Healthcare in the Himalayas

Drones To The Rescue

TEACHER RESOURCE PACK – YEARS 7-10

She Maps

All units of work designed and created by She Maps are linked to the Australian Curriculum across multiple learning areas both inside and outside the STEM-identified subjects.

By using these programs you help to equip your students with the necessary STEM skills and knowledge that will enable them to engage with the careers of the future.

Working in collaboration with schools we set out to achieve the five strategies of action outlined in the Australian STEM education strategy.

This includes:

1. Increasing student STEM ability, engagement, participation, and aspiration

2. Increasing teacher capability and STEM teaching quality

3. Supporting STEM education opportunities within school systems

4. Facilitating effective partnerships with tertiary education providers, business and industry

5. Building a strong evidence base.

LESSON SEQUENCE

Years 7— 10 Unit Overview

Nepal has 8 of the world's 10 tallest mountains, including the highest mountain in the world – Mt Everest! Although undeniably beautiful, life in the Himalayas can be complicated by these enormous mountains. It can make it difficult to transport essential items such as food and medicine to some communities. Access to healthcare is a challenge in many remote regions of Nepal, as patients and healthcare workers have to walk for hours or even a full day along steep, winding tracks between the village and the nearest hospital.

How can drones help?

CHALLENGE:

Nepal Flying Labs needs assistance from you to design and plan a drone system that will fly medical samples and/or medication from medical centres into central hospitals.

LEARNING INTENTION

Design and plan a drone system that will simulate the transportation of samples and/or medication between central hospitals and medical outposts in remote mountainous regions.

SUCCESS CRITERIA

- evaluate the fastest system for medical delivery in remote areas of Nepal

- design and construct a model drone attachment that will successfully simulate a method to carry medical supplies and patient samples

- manually and autonomously fly a drone to simulate delivery of the medical supplies

- understand how drones can be used to overcome humanitarian challenges.

Note: This unit has been designed as a transdisciplinary unit over 10 weeks. It has been designed in modules to allow the unit to be taught by either a single teacher or in collaboration across subject departments. Content descriptions have been provided for each module which can be modified to support the requirements of your students and school approach.

RESOURCES

Assessment rubrics
Healthcare in the Himalayas Drones to the Rescue Story Map
CARS Checklist Poster
Activity sheet 1 –Research Retrieval Sheet – Years 7-8
Activity sheet 1 –Research Retrieval Sheet – Years 9-10
Activity sheet 2 – Calculating Distances – Years 7-10
Teacher notes
Teacher reference: Demonstration of Mission

Years 7 — 10 Lesson Sequence

GEOGRAPHY	TECHNOLOGIES	MATHEMATICS

See curriculum mapping document for details of Content descriptions and Achievement standards.

Unit Sequence

Strands and sub-strands	Core Concepts	Lesson Sequence	Activities and Assessment Opportunities
Knowledge and understanding Skills – • Questioning and researching using geographic methods • Interpreting and analysing geographical data and information • Concluding and decision-making Data representation and interpretation	• Place and space • Interconnections • Identity and diversity • Problem solving	**Module 1. Nepal – Geography focus – Contextual Framing for task (5 x 50 mins)** **Content descriptions:** **V8.** Year 7 - ACHGK043 ACHGK044 ACHGK045 ACHGK046 ACHGS047 ACHGS048 ACHGS049 ACHGS050 ACHGS051 ACHGS052 ACMSP169 Year 8 - ACHGK048 ACHGK049 ACHGK050 ACHGK053 ACHGS055 ACHGS056 ACHGS057 ACHGS058 ACHGS059 ACHGS060 Year 9 - ACHGK066 ACHGS063 ACHGS064 ACHGS065 ACHGS066 ACHGS067 ACHGS068 ACHGS069 ACMSP228 Year 10 - ACHGK076 ACHGK077 ACHGK079 ACHGK081 ACHGS072 ACHGS073 ACHGS074 ACHGS075 ACHGS076 ACHGS077 ACHGS078 **V9** Year 7 - AC9HG7K05 AC9HG7K06 AC9HG7K07 AC9HG7S01 AC9HG7S02 AC9HG7S03 AC9HG7S04 AC9HG8S04 Year 8 - AC9HG8K01 AC9HG8K03 AC9HG8K05 AC9HG8S01 AC9HG8S02 AC9HG8S03 Year 9 - AC9HG9K05 AC9HS5S01 AC9HG9S02 AC9HG9S03 AC9HG9S04 Year 10 - AC9HG10K05 AC9HG10K06 AC9HG10K08 AC9HG10S01 AC9HG10S02 AC9HG10S03 AC9HG10S04	**Formative** – student responses – what they know about Nepal prior to research – student ability to gather and work with statistics – student research responses **Summative** – student slideshow presentations **Resources** Healthcare in the Himalayas Drones to the Rescue Story Map Activity sheet 1 – Research Retrieval Sheet – Years 7-8 Activity sheet 1 – Research Retrieval Sheet – Years 9-10 CARS Checklist Poster

