Weekly Agenda – Week 1 Quarter 2

Foundations Physical Science

Weekly Learning Outcomes
-I can… 1. Identify and compare work and power. 2. Calculate work and power using coding strategies in word problems.

Date	*Activities*	*What's Due*
Monday 10/30	-Pre-assessment: Work, Power, Energy (separate) -Energy Notes Introduction (p. 1-3) -Bill Nye: Energy	
	-Homework: TAG Sheets (p. 13-16)	
Tuesday 10/31	-Work and Power Calculations (p. 4-5)	-TAG Sheets (p. 13-16)
	Homework: Work and Power Problems (p. 4-5)	
Wednesday 11/1	-Review Work and Power problems (p. 4-5) -Work and Power Lab (p. 10-12)	-Work and Power problems (p. 4-5)
	Homework: Lab	
Thursday 11/2	-Work and power Lab continued (p. 10-12) -Work and Power Problems review (p. 6-9)	*-Work and Power problems* (p. 4-5)
	Homework: Review Problems	
Friday 11/3	-Quiz on Work and Power -Magic School Bus "Gets Energized" -Start Energy problems / Finish TAG Sheets	*-Work and Power Lab* (p. 10-12)
	Homework: Flex	

FPS – Work and Power Notes

Name_____ Period_____

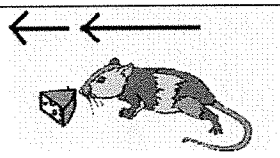
I can…
Define work and power. *Calculate work and power.* *Identify examples of work and power.*

Work and Power Notes
Bellwork: Write down three examples of what you think **work** is.

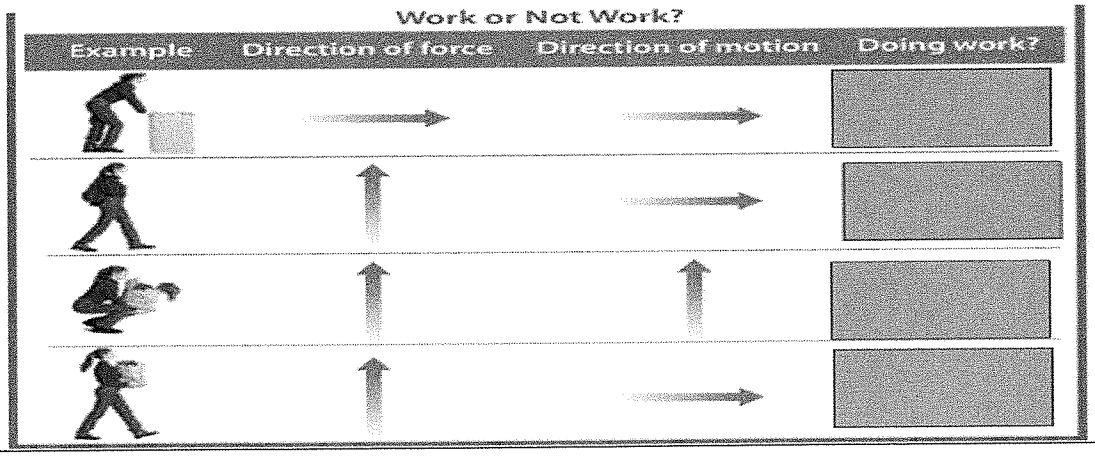
1. ***What is work?***
   - In science, the definition of work is:

   - Both the _____ and the _____ of the object are in the _____ direction.

2. Work or not?
   - a teacher lecturing her class YES / NO
   - A mouse pushing a piece of cheese with its nose across the floor YES / NO

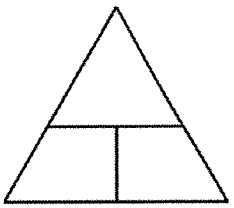


3. The mouse is using a _____ to move the cheese a _____; both _____ _____ _____.



4. What's work?
    - A scientist delivers a speech to an audience of his peers.
      YES / NO
    - A body builder lifts 350 pouds above his head.
      YES / NO
    - A mother carries her baby from room to room.
      YES / NO
    - A father pushes a baby in a carriage.
      YES / NO
    - A woman carries a 50 kg grocery bag to her car.
      YES / NO

5. Formula for work



- The unit of force is _____.
- The unit of distance is _____.
- The unit of work is _____.
- A Newton-meter is equal to one ***joule.***
- Unit for work is a _____.

6. The Joule
    - Named after British Physicist
      _____.

7. Let's practice calculating work. (W = F x d)
    - If a man pushes a concrete block 10 meters with a force of 20 N, how much work has he done?

8. Power

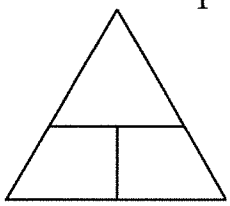
-What do you think makes something ***powerful***?

_____

_____

- Measure of how _____ work is done.
- Amount of _____ per unit of _____.
- Formula:

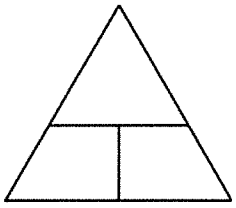
- The unit of power is the _____.



