Unit 4: Planetary Motion

Physics: Friday, April 26

Agenda

- Warm Up
- Exoplanet 101
- Exoplanet Jigsaw

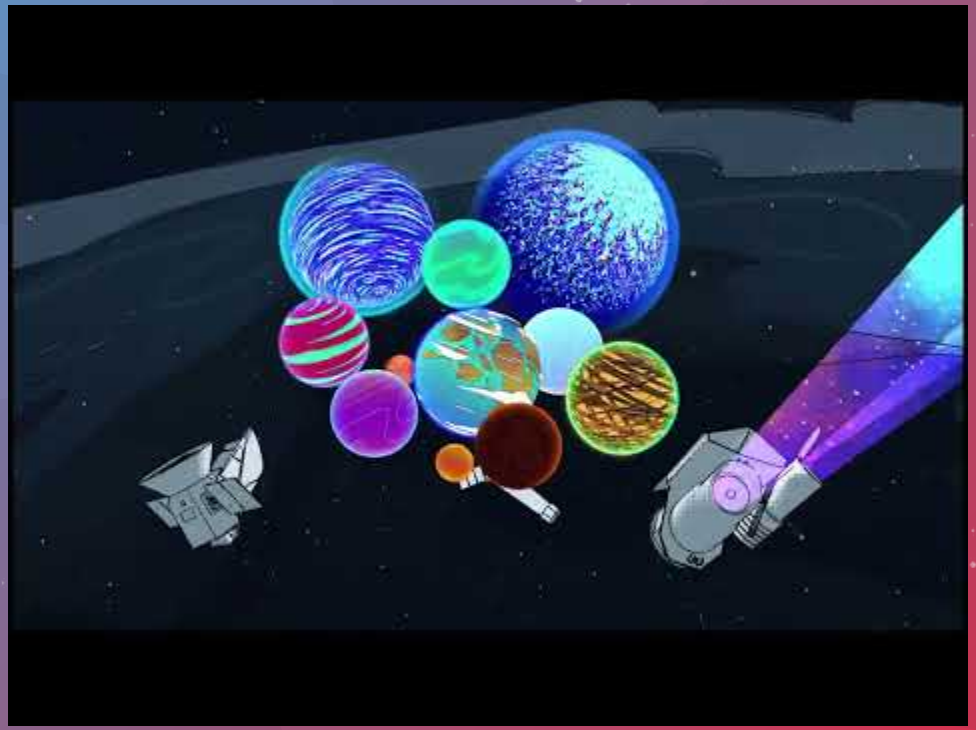
Warm Up

- In your own words, what is an exoplanet?
- Do you think they are worth studying? Why or why not?

Reminders

- Jigsaw Due Today
- Groups of 1 or 2 for Project (Seniors must work together)

