

# Forces



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Physical & Chemical Changes - Science (3<sup>rd</sup> ESO optional subject)

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Material elaborat durant la realització de la formació adreçada als docents que implementen el pilotatge del GEP (Grup d'Experimentació per al Plurilingüisme) durant el curs 2015-2016, realitzada amb la formadora del British Council.

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## Tips for successful learning

- Be independent and responsible for your own learning.
- Work collaboratively in pairs and in groups.
- Ask questions. Do not be ashamed to admit that you don't know something. Most likely, you are not alone.
- Ask for help before things become emergencies.
- Find buddies to create informal learning communities to gain and give academic and social support.
- Take good notes. Sometimes you will need to recopy some notes to understand them better.
- Take care of your materials. They are valuable sources of information.
- Use different kinds of materials such as authentic texts or multimedia.
- Reflect on your learning process and how you can improve.
- Assess your own work and your peers work.

## Reading – What are forces?

Adapted from: <http://www.bbc.co.uk/education/guides/zttfyrd/revision/1>

A force can be a **push** or a **pull**. For example, when you push open a door you have to apply a force to the door. You also have to apply a force to pull open a window.

You cannot see a force but often you can see what it does. When a force is exerted on an object, it can change the object's:

- speed
- direction of movement
- shape (for example, an elastic band gets longer if you pull it)

Forces can be **contact forces**, where objects must touch each other to exert a force.

Other forces are **non-contact forces**, where objects do not have to touch each other. These include:

- gravity forces
- magnetic forces
- forces by static electricity



## Measuring forces

Forces can be measured using a **dynamometer**. Dynamometers contain a spring connected to a metal hook and a graduated scale. The spring stretches when a force is applied to the hook.

The bigger the force applied, the longer the spring stretches and the bigger the reading.

The unit of force in International System, SI, is called the **newton**, and it has the symbol **N**. The greater the force, the bigger the number, so 100 N is a greater force than 5 N.



A **dynamometer** is used to measure forces.

# Reading – What are forces? Questions

## Recalling

1. What is the difference between contact and non-contact forces?

2. What are the tree parts of a dynamometer?

## Understanding

3. Give an example for a contact force and another example for a non-contact force.

4. What types of forces are exerted when we throw a ball up in the air?  
How do these forces affect the ball when we throw it?

## Analyzing

5. Is the force of gravity the same at the top of a mountain and at the bottom of a mountain?

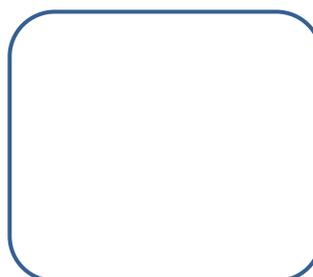
6. Why do we need newtons to measure weight when we have grams?

# Revision – Interacting forces

Forces appear when two bodies interact. Sometimes these two bodies are in physical contact and other times they are not.

1. Draw a picture for each of the following examples of forces interacting.

Draw **two arrows** in each picture that indicate the two forces.

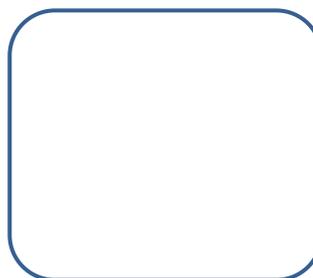
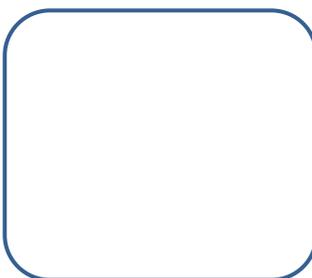
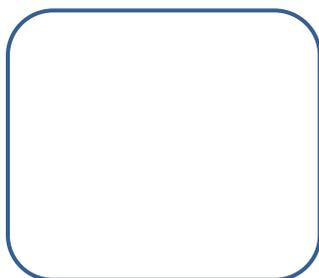


A person pushing a car that does not start.

A table supporting a book on its top.

The wind moving a windmill.

A stone falling to the ground.



A goal keeper stopping a ball in a football match.

A weight hanging from a spring.

