Unit 4: Forces
In Class Slides

Physics Daily Agenda- Thurs 2/18 & Fri 2/19

Schedule

- In-Person Review Expectations
- Review new schedule
- Class Warm Up
- Share Models
- Class Model
- **Break 5-10 minutes**
- Review Unit 4 Materials
- Forces Intro
- Exit Ticket

Do Now

What are components of a great model?

Take out your model from yesterday!

Standards:

N/A

In Person Expectations

- Mask on at all times
- Use QR Code to use bathroom
- Hand Sanitizer when entering and leaving (including bathroom breaks)
- Same seat all year
- Store belongings away from aisles in classrooms
- Login to device as soon as you get in
- Be mindful of your actions in and out of school

5-10 minute walk/mask break every day for everyone

	Monday (A-L In-Person)	Tuesday (A-L In-Person)	Wednesday (Asynchronous)	Thursday (M-Z In-Person)	Friday (M-Z In-Person)
	Doors Open at 7:00 am			Doors Open at 7:00 am	
7:22 a.m. - 7:37 a.m.	1st Hr - Postivity Project/SEL	4th hr -Postivity Project/SEL	1st Hr Office Hours (7:22-7:52)	1st Hr - Postivity Project/SEL	4th hr -Postivity Project/SEL
7:37 a.m. - 9:04 a.m.	1st hr	4th hr	2nd Hr Office Hours (7:52-8:22)	1st hr	4th hr
9:16 a.m. - 10:43 a.m.	2nd hr	5th hr	3rd Hr Office Hours (8:22-8:52) 4th Hr Office Hours (8:52-9:22)	2nd hr	5th hr
10:55 a.m.	3rd hr - start	6th hr - start	5th Hr Office Hours (9:22-9:52)	3rd hr - start	6th hr - start
Lunch 1	10:43 - 11:13	10:43 - 11:13	Break (9:52-10:02)	10:43 - 11:13	10:43 - 11:13
Lunch 2	11:23 - 11:53	11:23 - 11:53	6th Hr Office Hours (10:02-10:32)	11:23 - 11:53	11:23 - 11:53
Lunch 3	12:03 - 12:33	12:03 - 12:33	7th Hr Office Hours (10:32-10:52)	12:03 - 12:33	12:03 - 12:33
Lunch 4	12:43 - 1:13	12:43 - 1:13	Asynchronous Assignment Checks (11:00-11:30)	12:43 - 1:13	12:43 - 1:13
1:13	3rd hr - end	6th hr - end	Lunch (11:30-12:00)	3rd hr - end	6th hr - end
1:25 - 2:07	7th hr	7th hr	Planning (12:00-1:00)	7th hr	7th hr
2:22 (School Ends) Staggered Releases Prior to 2:22	2:22 (School Ends) Staggered Releases Prior to 2:22	2:22 (School Ends) Staggered Releases Prior to 2:22	PLC (1:00- 2:22)	2:22 (School Ends) Staggered Releases Prior to 2:22	2:22 (School Ends) Staggered Releases Prior to 2:22

Beginning	Middle	End

Force: Push or pull
Unit: Newtons (N)
Vector!

Types of Forces

- Gravity
- Normal (Support)
- Applied Force
- Friction
- Spring
- Tension
- Air Resistance

Free Body Diagrams (FBD)

- Box to represent the object
- Arrows with labels to represent the forces
- Tick marks to show equality between forces
- Rest or constant velocity: all forces are equal!

A ball is pushed across a table at a constant velocity.

A ball is pushed across the table and is slowing down.

FBD Practice

1. A ball sits on a desk
2. A ball is dropped from your hand
3. A ball is thrown up in the air
4. A ball rolls off a desk onto the ground
5. A ball rolls across a desk with friction and slows down
6. A ball rolls up a ramp with friction
7. A ball rolls down a ramp
8. A ball is thrown down off a building

Net Force

Total force in a system (x and y are separate)

A box is pushed with 10N left and 20 N right. What is the net force?

Is the net force zero or nonzero in the x and the y?