Exoplanet 101



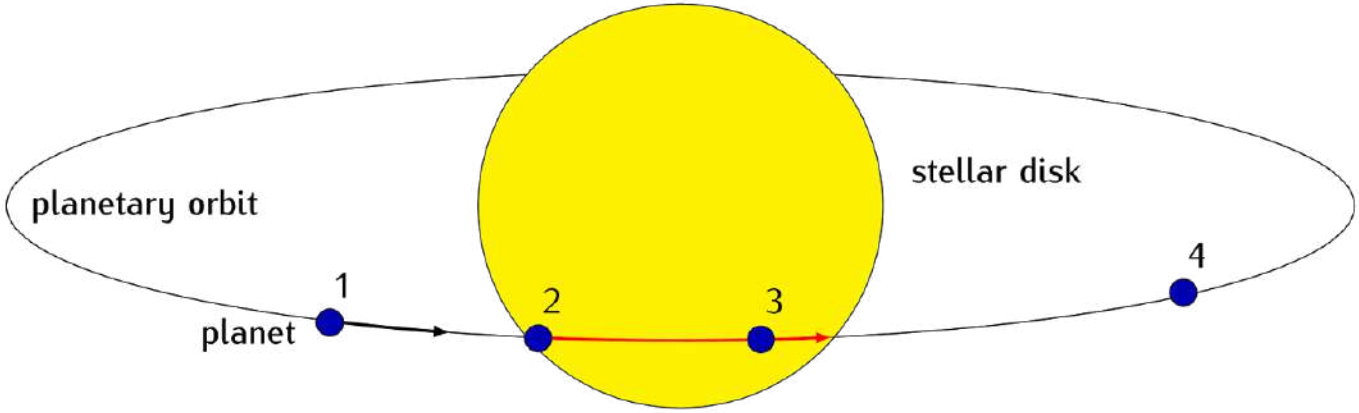
Warm Up Questions: Choose 1

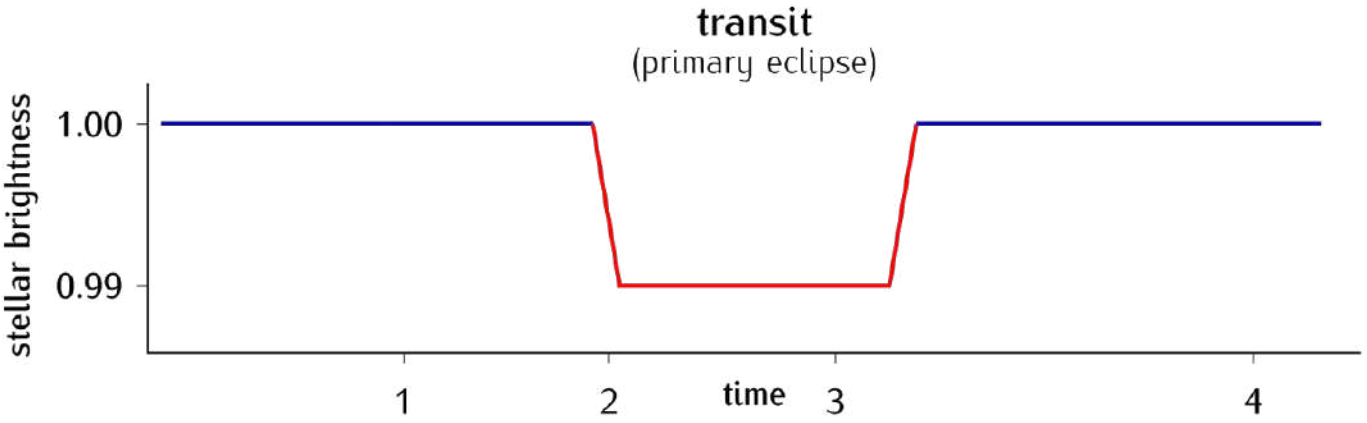
- Do you think other forms of life exist in the universe? Explain your answer.
- How will scientists be able to identify other life forms if they don’t resemble life as we know it on Earth?
- How important do you think it is for scientists to continue to look for exoplanets?


9 NEW IMAGES

1ST	7.22AM-7.55AM
2ND	8.00AM-8.32AM
3RD	8.37AM-9.09AM
4TH	9.14AM-9.46AM
6TH	9.51AM-10.23AM
7TH	10.28AM-11.00AM
5TH	NORMAL

AFTER LUNCH RETURN TO YOUR 4TH HOUR, THEN LAISONING THEN ANNOUNCEMENTS WILL DISMISS YOU


planetary orbit
stellar disk
1
planet
2
3
4


transit
(primary eclipse)
stellar brightness
1.00
0.99
1
2
time
3
4

How do we name exoplanets?

Physics
May 1st

Agenda

- What we want to know
- Mini Poster
- Webquest Part 1

Warm Up

What is something about your Exoplanet you can share? Open up the Planet Profile and make a copy (one per group)

Reminders

Poster and Webquest Part 1 due end of class.

What is vocabulary or information you want to learn more about as we start this project?

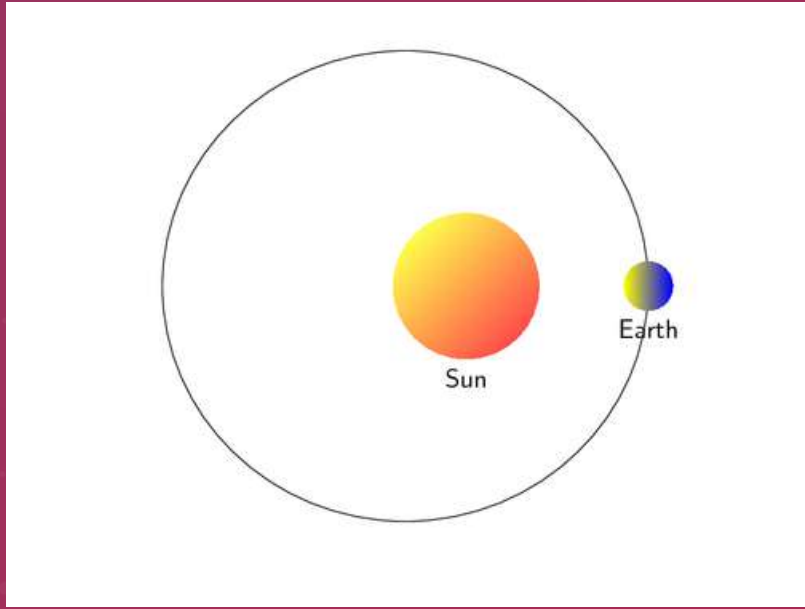
To Complete Today...

1. Exoplanet Mini Poster and Hang Up
2. Webquest Part 1
3. Start on your Exoplanet Profile- if you don't know how to do something, skip it! We will work on this in depth next week

Warm Up: What is an orbit?

What variables could you change about an orbit of a planet around a star?

What is a “year” on your exoplanet? What might that tell you about the orbit?



- Choose Exoplanet and tell teacher
- Make a copy of the Exoplanet Profile Report
- Begin working on the Exoplanet Profile Report

Physics: Tuesday, March 7

Agenda

- Exoplanet Detection Methods
- Exoplanet research

Warm Up

If you had to spend the rest of your life in a museum, library, or zoo, which would you choose and why?

Reminders

Grade check in Wednesday

Physics: Wednesday, March 8

Agenda

- Grade Check In
- Exoplanet Detection Methods
- Exoplanet Project Mini Poster

Warm Up

Describe 2 different types of ways we detect exoplanets. What method was you used to detect your exoplanet.

