



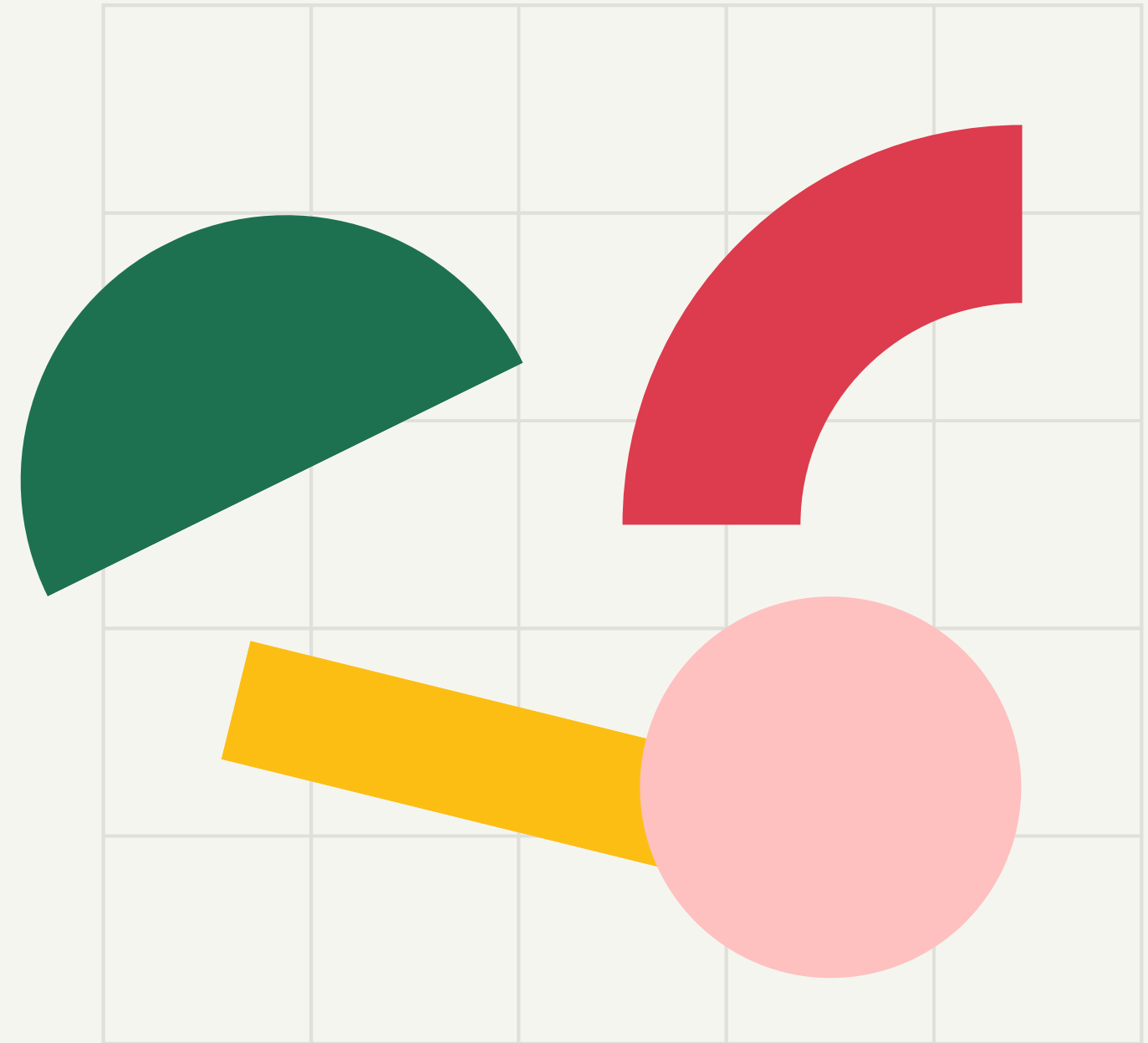
What is physics?

A physics lesson

Welcome to class!

Today's learning path

- What is physics?
- What are some of the areas physics studies?
- Physical quantities
- What do physicists work on?
- The scientific method, experiments and solving problems



When you think of physics, what comes to mind?

When someone says PHYSICS, what is your first thought? What words, concepts or definitions come to mind? Take a minute and write down at least 8 things you relate to physics.

What is physics?

Brief Introduction

Physics is a science that tries to describe the world around us, the properties of matter and objects using physical quantities and terms.