1. A ball sits on a desk
2. A ball is dropped from your hand
3. A ball is thrown up in the air
4. A ball rolls off a desk onto the ground
5. A ball rolls across a desk with friction and slows down
6. A ball rolls up a ramp with friction
7. A ball rolls down a ramp
8. A ball is thrown down off a building

Exit Ticket (Take a Picture and Upload)

1. A person drops a ball off a balcony. There is air resistance. Draw a FBD with tick marks and determine whether the net force is zero or nonzero and explain why.
2. A person pushes a ball across a desk at a constant velocity. Draw a FBD with tick marks and determine whether the net force is zero or nonzero and explain why.

Physics Daily Agenda- Mon 2/22 & Tues 2/23

Schedule

- In Class Expectations
- Review Warm Up
- Review Exit Ticket
- Net Forces: Zero or Nonzero
- FBD Treasure Hunt (20 minutes)
- Practice Packet Pages 1 and 2

Do Now

A box sits on a counter. Draw a FBD. Is the net force zero or nonzero?

Upcoming

Async Wednesday:

Open Note Assessment for Standard 4.1 (Forces)

In Person Expectations

- Mask on at all times
- Use QR Code to use bathroom
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- Be mindful of your actions in and out of school

5-10 minute walk/mask break every day for everyone

Exit Ticket

1. A person drops a ball off a balcony. There is air resistance. Draw a FBD with tick marks and determine whether the net force is zero or nonzero and explain why.
2. A person pushes a ball across a desk at a constant velocity. Draw a FBD with tick marks and determine whether the net force is zero or nonzero and explain why.

Types of Forces

- Gravity
- Normal (Support)
- Applied Force
- Friction
- Spring
- Tension
- Air Resistance

How to create a FBD:

1) Draw a circle or box to represent the object
2) Choose the forces acting on the object
3) Draw arrows out of the object to show the forces
4) Use tick marks to indicate if forces are equal or unequal

Net Force

Total force in a system (x and y are separate)

A box is pushed with 10N left and 20 N right. What is the net force?

Net Force: Zero or Nonzero?

Separate in the x and y

- Zero
  - At Rest
  - Constant Velocity
- Nonzero
  - Speeding up
  - Slowing down
  - Falling

Is the net force zero or nonzero in the x and the y?

1. A ball sits on a desk
2. A ball is dropped from your hand
3. A ball is thrown up in the air
4. A ball rolls off a desk onto the ground
5. A ball rolls across a desk with friction and slows down
6. A ball rolls up a ramp with friction
7. A ball rolls down a ramp
8. A ball is thrown down off a building

FBD Treasure Hunt

- Find examples of the FBD's in your home or in the school
- They can be moving or at rest. You can create the situation too.
- You must create the free body diagram for each situation.
- Determine whether the net force is zero or nonzero in the x and y.

- 2 or more must have normal force
- 2 or more must have tension
- 2 or more must have air resistance
- 3 or more must have applied force
- 2 or more must have frictional force

Practice for Check In Quiz: Pages 1 and 2 of the Practice Packet (Under Materials)

Make sure to write whether net force is zero or nonzero in the x and y!

Physics Daily Agenda- Thurs 2/25 & Fri 2/26

Schedule

- Review FBD and Quick Quiz
- Newton's Law Flipgrid

Do Now

- Take out your FBD Quick Quiz from yesterday
- Rate yourself 1-4 on your understanding

Upcoming

Due before class on Tuesday: Newton's Law Flipgrid

Newton’s Laws Demos Flipgrid

What are Newton’s Laws?

1) Object at rest stays at rest and object in motion stays in motion until acted on by an outside force
2) Force = mass x acceleration
3) Every action has an equal and opposite reaction

Physics Daily Agenda- Monday 3/1 & Tuesday 3/2

Schedule

- Newton's Law Flipgrid Reflection
- Review Newton's Laws

Do Now

In the chat… tell me something positive!

A-H: Newton's First Law
J-N: Newton's Second Law
O-Z: Newton's Third Law

Upcoming

Asynchronous Assignment due Wednesday

1st Law

What is inertia? How hard it is to move something aka MASS.

Mass: The amount of molecules in something. The stuff of what you are.

*Not weight

3rd Law

Equal and opposite reaction

Think FBDs, collisions, crashes, etc.