Reminders

Thursday and Friday- PhET Gravity and Orbits and Mini Poster due Friday

Physics: Monday, May 6

Agenda

- Exoplanet Profile Review
- Webquest

Warm Up

Open up your Exoplanet Webquest and Profile (make a copy if you haven't already)

Reminders

Webquest due Tuesday

Monday Goals

1. Complete Webquest and turn in
2. Start your Exoplanet Profile
    a. If you do not know how to do something right now, leave it blank or ask me.
    b. We will review conversions and star information tomorrow.
    c. Seniors- your profile will be turned in on Wednesday, May 15th. Juniors and Sophomores will have a check in on Thursday 5/16.

Physics: Tuesday 5/7

Agenda

- Review Exoplanet and Star Profile
- Work Time

In class observation Investigation

Warm Up

In your notebook determine…

- Mass of the Earth in kg
- Radius of Earth in km and meters
- Mass of Sun in kg
- Radius of Sun in km and meters

Reminders

Webquest due Wednesday

What is the mass?

- Mass of the Earth in kg
- Radius of Earth in km and meters
- Mass of Sun in kg
- Radius of Sun in km and meters

Tuesday Goals

1. Complete Webquest and turn in (due Wednesday)
2. Work on your exoplanet profile
    a. Use the extra information sheet on Google Classroom
    b. Show all work on the Profile page
    c. Make sure to include units

Work with your classmates to determine where you sit according to the directions below.

Line up in alphabetical order by the name you like to be called. Use last names and then middle names as tie-breakers. First Person sits in seat 1 , second person seat 2, and so on.

Exoplanet Name

Drawing of our exoplanet

Date of Discovery

Detection Method(s)

Mass Compared to Earth

Radius Compared to Earth

Name(s) Hour

To Do Today

- Talk to me about your grade and/or report if needed
- Complete Exoplanet Detection Methods on GC
- Exoplanet Mini Poster
- PhET Gravity and Orbits

What about my Exoplanet Profile? We are working on the profile throughout the next few weeks in class- but if you ever get done with everyone you are welcome to work on it if everything else is done!

Physics Grade Check In

Look at your overall scores and write them down below:

- S1 Communication:
- S2 Data Collection:
- S3 Mathematical Thinking:
- My current grade is:
- What can I do to continue to improve in this class?
- Describe your attendance and behavior in this class
- Which one of the three standards do I want to focus on this unit?

Grade	Combination:	Examples (not exhaustive)
A	3's and one or more 4's	3, 3, 4 or 3, 4, 4 or 4, 4, 4
B+	All 3's	3, 3, 3
C+	One or more 2's (no 1's)	2, 4, 4 or 2, 2, 2 or 2, 2, 4 etc.
D+	One 1	1, 2, 2 or 1, 2, 3 etc.
E	Two or more 1's or one 0	1, 1, 4 or 1, 1, 1, etc. 1, 2, 0

No matter what your grade is

look forward.

If you aren't where you want to be there are 3 months of opportunities for improvement and growth.

Physics: Monday, March 13

Agenda

- Exoplanet Detection Methods
- Work Time- Mini Poster and PhET Gravity and Orbits

Warm Up

- Open up Exoplanet Detection Methods on GC
- What method was your exoplanet discovered?

Reminders

PhET Gravity and Orbits and Mini Poster due End of Class Today

To Do Today (Monday)

- Exoplanet Mini Poster
- PhET Gravity and Orbits
- Complete Exoplanet Detection Methods on GC (this is very very past due)

What about my Exoplanet Profile? We are working on the profile throughout the next few weeks in class- but you are welcome to work on it if everything else is done!

Exoplanet Mini Poster Presentations

- Communication of Content
- You are presenting the basics of your exoplanet from your Mini Poster
  - Do not read off the paper
  - This is a visual aid that helps you but what can you expand on?

Exoplanet Project Conversions

- What is scientific notation?
- What is an AU?
  - Astronomical Unit
  - Distance from Earth to the Sun
  - 149, 597, 871 km
  - 149, 597, 871, 000 m
- Research you will have to do...
  - Mass of the Earth- in kg
  - Radius of Earth- in km and meters
  - Mass of Sun- in kg
  - Radius of Sun- in km and meters

Physics: Wednesday, March 15

Agenda

- Exoplanet Profile and Conversions
- Sun Information
- Work Time!

Warm Up

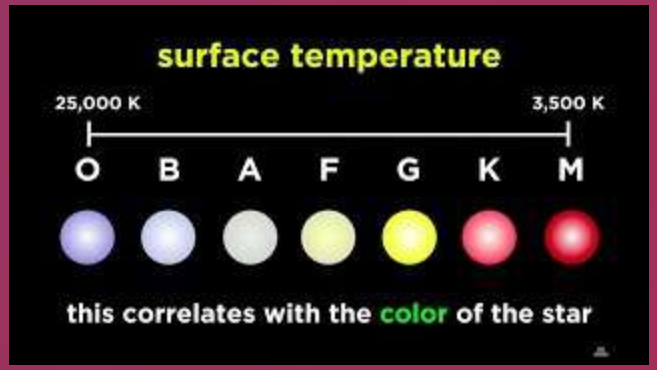
Open up your Exoplanet Profile Report

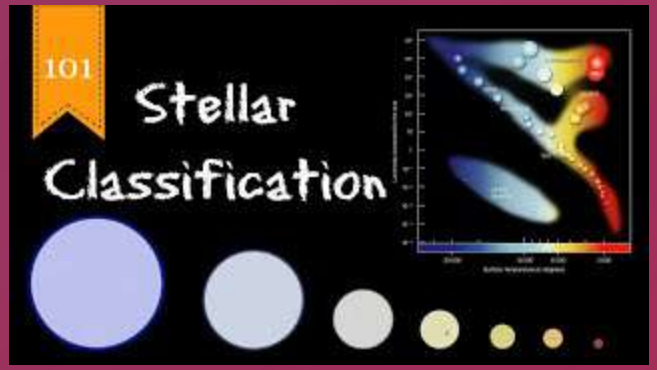
Reminders

Exoplanet Profile Exoplanet and Star Information due Thursday

Warm Up

What type of star does your Exoplanet Orbit?


