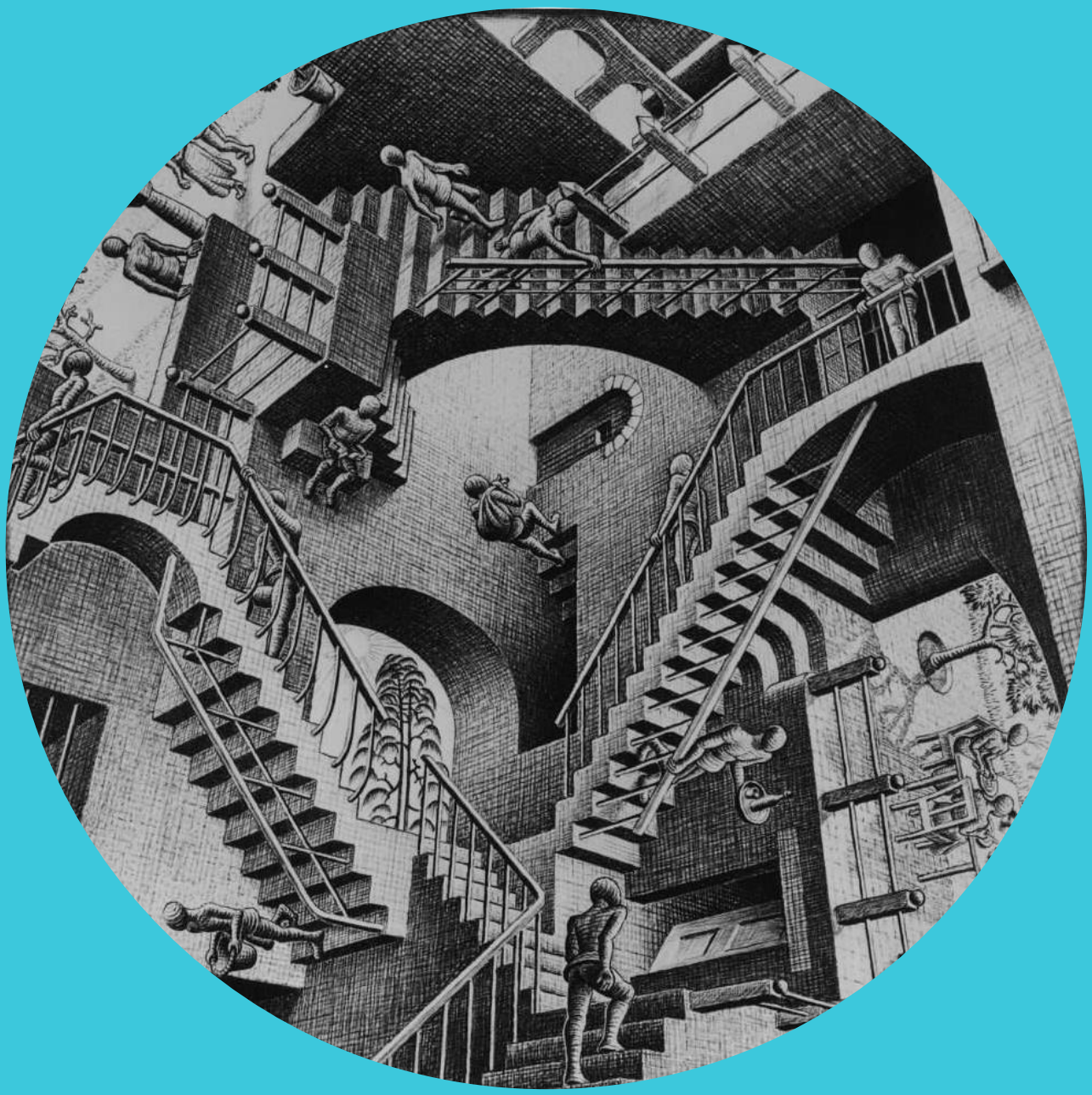
Researchers in Schools



Why Don't Planes Fly in Straight Lines?

Key Stage 4 Programme

Pupil Name

Coursebook Designed by **Mr J Oliver**

Timetable and Assignment Submission

Timetable – Tutorials

Tutorial	Date	Time	Location
1	09/12/2019	13:00-16:00	The University of Sheffield
2			
3			
4			
5			
6 (Feedback)			
7 (Feedback)			

Timetable – Homework Assignments

Homework Assignment	Description	Due Date
Tutorial 1	Baseline Assignment: Spherical Geometry	
Tutorial 2	Euclidean/Non-Euclidean	
Tutorial 3	Geometry on the Torus	
Tutorial 4	Curvature	
Tutorial 5	Final Assignment: Non-Euclidean Geometry	

Assignment Submission – Lateness and Plagiarism

Lateness	
Submission after midnight on	10 marks deducted
Plagiarism	
Some plagiarism	10 marks deducted
Moderate plagiarism	20 marks deducted
Extreme plagiarism	Automatic fail

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Course Rationale

The Geometry of the world we live in does not always work the way we think it should. For example if we were to hold a long piece of string between two people either side of a room, would that string be a straight line? It would certainly look straight, but due to the curvature of the earth, it would in fact be curved.

By assuming that all lines are "straight" we get a geometry that was first described in 300BC by a Greek Mathematician called Euclid. This geometry is now known as Euclidean Geometry (although you may just know this as "geometry" from GCSE), Euclid's ground-breaking book "The Elements", which describes his Euclidean Geometry in great detail, was massively influential to scholars all the way up to the 20th century and is theorised to be the second most printed book in history, second only to the bible [1].

In this course we will explore some strange effects these different geometries have on lines, triangles, circles and squares. We will see how some of these geometries are often a better way to view the world we live in and hopefully, by the end of the course, if I were to ask you "do parallel lines ever touch each other?" instead of answering "don't be silly, of course they don't!" your answer will be "It depends on the geometry".

[1] Wilson, R.: *Euclid*, 2002, 16th Aug 2019, https://www.gresham.ac.uk/lectures-and-events/euclid.

The course will be taught in the style of university tutorials and the final assignment will be similar to the work you would be set at university.

Uni Pathways Mark Scheme 2019 – problem-set assignments

	Skills	1st (70-100)	2:1 (60-69)	2:2 (50-59)	3rd (40-49)	Mark /100
Subject knowledge	Knowledge and understanding	o All content included and materials used are relevant to the general topic and to the specific question/title o Good understanding of all the relevant topics. o Technical terms are defined and used accurately throughout o Clear justification of how the material and content included is related to the specific issues that are the focus of the assignment	o Most of the content included is relevant to the general topic and to the specific question/title o Good understanding of most the relevant topics o Technical terms are used accurately but not always clearly defined. o Adequate justification of how the content included is related to the specific issues that are the focus of the assignment	o Some of the content included is relevant to the general topic and to the specific question/title o Good understanding on some of the relevant topics but occasional confusion on others. o Scientific terms are used mostly accurately with occasional confusion and often not defined. o Some justification on how the content included is related to the specific issues that are the focus of the assignment	o The content included and materials used are not applied to the question/title in a relevant manner o There is confusion in how understanding of the topics is expressed	
Critical thinking	Research and evidence	o Uses evidence/calculations to support claims/assertions/ideas, consistently clearly and convincingly o Data is effectively analysed, and appropriate assumptions/conclusions are reached o Includes rich sources of research findings, data, quotations or other sourced material as evidence for the claims/ideas	o Uses evidence/calculations to support claims/assertions/ideas, mostly clearly and convincingly o Data is analysed and the assumptions/conclusions that are reached are mostly appropriate o Includes adequate sources of research findings, data, quotations or other sourced material as evidence for the claims/ideas	o Uses evidence/calculations to support claims/assertions/ideas, at times clearly and convincingly o There is an attempt to analyse data is and draw assumptions/conclusions o Includes some sources of research findings, data, quotations or other sourced material as evidence for the claims/ ideas	o Data is presented largely without analysis	
	Developing an argument	o Argument/proof is <u>exceptionally</u> well-developed and well-justified o Uses content from the tutorials in an unfamiliar context and does so accurately and confidently.	o Argument/proof is <u>clear and well-developed,</u> and position is justified o Uses some content from the tutorials in an unfamiliar context, but not always accurately	o Argument/proof is <u>clear but not well-developed</u> o Limited use of content from the tutorials in other contexts	o Sometimes the argument/proof is not clearly established o Limited use of content from the tutorial and often inaccurately	
	Critical evaluation	o Effectively critiques the problem set and effectively establishes a thorough response to it	o Some evidence of critiquing the problem set and establishes a reasonable response to it	o Limited evidence of critiquing the problem set and establishes a response to it that has some coherence	o The problem is explored in the work but without explanation	