We use this in momentum!

2nd Law

$F = ma$

Units?

What is weight?


Why do you weigh less on the moon?

Physics Daily Agenda- Thursday 3/4 & Friday 3/5

Schedule

1. Review Forces and FBD (Warm Up)
2. Review Asynchronous Activity
3. Review Newton's Second Law
4. Newton's Second Law Word Problems
5. Work On Practice Packet Pages 3-4

Do Now

- A ball is thrown downwards. There is air resistance. Create a FBD and determine net force in the x and y.
- A ball rolls across the ground and rolls to a stop. Create a FBD and determine net force in the x and y.

Standards:

4.1 Forces and FBD

I can identify forces acting on an object and representing them using a free body diagram (FBD)

4.2 Newton's Laws

I can use Newton's Laws to describe and explain the movement of an object.

Do Now

- A ball is thrown downwards. There is air resistance. Create a FBD and determine net force in the x and y.
- A ball rolls across the ground and rolls to a stop. Create a FBD and determine net force in the x and y.

How to do a word problem?

1) Read it!
2) Known!
3) Unknown!
4) Equation!
5) Rearrange!
6) Plug it in!
7) Answer with units!

Newton’s 2nd Law

F=ma

How much force must an engine provide to make a 1800 kg car accelerate at 4.5 m/s^2?

Newton’s 2nd Law F=ma

A 1500 kg car is stopped at a red light. When the light turns green, the engine supplies 5000 N of force to the wheels. What is the car's acceleration?

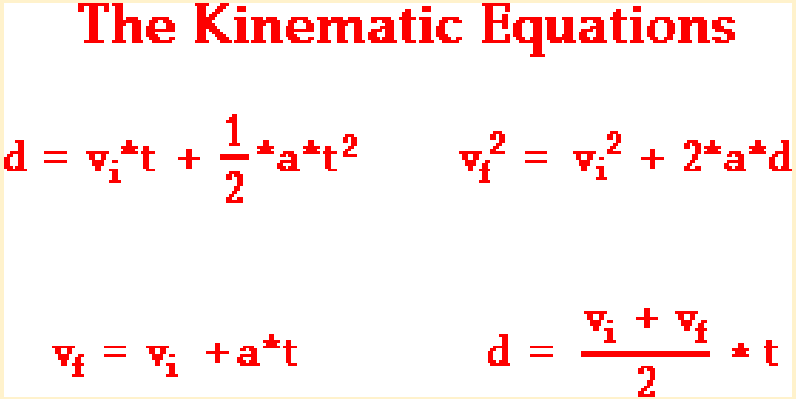
Newton’s 2nd Law F=ma

Find the mass of a go cart if it uses 390 N of force and accelerates at 2 m/s^2

The same go cart now starts from rest and goes 5 m in 5 seconds. What is the acceleration of the go cart? Force?

Newton’s 2nd Law F=ma

A 1000 kg car starts from rest and accelerates for 10 seconds over 200 m. What is the force of the car after the 200m?



Exit Ticket

A 45 kg person is running at 4 m/s and slows down to a stop in 20 m. What is the acceleration of the person? The force needed to stop?

Practice Packet Pages 3-4

Come to next block with this done- we will be reviewing it!

Physics Daily Agenda- Monday 3/8 & Tuesday 3/9

Schedule

1. So you want to take AP Physics?
2. Review Practice Packet- Newton's Second Law
3. What is weight?
4. Falling objects and Newton's Second Law
5. Revise Phenomenon
6. Share revised Phenomenon

Do Now

A 0.6 kg ball rolls 7.8 meters in 4 seconds and slows down to a stop. What is the force exerted on the ball to make it stop? Draw a FBD of the situation

Standards:

4.1 Forces and FBD

I can identify forces acting on an object and representing them using a free body diagram (FBD)

4.2 Newton's Laws

I can use Newton's Laws to describe and explain the movement of an object.

So you want to take AP Physics?

Are you...

- A current sophomore or junior?
- Completed Algebra 2 this year?
- Completed BOTH biology and chemistry this year?
- Have taken physics (not required anymore, but **highly** recommended)? Students with physics first are more successful at labs, inquiry and conceptual topics.
- Have a strong work ethic, desire to learn more about physics, apply mathematical concepts to physics, learn more conceptual topics and write lab reports?
- In need of a senior math credit?

