

# Lesson Plan

## IMVR LESSON PLAN

# 3D Measurement

<b>Learning Area</b>	Mathematics	<b>Kit</b>	Lumination Immersive Virtual Reality (IMVR) Kit (Lumination AR/VR Education Kit if using devices)
<b>Year Level</b>	Year 9-10	<b>Duration</b>	1x 60 minute Lesson

### Introduction/Description

Visualising 3D Mathematics is often difficult when viewed in a 2D representation (e.g. on a page). Using Geogebra Mixed Reality and Cospaces, students will be able to view 3D solids in a unique way to understand their features and solve related problems.

### Learning Intentions

Students will solve abstract and practical problems involving 3D solids as well as develop an appreciation for unique 3D constructions such as the Mobius Strip and Lissajous Curve

### Task Summary

Students will explore 3D Mathematical solids in Geogebra Mixed Reality as well as practise their skills in creating and solving composite solids problems in Cospaces

### Preparation

Students are expected to:

- Have some background knowledge on using Immersive Reality (IMVR) Headsets.
- Have some background in using Cospaces
- Have background skills in solving volume problems involving simple and composite solids

Teachers should make sure that:

- Devices are charged (if using)
- Presentation slide deck has been checked.
- A copy of the Student Digital Notebook has been distributed to students and they have downloaded/ made a copy for themselves.

- Students are divided into pairs or groups depending on how many devices are available. A suggested rotation cycle may be:

Group	Round 1	Round 2	Round 3
Group 1	IMVR	Fluency	AR
Group 2	AR	IMVR	Fluency
Group 3	Fluency	AR	IMVR



*This may differ based on student numbers and number of IMVR headsets/ devices.*

## Resources

### **Hardware**

- IMVR Headsets
- Mobile Devices
- Student Laptops
- Headphones
- Internet Access
- Smartboard/TV

### **Tasks/Presentations**

-  3D Measurement - Student Digital Notebook
-  3D Measurement - Teaching Deck
- [VR Safety Poster](#)

### **VR Experiences**

- [GeoGebra Mixed Reality](#)  
*GeoGebra Mixed Reality allows you to manipulate objects in a 3D space*

### **Websites**

- [Cospaces](#)  
*Open a suite of intuitive built-in tools to create anything in 3D! Use existing assets from the library, building blocks to model your own objects, or upload external files.*
- [Mathspace \(Composite Solids\)](#)  
*Some examples of problems which could be created and solved in the lesson*


## Other Learning Areas

- Digital Technologies

# Learning Sequence

1

Introduction  
(8-10 mins)

- Ask students copy and complete the table from page 2 of the  3D Mathematics - Student Digital Notebook
- Go through the responses as the class and address any questions or misconceptions regarding the formulas

2

Development  
(40 - 45 min)

Introduce the stations students will engage in

## **Station based learning**


*Station-based Learning in 10-15 min interval rotations*

### Station 1 - IMVR

In groups, engage with the the various prompts available on GeoGebra Mixed Reality, including:

- 3D Solids
- Mobius Strip
- Lissajou Curve

Students answer the questions on page 3 of the

 3D Mathematics - Student Digital Notebook

### Station 2 - AR


Students use Cospaces to recreate a 3D solid composite problem of their own creation or one found in their learning resource (e.g. textbook, online maths software, etc.). The composite solid should include

- At least two 3D solids
- Relevant measurements
- What will the age groups be?
- What facilities will be required?

How to create a 3D composite solid in CoSpaces

1. Select "Merge Cube"
2. Select "Library"
3. Select "Building"
4. Select "Three-Dimensional" to import various 3D solids
5. Select "Flat" to annotate relevant measurements

Students answer the problems on pages 4-5 of the

 3D Mathematics - Student Digital Notebook

### Station 3 - Applications

Students will research the internet for applications of calculating surface area and volume. They will answer the following prompting questions:


- "Calculating surface area can help in real life situations such as"
- "Calculating volume can help in real life situations such as"

Following this students will come up with a problem for other students to solve involving the situations they have come up with.

3

Conclusion  
(40-45 mins)

Students complete the reflection on page 6 of the

 3D Mathematics - Student Digital Notebook

## Additional Teaching Notes

Students can complete each other's 3D composite solid problems as a homework task or the following lesson.

Text boxes and lines can be used in Cospaces to annotate the 3D composite solids

There are many other models in the "Geogebra Mixed Reality" application. They may provide student enrichment opportunities outside the scope of the high school syllabus.



## Modifications

### Adaptations

Students could adjust the complexity of the problems depending on their level of understanding (e.g. simple 3D solids or more difficult applied measurement questions)

### Extension Ideas

Students could explore the different 3D graphing features available in GeoGebra Mixed Reality

- Students could explore the construction of the football from a regular icosahedron/icosahedron Football resources:
  -  All UK football road signs are wr...
  -  Geometry of Footballs and the C...
- Students can further research the Sierpinski Triangle Resources:  
<https://nrich.maths.org/4757>

# Curriculum Connections

Australian Curriculum	NSW Curriculum	VIC Curriculum
<p>Year 10 - Mathematics</p> <p>Solve problems involving surface area and volume for a range of prisms, cylinders and composite solids <b>ACMMG242</b></p>	<p>Stage 5 - Mathematics</p> <p>calculates the surface areas of right prisms, cylinders and related composite solids <b>MA5.2-11MG</b></p> <p>applies formulas to calculate the volumes of composite solids composed of right prisms and cylinders <b>MA5.2-12MG</b></p>	<p>Levels 9 &amp; 10 - Mathematics</p> <p>Calculate the surface area and volume of cylinders and solve related problems <b>VCMMG313</b></p> <p>Solve problems involving the surface area and volume of right prisms <b>VCMMG314</b></p> <p>Solve problems involving surface area and volume for a range of prisms, cylinders and composite solids <b>VCMMG343</b></p>

## Cross-Curriculum Priorities

- ☐ Aboriginal and Torres Strait Islander Histories and Cultures
- ☐ Asia and Australia's Engagement with Asia
- ☐ Sustainability

## Capabilities

- ☐ Literacy
- ☒ Numeracy
- ☒ ICT Capability
- ☒ Critical and Creative Thinking
- ☐ Personal & Social Capability
- ☐ Ethical Understanding
- ☐ Intercultural Understanding