Written communication	Structure and presentation	○ Ideas are presented in paragraphs and arranged in a logical structure that is appropriate for the assignment ○ The introduction clearly outlines how the essay/report will deal with the issues ○ The conclusion summarises all the main points clearly and concisely ○ All calculations, formulas and methods are clearly structured, clear to follow and correct ○ Tables and graphs are effectively constructed including appropriate headings, units and scales. ○ All sources are referenced correctly in an agreed format	○ Ideas are presented in paragraphs and arranged in a structure that is mostly appropriate for the assignment ○ The introduction adequately describes how the essay/report will deal with the issues ○ The conclusion summarises most of the main points clearly ○ Calculations, formulas and methods are mostly structured, clear to follow and correct ○ Most tables and graphs are well constructed ○ Most sources are referenced correctly in an agreed format	○ Ideas are presented in paragraphs and arranged in a structure ○ The introduction mentions how the essay/report will deal with the issues ○ The conclusion summarises some of the main points clearly ○ Calculations, formulas and methods are not always structured, clear to follow and correct. ○ Some tables and graphs are well constructed but contains some errors ○ Some sources are referenced correctly in the agreed format with occasional errors	○ Ideas are presented in paragraphs but there is a lack of structure in how the work is presented ○ The work lacks an introduction that establishes the scope of the question ○ The work lacks a conclusion that summarise the main points raised ○ Work is not referenced accurately	
	Language and style	○ No spelling, grammar or punctuation errors ○ Writing style consistently clear, tone appropriate and easy to follow ○ Accurate and consistent use of technical language and vocabulary	○ Minimal spelling, grammar or punctuation errors ○ Writing style mostly clear, tone appropriate and easy to follow ○ Some attempts of using technical language and vocab alary, but not always accurate	○ Some spelling, grammar or punctuation errors ○ Writing style moderately clear, tone appropriate and easy to follow ○ Use of simple language and vocabulary effectively but struggles to use technical language	○ There are a significant number of spelling, grammar and punctuation errors ○ Use of simple language and vocabulary effectively but a lack of technical language	

Overall Mark for written element (average of the 6 marks from the criteria above)/100	
	+
Problem Set mark/100	
	÷ 2
Final mark/100	

Baseline Assignment: Pupil Feedback Report

Name of Pupil	
Name of School	
Name of RIS teacher	Mr J Oliver
Title of Assignment	Spherical Geometry

How your assignment is graded:

Grade	Marks	What this means
1st	70+	Performing to an excellent standard at A-level
2:1	60-69	Performing to a good standard at A-level
2:2	50-59	Performing to an excellent standard at GCSE
3rd	40-49	Performing to a good standard at GCSE
Working towards a pass	0-39	Performing below a good standard at GCSE
Did not submit	DNS	No assignment received by The Brilliant Club

Lateness	
Any lateness	10 marks deducted
Plagiarism	
Some plagiarism	10 marks deducted
Moderate plagiarism	20 marks deducted
Extreme plagiarism	Automatic fail

Marks

OVERALL MARK / 100		FINAL MARK / 100 (including any deductions)	
DEDUCTED MARKS		FINAL GRADE	

If marks have been deducted (e.g. late submission, plagiarism) the teacher should give an explanation in this section:

Mark Breakdown and Feedback

Knowledge and Understanding		Research and Evidence	
	mark		*mark*
Developing an Argument		**Critical Evaluation**	
	mark		*mark*
Structure and Presentation		**Language and Style**	
	mark		*mark*

Problem Set	
Comment	*mark*

Final Assignment: Pupil Feedback Report

Name of Pupil	
Name of School	
Name of RIS teacher	Mr J Oliver
Title of Assignment	Non-Euclidean Geometry

How your assignment is graded:

Grade	Marks	What this means
1st	70+	Performing to an excellent standard at A-level
2:1	60-69	Performing to a good standard at A-level
2:2	50-59	Performing to an excellent standard at GCSE
3rd	40-49	Performing to a good standard at GCSE
Working towards a pass	0-39	Performing below a good standard at GCSE
Did not submit	DNS	No assignment received by The Brilliant Club

Lateness	
Any lateness	10 marks deducted
Plagiarism	
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Marks

OVERALL MARK / 100		FINAL MARK / 100 (including any deductions)	
DEDUCTED MARKS		FINAL GRADE	

If marks have been deducted (e.g. late submission, plagiarism) the teacher should give an explanation in this section:

Mark Breakdown and Feedback

Knowledge and Understanding		Research and Evidence	
	mark		*mark*
Developing an Argument		**Critical Evaluation**	
	mark		*mark*
Structure and Presentation		**Language and Style**	
	mark		*mark*
Problem Set			
			mark

Subject Vocabulary

Word	Definition	In a sentence
Great Circle	Any circle drawn on the sphere that has the same diameter of the sphere.	
Euclidean Geometry	The geometry usually taught in schools.	
Spherical Geometry	The geometry of the surface of a sphere.	
Non-Euclidean Geometry	Any geometry that is not Euclidean Geometry. i.e. Geometry where any of the 5 postulates of Euclid fails.	
Axiom/Postulate	A statement that we assume to be true.	
Theorem	A statement that can be proven to be true from the axioms/postulates.	
Torus	A shape that is more commonly known as a doughnut.	
Torus Geometry	The geometry of the surface of a torus.	
Fundamental Square	A square with certain sides identified that we use to represent another shape.	
Curvature	A measure of how round or curved a shape is.	
Principle Curvature	A measure the maximum and minimum bending of a shape at each point.	
Gauss Curvature	A measure of how the whole shape is curved.	
Taxicab Geometry	The geometry of an x, y grid. Models the geometry of an American city.	

Tutorial 1 – Spherical Geometry

What is the Purpose of Tutorial 1?

This tutorial will get you thinking about the world we live in and how this effects objects you are already familiar with. Are triangles what you think they are? Exactly how big is a football pitch? Why don't planes fly in straight lines? These questions all depend on the world we live in or more generally the world we are doing our geometry on.

We will discuss geometry on the sphere, and show its differences to the geometry we all know and love.

By the end of the tutorial, you should be able to:

- Define what a great circle is.
- Describe the key differences between triangles in spherical geometry and usual triangles.
- Calculate the surface area of a triangle in spherical geometry.

Activity 1 – The riddle of the lost explorer

You are an explorer, you travel 1 mile south, turn and travel 1 mile east, turn once more and travel 1 mile north to arrive back at your first point, where are you?

Notes:

Activity 2 – These circles are great!

In pairs, decide which circles are great circles and which circles are not.

This circle is great!	This circle is not so great

Remember:

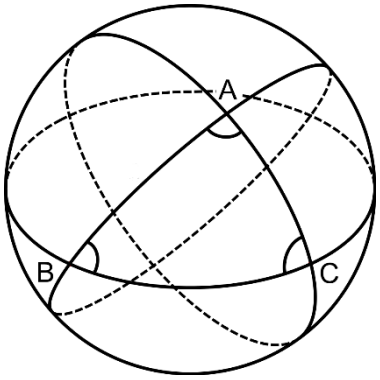
The interior angles of a triangle on the sphere add up to larger than 180º.