surface temperature
25,000 K
3,500 K
O B A F G K M
this correlates with the color of the star


101
Stellar
Classification


Types of Stars
Yellow Dwarf Star
Red Dwarf Star
Red Giant Star
Red Supergiant Star
Blue Giant Star
White Dwarf Star
Brown Dwarf Star

Main Sequence Stars

Spectral Type:	O	B	A	F	G	K	M
Temperature:	40 000K	20 000K	8500K	6500K	5700K	4500K	3200K
Radius (Sun=1):	10	5	1.7	1.3	1.0	0.8	0.3
Mass (Sun=1):	50	10	2.0	1.5	1.0	0.7	0.2
Luminosity (Sun=1):	100 000	1000	20	4	1.0	0.2	0.01
Lifetime (million yrs):	10	100	1000	3000	10 000	50 000	200 000
Abundance:	0.00001%	0.1%	0.7%	2%	3.5%	8%	80%

Giant Stars

Low mass stars near the end of their lives.

Spectral Type:	Mainly G, K or M
Temperature:	3000 to 10 000K
Radius (Sun=1):	10 to 50
Mass (Sun=1):	1 to 5
Luminosity (Sun=1):	50 to 1000
Lifetime (million yrs):	1000
Abundance:	0.4%

White Dwarfs

Dying remnant of an imploded star.

Spectral Type:	D
Temperature:	Under 80 000K
Radius (Sun=1):	Under 0.01
Mass (Sun=1):	Under 1.4
Luminosity (Sun=1):	Under 0.01
Lifetime (million yrs):	–
Abundance:	5%

Supergiant Stars

High mass stars near the end of their lives.

Spectral Type:	O, B, A, F, G, K or M
Temperature:	4000 to 40 000K
Radius (Sun=1):	30 to 500
Mass (Sun=1):	10 to 70
Luminosity (Sun=1):	30 000 to 1000 000
Lifetime (million yrs):	10
Abundance:	0.0001%

Physics: Thursday, March 16

Agenda

- Work Time!

Warm Up

Open up your Exoplanet Profile Report

Reminders

Exoplanet Profile Exoplanet and Star Information due TODAY

Thursday Goals

- Complete all of your exoplanet and star profiles with all conversions
- Get checked by teacher
- Review Gravitational Motion Equations for tomorrow (on GC)
- Work on Kepler's Laws Simulation (due Tuesday)

Physics: Friday, March 17

Warm Up

Open Up PhET Gravity and Orbits

Agenda

- PhET Gravity and Orbits Class Conclusions
- Gravity and Gravitation Equations

Four Corners: PhET Gravity and Orbits
Use evidence to support your answer

1. What happened when we increased the mass of the Sun?
2. What happened when increased the mass of the Earth?
3. What happened when we increased the distances between the Star and Planet and Planet and Satellite?
4. How does this relate to your Exoplanet?

To Do Wednesday

Seniors: Exoplanet and Star Profile due Wednesday end of class

To Do:

1. PhET Gravity and Orbits Turn In
2. Exoplanet and Star Profile (get it checked)
3. Start Presentation (see project requirements)
4. Try out the equations... we will go over them more tomorrow!

To Do Wednesday

Seniors: Exoplanet and Star Profile due Wednesday end of class

To Do:

1. PhET Gravity and Orbits Turn In
2. Exoplanet and Star Profile (get it checked)
3. Start Presentation (see project requirements)
4. Try out the equations... we will go over them more tomorrow!

To Do Monday

To Do:

1. Complete Exoplanet and Star Profile and get checked by teacher
2. Completed Equations and get checked by teacher
3. Work on Kepler's Laws Simulation- due Tuesday end of class

Charge your laptop for the NWEA Reading 2nd-3rd!

NWEA Session

- Put away all headphones and phones in your backpack
- Find somewhere to sit that is comfortable and will not be distracting
- Login to NWEA
  - Reading 520
  - 8234
  - TAKE YOUR TIME!
- When done, work on your Exoplanet and Star Profile, Equations and Kepler's Laws Webquest

To Do Tuesday

To Do:

1. Complete Exoplanet and Star Profile and get checked by teacher
2. Completed Equations and get checked by teacher
3. Work on Kepler's Laws Simulation- due Tuesday end of class
4. Complete Exoplanet Profile Kepler's Law Section
5. Start Presentation (look at requirements)

1-3 are due start of class tomorrow for a Kepler's Law discussion!