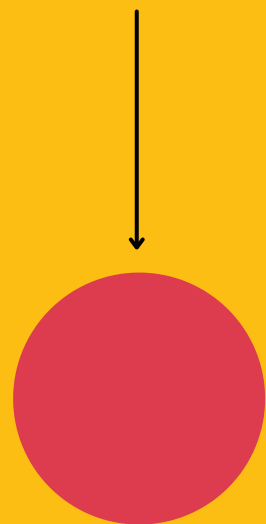
Physics, comes from the Greek word "fisis", meaning *nature*.



What are some of the areas physics studies?

Mechanics (motion)

In this part of physics, physicists study the motion of objects and how they interact with the environment.



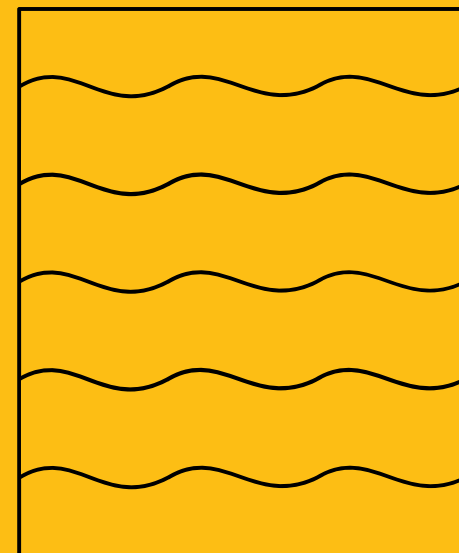
Thermodynamics

Here, physicists work on heat and temperature! Yes, they are different. In this class you will see why.



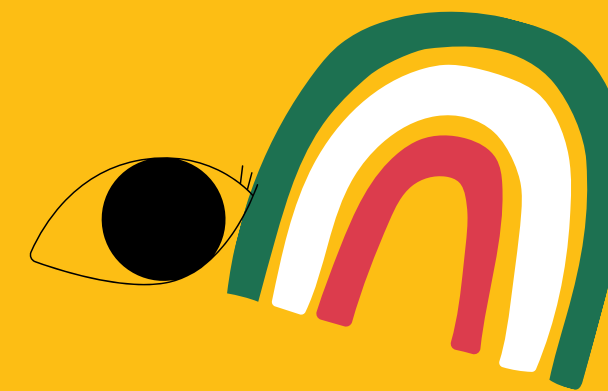
Vibrations and waves

Here, we will talk about vibrations like sound, and waves like sound waves or generally how waves work.



Optics

Here we talk about light, optics, colors and rainbows. Certainly a colorful branch of physics!



Electromagnetism

Here we talk about electricity, and how modern technology works. We also talk about magnets and how magnetic fields work.



Examples of everyday physics?

Thinking time

Take a minute, and think about your daily life. Everything you do in a day, maybe see in a day and think if those things can be analyzed using physics. Write down at least 5 things you can think of that are related to physics.

Daily physics

Here are some examples you maybe wrote down or haven't thought of!

Writing with a pencil

Have you ever thought about how you can write with your pencil?

Thinking time!

When you move your pencil on a sheet of paper, the **force of friction** makes the graphite leave a mark on the paper, etching out your writing.

Throwing objects

Have you ever thought why things fall to the ground when you throw them?

Thinking time!

When you throw an object, you act upon it with **force**, and it uses the **energy** you gave it until **gravity and friction** slow the object down and it falls.

Warm blanket

Have you ever wondered why a blanket makes you feel warm?

Thinking time!

Your body has a certain **temperature**, and it gives off **heat**. When you put a blanket on top of yourself, it traps the **radiating heat** from escaping, making you feel warmer.