Formula:

The surface area of a triangle on the sphere is given by:

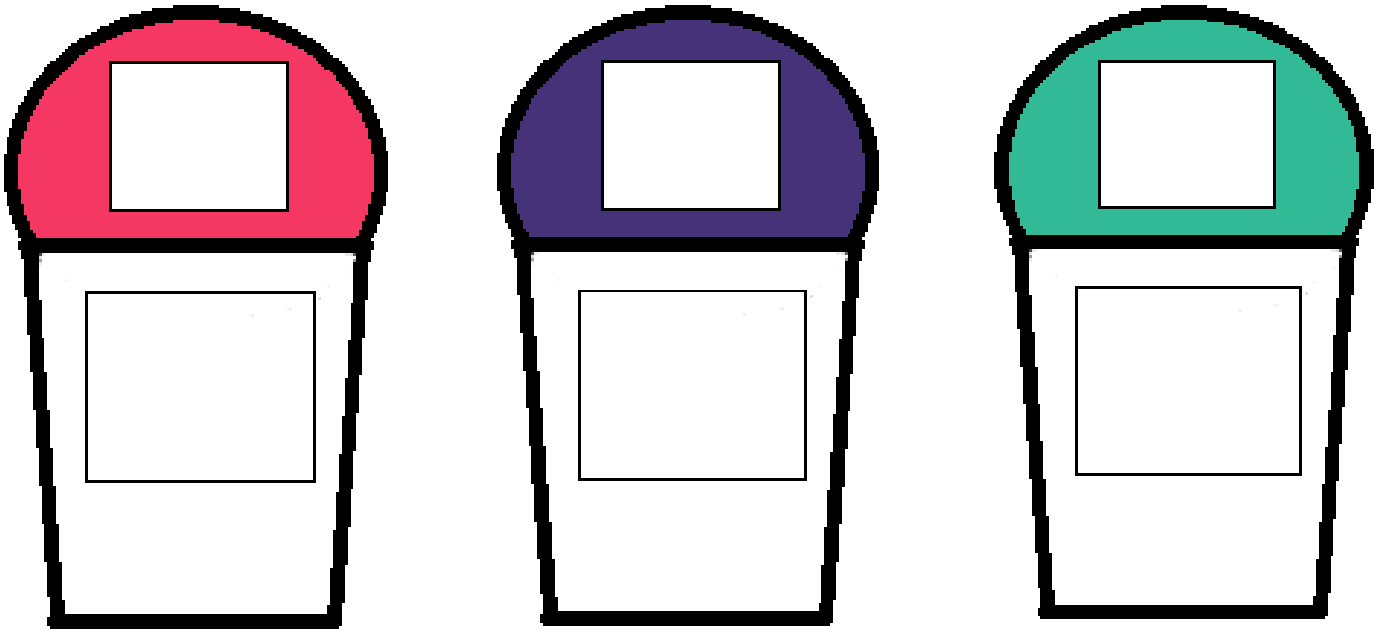
$$Area = (A + B + C - 180) \times \pi \times r^2 \div 180,$$

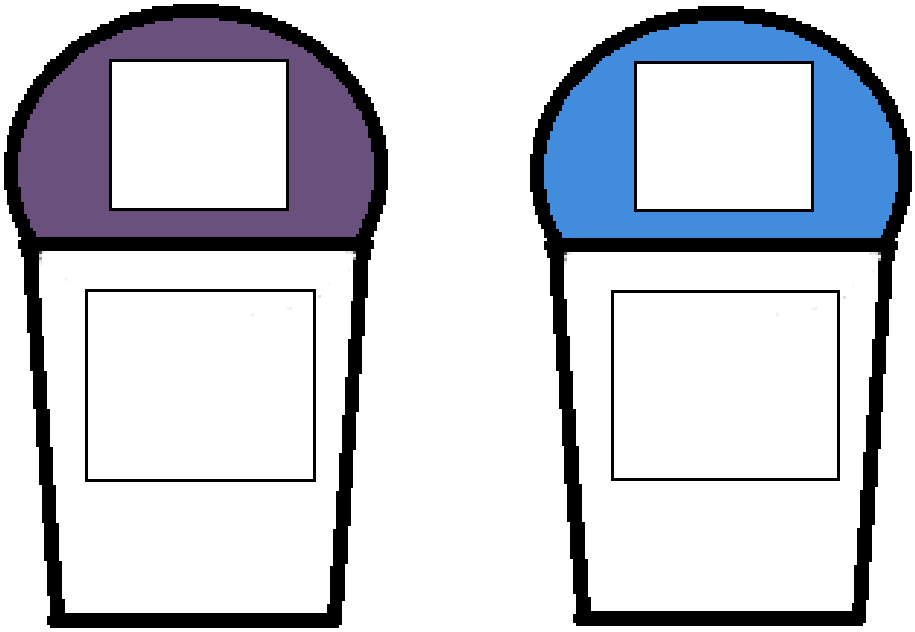
Where, A, B and C are the interior angles of the triangle and r is the radius of the sphere.



Activity 3 – Sphere in the cup.

Match the correct sphere to the correct cup. Then copy the answers into the pictures below.





Notes:

Tutorial Glossary

Word	Definition	In a sentence
Great Circle		
Euclidean Geometry		
Spherical Geometry		

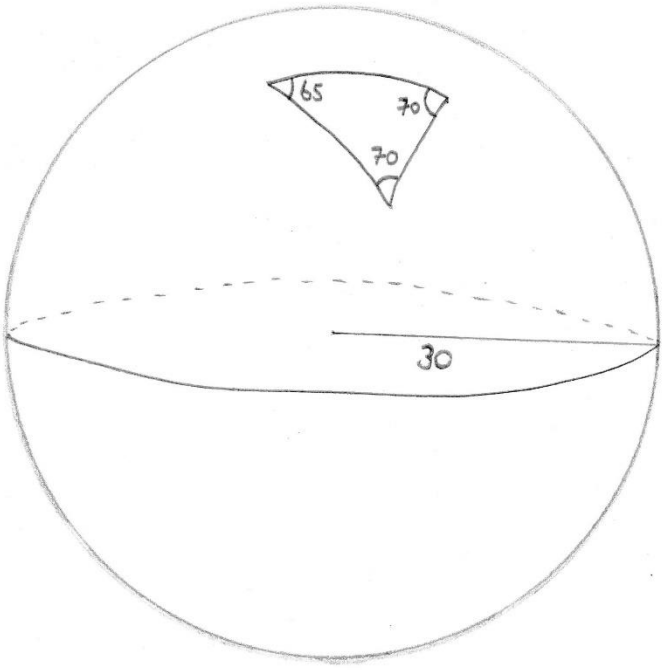
Notes:

Homework – Baseline Assignment

Problem set:

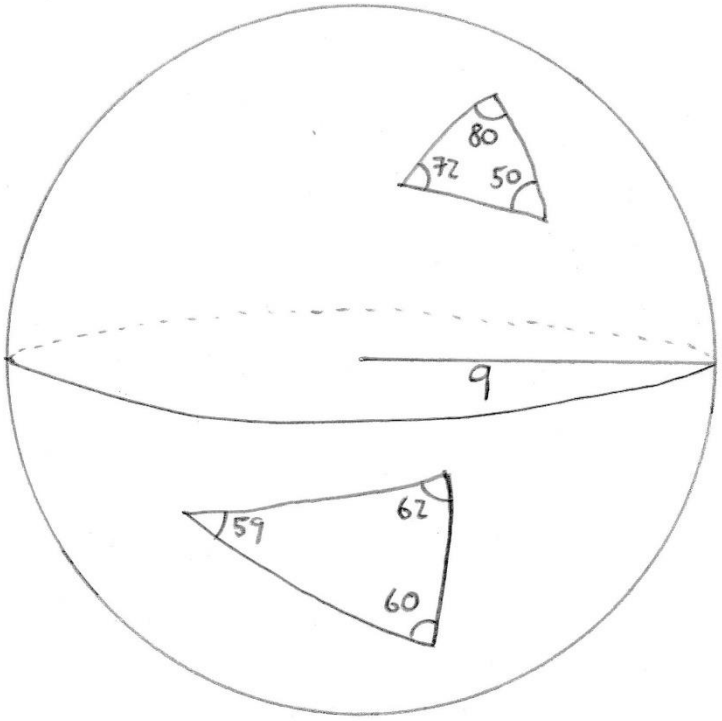
1. Calculate the surface area of the spherical triangle.

   (Picture not to scale)



2. Calculate the total surface area of the two triangles.

   (Picture not to scale)



3. A standard football pitch is 105 by 68 meters. James says the surface area of a standard food ball pitch is 7140 meters, Amy disagrees and says that in fact would be slightly larger than that. Who do you think is correct? Explain your answer.

