more tricks. Some yo-yos are even designed with ball bearings around the axle to reduce friction and give higher performance.

In addition to the physics, there is one more thing that makes a yo-yo perform well, and that is the operator. Just like with driving a car, operating a yo-yo takes practice. Practice, practice, practice, and one day you will be able to do tricks like "walk the dog" and "rock the baby." A little more practice and you might be ready to do "double or nothing" or "pop the clutch."

**Questions**

1. What is used to explain the workings of a yo-yo?
2. Biology b) Physics c) Geology d) Chemistry
3. The energy of motion is called \_\_\_\_\_\_\_\_\_ energy.
4. physical b) potential c) kinetic d) momentum
5. As a yo-yo rolls down its string, it builds up \_\_\_\_\_\_\_\_\_\_.
6. momentum b) friction c) potential energy d) weight
7. Yo-yos eventually stop because of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
8. their strings being too short
9. friction
10. weight
11. their strings being too long
12. Name two types of yo-yo tricks below.
	1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_