To Sign Up for AP Physics...

- Not sure if you're ready? Ask Mrs. Wentzloff or Mrs. Lee.
- Fill out any paperwork. Last year it included...
  - Be done with Algebra 2, biology and chemistry
  - Get your current science teacher to sign off
  - Get your current math teacher to sign off
  - Get a parent signature
  - Write a paragraph about why you want to take this class and fill out other questions
- Turn it in by the due date or you will not be accepted into the course

Review Practice Packet Questions

What is weight? Newton’s Second Law application to Vertical Motion

Weight

A 0.5 kg weather balloon needs to move off the ground. How would we determine the force needed to raise the weather balloon off the ground?

Newton’s Laws in the Vertical

A 0.3 kg ball is dropped from a 10 m building. What is the force when the ball hits the ground?

Beginning	Middle	End

Slinky Phenomenon

- Look at your phenomenon from the start of the unit
- Create the phenomenon now adding in Free Body Diagrams and explain how each of Newton's Laws relates to the situation

Physics Daily Agenda- Thursday 3/11 & Fri 3/12

Schedule

1. Review Friction Asynchronous
2. Friction Shoe Lab- 45 minutes
3. Review the Friction Equation
4. Practice Problems
5. Slinky Newton's Laws Phenomenon

Sting Report

Do Now

How would you describe friction in your own words? What are surfaces that have high friction? Low friction?

Upcoming

3/18 & 3/19- Standards 4.1, 4.2, 4.3 Quiz (Re-assessment)

Friction?

Physics Daily Agenda- Monday 3/15 & Tuesday 3/16

Schedule

1. Review Friction Shoe Lab
2. The Friction Equation
3. What is normal force?
4. Standards 4.1, 4.2, 4.3 Review
5. Practice Packet Work Time (Pages 1-5)

Do Now

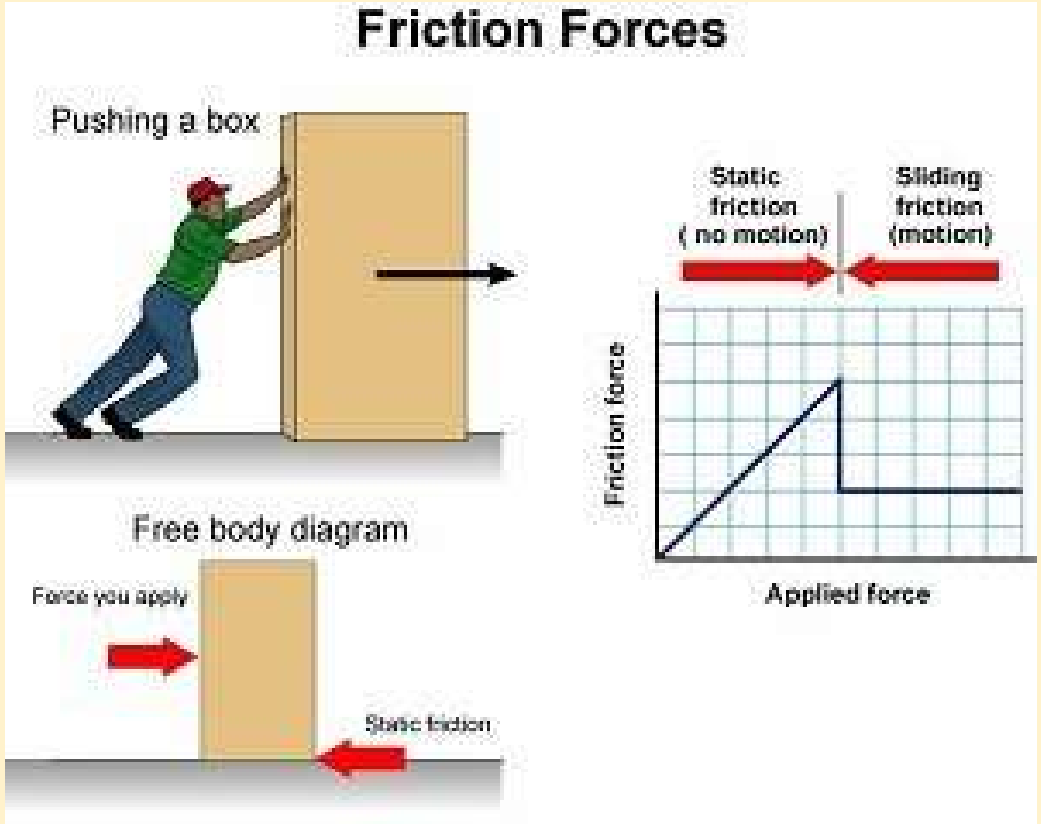
- Take out your shoe lab!
- What was different about the soles of the shoes that you chose?
- Which one was easier to pull? Why?