- Unit named after Scottish inventor _____.
- Invented the _____.

9. Watts – used to measure _____ and other small appliances. Your electric bill is measured in _____.

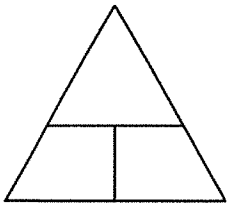
Practice Problems



Let's calculate work and power. Use these formulas:

$$Work(Joules) = Force\ (Newtons) \times distance\ (meters)$$

$$Power(Watt) = \frac{Work\ (Joules)}{time\ (s)}$$



1. Solve for **work** if a box is pulled with a force of 500N for 5 m.

2. Solve for **distance** is if 2 Joules of work is done with 4 N of force.

3. Solve for **power** if 90 Joules of work is done in 20 seconds.

4. Solve for **time** if 20 Joules of work is done with a power of 6 watts.

Try the others on your own, and get a teacher's initial to check them! Don't forget UNITS!

5. Amy uses 20N of force to push a lawn mower 10 meters. How much **work** does she do?	Teacher Initial
6. Joe balances a coin using 1 N of force and lifting it 0.20 meters. How much **work** does he do?	
7. Frank does 2400 J of work by climbing stairs. If he does this for 100m, how much **force** does he apply?	
8. How much **power** do you need to do if you pull a sled if you want to use 60 J of work in 5 seconds?	Teacher Initial
9. How much **work** does an elephant do while moving a wagon 20 meters with 200 N of force?	
10. If it takes you 5 seconds to do 1000 J of work, what is your **power** output?	
11. A 200N mountain climber scales a 100 meter cliff. How much **work** is done?	
12. A small motor does 4000j of work in 20 seconds. What is the **power** of the motor?	

13. A woman runs a race using a power output of 500 W and applying 6000 J of work. How long does it take her?	
14. What is the **distance** you go if you apply 600 N of force and 1200 J of work?	
15. What is the **work** you do if you use a power of 10 W and it takes you 10 seconds?	
16. You do 1400 J of work in 90 seconds. What is your **power**?	
17. How much **time** does it take you to do 1400 J of work if you have a power output of 80 watts?	
18. Solve for **power** if 90 Joules of work is done in 20 seconds.	
19. Solve for **work** if a box is pulled with a force of 500N for 5 m.	
20. A dog jumps 1 meter by applying 10 N. What is the dog's **work**?	

FPS – Work and Power stations

Names_____ Period_____

I can…
Define work and power. *Calculate time, distance, force, power, and work.*

In your groups, complete each section below. Each person in your group must be the recorder at least once. Write their name in the box for each section. You must all work together to complete each section. *Get Ms. Perry's initials in the box to move on.*

Section 1- Recorder Name:_____
What is the difference between work and power? Give a specific example for EACH.
Give a specific example of two things doing the same WORK but one is more POWERFUL.
Write the derived and renamed units for both work and power.
Give an example of something that **is work** and something that is **not work**.

*Section 2- Recorder Name:*_____

A deflated hot-air balloon weighs a total of 8000 N. Filled with hot air, the balloon rises to a height of 1000 m. How much work is accomplished by the hot air?

A rope is thrown over a beam, and one end is tied to a 198 kg bundle of lumber. You pull the free end of the rope 2 m up with a force of 498 N to lift the bundle up off of the ground. How much work was done?

What is the force necessary for an engine to do 632 J of work over 30 meters?

A horse can do 3100 J of work by applying 600 N of force to the carriage it is pulling. How far can it pull the carriage?

*Section 3- Recorder Name:*_____

Cheryl is a young girl climbing up a 3 m flight of 10 stairs. She is essentially "carrying" herself up the stairs, and her weight is 50 N. What is the total work done? What is the work done per step?

Cheryl climbs the stairs in 3 seconds. How much power does she have?

How much work does Cheryl do if she has a power of 4.5 watts and she takes 30 minutes to exercise?

How long does it take Cheryl to cut the grass if her lawnmower has 400 watts of power and she needs to do 16,000 J of work?

*Section 4- Recorder Name:*_____

Cheryl's weight is still 50 N and she wants to hang a painting. She must apply 10 N of force to lift the painting up over her head to hang it on the wall. She lifts the painting 0.5 m up, and it takes her 0.75 seconds to do so. Showing all your work, solve for Power. (Hint: find the work done first.)

Cheryl and her friend James are playing in a parking lot while their parents shop. Cheryl's friend James weighs 49 N and wants to push Cheryl in a shopping cart which weighs 38 N across the parking lot. The parking lot is 62 meters long, and it takes James 3 minutes to push her all the way across. Showing all your work, how powerful is James? (Hint: find work done first.)

Name: _____

Work and Power Lab

How Fast Can You Do Work?

Purpose: In this activity, we will experience the concepts of Work and Power using simple classroom materials. Please complete the following activity in your group.