A kid carrying a rucksack to school.

A hand pressing a rubber ball.

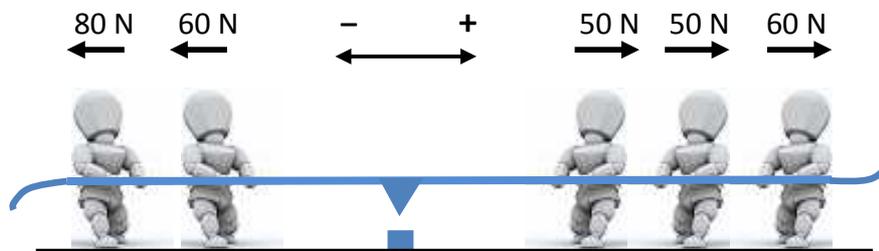
2. Now classify the examples into **contact** and **non-contact** forces.

Contact forces

Non-contact forces

## Extension – Adding forces

Observe this picture. Who will win?



[Macobru / CC-BY-SA-4.0](#)

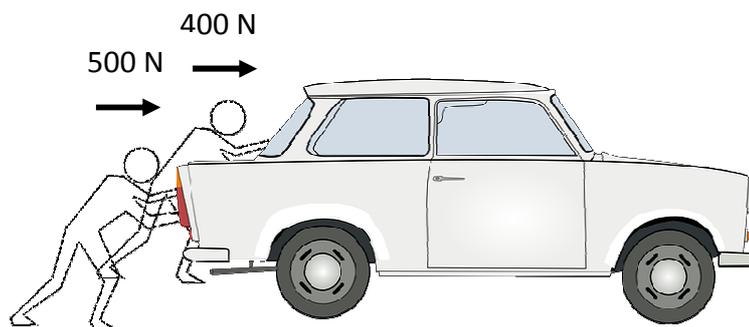
When there is more than one force acting on a body (in this case a rope), we can add forces with positive and negative numbers.

To calculate the resulting force on the rope we need the following calculation:

$$R_f = -80 - 60 + 50 + 50 + 60 = -140 + 160 = +20 \text{ N}$$

The resulting force is 20 N towards the right side. So the rope and people will move towards the right side.

1. What is the resulting force of these two people pushing the car?



2. Now draw a similar situation in which different forces interact and are added. Explain it to your mates.

## Project part 1 – Lab practice

### Objective

1. What is the objective of this laboratory practice? Circle the correct one.
  - a) to distinguish between mass and weight.
  - b) to play with a dynamometer.
  - c) to measure the weight of some objects with scales.

### Materials

2. Which of these materials do we need for the practice? Circle the correct ones.



dynamometer



electronic balance



calculator



mobile phone



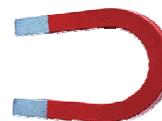
hook weights



support stand with rings  
or clamps



Bunsen burner



magnet

### Procedures

3. Put the following linkers in their right place. Some of them can be interchanged!!

Finally,

Then,

First,

Next,

Afterwards,

Later,

- a. .... we measure different masses with the electronic balance.
- b. .... we write down the masses on the table and we convert them to kg.
- c. .... we measure different weights with the dynamometer.
- d. .... we write down the weight on the table.
- e. .... we apply the formula to weight = mass x gravity to check similarities.
- f. .... we relate mass and weight in a graph to search for correlations.



