

DYNAMICS

Student's worksheets

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- autumn 2009 -

Activity 1.1 fill in the gaps

Instructions

- Watch the ppt presentation carefully and make notes in your notebook.
- Revise your notes to ensure they make sense.
- Fill in the gaps with the most suitable words the text shown below.

There are more words than gaps so that be careful about that!

Newton's laws of _____ are three physical laws that form the basis for classical _____. They are:

1. In the absence of _____, a body either is at rest or moves in a _____ line with _____ speed.
2. A body experiencing a force \vec{F} experiences an _____ \vec{a} related to ___ by _____, where m is the mass of the body.
3. Whenever a first body exerts a force \vec{F} on a second body, the second body exerts a force $-\vec{F}$ on the first body. \vec{F} and $-\vec{F}$ are equal in _____ and opposite in _____.

These laws describe the relationship _____ the forces acting on a body and the _____ of that body. They were first _____ by Sir Isaac Newton in his work *Philosophiæ Naturalis Principia Mathematica*, first published on July 5th, 1687. Newton used them to explain and _____ the motion of many physical objects and systems.


constant	velocity	\vec{F}	acceleration	vector	between	straight
force	investigate	motion	displacement	$\vec{p} = m \cdot \vec{v}$	\vec{v}	direction
motion	\vec{a}	sense	magnitude	mechanics	$\vec{F} = m \cdot \vec{a}$	compiled



Activity 1.2 crosswords

Instructions

- You will work in pairs.
- You will be given a piece of crossword with half of the words missing.
- Your partner will have the other half so that you will have to ask him or her for the words you need to complete your crossword.
- When you are asked for a word try to give a KISS explanation or definition.



KISS stands for Keep It Short and Simple

Language scaffolding

- Giving instructions in a crossword

3 ACROSS:
part of mechanics studying motion

14 DOWN:
part of mechanics studying forces



Activity 1.3 cards

Instructions






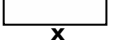
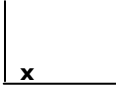
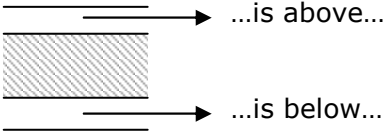
- You will work in pairs.
- You will receive a set of cards that must be placed face-down on the table.
- One of you (student A) picks up a card and explains his or her partner what is shown.
- The other one (student B) sketches it in a piece of paper and tries to explain what happens using the Newton's laws of motion.
- Roles are changed now and student B picks up a card.
- The activity finishes when there are no cards to be picked up.
- Remember the KISS, it will help you to make things meaningful.

Language scaffolding for DEFINING and DESCRIBING




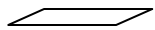
Structure:

- ...is made up of...
- ...contains...
- ...feels/looks like...
- ...can take other shapes...
- ...it includes...
- ...is a part that contains...
- ...consist of...

Location:

...is on... 	...is over... 	...is under... 
...is in... 	...is behind... 	...is underneath... 
...is at... (precise point) 		

Shape:

squared 	rounded 
cubic 	flat 

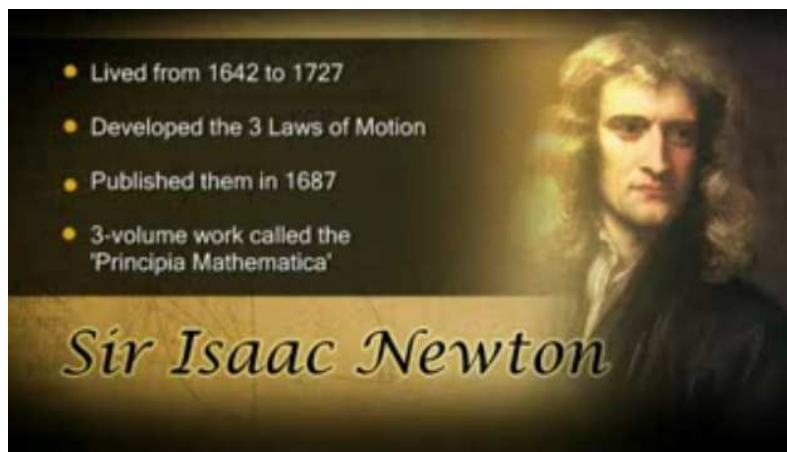
Movement:

- ...is at rest
- ...is still
- ...is flying/running/
- ...is moving:
 forwards/backwards/upwards/downwards
- ...is falling



Activity 1.4 **subtitling****Instructions**

- You will work in groups of four
- You will add subtitles to a short video available on Youtube.