To Do Wednesday

Review Kepler's Laws

Work Time

To Do Wednesday

Presentation Guidelines

Expectations next week

Velocity of an Orbit

Mass = mass of exoplanet in kg

R = distance from exoplanet to star

Formula

$$V_{orbit} = \sqrt{\frac{Gm}{r}}$$

V_{orbit} → Orbital Velocity

G → gravitational constant ($6.67 \times 10^{-11}\ m^3\ kg^{-1}s^{-2}$)

m → mass of Earth, Moon, or any other Planet

r → distance from the center point of planet

Gravitation Equation

$$F_g = G\frac{m_1 m_2}{r^2}$$

where

- F_g is the force
- G is the gravitational constant (6.674×10^{-11} $m^3.kg^{-1}.s^{-2}$)
- m_1 and m_2 are the masses of the objects
- r is the distance between the centers of the objects

Gravity on a Planet and Sun

$$g = G\frac{M}{R^2}$$

Practice

Newly Discovered Planet XYZ has a mass of 1 x 10^15 kg and a radius of 3000 m. The star it orbits has a mass of 3 x 10^30 kg and a radius of 400,000 m. The star and planet are 300,000,000 m apart.

1. Determine the velocity of the planet
2. Determine the gravitational attraction between planet and sun
3. Determine the gravity on the planet
4. Determine the gravity on the sun

Physics: Tuesday, March 21

Warm Up

Using the equation for gravity (look on your sheet), determine the gravity on Earth and our on Sun (in your notebook)!

Agenda

- Warm Up
- Your Exoplanet's and Stars gravitational equations
- Kepler's Law Simulation

Physics: Wednesday, March 22

Warm Up

Take out your calculations for Gravitation Equations for your Exoplanet

Agenda

- Calculations for Gravitation Equations and get checked by teacher
- Kepler's Law Simulation

To Do Today

1. Complete any of your Exoplanet and Sun profile (this should already be completed)
2. Complete your Gravitational Equations for your Exoplanet and Sun and get it checked
3. Complete Kepler's Law Simulation
4. Finish the rest of your profile and start your presentation (see requirement sheet for more details)

Physics: Thursday, March 23

Warm Up

- Open up your project requirements sheet and scroll down to the presentation requirements (Page 3)
- Read over it!

Agenda

- Project Requirements
- Work Time

Physics Grade Check In

Look at your overall scores and write them down below:

- S1 Communication:
- S2 Data Collection:
- S3 Mathematical Thinking:
- My current grade is:
- What can I do to continue to improve in this class?
- Describe your attendance and behavior in this class
- Which one of the three standards do I want to focus on this unit?

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A	3's and one or more 4's	3, 3, 4 or 3, 4, 4 or 4, 4, 4
B+	All 3's	3, 3, 3
C+	One or more 2's (no 1's)	2, 4, 4 or 2, 2, 2 or 2, 2, 4 etc.
D+	One 1	1, 2, 2 or 1, 2, 3 etc.
E	Two or more 1's or one 0	1, 1, 4 or 1, 1, 1, etc. 1, 2, 0

No matter what your grade is

look forward.

If you aren't where you want to be there are 3 months of opportunities for improvement and growth.

Physics: Monday, April 3

Warm Up

- Open up your project requirements sheet and scroll down to the presentation requirements (Page 3)
- Read over it!

Agenda

- Kepler's Laws Review
- Habitable Planets
- Project Requirements
- Work Time- Presentation!

To Do Today

1. Complete any of your Exoplanet and Sun profile (this should already be completed)
2. Complete your Gravitational Equations for your Exoplanet and Sun and get it checked
3. Complete Kepler's Law Simulation (you should be here!!!!!!!!!)
4. Finish the rest of your profile and start your presentation

Physics: Monday April 3

Warm Up

- Open up your Exoplanet/Sun Profile and your presentation

Agenda

- Project Calendar and Presentation Days
- Work Time

Kepler's Laws and Habitable Planet Tuesday

Monday	Tuesday	Wednesday	Thursday	Friday
April 3 Exoplanet Project Prep	**4** Exoplanet Project Prep	**5** Exoplanet Project Presentations Practice	**6** Exoplanet Project Presentations- Gallery Walk	**7** **No School**
10 **No School**	**11** Exoplanet Project Presentations- Gallery Walk	**12** **No Class Testing**	**13** **No Class Testing**	**14** Exoplanet Project Presentations- Gallery Walk Makeups and Reflections Report and Presentation due on Google Classroom

To Do Today (Monday)

1. Kepler's Law Simulation
2. Complete any of your Exoplanet and Sun profile
3. Start your presentation (requirements are on the Project Requirements Sheet)