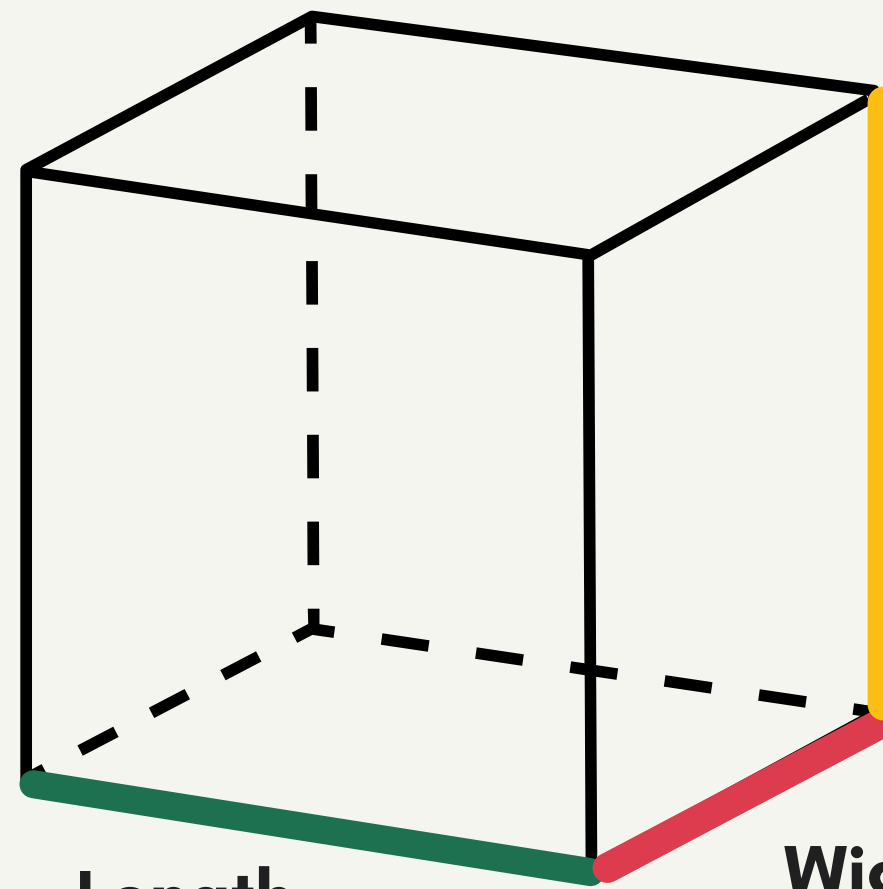
What we are learning in physics?

All of the things in **bold** in the previous slide: are interesting areas of physics we are going to cover in this class! So buckle up for the amazing world of physics.

What can we measure in physics?

Write down everything you can think of that we can measure when it comes to physics.

Physical quantities



Height

Measuring units: cm, mm, m, km,...

Length

Measuring units: cm, mm, m, km,...

Width

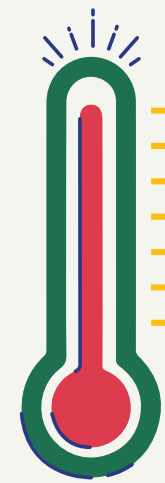
Measuring units: cm, mm, m, km,...

Physical quantities



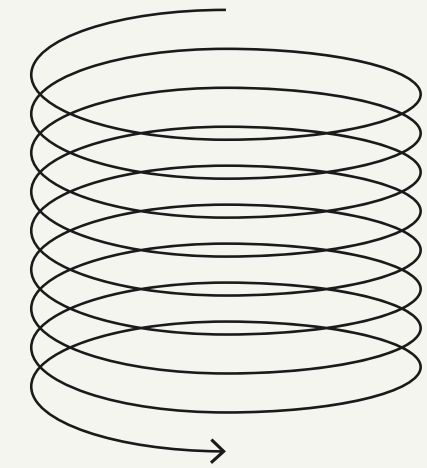
Time

Measuring unit: second, minute, hour,...



Temperature

Measuring unit: Kelvin, °C, °F.



Elasticity

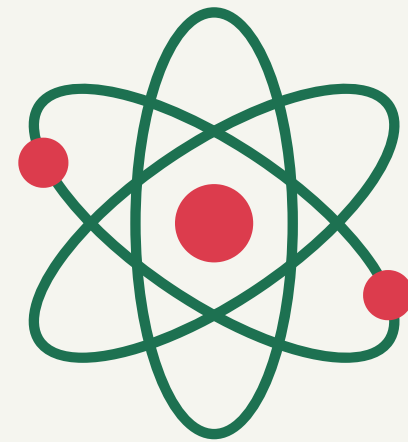
Measuring unit: N/cm, N/m.

Physical quantities



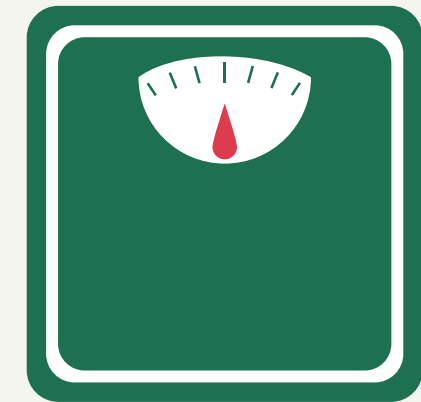
Volume

Measuring units: liter, deciliter, cm cubed, meters cubed,...



Density

Measuring units: kg/m cubed, g/cm cubed.



Mass

Measuring units: g, kg, ton,...

What do physicists do?

Physicists try to understand how the world works around them, study objects and the areas we mentioned beforehand using experiments, equations and scientific thinking.

People work in groups, exchanging ideas, equations, experiment results, to create a vibrant and fun workplace. Writing, maths, chemistry, precision and communication is very important to physicists.

How physics is done

Question → Hypothesis

Everything starts with a question. For example, do all objects on Earth fall to the ground? Then we would think of a reasonable hypothesis to answer that question. For example: YES, because of the **force of gravity**.

Experiments, formulas

After setting up a hypothesis, the next step is to create an experiment to test your hypothesis. In this example, a great experiment would be to drop objects of various masses from various heights and see do they fall to the ground. After plenty of experiments you can see how the force of gravity affects the objects.

Conclusion

After finishing the experiment and analysing the data, we see that every object we dropped, it fell to the ground. Now we cannot be sure that it will **always fall to the ground. We can never prove anything**. However, we can be 99% sure it will always happen because of work done by physicists. We always end a good experiment with a conclusion that states is the starting hypothesis correct or false.

Experiments

How do we conduct experiments?



Research, think, set up

Before starting an experiment, it would be great to do research on the thing you are experimenting. For example, falling objects. You would research gravity, mass, falling bodies...



Experiment!

After research design an experiment and follow through! Gather the materials, paper and a pencil and start experimenting! Record your data in a table for the best organisation.



Conclusions

After analysing your data by drawing graphs or looking through the rows and columns, and stating some results you found during your experiment. It can be the conclusion of a hypothesis, a correlation or something else!

How we solve physics problems

This is super similar to maths problems!

Set up the problem

- Write down all the information given
- Write down what you need to figure out
- Create a **tree**: write down the term you need to find, and branch down the equation needed to get that term, then write down the equation for a missing term, and so on until you have every term available

Formulas and maths

- After making a plan of attack, use the formulas to get to the answer and work your way up the tree! Once we learn an equation or two, we will practice this method out.
- When you get the answer, perform a **sanity check**: is this answer reasonable? Are the **units** correct? A lot of the time we incorrectly use the measuring units, so be very careful!

Tips:

- draw out your problem, use diagrams
- think about real world examples
- when practicing, use your notes for reinforced learning
- don't be afraid to make mistakes

How we solve physics problems

Example of a problem

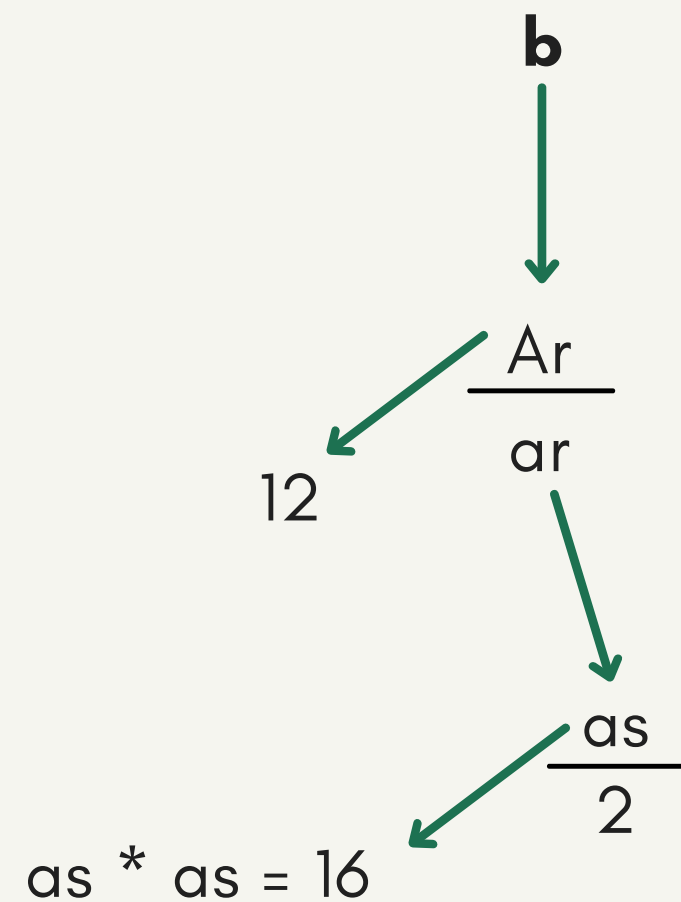
Problem

There are 2 shapes you have to calculate the area for. One is a rectangle, and one is a square. The shorter side of the rectangle is 2 times smaller than the side of the square. What is the other length of the rectangle if its area is 12 cm squared and the squares area is 16 cm squared?

Write up what we know

Ar = 12cm squared
 As = 16 cm squared
 $as = 2 * ar$
 $b = ?$

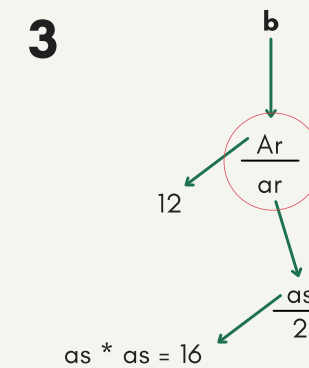
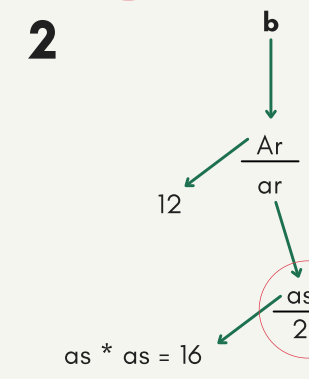
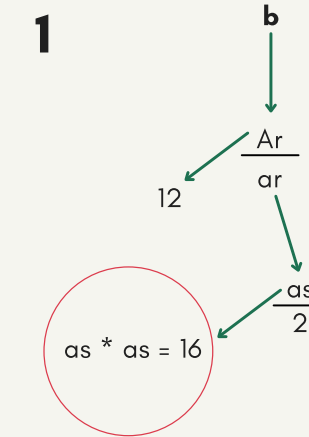
Tree



Solution

$$as * as = 16$$

$$as = 4 \quad 4 * 4 = 16$$



$$ar = \frac{as}{2} = \frac{4}{2} = 2$$

$$\frac{Ar}{ar} = \frac{12}{2} = 6$$

b = 6 cm

Today's revision questions! Answer them in your notebooks and work in pairs. (If at home, do it by yourself :)

1. What is physics?
2. What areas does physics study?
3. Name 2 examples of things physics can study in everyday life.
4. Name the physical quantities we use all the time in physics.
5. What do physicists do?
6. Name and describe the 3 steps of doing physics and science in general.
7. How do we do experiments?
8. How do we solve problems in physics?

Cool projects!

Pick a project to complete until next time!

The 3D ruler

Imagine if you could measure the 3 dimensions simultaneously! Design a contraption that can measure length, width and height at the same time!

Are there more areas of physics we didn't learn?

There are more subareas of each category we learned about today. Find out the rest of them and write down a fun fact about each of them.

Design an experiment worksheet!

Based on what we learned today, try your hand at designing a worksheet students can use to perform experiments! We will pick the best one and use for the rest of the year!

Video about the scientific method

Want to learn more about the scientific method? Check out this video for next class!



Article to read for the next lesson!

If you would like to prepare for our next class, read this super short article about length, width, height, area, volume, mass and temperature! It is a light read perfect for an introduction to our next weeks class.

<https://adventuresinastrophysics.com/the-art-of-measuring/>

Summary of Today's Class



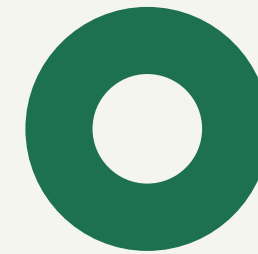
What is physics?

Physics is an experimental science, used to discover the world around us.



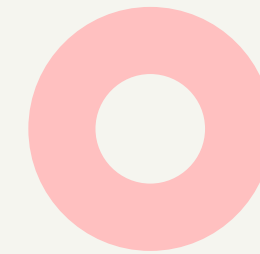
What does physics study?

It studies mechanics, thermodynamics, waves, optics and electromagnetism



Physical quantities

Length, width, height, time, temperature, density, volume, mass,...



How is physics done?

Physics is done by doing experimental work, solving problems and working with other people. It requires creativity and critical thinking.

**And we're done
for the day!**

Have any questions? Don't be afraid to ask!
Enjoy the rest of the day :)