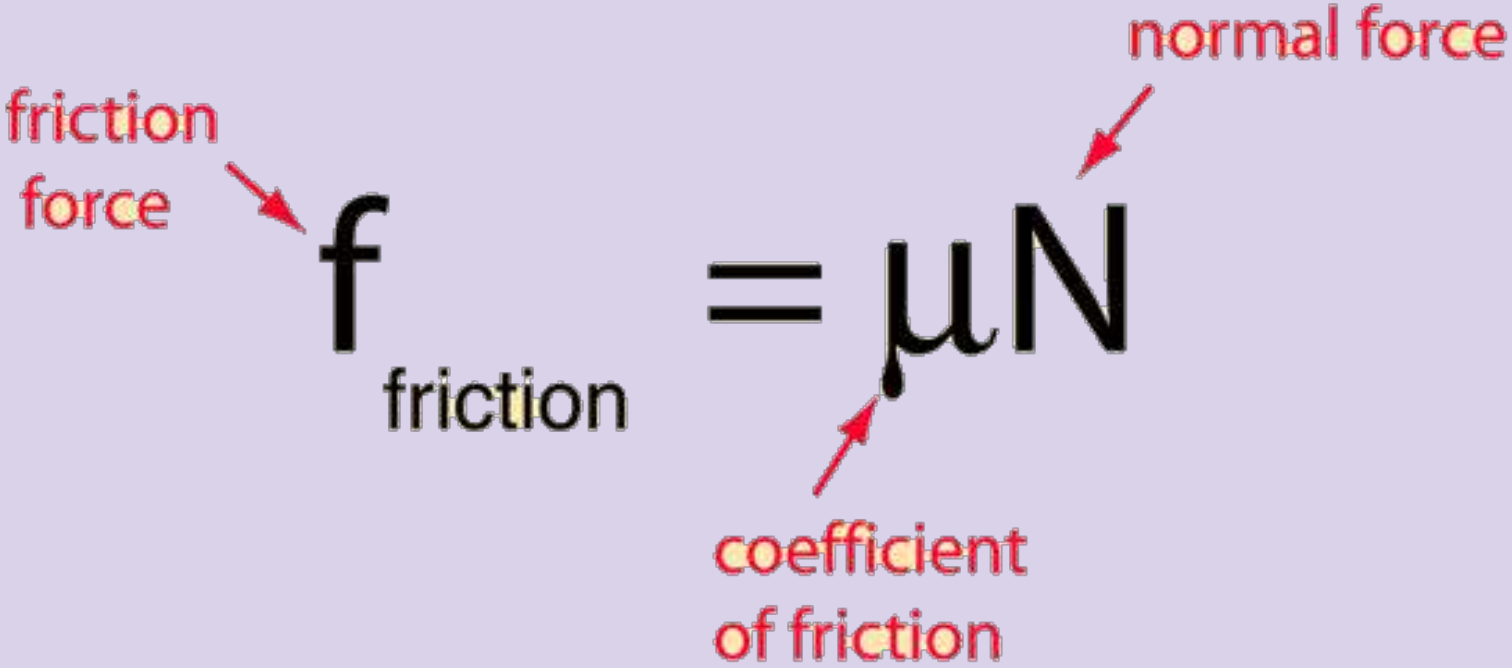
Upcoming

3/18 & 3/19- Standards 4.1, 4.2, 4.3 Quiz (Re-assessment)

Mu of my Shoe Lab- Qualitative

Friction Forces




friction force
normal force
$f_{friction} = \mu N$
coefficient of friction

A 2 kg shoe is pulled with a force of 2 N. What is the coefficient of friction?