Physics: Monday April 4

Warm Up

- Open up your Kepler's Laws Simulation

Agenda

- Kepler's Law
- Habitable Planets
- Work Time
- Presentation Practice Tomorrow

Physics: Tuesday April 4

Warm Up

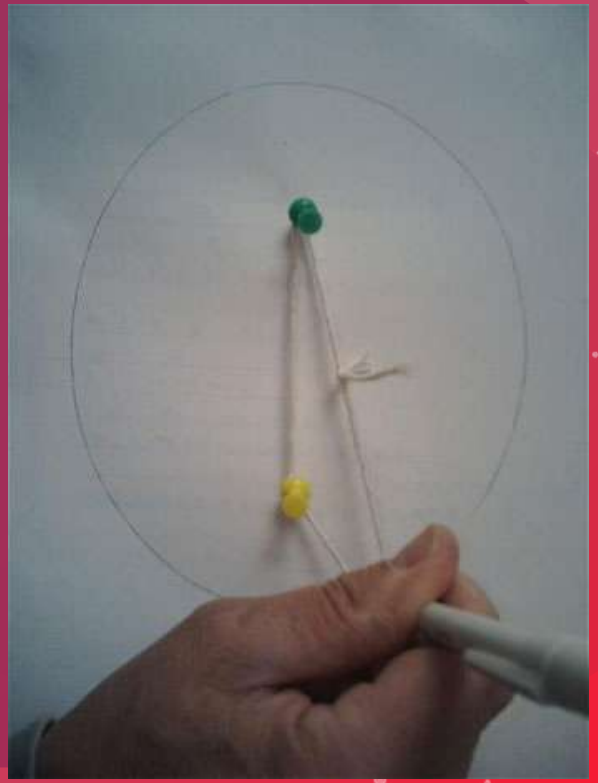
- Open up your Kepler's Laws Simulation

Agenda

- Kepler's Law
- Habitable Planets
- Presentation Requirements

Kepler's Law Exploration

- Cut two pieces of strings at a length of 15 cm, 20 and 30 cm
- Take two thumbtacks and place a few cm apart of on the paper and board
- Place the 15 cm loop around the thumbtack and orbit around so it creates an eclipse. Label.
- Now move the thumbtacks farther apart. Repeat this moving them farther apart.
- Take data. What did you observe? How does this show Kepler's Law?
- Repeat with the other string.



To Do Thursday

To Do:

1. Complete Exoplanet and Star Profile and get checked by teacher
2. Completed Equations and get checked by teacher
3. Work on Kepler's Laws Simulation- Now Due Today!
4. Complete Exoplanet Profile Kepler's Law Section
5. Start Presentation (look at requirements)

Next week- in the HUB Digital Workshop

Presentations are Thursdy and Friday in class (Gallery Walk)

Physics: Tuesday

Weekly Agenda

Tuesday: Work Day
Wednesday: Work Day
Thursday: Presentations Day 1
Friday: Presentations Day 2

Friday: Presentation and Exoplanet Profile due on Google Classroom

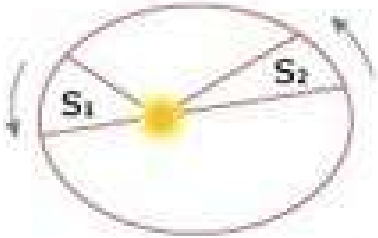
To Do

- ★ Complete Profile
- ★ Work on Presentation- Requirements on are on Google Classroom under Exoplanet Project