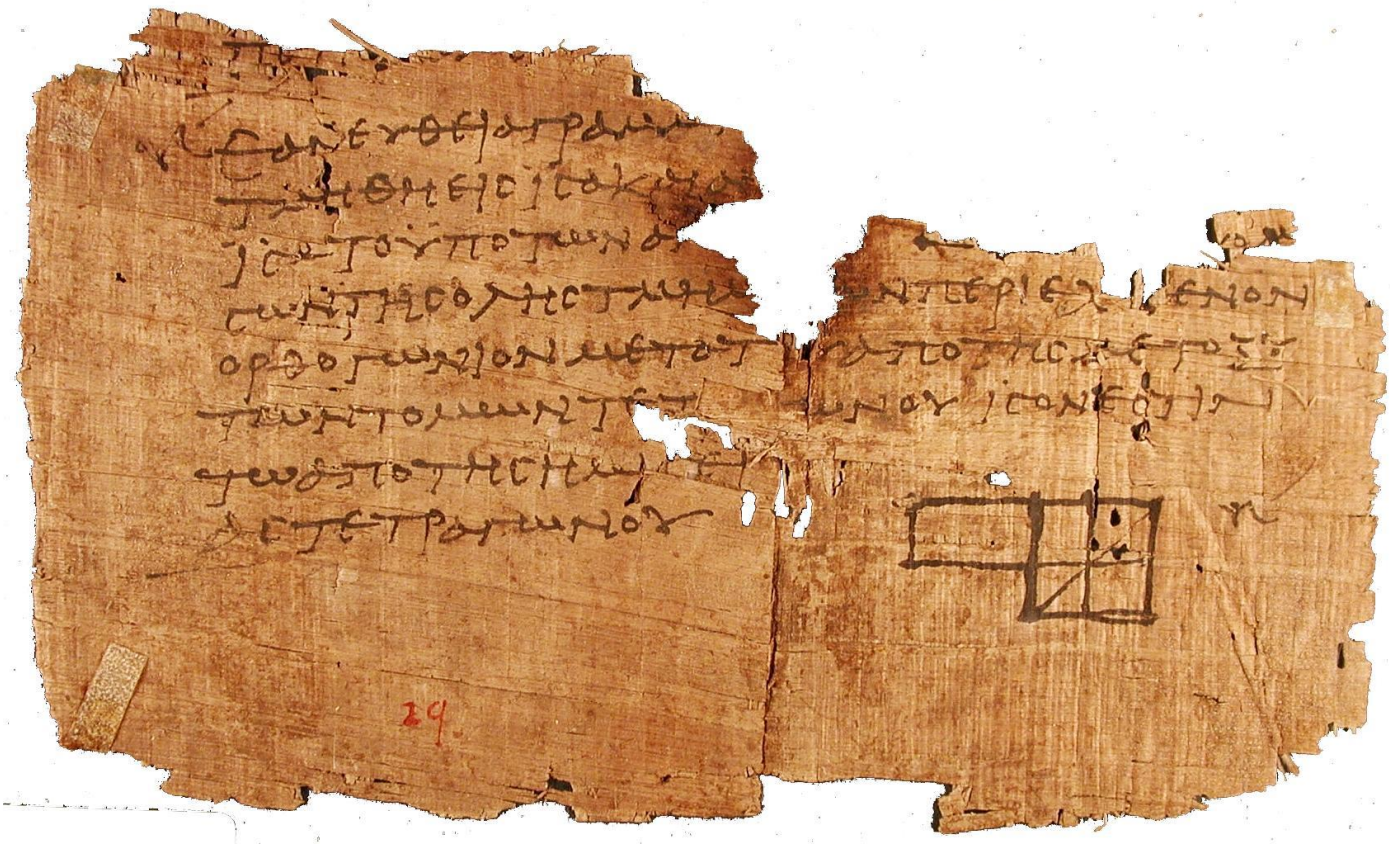
Essay:

What are the benefits of using spherical geometry to describe our world as opposed to using Euclidean geometry? (250 words)

A successful essay will:

- Have 3 specific examples that illustrate your point.
- Use all the key words when needed. For example, use "sphere" not "ball" to describe the shape, or use "Euclidean geometry" instead of "normal/regular geometry"
- Follow the Point, Evidence, Explanation method:
    - Point – make the key point clearly
    - Evidence – explain the evidence for the point
    - Explanation – explain why your point is relevant and important
- Be clearly structured into paragraphs:
    - Introduction – Introduce the essay, what are you going to talk about?
    - Explain – What are your reasons for the benefits of using spherical geometry? Using specific arguments and examples.
    - Summarise – Collect all your main points into one paragraph, give a conclusion to your work.

Tutorial 2 – Euclidean/Non-Euclidean Geometry



What is the Purpose of Tutorial 2?

In this tutorial we will dive deeper into non-Euclidean geometry. We will investigate the theory of Euclidean geometry (the geometry you know and love). We will see the 5 assumptions of Euclid and see how we can deduce more information only using these 5 assumptions. We will also see which of these assumptions breaks when we are thinking of geometry on the sphere.

By the end of the tutorial, you should be able to:

- Define what an axiom/postulate is
- List and describe Euclid's 5 postulates
- State the difference between an axiom/postulate and a theorem

Activity 1 – When you ASSUME you make an ASS out of U and ME.

In pairs discuss some assumptions you make every day and write them in the list below.

Some examples could be:

- In a mathematics lesson I assume I will be learning mathematics.
- I assume there will be food at a party.

1.	
2.	
3.	

An Axiom/Postulate is…

Activity 2: Euclid's 5 Postulates

Number	Description	Drawing
1.	A straight line segment can be drawn to join two points.	
2.	Any straight line segment can be extended infinitely into a straight line.	
3.	Given any straight line segment, a circle can be drawn with radius the length of the line segment and centre one of the end points of the line segment.	
4.	All right angles are the same.	
5.	If two lines are drawn which intersect a third in such a way that the sum of the inner angles on one side is less than two Right Angles, then the two lines inevitably must intersect each other on that side if extended far enough.	

Activity 3 – Axioms and Theorems.

From the given cards, decide in pairs which cards are axioms/postulates and which are theorems.

Axiom	Theorem

Tutorial Glossary

Word	Definition	In a sentence
Spherical Geometry		
Non-Euclidean Geometry		
Axiom/Postulate		
Theorem		

Notes:

Homework – Euclidean/Non-Euclidean Geometry

1. State two theorems that follow from Euclid's 5 postulates.

2. Describe which of Euclid's 5 postulates breaks in spherical geometry. (Be sure to give a sentence or two with a reason why you think the postulate fails.)

3. Come up with 3 axioms/postulates of your own devising and give up to two theorems which follow from these axioms. (Give explanations as to why your theorems follow from your axioms/postulates.)

A successful homework will have:

- Listed two theorems that follow from Euclid's 5 postulates, think about theorems (or rules) you have learnt in your mathematics class about shapes.
- Describe your answer to question 2. i.e. give a sentence or two with your description of which postulate breaks.
    - Be sure to use correct key words.
    - Write in full sentences with full stops and capital letters.
- List your three axioms/postulates and then give your two theorems making sure that you
    - Explain why your theorem is true. Convince me!
    - Be sure to use correct key words if you need to.
    - Have fun with it. The axioms don't have to be mathematical like Euclid's axioms, they could be any assumptions you insist is true. For example as an axiom, let us assume that "the earth is flat", we all know that it's not, but if we assume that it is just for fun, then we have a theorem "the pictures NASA have taken of the earth are all fake".

Tutorial 3 – Torus Geometry

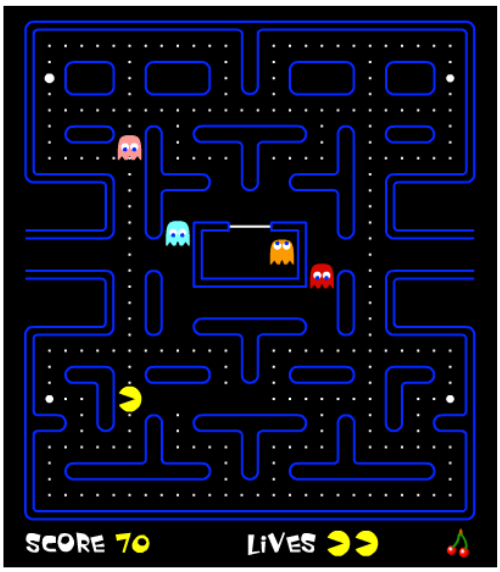
What is the Purpose of Tutorial 3?

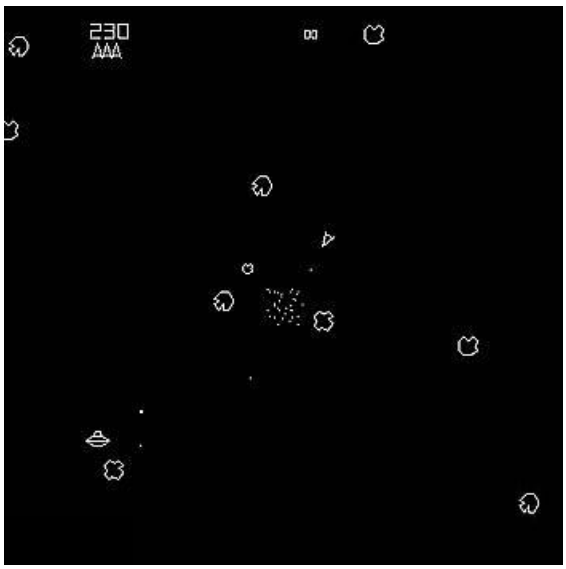
Building on what we learnt in tutorials 1 and 2, we explore a type of geometry that is quite alien to us: geometry on the torus (doughnut). We will explore the world of torus geometry by seeing examples of how a torus is used in games, and its links with fundamental squares.