Materials	μ_s	μ_k
Steel on steel	0.74	0.57
Aluminum on steel	0.61	0.47
Copper on steel	0.53	0.36
Rubber on concrete (dry)	1.0	0.8
Rubber on concrete (wet)	0.3	0.25
Wood on wood	0.25-0.5	0.2
Glass on glass	0.94	0.4
Teflon on Teflon	0.04	0.04
Teflon on steel	0.04	0.04
Waxed wood on wet snow	0.14	0.1
Waxed wood on dry snow	0.10	0.04
Metal on metal (lubricated)	0.15	0.06
Ice on ice	0.1	0.03
Synovial joints in humans	0.01	0.003
Very rough surfaces		1.5

Wednesday Asynchronous: Review for Quiz

Thursday: Reassessment on...

- Forces/FBD
- Net Force
- Newton’s Laws
- Using F=ma
- Using Friction Equation

Standards 4.1, 4.2, 4.3

Types of Forces

- Gravity
- Normal (Support)
- Applied Force
- Friction
- Spring
- Tension
- Air Resistance

EXIT TICKET

A 10 kg bowling ball rolls down a lane. The coefficient of friction is 0.15. Determine the force of friction between the bowling ball and the lane.

Practice Packet Class Review

Practice Problems!

Page 5 in your Practice Packet

Physics Daily Agenda- 3/17 & 3/18

Schedule

1. Review Async from Wednesday for Quiz
2. Forces Quiz

Do Now

- What type of force is in every FBD?
- What is Newton's Second Law?
- What is our equation for friction?
- What does normal force equal (equation)?

Upcoming

- We will start Hooke's Law Lab on Monday! You can work with a partner to take data.
- Asynchronous Gold Day Friday
- Full In Seat Students on Monday

Physics Daily Agenda- 3/22 & 3/23

Schedule

1. What is Hooke's Law?
2. Intro Hooke's Law Lab
3. Take Data

Do Now

What is similar about these springs? Different?