Kepler's Laws Simulation

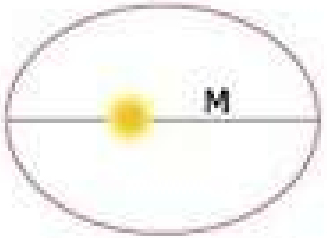
1st Law

2nd Law



Equal area in the same time
area S1 = area S2

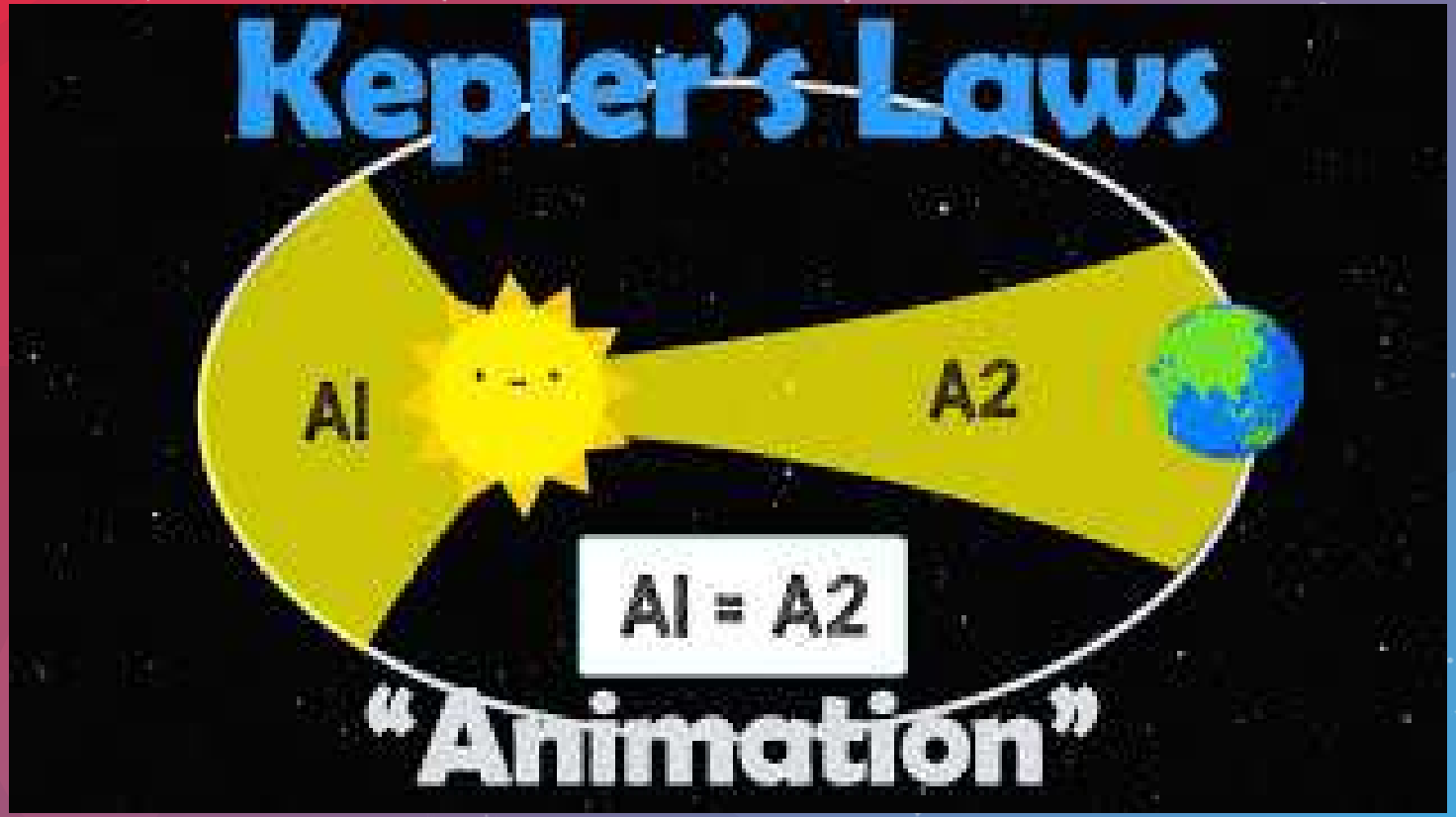
3rd Law



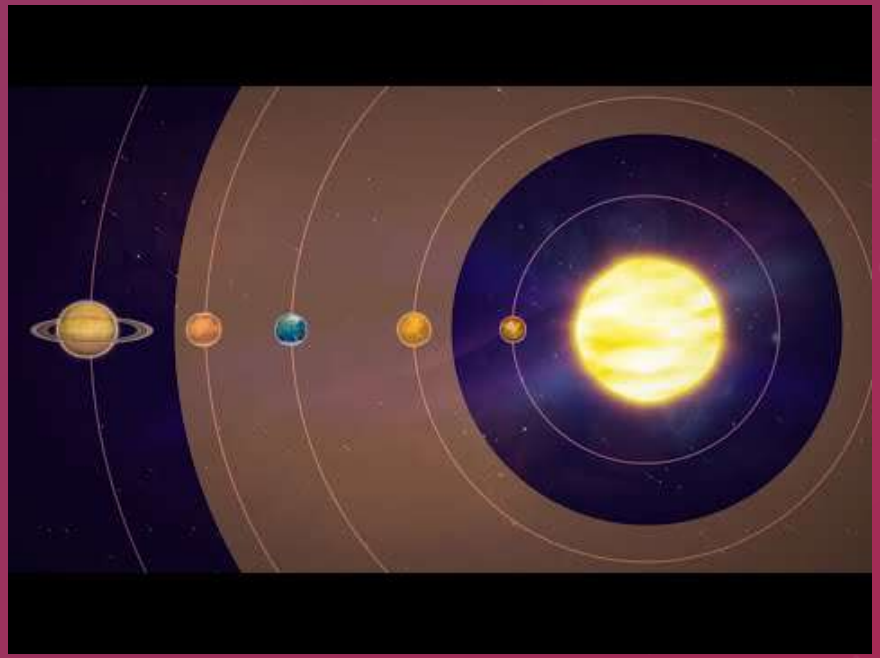
P: period (the time for one cycle)
M: length of the major axis

P^2/M^3 is the same for all planets

Kepler's Laws



What makes a planet habitable?



Gallery Walk Presentation: Why should we invest further research and resources in your exoplanet?

- You are tasked with convincing the public that is worth investing in your exoplanet with further research and resources in your exoplanet
- Gallery Walk: 10-15 Minute Presentation
- You are creating a dynamic presentation on Google Slides
- You are presenting to other students, teachers, community members, etc. who will help determine if it's worth investing in research and resources in your exoplanet
- Less text (short bullet points only, no sentences), more verbal explanations, and visuals

Your presentation must include…

- Profile of Your Exoplanet and Its Star
    - Take out key information (not all of the information) from Part 1 that is interesting and vital to give the profile of your planet, its sun, solar system, etc. **Do not just copy and paste everything in. This is a presentation.**
    - Must include exoplanet detection method.
- Your Exoplanet World
    - Based on your research you will conclude
        - What does your exoplanet look like?
            - You will need to make a diagram or drawing based on your research. The NASA website just has an artist's rendition so they all look the same. Do not use that. You can use it from another source!
        - Describe the terrain, atmosphere, etc. that you predict
        - Is it habitable or potentially habitable? How similar is it to Earth? Think about the goldilocks zone, the type of star, etc.
        - Why should you invest in further research of your exoplanet? What additional information and resources do you need from the public (think telescopes, experts, research, etc.)
        - What other information do you want to gain about this exoplanet, its star, and/or other planets in the system.