By the end of the tutorial, you should be able to:

- Describe the relation between a strip of Euclidean space and a cylinder.
- Describe the relation between a fundamental square and a torus.

Activity 1 – The world of games





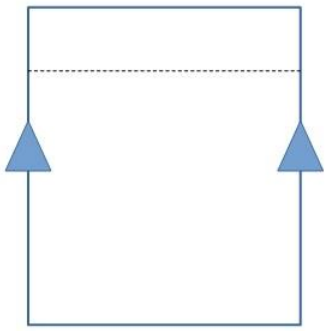
Watch the two videos and note what you notice about the edges of the game. After we will discuss what was happening.

Notes:

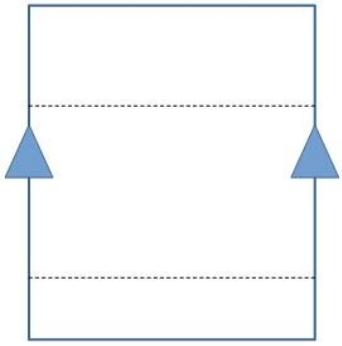
Activity 2 – Cylinders

Look at the following strips of Euclidean space, if you cut the dotted lines with scissors, describe what would happen to the cylinder.

1.



2.



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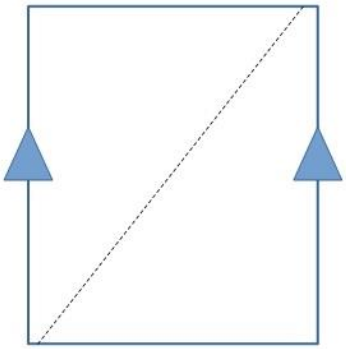

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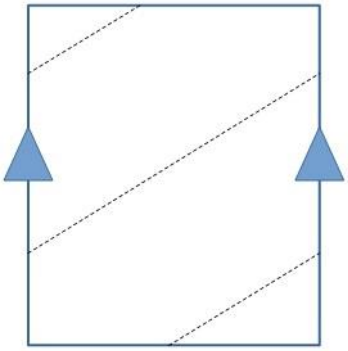
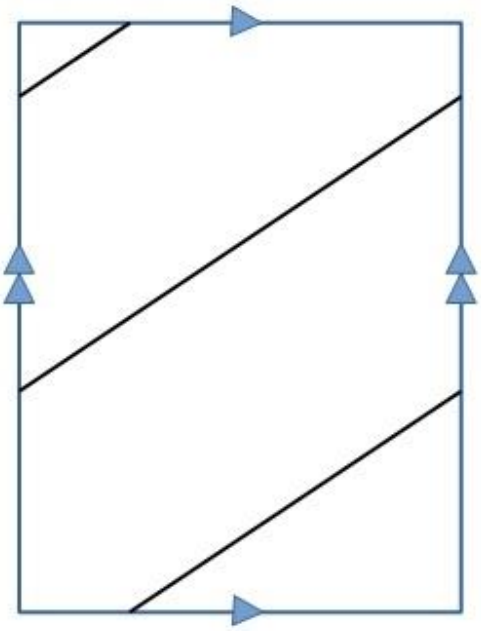


Activity 3 – Torus and fundamental square connection

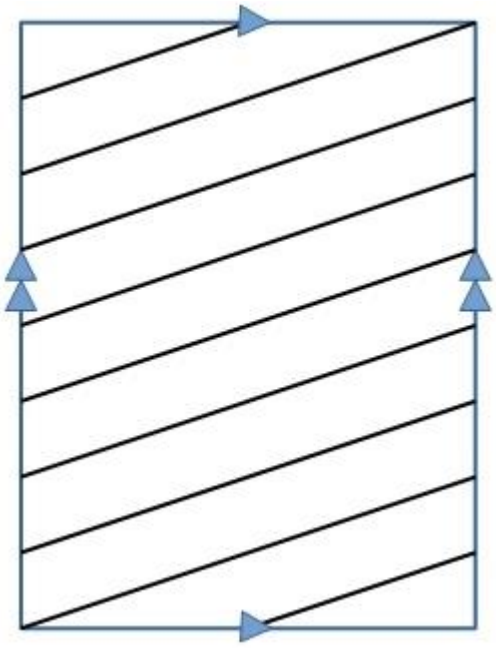
How many colours would be needed to colour the torus represented by the fundamental squares below.

1.



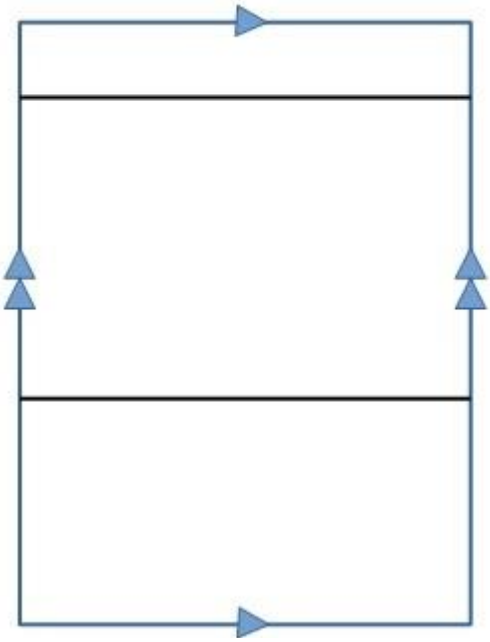
Number of Colours: _____

2.



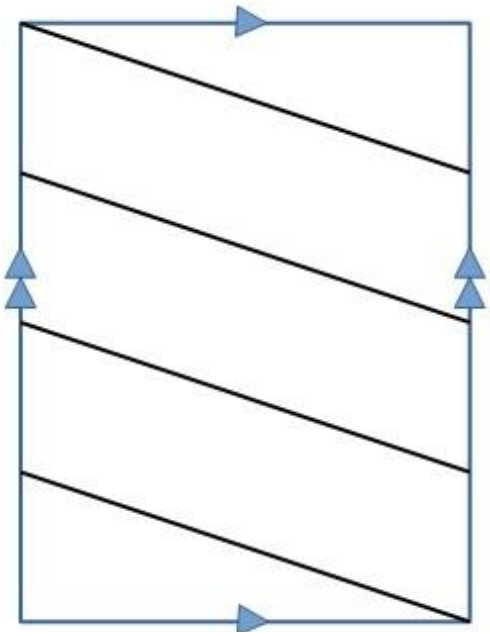
Number of Colours: _____

3.



Number of Colours: _____

4.



Number of Colours: _____

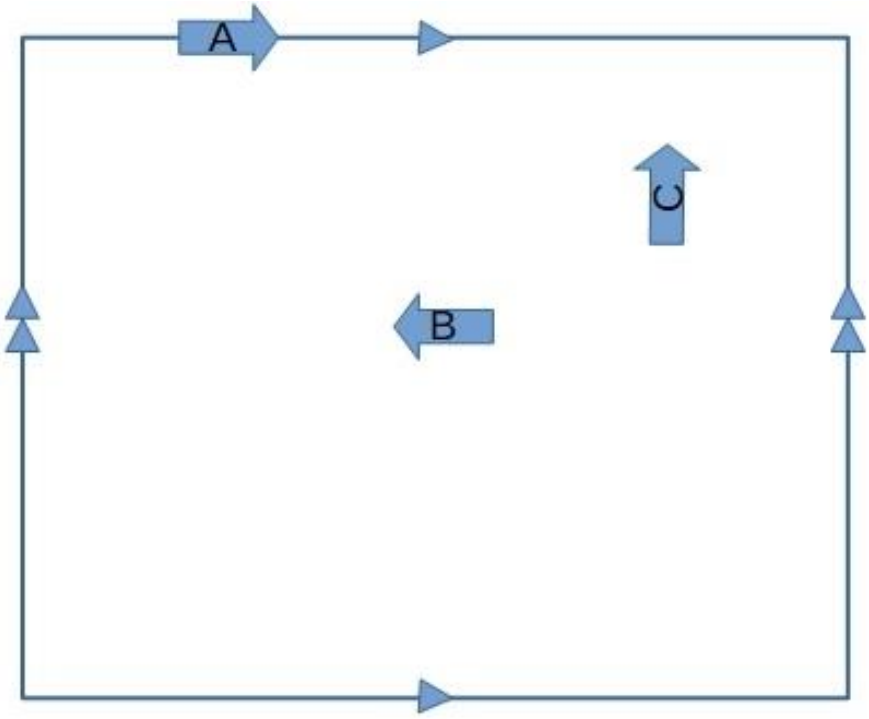
Tutorial Glossary

Word	Definition	In a sentence
Torus		
Torus Geometry		
Fundamental Square		

Notes:

Homework – Torus Geometry

1. Imagine you are stood on the torus at the points represented by the points A, B and C on the fundamental square. Imagine you are facing in the direction indicated by the arrows. Give a short description (one or two sentences) of what you would see in front of you and to either side of you.



