

Mobile Phones & Functional Mathematics (created by Franck Powell)

The intention of the following document is to outline the main features of a unit of work which I recently developed and put to use as an introduction to Functional Mathematics with one of my own Year 11 classes.

Briefly, it will comprise the following:

- A short overview of the task and how the idea was developed.
- A brief outline of the sequence of lessons planned for this class.
- The materials used and developed in class.
- Some notes on aspects of this idea which might be altered depending on the group it is to be put to, or the desired learning outcomes.
- Some further development suggestions from colleagues who I have shared this idea with.

Short Overview of the Task

The idea for this task came to me as I worked with a Year 7 class on a Data Handling unit of work called “Health Club”¹ in which students are given a set of cards containing personal information (such as name, age, rest pulse rate etc...) about the members of a fictional gym.

Using these cards as their main “stimulus” a series of exercises is then put to them which involve sorting the cards into relevant categories in order to assist them in producing a series of graphs to represent this data. These graphs (along with relevant statistics) are then of course used by students to comment on and compare the data.

Struck by the potential of this form of stimulus I was keen to develop the idea, but avoid the false context in which the data was presented in order to put it to use in the arena of Functional Mathematics. This context was of course key in capturing students’ interest and after some thought I chose the theme of mobile phones, mainly for the following two reasons: Firstly, I thought it would be of interest to *my* students and secondly, it appeared rich enough in relevant data to explore.

This theme is therefore what the following sequence of lessons focussed on exploring in more detail.

¹ SMP Interact Book 7C. Cambridge: Cambridge University Press, 2003. p 80-82.

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Sequence of Lessons

The following lessons were mostly planned at the outset of the unit but also with the intention of remaining open to developments and contributions in the classroom which could indicate that another course of action may prove more beneficial. As such, it is therefore intended to give a brief account of the direction in which my students and I took this task on this occasion, but not by any means what would happen at a different time or with a different class, something which I will come back to later.

Prior to beginning the unit

The mobile phones quiz, which was the first resource used in class, was in fact intended to highlight how adept students were in using the internet and search engines, which in turn may have prompted me to adapt the task to take this into account. I wrote the questions for this (from the most up to date sources I could find) and decided to offer a small prize to the student(s) who would return the best answers. Depending on circumstances, a similar task could be given to a group as a homework or as part of a planned lesson during which students have access to the internet.

Introduction to the task (Lesson 1)

Blank mobile phone data handling card sheets, together with current copies of the Argos catalogue (and access to the internet) were presented to students and the brief aim of the exercise explained to them. Namely that we were going to do some data handling work with facts and figures about mobile phones that they were in charge of choosing and collecting in groups of two. In the example given here a partially filled in template was given to students as their starting point since I knew that they might otherwise have problems accessing the topic, but again, depending on the circumstances, a session could be spent discussing the different types of data that might be collected and students could be given more freedom to design their own template before doing so.

Production of printed cards (Lesson 2)

Students were now given the opportunity to input their handwritten data into a word-processed template with the aim of printing this work out onto coloured card. Access to a guillotine to trim these to size and small coloured envelopes to store these in gave plenty scope to further personalise the data cards *they* were to work with. Although tempted to speed this process up I was keen to give students yet another chance to take ownership of their work but this time in a more creative sense, which seemed to pay off. As an extension some students were also asked to produce simple closed questions to use as starter activity in the next lesson.

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Using the cards to process the data (Lesson 3)

I word-processed and printed some of the best questions which students wrote and put these together with blank tables and graphs for the group to work on. The range of questions and types of graphs covered in this case was relatively limited given the learning outcomes which I chose to focus on with this group, but again, students might be given the scope to explore a greater range of ways in which to represent their data and consequently produce their own graphs and tables completely from scratch, using ICT or otherwise.

Discussing and interpreting the data collected (Lesson 4)

Having spent last lesson representing the data that each had collected we now turned our attention to interpreting our results and discussing our findings: Firstly students wrote 3 - 4 statements concerning each of their graphs which they felt were justified given their content (examples of what such a statement consisted in, as well as some partially worded "sentence frames" were on hand for the those who had difficulty in getting started on this). Students' observations were then discussed as a class and a range of questions posed such as why potentially contradicting findings might emerge depending on the sample of phones that students decided to work with.

Creating posters to present results and findings (Lessons 5 and 6)

Two lessons were then allocated to give students the opportunity to present their work and findings in the form of posters which were to be hung up in the classroom. At the suggestion of one of my students more prizes were also put on offer! 3 categories were decided on by all of us including "Best Presentation", "Best effort" and "Best Overall".

