Nooton's Lesson - Physics

Objectives

Lesson 3 – Whole Class Version.

L.O:

I Understand the Relationship Between the Smallest and Biggest Things in the Universe.

I Understand What SI units Are and Can Convert Between Some Forms of SI and Imperial Units.

I Have Begun to Understand What Standard Form Is.

Scale and Size

STARTING ACTIVITY – Putting Measure in Perspective. (10 minutes)
Explain to the class that in this lesson they will learn about the **scale** of the universe. Have the empty **scale** stuck up on the wall ranging from *'smallest'* to *'biggest'*.

Begin by using a **tape measure** to have the class measure their own heights and compare with each other, then stand in order of smallest to tallest. Now compare the smallest height to the smallest person in history and the tallest person to the tallest person in history.

The smallest person to ever be verified by the Guinness Book of World Records, stands at one foot (singular of **feet**) and eleven **inches** tall.

Whilst the tallest person in recorded history towered over him at eight **feet** and eleven **inches**.

GROUP DISCUSSION – What are *'feet'* and *'inches'*? Have your pupils seen these used before? (Where possible have the pupils explain as much of this as possible to each other but if necessary, step in to mention: 12 inches makes a foot; **feet** are a way of measuring length like a **metres** or **kilometres**; these are imperial **units**).

MAIN TEACHING – Why Do We Use Kilograms, Kilometres and Metres? (25 minutes)
Ask the class if they are familiar with SI units? Explain that *'SI units'* (*'Système International Unités'* or *'International System Units'*) are the types of units of measure we know from mathematics like **metre** (m) or **kilogram** (kg). These are the units used in sciences across the world, something that is measured in other units must be converted into these in order to be used in scientific equations. They are the newest and current form of measurement compared to **imperial units** which were used in the past.

GROUP DISCUSSION – As a class go over some common conversions between imperial units and SI units. Using the conversion table below, have volunteers come up with different lengths to convert into or between the SI units on your IWB/Whiteboard.

Kilometre = Metre×1,000

Kilometre = Centimetre÷100

Kilometre ≈ Mile×1.6

Metre ≈ Foot3.3

Kilogram ≈ Stone×6.4

Extra Information

Materials Required:
- ✓ Tape Measures
- ✓ Paper for the scale
- ✓ Printed objects for the scale
- ✓ Blu Tack
- ✓ Pens
- ✓ Paper

Key Words:
- ✓ Scale
- ✓ Feet
- ✓ Inches
- ✓ Metre
- ✓ Kilometre
- ✓ Imperial Units
- ✓ International System Units
- ✓ Kilogram
- ✓ Stone
- ✓ Standard Form
- ✓ Blue Whale
- ✓ Hyperion
- ✓ Pyramid
- ✓ Supermassive
- ✓ Blackhole
- ✓ Observable

Nooton's Lesson - Physics

Objectives

Scale and Size

After the class is comfortable with conversion between these units of measure, explain that **standard form** is a method of writing very large or very small numbers to make them easier to read and that today we will be dealing with very big numbers.

Tell the class that a one with fifty zeroes would be incredibly hard to read, it would be easy to lose count of the zeroes and this makes it easy to make mistakes. Because of this we write numbers that big in standard form:

1×10^{50}

Explain that this means 'one multiplied by ten fifty times' which is the same as one with fifty zeros after it. For comparison and to help pupils who are struggling with the new concept show them the second example:

$1\times10^{2} = 100$

Concentrating on how this gives us a one with two zeroes after it. Then ask your class what would the following **standard form** number give us if read out fully:

3×10^{4}

You can follow this up with these examples:

1. 5×10^{1}
2. 2×10^{36}

And ask what these numbers would be in **standard form**:

1. 4,000,000
2. 700

MAIN TASK – (20 minutes)
Printing out and using the images included in this lesson plan split the class into five small groups and give them two random images each, then ask them to work together to put their objects in order of size.

Guidance – If you want to make it slightly easier tell them that in this session, we will only be going half way down the scale from the largest to the middle.

Extra Information

Success Criteria:

- ✓ I understand what SI units are.
- ✓ I understand what SI units are and can convert between some forms of SI unit.
- ✓ I understand what SI units are and can convert between some forms of SI unit. I also have begun to understand what standard form is.

Nooton's Lesson - Physics

Objectives	Scale and Size	Extra Information
	✓ **Blue Whale:** *Approximately 30 metres long* At the length of three buses and the weight of three lorries the Blue Whale is the largest animal to have ever lived, swimming through the seas at up to 30km per hour. ✓ **Hyperion The Tree:** *Approximately 116 metres tall* Named after the Greek God of Beauty, the great redwood tree Hyperion is the world's tallest known living tree, towering over its fellow forest dwellers in the Redwood National Park, California, USA. ✓ **Pyramid of Giza:** *Approximately 139 metres tall* Taking almost two hundred years to build made up of over two billion rocks some of which weigh more than elephants and looming one hundred and thirty-nine metres above Cairo in Egypt, to say the Pyramid of Giza was big would be a Pharaoh statement. ✓ **Mount Everest:** *Approximately $9x10^3$ metres tall* This fifty to sixty-million-year-old monster is the highest mountain in the whole world and takes forty days to climb; mainly due to climbers needing to readjust their bodies to the thinning air the higher they get. ✓ **Earth:** *Approximately $1.3x10^7$ metres from pole to pole* Earth (our home) is: the third closest planet to our sun; the densest planet within our Solar System and home to just over eight million different species of life. ✓ **Sun:** *Approximately $1.4x10^9$ metres in diameter* That big fiery, 4.6-billion-year-old, ball at the centre of our Solar System could fit a huge one million Earths inside of it and has a core temperature of twenty-seven million degrees. ✓ **Sagittarius A:** *Approximately 22 million kilometres in diameter* The supermassive black hole at the centre of our Milky Way Galaxy, Sagittarius A is ap proximately 3x104 lightyears from Earth and acts as a sort of anchor; with its 'supermas sive' gravitational pull holding everything within the Galaxy together. How could it be smaller than our solar system but hold a whole galaxy together?	