Remember that we identify the top and bottom lines first, then then we identify the left and right lines. Try using a sheet of paper or to see where the points will be on the torus then describe what you can see if you were on the torus. For example, does it look like you are on top of a hill? Is the ground flat in front of you but curved upwards at either side of you?

A successful homework will have:

- Full explanations of what you would see, in front of you, to either side of you and behind you.
- Full sentences with full stops and capital letters.
- Good use of key words, i.e. the use of fundamental square and torus when needed.

Tutorial 4 – I'm not flat, I'm curved!

What is the Purpose of Tutorial 4?

Curvature is incredibly important in the real world, we have to take into account the curvature of the earth when building, transport and so much more. We will see how we describe curvature and how we can classify objects depending on this curvature.

By the end of the tutorial, you should be able to:

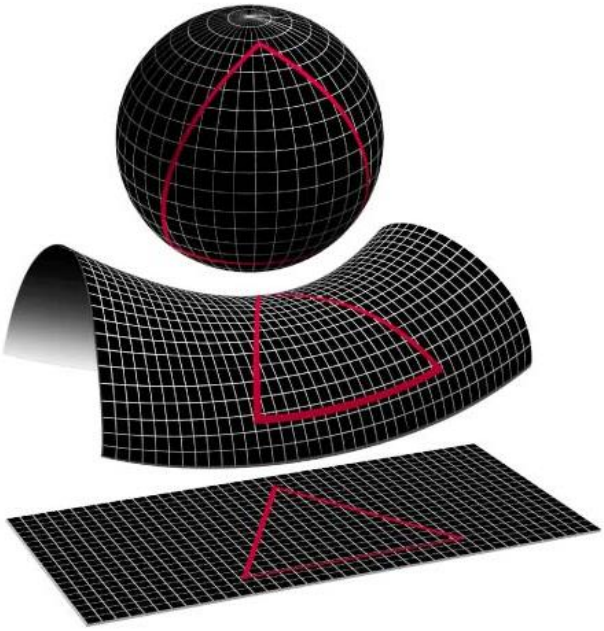
- Give the sign of the principle curvatures from a point on a surface.
- Define Gauss curvature.
- Be able to say whether a surface is positively curved, negatively curved, or has zero Gauss curvature.

Activity 1 – What is curvature?

Think to yourself and write down any ideas you have about:

- What you think curvature is,
- How do you describe when a shape is more curved than another shape?

We will then discuss these questions as a group.



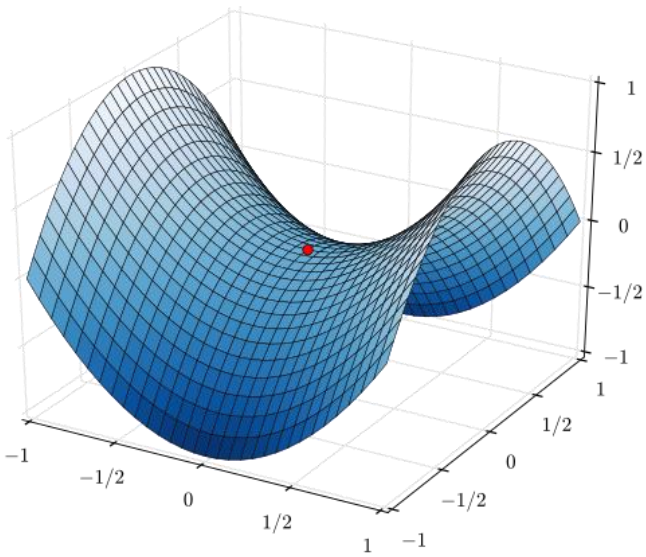
What is curvature?

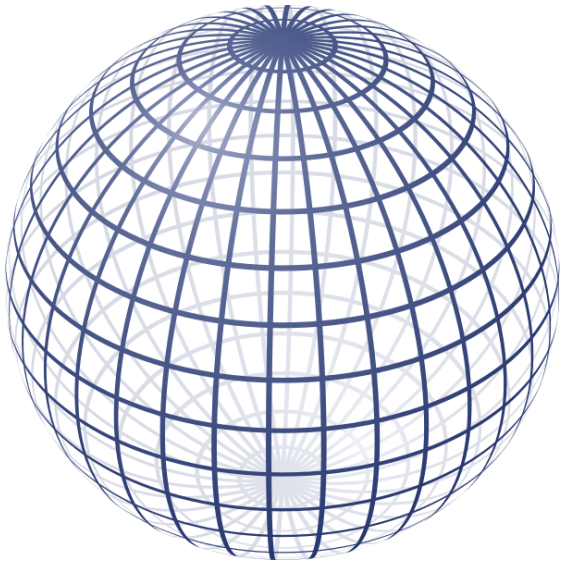
Activity 2 – Positive, negative or zero

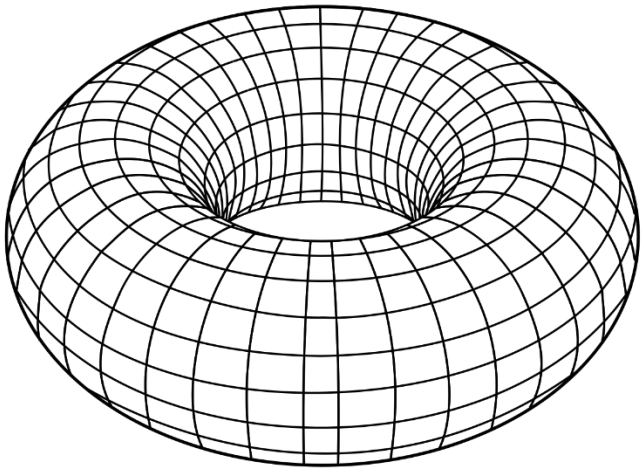
Remember:

Principle curvatures are the maximum and minimum bending of a surface. A Principle curvature is positive if the surface slopes up from the point, negative if the surface slopes down and zeros if it doesn't slope at all.

On the pictures below, draw the directions of the principle curvatures from the point indicated.







Remember:

Gauss curvature is the multiplication of the two principle curvatures, so the sign depends on if the principle curvatures are positive or negative. So we have

Maximum Principle curvature (k_1)	Minimum Principle curvature (k_2)	Gauss curvature
+	+	+
+	-	-
-	-	+

Activity 3 – Gauss Curvature

Given the sign of the Gauss curvature, give the signs of the maximal principle curvature (k_1) and the minimal principle curvature (k_2), then describe what kind of shape this would look like.

k_1 is positive, k_2 is positive.

Gauss curvature is…

The shape looks like…

k_1 is positive, k_2 is negative.

Gauss curvature is…

The shape looks like…

k_1 is zero, k_2 is negative.

Gauss curvature is…

The shape looks like…

Tutorial Glossary

Word	Definition	In a sentence
Curvature		
Principle Curvature		
Gauss Curvature		

Notes:

Homework – Curvature

1. Walk around your home, and find examples of shapes that have positive, negative and zero Gauss curvature. You should aim to find two examples of each positive, negative and zero Gauss curvature, list them and provide a short description of why the shape has positive, negative or zero Gauss curvature.
2. What shape has zero maximal principle curvature, and zero minimal principle curvature? (explain your answer, in a few sentences)

A successful homework will:

- Have two examples of each positive, negative and zero gauss curvature these could be parts of objects around your house for example "part of the TV stand".
- Have a short description of why the shapes have positive, negative and zero curvature.
- Give a shape asked for in question 2. With an explanation giving your reasons why you think the shape you picked has zero maximal principle curvature and zero minimal principle curvature.
- Write in full sentences with capital letters and full stops.