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How I Might do Things Differently Next Time

I sincerely believe that my students gained a lot from this unit of work, and can certainly testify to the motivation and enthusiasm they showed throughout the time we spent in class; not just completing the work, but also researching and creating some of the resources they interacted with.

The next time I decide to use this idea I shall therefore plan to re-construct the whole unit of work, working closely with the students in question in an attempt to customise the content to suit *them*, and ultimately give them the opportunity to have a significant input in the way *their* learning will hopefully take shape. Working in this way will also ensure that the materials used are as up to date as can be since students will be compiling info about the latest technology available!

Further ways in which I thought this idea could be developed include:

- Using a much less structured approach to the exercises given and allowing students more freedom in terms of the graphs and statistics they might use. The materials in the present example simply reflect the needs of the students I worked with on this occasion but there is no reason as to why students could not decide for themselves how to do this.
- Putting an emphasis on letting the students design their own card templates and so on in order to make the most of the cross-curricular learning opportunities with ICT (and possibly Graphics and Art) this presents.
- Encouraging students to work on the unit from the perspective that they are creating a series of exercises for a younger group to attempt, effectively giving them the scope to gain insight into aspects of how these resources should encourage learning in others.
- Visiting local businesses and mobile phone shops to gather data which could open up a whole host of opportunities for work to be done outside the classroom.
- Further exploring audiences for students to report their findings to, as well as using different methods in order to do this. Powerpoint presentations are one alternative, but for those students and teachers who have the know-how, podcasts could offer an exciting way of sharing students' work with parents (as well as the local community) by uploading them to the school's website or virtual learning environment. This could be especially interesting if students had gained the opportunity to film footage and interview people in local mobile phone shops for example.

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Further ideas and development suggestions from colleagues

I have been very fortunate to share this idea with number of colleagues who took the time (mostly anonymously on Post-it notes) to make the following excellent suggestions for further development of this unit:

In terms of the feedback I have received so far, these include:

- Students could design appropriate surveys and collect data from their peers within school (possibly justifying a presentation of their findings to this audience in an assembly). A particularly attractive proposition was to use online resources such as those offered by Cre8ate Maths (a web based Mathematics resource currently in development with Sheffield Hallam University) to give students the scope to quickly compile surveys and collect data by publishing their work on the Cre8ate Website. Although this idea is still in its infancy at the moment, I suspect this excellent tool for teaching will be available to all of us very soon.
- Make provision for students to create their presentation material through the medium of ICT, possibly including the use of spreadsheets to create graphs as well as graphics packages to make their displays or presentations as attractive as possible.²
- Make a mobile phones set of Top Trumps cards which students could use to play against each other to familiarise themselves with the data. The potential to catch students' interests here is almost limitless and particularly highlights the possibility of choosing different topics of investigations (rally cars, motorbikes, footballers, heavy-weight boxers, you name it!)
- Simpler, but nevertheless interesting, suggestions were also made such as including a focus on comparing MP3 and non-MP3 player phones in terms of price or weight, and even investigating a correlation between weight and price (I haven't tried this but wouldn't be surprised to find a positive correlation with more expensive, feature laden models weighing more...)
- Use the excellent idea of pairing this activity with a fundraising event for charity.³ Indeed many organisations offer to recycle old mobile phones at no expense and with the aim of passing on profits to worthwhile causes. As such this type of collection within school would be a great way of raising students' awareness of such causes, whilst also collecting a wide range of devices which students could physically 'process' before despatch. Again, the possibilities here are numerous but specific tasks might include:
- Weighing or measuring phones and comparing this data against that quoted by manufacturers in order to decide whether their figures are accurate.

² Care would obviously have to be taken in order not to lose the key tactile and kinaesthetic elements of the task by turning the whole thing into a 'data crunching' exercise.

³ I am very grateful to John Smith from Evaluation Training Consultancy (etc) for suggesting this idea to me at the Influence Network Conference on the 23rd February 2008.

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- Researching the market launch dates of the devices donated in order to look at their expected life before they either stop working or owners replace them with a newer model.
- Some organisations apparently offer some means for individuals to assess the cash value of the phones handed in, which could yield a large amount of data to compile and analyse, not just in terms of the amount of money raised but also investigating the depreciation in price of this type of technology.
- Finally, whichever of these ideas might be looked at in further detail, the whole-school fundraising nature of the project clearly presents an interesting opportunity for students to present their findings back to their peers, teachers and parents.