Supplies needed include:

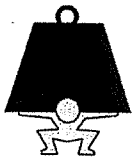
1) Spring Scale
2) Triple Beam Balance
3) Object to lift
4) Meter Stick
5) Stopwatch
6) Calculator

Define the following, include the equation used to calculate the term if it applies.

1) **Work:** _____
2) **Power:** _____
3) **Newton:** _____
4) **Joule:** _____
5) **Watts:** _____

Part 1

Let the FORCE Be With You…



Measure Force

1) Select an object (wood block, etc.) that has a mass that provides a readable measurement when you use the spring scale.
2) Determine the mass of the object using a triple beam balance: _____ g
3) Convert the mass of the object to kilograms. _____ kg
4) Use the Spring Scale to "lift" the object. Determine how many Newtons your object weighs. [ ] N

Calculate Force

5) Calculate the Force (weight) of the object using Newtons' 2nd Law:

Force = mass x acceleration of gravity

Force (weight) = _____ kg x _____ m/s^2 = [ ] N

6) Compare your measured Force (see #4) with the calculated Force (#5). Analyze any similarities or differences you see._____

_____

_____

_____

_____

_____

_____

Part 2
How Fast Can You Do Work?

Procedure: Calculate the work and power that you can do with your arms and legs.

ARMS

1) Attach a mass to the end of a string.
2) Measure the distance from the hanging mass to the top of the string.
3) Time how quickly you can raise the mass by rolling the string onto the dowel rod lifting the mass as you twist your hands.
4) Record the mass of the object that was lifted.
5) Calculate the work and power that was produced from this activity and record your data in the table below.

LEGS

1) Determine the vertical distance in meters from the first floor to the second floor. To do this, measure the height of each step and count the number of steps between the first and second floor.
2) With a stopwatch, see how quickly you can get from the first floor to the second floor.
3) Record your weight (kilograms) and time (seconds) the data table below.
4) Calculate the work and power that was produced from this activity and record your data in the table below.

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Muscle Group	Mass of Obj.(kg)	Distance (m)	Force (N)	Time (s)	Work (J)	Power (W)	Horse-power
ARMS	0.5						
LEGS	65						

m x 9.8

ANALYSIS QUESTIONS: On a separate sheet of paper, answer the following questions using complete sentences. (next page)

1) Which activity required the most work? Explain this using the two variables that affect work.
2) Which activity produced the most power? Explain why.
3) If you wanted to produce more power, what could you do to maximize power?
4) Would you be doing any more work by going up the stairs twice as fast? Explain.
5) This lab should have led you to a point of better understanding of work and power. It is now your chance to pull it all together by writing a **well written, thoughtful paragraph** . It should **make logical sense** and include all of the following terms.

Work	Power	Joule	Newton meter
Kgm/s^2	Joule / second	$kg\ m^2/s^2$	Horsepower
Force	Distance	Time	Watts

FPS - T.A.G. Sheet - Chapter 14

Name_____ Period_____

I can...
Explain how the motion of an object is affected when balanced and unbalanced forces act on it. *Compare and contrast the 4 types of friction.* *Describe how Earth's gravity and air resistance affect falling objects.* *Describe the path of a projectile.*

Section 14.1 – page 412-416	
Title of the Section _____ _____	Describe any image in the section .

1. What conditions must exist in order for a force to do work on an object?

_____

_____

2. Which formula relates work to power?

_____

_____

3. How much work is done when a vertical force acts on an object moving horizontally? Explain.

_____

_____

4. What is one horsepower equal to?

_____

_____

FPS - T.A.G. Sheet - Chapter 14

Name_____ Period_____

I can...
Describe Newton's first law of motion and its relation to inertia. *Describe Newton's second law of motion and use it to calculate acceleration, force, and mass.* *Relate the mass of an object to its weight.*

Section 14.2 – page 417-420	
Title of the Section _____ _____	Describe any image in the section .

5. What 3 things do machines do?

_____

_____

6. What is work input?

_____

_____

7. What is work output?

_____

_____

_____

_____

FPS - T.A.G. Sheet - Chapter 14

Name_____ Period_____

I can...
Explain how action and reaction forces are related according to Newton's third law of motion. *Calculate the momentum of an object.* *Describe what happens when momentum is conserved during a collision.*

Section 14.3 - page 421-426	
Title of the Section _____ _____	Describe any image in the section .

8. State mechanical advantage.

_____

_____

9. How can we calculate mechanical advantage?

_____

_____

10. Why is actual mechanical advantage less than ideal?

_____

_____

_____

_____

FPS - T.A.G. Sheet - Chapter 14

Name_____ Period_____

I can...
Explain how action and reaction forces are related according to Newton's third law of motion. *Calculate the momentum of an object.* *Describe what happens when momentum is conserved during a collision.*

Section 14.4 – page 427-	
Title of the Section _____ _____	Describe any image in the section .

11. What are the 6 types of simple machines?

_____

_____

12. If you want to pry the lid off of a can, what will require less force, a long screwdriver or a short screwdriver? Explain.

_____

_____

_____

_____

_____

_____