Tutorial 5 – Taxicab Geometry

What is the purpose of Tutorial 5?

Life as a taxi driver in Manhattan (New York) must be hard, as they have to remember all the street names while also driving in a non-Euclidean world! The geometry a taxi driver has to utilise to drive their fairs as fast as possible is called Taxicab geometry or sometimes called Manhattan geometry. We will look at this particular geometry and see how our ideas of straight lines and normal shapes changes.

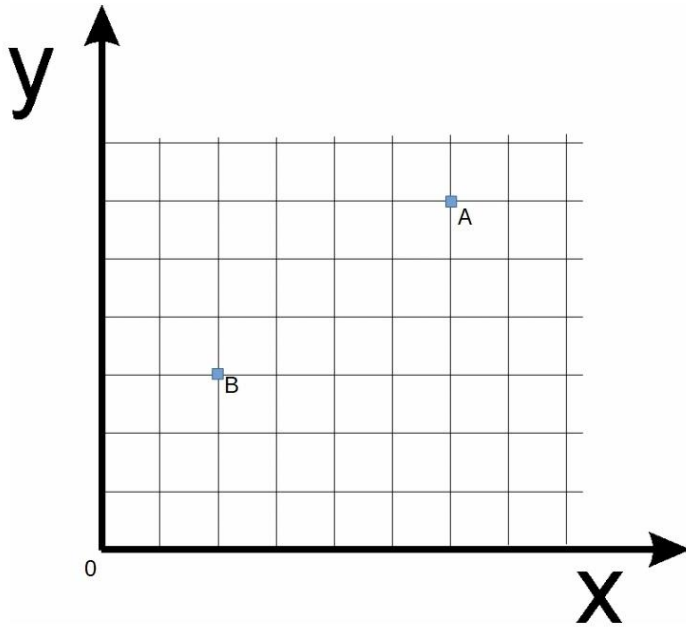
By the end of the tutorial, you should be able to:

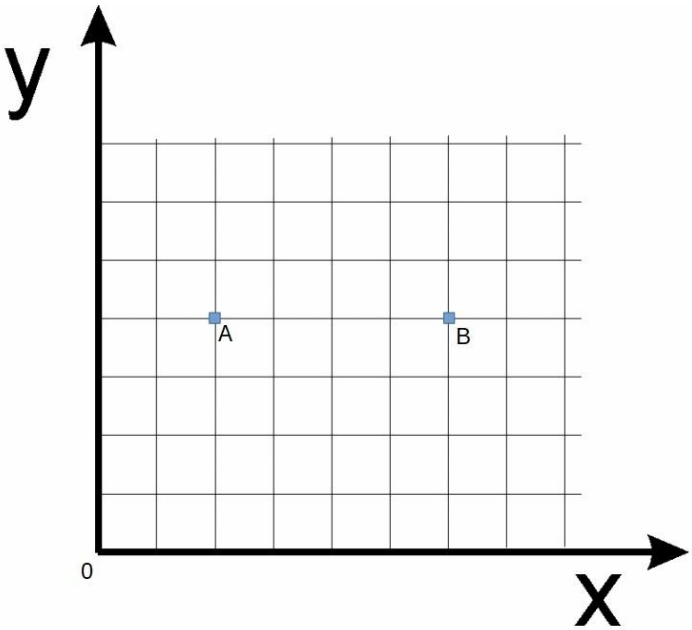
- Explain what we mean by Taxicab Geometry.
- Describe, with reasons, what the shortest distance between two points is in taxicab geometry.
- Describe what circles and squares look like in taxicab geometry.

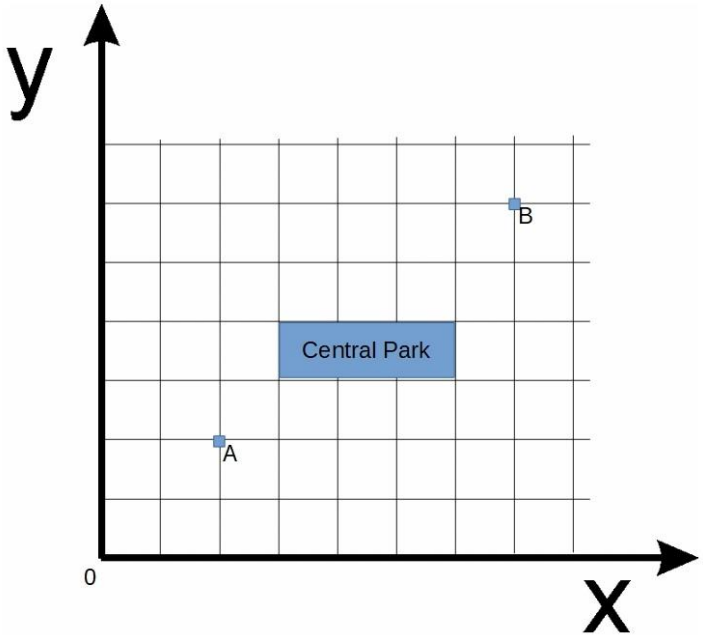
Activity 1 – The environmentalist taxi driver

A taxi driver needs to drive their passenger from point A to point B. The taxi driver wants to save fuel and to get from point A to point B in the shortest route.

In each of the pictures below draw a path of shortest distance between point A and point B.



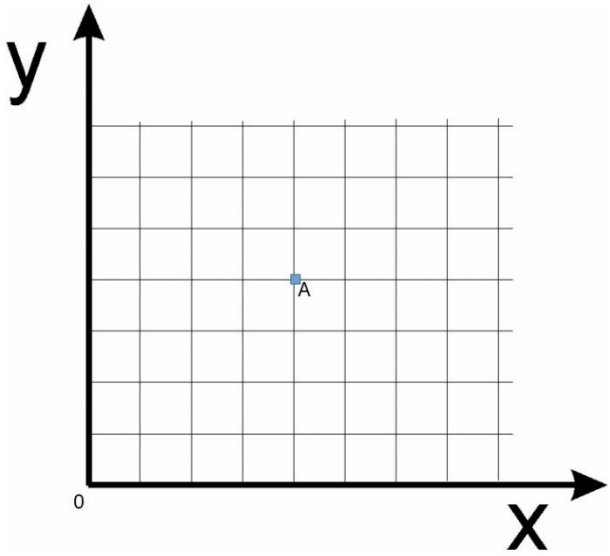




Is each path you drew for the taxi driver unique or could they have taken multiple routes?

Activity 2 – I'm going around is squares?!

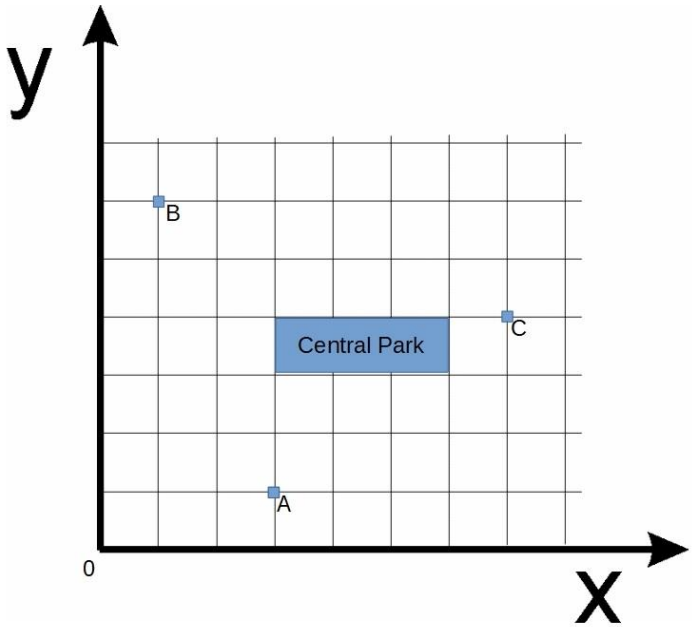
On each of the pictures below draw the correct path.



Jane wants to go for a run, she wants her run to start and finish at her house (point A), she knows each block on her street is 500m and she wishes to run 5km. Can Jane run in a circle? If so, draw the circle, if not then draw a suitable path that Jane can run.

Omar (point A) has to pick up his friends Helen (point B) and Ellen (point C), Omar thinks he should pick up Ellen first as she is closer then drive to pick up Helen. Is Omar right? Explain your answer.

Draw a suitable path for Omar to pick up Helen and Ellen.