Names	Exoplanet	Presenting Day
Martin, Matthew J	K2-266 c	Tues 4/11
Colin, Josh	Kepler 1049 b	Thurs 4/6
Liz, Carlos	TRAPPIST 1d	Tues 4/11
Raymond	K2 116 b	Thurs 4/6
Achilles, Cody	KOI 55 b	Tues 4/11
Victoria	PSR B1257+12 b	Thurs 4/6
Maria, Madison	Kepler 11b	Tues 4/11
James, Myles, Jamari	K2 89 b	Thurs 4/6
Claudia, Jade	KOI 55 c	Tues 4/11
Allie	Kepler 524 c	Thurs 4/6
Kevin, Erick, Jonathan	Kepler 353 b	Tues 4/11
James W	Kepler 102 c	Tues 4/11
Joey W, Matthew L	Kepler 392 b	Tues 4/11
Connor	Kepler 1169	Thurs 4/6
Cameron, Jari, Kailee	Kepler 20 e	Tues 4/11

Names	Exoplanet	Presenting Day
Ash	Kepler 1464 c	Tues 4/11
Nick	Kepler 425 b	Thurs 4/6
Iralin, Hailey	K2 138 b	Tues 4/11
Emma, Bianca	Kepler 444 f	Thurs 4/6
Ryan, Evan, John	K2 136 b	Tues 4/11
Ati, Jocelyn, Reisha	K2 257 b	Tues 4/11
Jacob	K2 89 b	Tues 4/11
Danilo, Julius, Troy	Kepler 11 b	Thurs 4/6
Natheer	Trappist-1 e	Tues 4/11
Jordan, Jakobb	Kepler 137 b	Thurs 4/6
Makenna	Kepler 147b	Tues 4/11
Jeremiah, Imari	Kepler 106 b	Thurs 4/6
Ethan	K2 147	Tues 4/11

Thursday April 6

- If you are not presenting today sit in the center tables. You only need a pencil today.
- If you are presenting today, find a table on the outside to sit at. Load up your presentation!

Norms for Presentations?

Physics: Thursday, April 6

Warm Up

- Open up your Presentation for your Exoplanet Project

Agenda

- Presentation Practice and Feedback
- Presentation and Report Prep

Presentation Feedback

- Glows: What did the presenters do well?
- Grows: What is something the presenters work on?
- Questions you have about their presentation

Tuesday, April 11

- **If you are presenting today,** find a table on the outside to sit at. Load up your presentation!
- **If you are not presenting today**, find somewhere to sit at the inside tables and take out a pencil.

Make sure you have turned in your report and presentations on GC by the end of class.

Tuesday, April 11

- **If you are presenting today,** load up your presentation!
- **If you are not presenting today**, find somewhere to sit where you can work on your report

Make sure you have turned in your report and presentations on GC by the end of class on Friday.

SAT/PSAT Tips

- Arrive by 7:15am- make sure you sleep well and get something to eat in the morning
- Bring your student ID (not sure if it's required but a good idea anyway)
- Know your testing room before (check outside the HUb windows)
- Bring pencils and a calculator (and a backup if you have one)

Tips

- Letter of the Day- choose a letter for the entire test you will use for guessing- use the same exact letter every time you guess
- Essay- use direct evidence from the test
- If you are spending 5+ minutes on a question, you should guess, skip and come back if time permits
- If there is the 5 minute warning and you have bubbles not filled in, use your letter of the day

Friday, April 14

- Wrap Up any presentations left in your class hour
- Turn in report and presentation on Google Classroom
- Complete communication reflection on Google Classroom

30 Things a Standardized Test Can't Measure

Gallery Walk Presentation Dates

During all gallery walk presentations, you will complete a feedback form for other students.

Thursday:
Friday:

1. Cameron, Bryce
2. Jay, Addie
   Brandon
3. Charlie, Kevin
4. Yeabi, Evan
5. Joseph
   Shawnna
6. Marissa
   Za'Mariyah, Vicky

Aaron M
Blake,

Henry
Komal

Gallery Walk Presentations

1) No phones or headphones should be out. Put them in your bookbag.
2) You will listen to 2-3 presentations and give feedback on the Gallery Walk sheet during at least one of them (I will give you this sheet)
3) When we are done, please make sure your presentation and profile is turned in on Google Classroom.

Gallery Walk Presentation Dates

During all gallery walk presentations, you will complete a feedback form for other students

Thursday:

1. Kieran, Joey
2. Marco
   Daniel
3. Euna
4. Carly
5. Jennifer, Jess
6.
7.
8.

Friday:

Aniyah, Anaiya
Jordyn,
Mikayla
Lataysia
Melanie
Cameron
Justin, Cam

To Do... everyone!

1) By the end of the class period you must...
   a) Turn in your presentation and Exoplanet Profile
   b) Complete your project reflection

Next week we are learning about Multiwavelength Astronomy- we will have some assessments if you need another opportunity!

Grade check in Wednesday for Final Grades

To Do... everyone!

1) By the end of the class period you must...
   a) Turn in your presentation and Exoplanet Profile
   b) Complete your project reflection

Next week we are learning about Multiwavelength Astronomy- we will have some assessments if you need another opportunity!

Grade check in Wednesday for Final Grades

Monday To Do

- No computers this week! Be prepared to turn in your computer today or tomorrow in English class
- If you have someone else's charger or a teacher's, return it now!
- Final Grade Check In is Wednesday
- Today
  - All about galaxies
  - False color images