Upcoming

Asyn Wed: Graphing

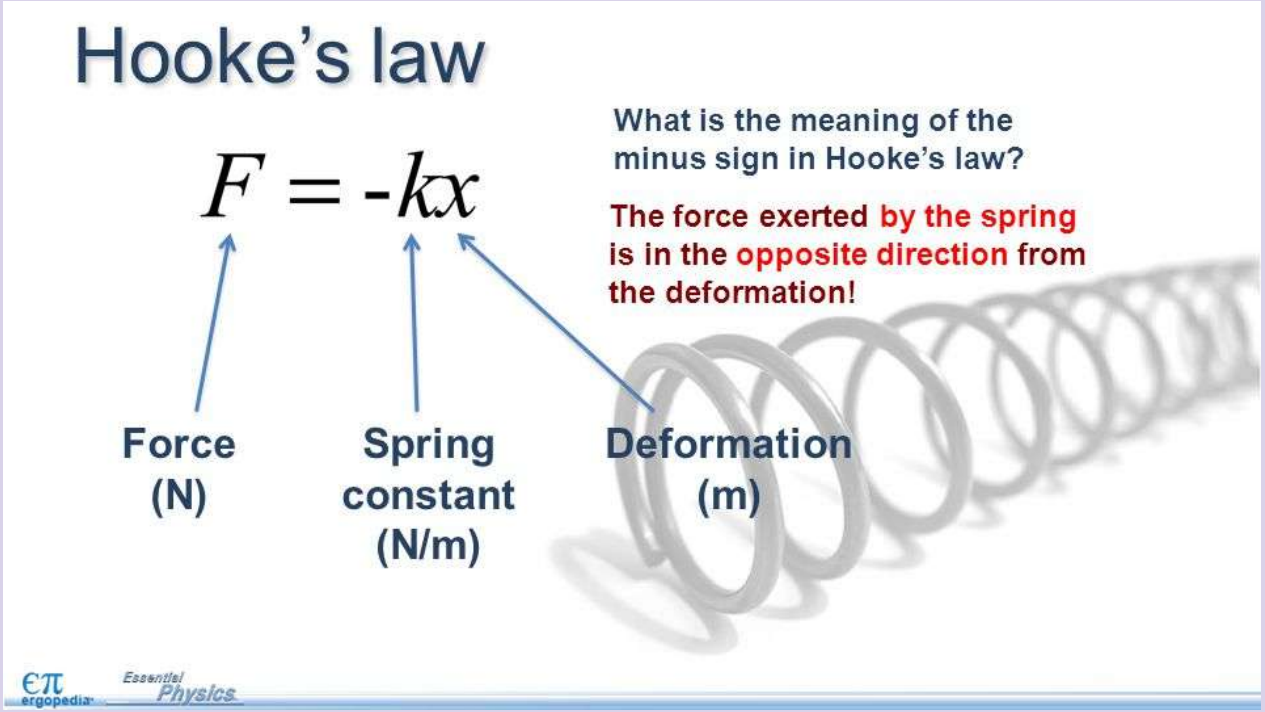
Hooke's Law Lab Due 3/26


fitness
BLENDER.COM

Resistance Loops

Level	Size	Tensile Strength
	L:25cm/W:5.08cm/ Thickness:0.4mm	10pounds
	L:25cm/W:5.08cm/ Thickness:0.7mm	20pounds
	L:25cm/W:5.08cm/ Thickness:0.9mm	30pounds
	L:25cm/W:5.08cm/ Thickness:1.2mm	40pounds

What is Hooke's Law?



A 60 g weight is on a spring. It stretches 30 cm. What is the spring constant?

Hooke’s Law Lab

Today’s Goal:

1) Take data
2) Get data checked by your teacher
3) Start Graphing

Physics Daily Agenda- 3/25 & 3/26

Schedule

1. How to graph and find k?
2. Writing your analysis
3. Work time on data, graph and analysis

Do Now

How do you find slope?

What is our equation for Hooke's Law?