<http://www.youtube.com/watch?v=iH48Lc7wq0U>

- You will use a web 2.0 tool in order to add the subtitles.



<http://www.dotsub.com>

- You don't have to translate, just add some short phrases describing the examples illustrating the three Newton's laws.



Remember...

KISS

ICT Scaffolding

A handout with specific instructions for using the web 2.0 tool will provided to you.

Language Scaffolding

You can use the scaffolding provided in activity 1.3.



Activity 1.5 Action!!**Instructions**

- You will work in groups of four
- You will create a short performance.
- The main aims for the performance are:
 - o It may show clearly the 3 laws of motion.
 - o It may last at least 2 minutes and it won't last more than 5.
 - o The format can be a video-clip or a short drama sketch.
 - o It will be a homework activity although they can start to write the script in the classroom.
 - o The script must be checked by the teacher before starting to produce it.
 - o It has to be delivered to the teacher at the end of the unit.

Video-producing Scaffolding

The teacher will provide it as needed. Technical aspects can be also asked to the technology teacher.

Language Scaffolding**Actions:**

To edit
To dub
To focus
To record
To rehearse
To screen

Lights, camera, action!

Vocabulary:

Actor/actress	Fade (out/in)
Close-up	Frame
Credits	Long/Medium shot
Crosscut	Producer
Cut	Take
Developing shot	Scene
Director	Script
Documentary	Storyboard

Find the definitions for the vocabulary here:

<http://quizlet.com/familiarize/168298/>



Activity 2.1 jigsaw**Instructions**

- After watching the slides and making some notes, read carefully the sentences below:

1 - *Vectors are very useful too to represent graphically forces.*

2 - *Then it is really helpful when a force has to be decomposed*

3 - *so that finding the resultant force acting upon a body becomes a matter of seconds.*

4 - *magnitude, direction and sense.*

5 - *A force is represented with a vector because forces are physical quantities*

6 - *in order to work out a resultant force*

7 - *Being considered a vector allows forces to be added easily,*

8 - *Firstly it facilitates a lot the problem solve because*

9 - *and the possible motion afterwards.*

10 - *we can see any situation in a very meaningful way.*

11 - *which need three properties to be completely described:*

- You have to organise them in order to get a text that will make sense. Write the right order in the table:

--	--	--	--	--	--	--	--	--	--	--

Scaffolding

Be aware of some words in the sentences, they are little hints that will help you to organise the sentences. This words act as connectors making the writing fluent.


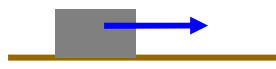
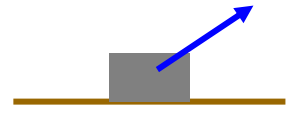
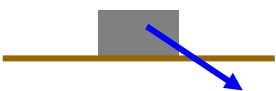
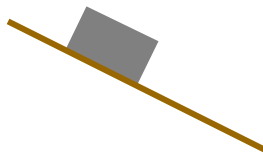
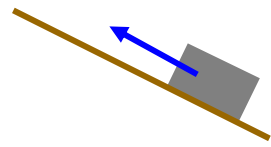
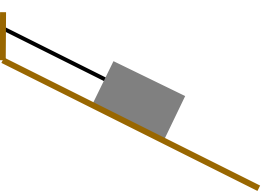
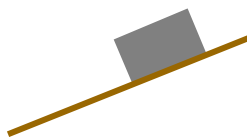
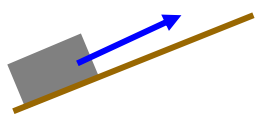
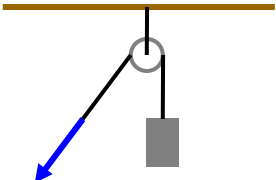
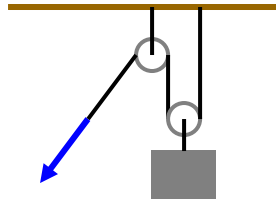
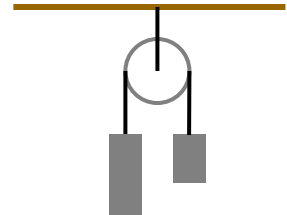
Some examples are: *too, then, firstly, secondly, and, which, so that*



Activity 2.2 representing forces

Instructions

- After watching at the slides and making some notes, look at the following pictures carefully.

<p>1</p> 	<p>2</p> 	<p>3</p> 
<p>4</p> 	<p>5</p> 	<p>6</p> 
<p>7</p> 	<p>8</p> 	<p>9</p> 
<p>10</p> 	<p>11</p> 	<p>12</p> 

- Represent (using vectors of course) all the forces involved in each situation.
- If any force needs to be decomposed, please do it.

External force: 

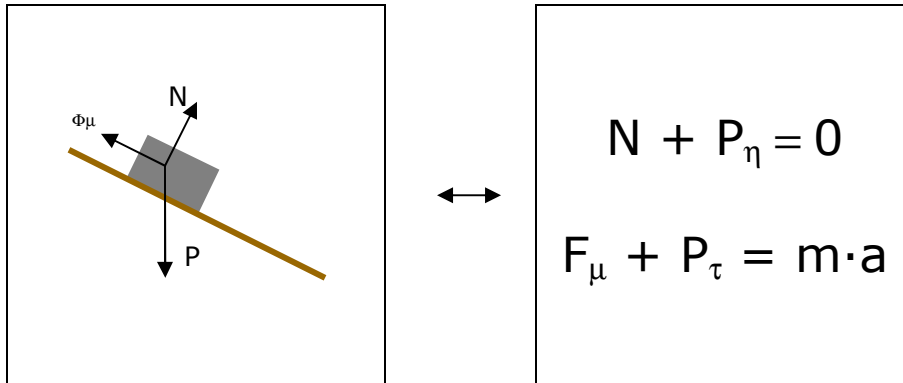
Activity 2.3 matching cards



Instructions

- You will work in pairs.
- Teacher will deliver a set of cards to you.
- There are two kind of cards, some with a force diagram and some with formulae.
- You have to match every picture with its right formulae.
- The rules are those of *memory*.

Example of matching:



Rules

- All the cards are spread and placed face-down on the table.
- Student A picks up two cards, s/he shows them to student B.
- If the cards match, student A keeps them, if not, the cards are placed face-down again in the same place.
- Then student B plays the game.
- The game will finish when no cards are on the table.

Scaffolding

- The scaffolding needed was provided in slide 10 of the Power-Point 'lesson 2'



Activity 2.4 problem solve**Instructions**

- You will work individually
- Teacher will deliver a sheet with some exercises to be solved.
- You have to start solving them in the classroom and finish them at home.

Scaffolding

- Read the instructions for every exercise and ask for doubts about the instructions if any.
- Some mathematical language is provided here:

+	plus	<	less than
-	minus	>	greater than
·	times; multiplied by		parallel to
/	over; divided by	⊥	perpendicular to
=	equals	Σ	sum; summation

$P = m \cdot g$	Weight equals mass times gravity
$ P_n = N $	Normal component of weight equals normal
$a = \frac{F}{m}$	Acceleration equals force over mass
$F_\mu + T = m \cdot a$	Friction plus tension equals mass times acceleration
$m \cdot a = -\mu \cdot m \cdot g$	Masses from both members can be cancelled
$\Sigma F_x = 0$	Summation of forces in X direction equals zero



Activity 2.5 problem creation

Instructions

- You will work individually.
- You will work using two social networks:



[twitter](#)



[twubs](#)

- Everyone of you will propose a set of three short problems based on 2nd Newton's law.
 - o Problem 1 – The unknown will be the force F .
 - o Problem 2 – The unknown will be the mass m .
 - o Problem 3 – The unknown will be the acceleration a .
- The you will answer three problems proposed by your partners.
- They must be one of each type.
- They don't need to be proposed by the same student.
- You will plan your problems in the classroom and ask your teacher for any help
- Then, you will upload them and solve your partner's ones at home.
- The solutions will be posted as well.
- **Important!!!** You can not answer a problem that has been already answered.

About twitter and twubs.

Twitter is a social network where you can publish (tweet) posts not longer than 140 characters. You will have to think of short instructions in order to publish them.

- All the tweets (the problems...) will be published in a twubs dash created by the teacher.

Scaffolding

A manual on twitter and twubs is provided.

Alternatives

- This activity can also be displayed in a traditional way by collecting all the exercises proposed and delivering them back to the students.
- The problems could be also posted in a blog, in a forum (in a moodle course), in Facebook... but I personally think twitter suits better because of the limitation to 140 characters in the post. This will challenge the students.



Activity 3.1 letter**Instructions**

- You will work individually.
- After watching the Power-Point presentation you have to answer the question shown in the last slide.

How could Archimedes answer the question having a bath?

- Imagine you are Archimedes. You have to send a letter to the King providing him the solution and a wide explanation about the process followed to solve the mystery.
- This is the letter the king wrote to you:

Dear Archimedes,

I have heard of your great intelligence and some of your strange inventions have been shown to me recently. I must say your work is really excellent and it will help Greece in a very special way.

I am writing to you because I have a little problem that only your intelligence may solve. As you may know I ordered the royal artist to make a gold crown. I gave him a mass of gold and after two months the artist came back with a golden crown.

The weight of the crown is exactly the same than the gold he was given, but maybe there is only gold in the external surface while the core is made of lead.

I want to know if the artist has been cheating or not, but I don't want to break the crown. I firmly believe that you will be able to work out whether the gold is fully made of gold or not.

His Majesty,

King

Athens

Scaffolding

All the scientific content needed has been provided in the slides of the presentation.

Details about Archimedes' biography may be searched in the library or internet.



Activity 3.2 problem - solve**Instructions**

- You will work individually.
 - You have to solve the exercises proposed in this sheet.
 - Finish them at home if you need some extra time.
- 1-** A body is completely sunk in water. Its mass is 10 kg and it seems to weigh only 30 N. Could you work out the body's volume?
 - 2-** If the liquid was mercury, find the mass of the body (consider volume found in 1) sunk into the liquid. ($\rho_{\text{Hg}} = 13'6 \text{ g/cm}^3$)
 - 3-** We want to build a ship with a mass of 70000 tones. If we want to see the 70% of the ship when sailing through the sea, which would be its volume?
 - 4-** You have a beach ball with a radius of 20 cm and a mass of 350 g. Find out the force you should apply upon the ball to get it completely sunk into the water. (You're in a swimming pool)
 - 5-** We have a cubic box with a 10 cm side. The mass of the box is 200 g, work out how many mercury can you put into the box before getting sunk.
 - 6-** Explain, using Archimedes's Principle, why it is easier to swim in the ocean than in a swimming pool.
 - 7-** How could you easily rescue a treasure from the deep ocean?
 - 8-** "Ice floats on water"
 - explain this sentence using Archimedes's Principle
 - what's the biological advantage?

Scaffolding

Teacher will provide any help needed to understand the instructions of any of the exercises proposed. So, read the instructions and ask him/her whatever you don't understand.

Mathematical language support has been provided in activity 2.4.



Activity 3.3 research

Instructions

- Students work in groups of 4.
- They have to write a scientific report on one of the topics showed below.

Ice melting

One of the consequences of global warming is the melting of ice in the poles. Specially dramatic is the situation in the Arctic where the whole mass of ice is thought to be melt in summer by 2030.

What is the problem about this?

Elba river

Hydraulic engineering had a big problem in Elba river. The engineers designed a channel over the river where fluvial sailing would be enabled.

The question is which depth should it be? All the ships would be able to sail through the channel?

Gulf stream

West coast of Europe, including the British islands, has a warmer climate than the east coast of America. Notice they both are at the same latitude. The reason is in the warm Gulf stream.

Why climate in Europe can be affected by ice melting in the Arctic?

Panama channel

When Panama channel was opened it supposed a big save in time and money because of the shortest trip.

How does the channel works?

Scaffolding

Language FOR reporting

- Use the passive.
- Avoid contractions, i.e. write *is not* instead of *isn't*.
- Avoid, if possible, personal references such as: He, she, they, I...
- Add references in your report, while writing, not only at the end in the bibliography.
- Try not to repeat words, verbs and adjectives.
- Use connectors such as: Firstly, secondly, then, however, otherwise, so that, meanwhile, after, before, furthermore...