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GE imagination at work

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Resources Used on This Occasion

Blank Mobile Phone Data Cards

Model: MP3 Player : YES NO Price Battery Life £ hrs Weight Camera (pixels) g MP	Model: MP3 Player : YES NO Price Battery Life £ hrs Weight Camera (pixels) g MP	Model: MP3 Player : YES NO Price Battery Life £ hrs Weight Camera (pixels) g MP	Model: MP3 Player : YES NO Price Battery Life £ hrs Weight Camera (pixels) g MP
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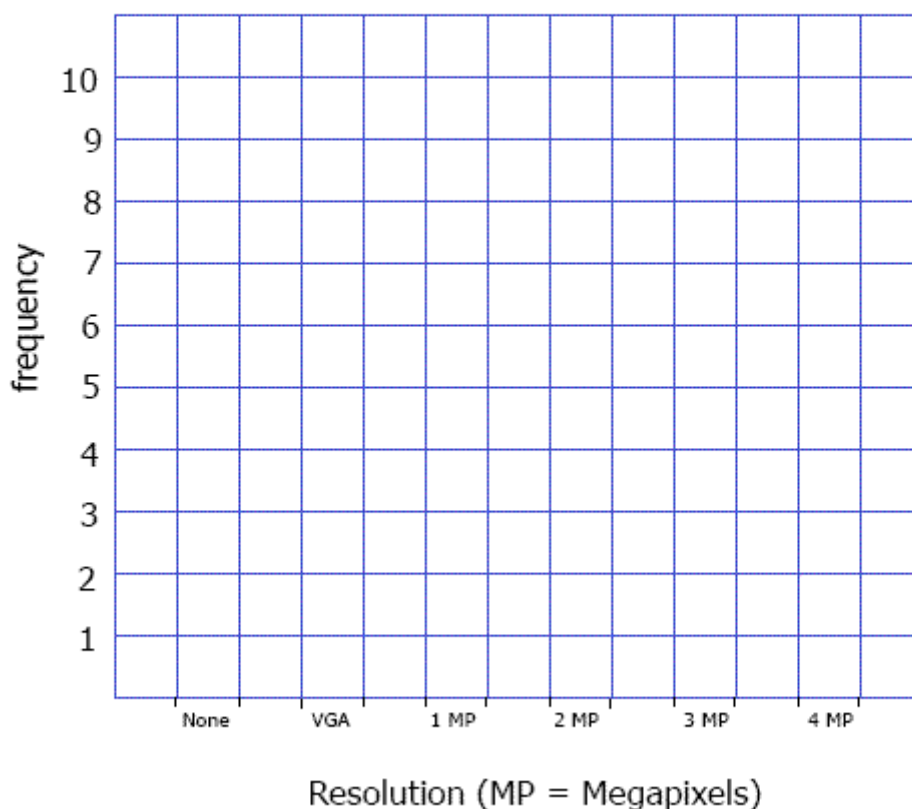


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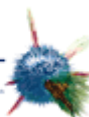
Questions

- What is the lowest mobile phone price?
- Which mobile phone has the smallest battery life?
- How many mobile phones are in the £0 to £49.99 group?
- Do any two phones have the same price? If so, which ones?
- How many phones are over the weight of 102g?
- Find the mobile with the highest weight?
- How many mobiles are over £79.99?
- How many mobile phones have over 260 hours of battery life?
- List the mobile phones that have more than a 2mp camera?

Bar Chart Showing the Camera Resolution of Some Mobile Phones Currently in the Argos Catalogue



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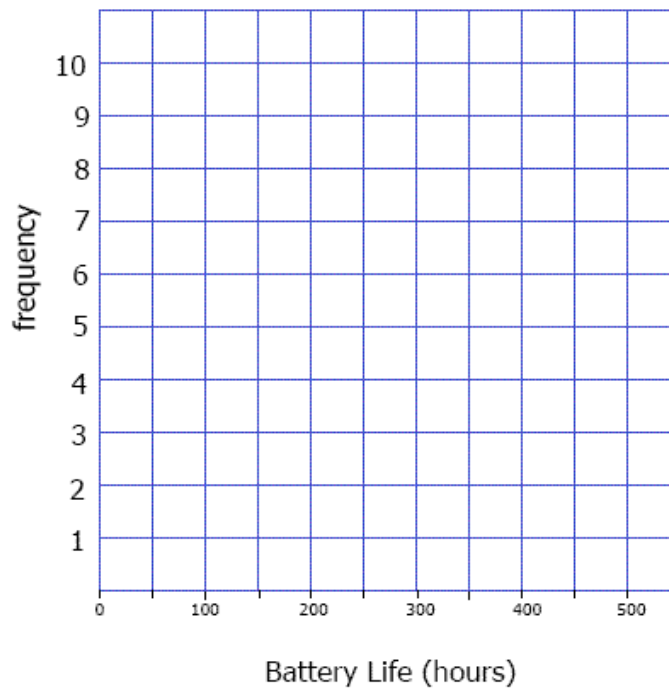
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Stand By Battery Life of Some Mobile Phones
Currently in the Argos Catalogue

Frequency Table:

Battery Life (h) in hours	Tally	Frequency
$0 \leq h < 100$		
$100 \leq h < 200$		
$200 \leq h < 300$		
$300 \leq h < 400$		
$400 \leq h < 500$		

Histogram:



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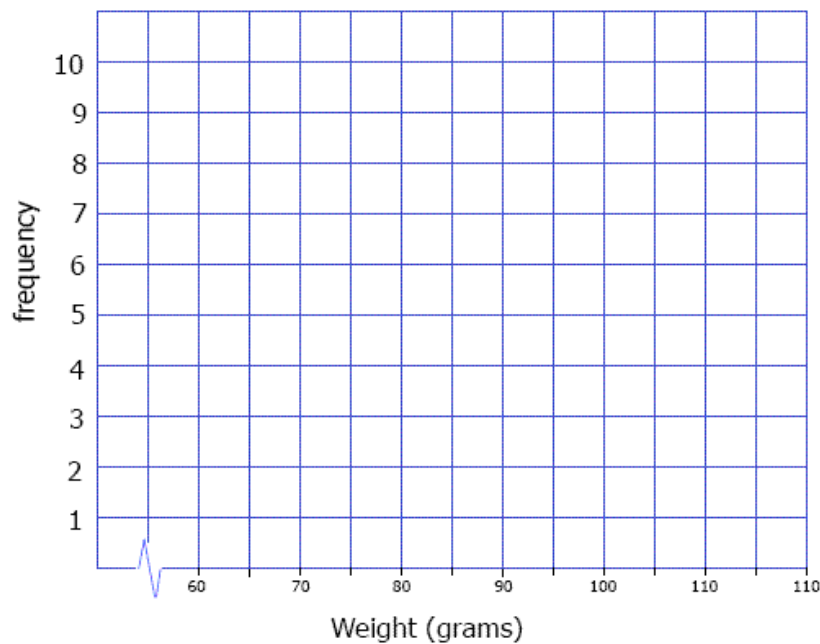
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Weight of Some Mobile Phones Currently in the Argos Catalogue

Frequency Table:

Weight (w) in grams	Tally	Frequency
$60 \leq w < 70$		
$70 \leq w < 80$		
$80 \leq w < 90$		
$\leq w <$		
$\leq w <$		
$\leq w <$		

Histogram:



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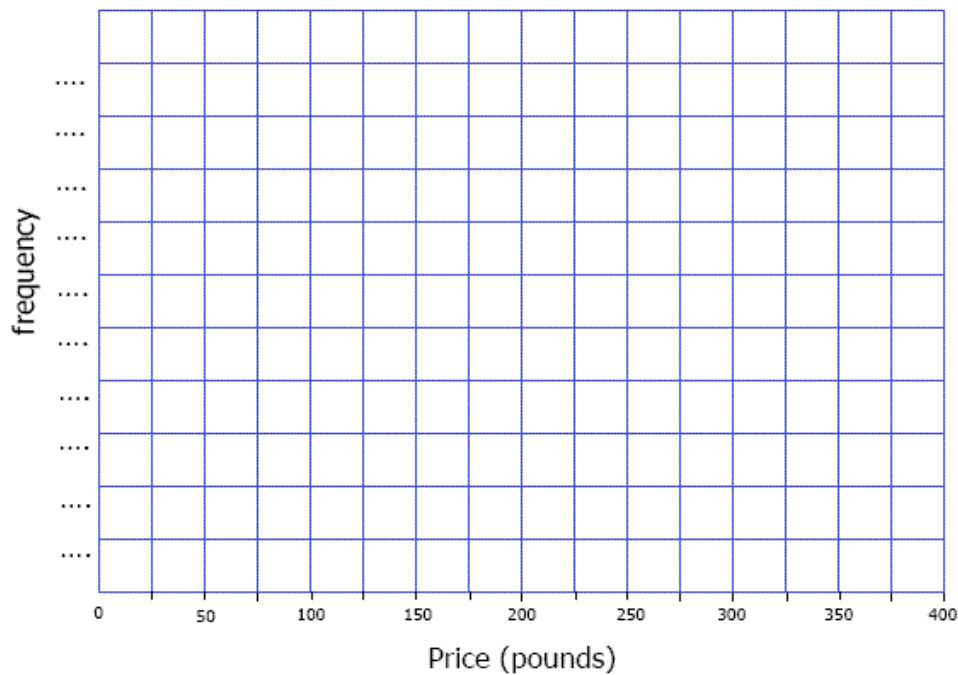
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Retail Price of Some Mobile Phones
Currently in the Argos Catalogue

Frequency Table:

	Tally	Frequency

Histogram:



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