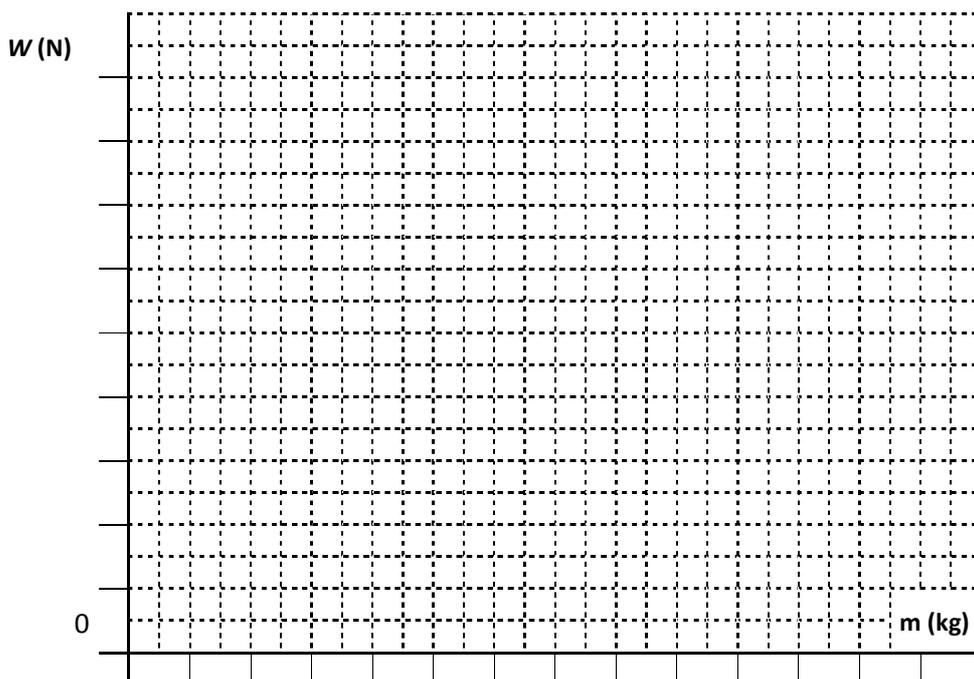
**Formula!**  
 Weight ( $W$ ) = mass ( $m$ ) x gravity ( $g$ )

## Data gathering and Analysis

4. Complete the table below with the data you obtain. Calculate the weight (mass times gravity).

	Mass (g)	Mass (kg)	Weight (N)	W = m x g
<i>Piece 1</i>				
<i>Piece 2</i>				
<i>Piece 3</i>				
<i>Piece 4</i>				
<i>Piece 5</i>				

5. Now complete this graph relating the masses (in kilograms) to their weight (in newtons).



## Conclusions

6. Complete the sentences with the following parts.

we have observed that      we have found out that      we have learnt that

- a. In this laboratory practice, ..... mass is the quantity of matter that a body has and weight is a force that depends on the local gravity.
- b. Also, ..... mass is measured with a balance, we can measure weight with a dynamometer and we can represent the data on a graph.
- c. Moreover, ..... the weight measured with the dynamometer does not completely match with the formula.
- d. Finally, we found interesting that...

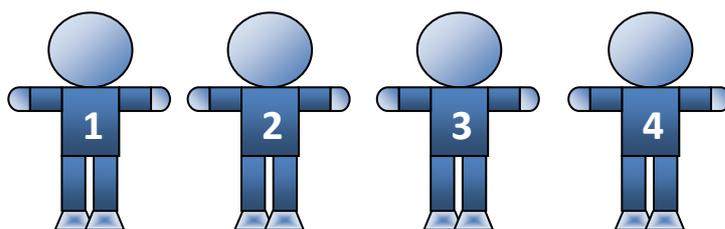
What was interesting about this lab practice? Write it here! You can also use drawings to help.

You can do it in Spanish or Catalan, but try to do it in English. Ask the teacher and mates for help. 😊

## Project part 2 – Oral presentation

Now, with all the information that you have gathered, present your results to your mates. Follow these directions:

1. Organize yourselves in groups of four. All of you need to talk equally.



2. The first member of the group will greet everyone and introduce the objective of the lab practice.

Example: "Good morning. We are A, B, C and D, and we are going to talk about..."



3. The second member of the group will show the materials that are needed for this practice and their function.

Example: "This is a Bunsen burner and we use it to heat water."



4. The third member of the group will explain the procedures of the lab practice.



5. The fourth member of the group will explain the results of the table and the graph in the analysis.



6. Finally, the person who greeted everyone and introduced the materials will explain the conclusions of the lab practice.