Nooton's Lesson - Physics

Objectives	Scale and Size	Extra Information

✓ **Solar System:** *Approximately $3x10^{11}$ kilometres in diameter*
Aside from the eight planets within the Solar System there are also one hundred and ninety-three moons, three thousand five hundred and eighty-three comets and approximately 8x105 asteroids sharing this space.

✓ **Milky Way Galaxy:** *Approximately $5x10^{17}$ kilometres in diameter*
At 13.51 billion years old the Milky Way is almost as old as the Universe itself and home to more than 200 billion stars, not the biggest of Galaxies but far from small and extremely fast travelling at approximately 600km/s (kilometres per second).

✓ **Observable Universe:** *Approximately $9x10^{23}$ kilometres in diameter*
The observable universe is a sphere that is centred around whoever is looking at it, meaning to us looking up and around at it, it appears round and we will always be at the centre of it from our perspective. But the same goes for wherever you look at it from within any of the one billion trillion galaxies that it contains.

PLENARY – (5 minutes)
During the lesson prepare a space on the wall to display the scale (ensuring there is enough space for lesson two's items). Once the main activity is completed, stick each of the items up on the display and ask the class to share fun facts about each item that they learned during the lesson. Use this opportunity also to see if the class has any questions regarding any points from this lesson.

Scale and Size - Reference Sheet

Blue Whale

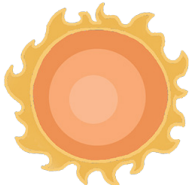
Hyperion The Tree

Pyramid of Giza

Mount Everest

Earth

Sun



Sagittarius A

Solar System

Milky Way Galaxy

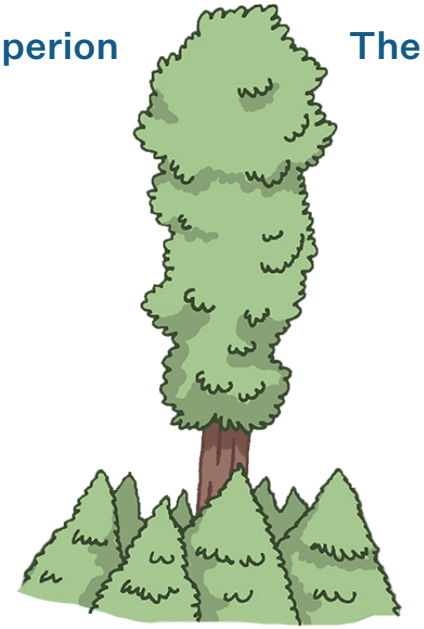
Observable Universe

Scale and Size - Reference Sheet

Blue Whale

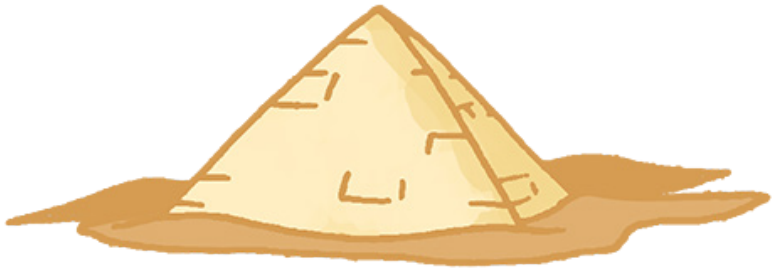
Hyperion

The Tree



Scale and Size - Reference Sheet

Pyramid of Giza

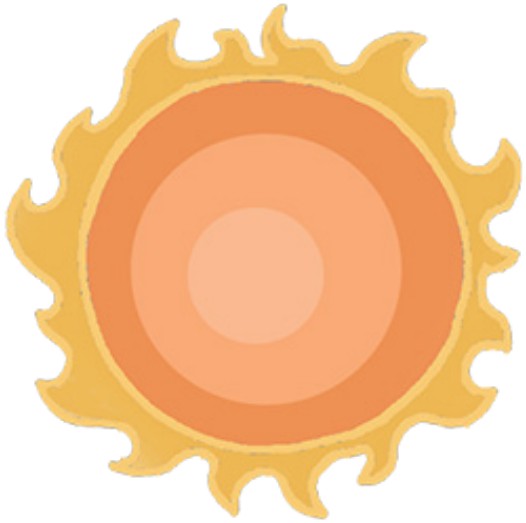


Mount Everest

Scale and Size - Reference Sheet

Earth

Sun



Scale and Size - Reference Sheet

Sagittarius A

Solar System

Scale and Size - Reference Sheet

Milky Way Galaxy

Observable Universe

Nooton's Lesson - Physics

Reflection	Child's Progress