Notes:

Tutorial Glossary

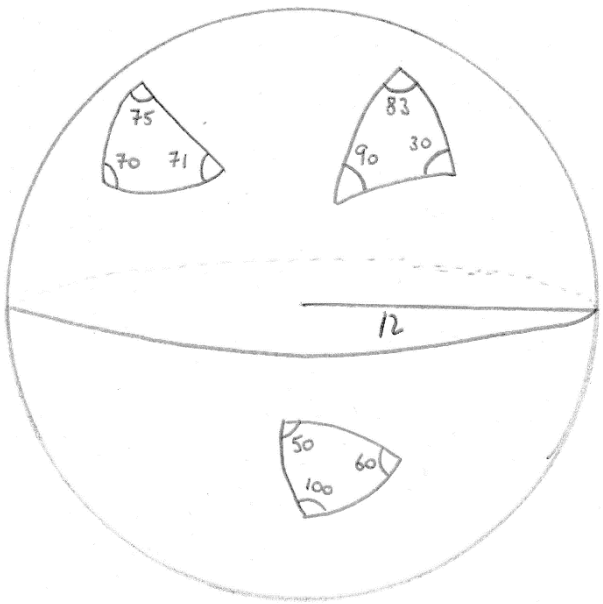
Word	Definition	In a sentence
Taxicab Geometry		

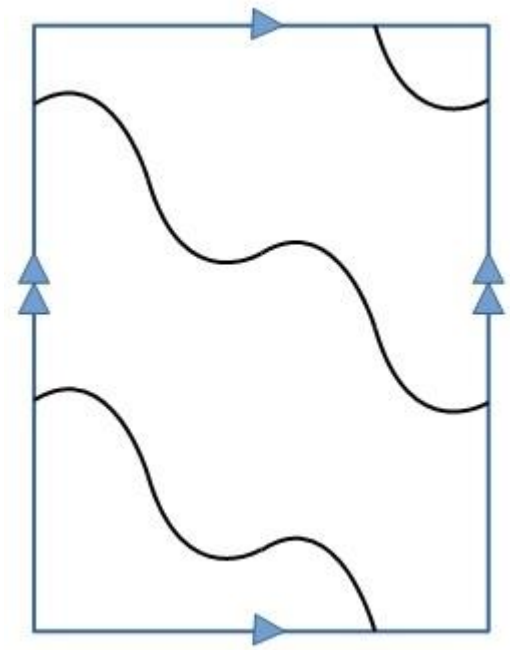
Notes:

Final Assignment

Problem Set:

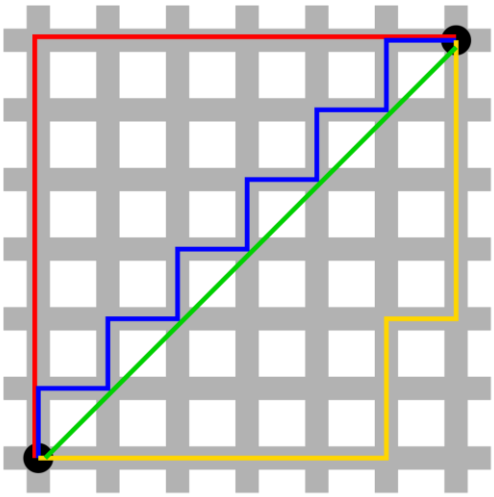
1. Calculate the total surface area of the two triangles. How much of the total surface area of the sphere is this? (give your answer as a percentage)





2. How many colours are needed to colour the torus represented by the fundamental square.

3. Four people Bill (red), Bob (blue), Michelle (yellow) and Lynda (green) were asked to draw the shortest distance between two points in taxicab geometry. Lynda thinks her line is shorter than everyone else's is she correct? Who do you think has drawn the shortest line between the two points? Explain your answer.



Essay:

Describe the differences and similarities between the Euclidean, Spherical, Torus and Taxicab Geometries (1000 words).

A successful essay will:

- Compare all four different geometries
- Numerous examples to illustrate how they are all useful in different ways
- Evidence of independent research
- Use all the key words when needed. For example, use "torus" not "doughnut" to describe the shape
- Follow the Point, Evidence, Explanation method:
    - Point – make the key point clearly
    - Evidence – explain the evidence for the point
    - Explanation – explain why your point is relevant and important
- Be clearly structured into paragraphs:
    - Introduction – Introduce the essay, what are you going to talk about?
    - Explain – What are your reasons and examples? Explain your comparisons, what is different, what is the same?
    - Summarise – Collect all your main points into one paragraph, give a conclusion to your work.

Tutorial 6 – Feedback

What is the Purpose of Tutorial 6?

- To receive feedback on your final assignment
- To respond to the feedback from your Uni Pathways teacher
- To write targets for improvement on your final assignment

Final assignment feedback from your Uni Pathways Teacher

(Remember to look at the mark scheme to help you understand what you have done well so far, and how you can do even better in your final assignment)

Here are three things that my Uni Pathways Teacher thought I did well in my draft assignment
•   •   •

Here are three things that my Uni Pathways Teacher thinks that I could do to get a higher mark in my final assignment
•   •   •

Tasks from my Uni Pathways Teacher to do during the feedback tutorial to help me improve
•   •   •
My response:

Actions I will take to improve my final assignment after this tutorial…
•   •   •

Hand in date for my final assignment:	

Tutorial 7 – Final tutorial

What is the Purpose of Tutorial 7?

- To receive feedback and a grade on your final assignment.
- To reflect on the programme including what you enjoyed and what was challenging.
- To ask any questions you may have about university.

Final assignment feedback from my Uni Pathways Teacher

Final mark:	University style grade:
Feedback: Here are three things that my Uni Pathways teacher thought I did well in my final assignment • • •	

Here are three things that my Uni Pathways teacher thinks I should remember for when I am doing this kind of study in the future
• • •

University

What questions do you still have about University after taking part in Uni Pathways?
•   •   •

Reflecting on Uni Pathways

What did you most enjoy about Uni Pathways?
•   •   •

What did you find challenging about the programme?	How did you overcome these challenges?
• • •	• • •

Appendix 1 – Referencing correctly

When you get to university, you will need to include references in the assignments that you write, so we would like you to start getting into the habit of referencing in your Brilliant Club assignment. This is really important, because it will help you to avoid plagiarism. Plagiarism is when you take someone else's work or ideas and pass them off as your own. Whether plagiarism is deliberate or accidental, the consequences can be severe. In order to avoid losing marks in your final assignment, or even failing, you must be careful to reference your sources correctly.

What is a reference?

A reference is just a note in your assignment which says if you have referred to or been influenced by another source such as book, website or article. For example, if you use the internet to research a particular subject, and you want to include a specific piece of information from this website, you will need to reference it.

Why should I reference?

Referencing is important in your work for the following reasons:

- It gives credit to the authors of any sources you have referred to or been influenced by.
- It supports the arguments you make in your assignments.
- It demonstrates the variety of sources you have used.
- It helps to prevent you losing marks, or failing, due to plagiarism.

When should I use a reference?

You should use a reference when you:

- Quote directly from another source.
- Summarise or rephrase another piece of work.
- Include a specific statistic or fact from a source.

How do I reference?

There are a number of different ways of referencing, and these often vary depending on what subject you are studying. The most important to thing is to be consistent. This means that you need to stick to the same system throughout your whole assignment. Here is a basic system of referencing that you can use, which consists of the following two parts:

1. **A marker in your assignment**: After you have used a reference in your assignment (you have read something and included it in your work as a quote, or re-written it your own words) you should mark this is in your text with a number, e.g. [1]. The next time you use a reference you should use the next number, e.g. [2].
2. **Bibliography**: This is just a list of the references you have used in your assignment. In the bibliography, you list your references by the numbers you have used, and include as much information as you have about the reference. The list below gives what should be included for different sources.

    a. **Websites** – Author (if possible), title of the web page, website address, [date you accessed it, in square brackets].

    E.g. Dan Snow, 'How did so many soldiers survive the trenches?', http://www.bbc.co.uk/guides/z3kgjxs#zg2dtfr [11 July 2014].

    b. **Books** – Author, date published, title of book (in italics), pages where the information came from.

    E.g. S. Dubner and S. Levitt, (2006) *Freakonomics*, 7-9.

    c. **Articles** – Author, 'title of the article' (with quotation marks), *where the article comes from* (newspaper, journal etc.), date of the article.

    E.g. Maev Kennedy, 'The lights to go out across the UK to mark First World War's centenary', Guardian, 10 July 2014.

Notes

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