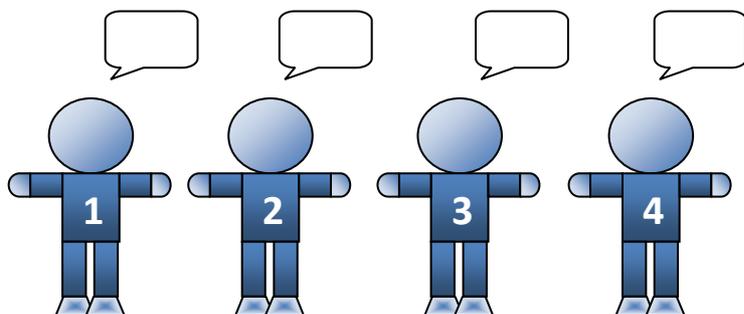


7. When you finish, you will close the presentation by saying goodbye politely.

Example: "That is all. Thank you very much for your attention."



Your teachers will video-record you and your mates and upload it to our blog, so **rehearse a lot!!!**



# Self-assessment

This is a document to help your teacher give you a mark for your work.

Please complete the following items with your opinion.

**Key: 1 – Hardly ever. 2 – Sometimes. 3 – Often. 4 – Always.**

1. I have listened to the teacher:	1	2	3	4
2. I have paid attention:	1	2	3	4
3. I have completed the exercises:	1	2	3	4
4. I have corrected the exercises:	1	2	3	4
5. I have done the homework:	1	2	3	4
6. I have talked in English:	1	2	3	4
7. I have helped my mates:	1	2	3	4
8. I have been careful with the materials:	1	2	3	4
9. I have revised the work at home:	1	2	3	4
10. I have worked hard. I tried hard.	1	2	3	4

**TOTAL: \_\_\_\_\_ /40**

## Comments

Is there anything you want the teacher to know about your work? Write it here. ☺

You can use Spanish, Catalan or English.

# Dossier co-assessment

This is a document that your mate has to complete for you. It's important to tell the truth because the teacher will check it later! Please follow these **guidelines**:

The dossier has a **cover**.

In the cover, there are:

- The title of the unit
- The name and surname of the student.
- The course
- The date when you handed it in.

**General appearance**: the pages are in order, numbered, clean, with good margins, etc.

**Figures**: the schemes, drawings, graphs, etc. are well done.

**Titles**: Each section, subsection, summary, exercise, etc. is clearly visible.

Everything is **complete**. There aren't any missing exercises, explanations, summaries, etc.

**Explanations**: in these exercises there are explanations about what you do, the objectives, vocabulary to study, etc.

**Corrections**: everything is corrected.

**CORRECTOR'S NAME:**

**STUDENT'S NAME:**

The **general appearance** is neat.

0-1

The activities are **finished**.

0-1'5

The **cover** has all the important information.

0-1'5

There are **explanations** and/or **vocabulary**.

0-1'5

The **handwriting** is easy to understand.

0-1'5

**Corrections** are easy to see.

0-1

The **margins** are adequate.

0-1

**OVERALL MARK**

 /10

If the dossier was **late**:

-1 / -2 / -3

The text is written with a **pen**.

0-1

**Repeat** pages:

**FINAL MARK**

 /10

## Oral presentation assessment

	0 Developing	1 Accomplished	2 Exemplary
Task Understanding	The student stops the task frequently and/or shows little preparation.	The student has prepared the information and contributes to the flow of the task.	The student does not read from the handout and follows the task appropriately.
Vocabulary	The student uses inappropriate vocabulary or repeats the same again and again.	The student uses the expected range of vocabulary which is adequate for the task.	The student uses a great variety of vocabulary which contributes to the improvement of the task.
Grammar	There are many grammar mistakes which greatly affect the comprehensibility of the student.	The grammar structures used are basically correct. There might be some mistakes which do not affect comprehensibility.	The student uses correct grammatical sentences extensively, which contribute to better understanding of the content.
Fluency	The student stops often or is unable to come up with the words needed.	The student shows correct fluency which allows the partner to follow the task.	The student shows quality fluency which contributes to give an impression of naturalness to the task.
Pronunciation	The student is hard to understand by a willing listener.	There are some pronunciation mistakes which affect comprehensibility.	Pronunciation is basically correct. There might be some mistakes which do not affect comprehensibility.

**Total: /10**

COMMENTS:



