



Are you a 'Golden' person?

What do credit cards, human bodies and ipods have in

common?

Introduction

Many artists and designers use the Golden Ratio (phi, 1: 1.618....) in their work simply because it is perceived to be the most aesthetically pleasing ratio that one can have. Many people go further and say that our bodies have been designed with phi integral to its design. Whether or not this is the case phi is a very interesting ratio used in the real and natural world. So by exploring phi and its uses we are really doing 'Functional Mathematics' – using and applying mathematics in the real world.

Target Audience

Students doing Foundation mathematics and basic numeracy courses.

Aim of the Activity

The work considers some ratios within the body and determines whether or not they approximate to the Golden Ratio (1 : 1.618....)

Activity Plan

Before doing the activity investigate what happens when two pairs of consecutive numbers are taken from the sequence of numbers 1, 1, 2, 3, 5, 8, 13, 21, 34....etc (Fibonacci numbers) and divide the larger number by the smaller number in each pair. By taking larger and larger numbers in the sequence the answer to the division approximates to phi, 1.618....

After doing this short activity watch the following video clip which illustrates the uses of the Golden Ratio in art and architecture <u>http://www.youtube.com/watch?v=SFZ3gHWAa-c</u>. Then pose the question 'Is phi really used in the design of our bodies?' How could we check this out? The activity sheets 'Are you a Golden person?' and 'Have you a Divine or Golden face?' focus on three ratios in the body and face which may be phi-related. Participants can measure and record the appropriate lengths and then calculate the resulting ratios from the measurements recorded. Depending on their answers the participants can say whether or not they have phi ratios in their bodies or faces. In my experience not many have.





Resources and Materials

Calculators and tape measurers; internet access and audio visual facilities to screen the video on Golden ratio and Fibonacci numbers.

The two main student activity sheets:

- Are you a Golden person?
- Have you a Divine or Golden face?

There is also an extra activity sheet:

• Arm Span and Height Investigation

Teaching Tips

Some participants might not like to have their bodies measured so just use the second sheet which involves measuring parts of the face.

How can this be adapted?

The Golden ratio and the Fibonacci numbers are very rich topics to explore both in terms of algebra, geometry and links to the real and natural world. A first port of call for further ideas to explore could be the web site http://www.maths.surrey.ac.uk/hosted-sites/R.Knott/Fibonacci/. This is a great source of information and activities related to the two topics.

Phi is an irrational number but an accurate representation of it is $\frac{(1 + \sqrt{5})}{2}$. An interesting question to explore is where does this representation come from? Also if phi is the Golden ratio what is the Silver ratio. [Answer: This is the ratio associated with A size paper and is 1: $\sqrt{2}$.]

Another body investigation to explore is arm span versus height (activity sheet 'Arm Span and Height Investigation'). This is inspired by Leonardo da Vinci's Vitruvian Man painting.

Applicability

The Golden ratio can be used in art and design projects.





Are you a Golden Person?

Look at the diagram and then measure carefully the 3 sets of pairs of your body measurements. Fill in the table below and use a calculator to work out the ratios/divisions.



	Set 1	Data		Set 2	Data		Set 3	Data	
	neck to navel	head to neck	ratio	navel to feet	head to navel	ratio	navel to knee	knee to feet	ratio
lengths in cm	A ₁	B ₁	$A_1 \div B_1$	A ₂	B ₂	$A_2 \div B_2$	A ₃	B ₃	A₃÷B₃

What do you find? Are any of your friends 'Golden People'?





Have you a Divine or Golden Face?

Look at the diagram and then measure carefully with a partner the 3 sets of pairs of your facial measurements. Fill in the table below and use a calculator to work out the ratios/divisions.



	Set 1	Data		Set 2	Data		Set 3	Data	
	Hairlin e	Corner of nose to	ratio	Corner of eye to	Corner of mouth to	ratio	Hairlin e to botto m of chin	Edge of cheek to other edge	ratio
	to corner of nose	botto m of chin		corner of mouth	chin		 heigh t of face	 width of face	
measuremen ts in cm	A ₁	B ₁	A ₁ ÷B ₁	A ₂	B ₂	A ₂ ÷B ₂	A ₃	B ₃	A ₃ ÷B ₃

Are you a 'Golden' person? www.mathsmagic-he.org.uk





What do you find? Have any of your friends 'Divine or Golden' faces? What about any famous people you like? Have they 'Divine or Golden' faces? Use photos to investigate.





Arm Span and Height investigation

Inspired by Da Vinci's painting Vitruvian Man the picture below begs the question 'Is a person's arm span the same as their height?'

Investigate.