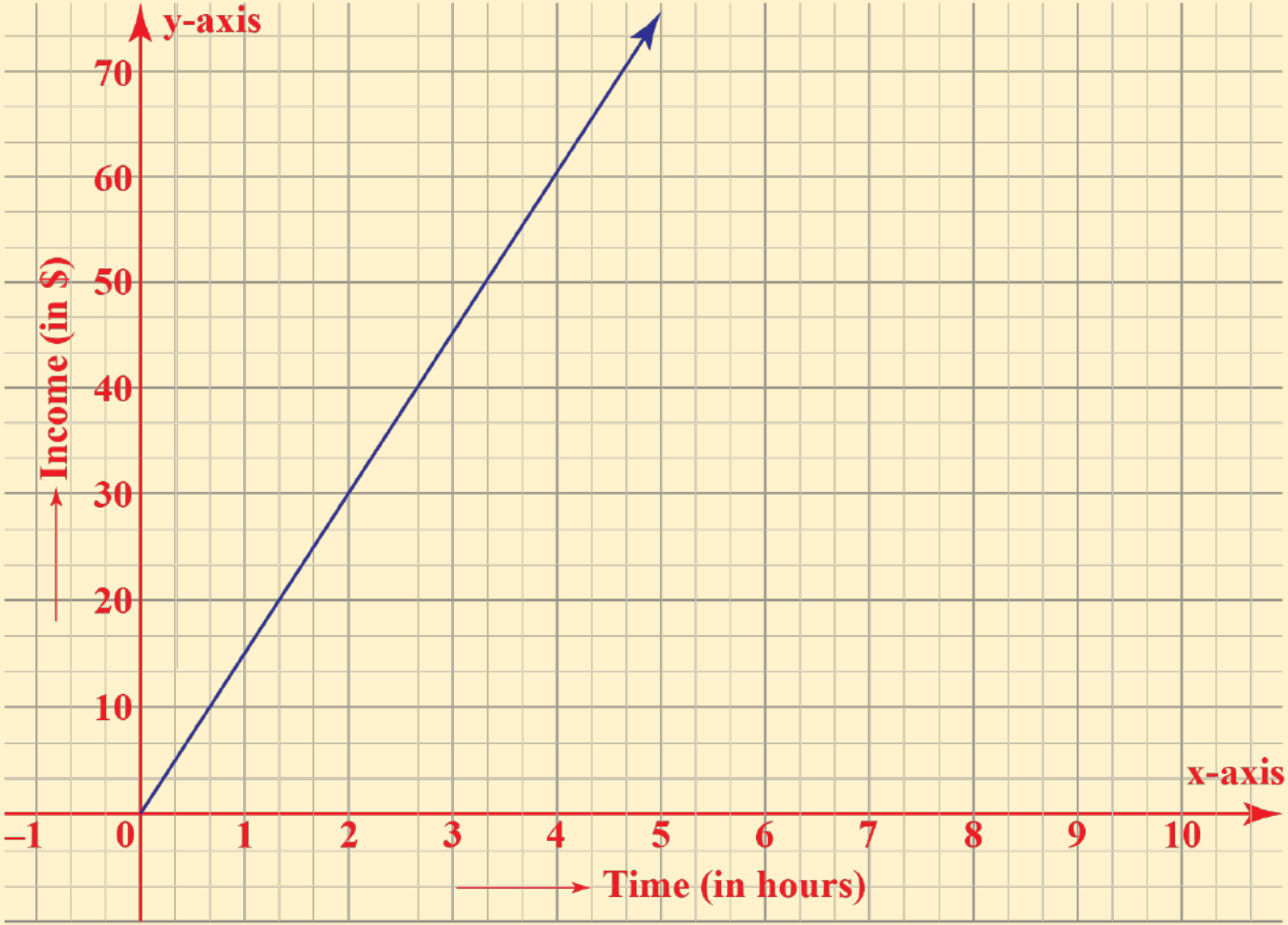
Upcoming

Due end of class: Data, Graphs and Analysis

Rough draft due Monday after Spring Break (end of class)

How to find Force?

Mass in kg x gravity
example : 0.05 kg x 9.81 m/s/s = 0.49 N


y-axis
70
60
50
40
30
20
10
Income (in $)
x-axis
–1
0
1
2
3
4
5
6
7
8
9
10
Time (in hours)

Join a Breakout Room

1) I need or am going to need help!
2) I am working on my data, graphs, finding slope and my k values, but I don't need help.
3) I am done with my data and working on writing my lab report

Due end of class today

- Data
- Graphs with k values
- Analysis

If done, continue working on the lab report sections.

Physics Daily Agenda- 4/5 & 4/6

Schedule

1. Standards self reflection
2. Review Standards Rubrics
3. Work time- Rough draft due end of class
4. Meet with teacher

Do Now

Open up your grade book. What were your scores for... (look at count as, second to last column)

- S.6.1 Measurements
- S.6.2 Appropriate Display of Data
- S.6.3 Data Analysis
- S.6.4 Sources of Error

Upcoming

- Rough Draft due End of Class
- Asyn Wed- Self Assessment
- Thursday/Friday- Writing Center Consultation
- Lab due Sunday

Physics Daily Agenda- 4/8 & 4/9

Schedule

1. Writing Center/Teacher consultations
2. Turn in lab by the end of class!

Do Now

What part of your lab report do you think you excel the most at? Why?

Upcoming

- Lab Due Sunday

Write in the chat where you are right now...

1. My rough draft is complete
2. I only have 1-2 more sections to work on
3. I only have half of my lab report done
4. I barely have anything done on my lab report

These are your scores

					Conclusions
	01/20/2021 01/20/2021 S.6.1 Conduct accurate measurement	4	4	4- In depth mastery	Gravity Lab Due 2/2
	01/20/2021 01/20/2021 S.6.2 Appropriate display of data	4	4	4- In depth mastery	Gravity Lab Due 2/2
	01/20/2021 01/20/2021 S.6.3 Analyze patterns and trends.	4	3.8	3.5 - Proficiency working towards mastery	Gravity Lab Due 2/2
	01/20/2021 01/20/2021 S.6.4 Sources of Error	4	4	4- In depth mastery	Gravity Lab Due 2/2