Knowledge and understanding Skills –
- Questioning and researching using geographic methods
- Interpreting and analysing geographical data and information
- Concluding and decision-making

Data representation and interpretation

- Place and space
- Interconnections
- Identity and diversity
- Problem solving

In this module students will use Geographical skills to research the people and geographic features of Nepal and the Himalayas.

Researching the communities who live in the mountainous regions of Nepal. (3 x 50 mins)

Show the *Nepal* section points 1 and 2 of the Healthcare in the Himalayas Drones to the Rescue Story Map as a visual guide for students.
- Ask students if they know where Nepal is. Have them share what they know about Nepal and the Himalayas.

Navigate to point 3 on the Story Map.
- Set the scene for learning by demonstrating to students how remote Pyuthan is and how even more remote the surrounding villages are. Explain that we will be completing a drone mission but first they must complete a research task to learn more about Nepal. They will present their research in the form of a slideshow presentation.
  - Ask students to frame their inquiry with an overall inquiry question. Brainstorm some possible questions (depending on curriculum requirement for year level). For example, *'What are the factors that affect the liveability of Nepal?'*, *'How did the earthquake of 2015 affect the people of Nepal?'*, *'How are the people of Nepal interconnected locally and globally?'* or *'How does infrastructure and services affect the wellbeing of the people of Nepal?'*
  - Watch these videos on Fact versus Opinion and Evaluating sources.
  - Display and discuss the CARS Checklist Poster
  - Students research using the websites linked in the StoryMap along with other credible sources they can locate and record their answers using Activity sheet 1 – Research Retrieval Sheet – Years 7-8 or Activity sheet 1 – Research Retrieval Sheet – Years 9-10

Formative

– student responses – what they know about Nepal prior to research

– student ability to gather and work with statistics

– student research responses

Resources

Healthcare in the Himalayas Drones to the Rescue Story Map

Activity sheet 1 – Research Retrieval Sheet – Years 7-8

Activity sheet 1 – Research Retrieval Sheet – Years 9-10

CARS Checklist Poster

Video – Facts VS Opinion

Video – How to Evaluate Sources for Reliability

Research sites:

CIA World Factbook

Wolfram Alpha - Australia VS Nepal

United Nations Sustainable Development Goals 2015-2030

Nepal Economic Forum

Knowledge and understanding Skills –
• Questioning and researching using geographic methods
• Interpreting and analysing geographical data and information
• Concluding and decision-making
Data representation and interpretation
	• Place and space
	• Interconnections
	• Identity and diversity
	• Problem solving
		Creation of Slideshow on Nepal and its people. (2 x 50 mins depending on student skill level)
		
		• Students create a slideshow about Nepal. There are many online slideshow creation sites. Could also be made in PowerPoint or as a Google Slide. Slideshow must include synthesised answers to all questions on the research retrieval sheet and might include:
		
		    • Text and images
		    • Data tables and graphs
		    • Infographics
		    • Sound
		    • Video
		    • Animations to explain processes or changes over time.
			Summative – student slideshow presentations
			Resources
			Healthcare in the Himalayas Drones to the Rescue Story Map
			Activity sheet 1 – Research Retrieval Sheet – Years 7-8
			Activity sheet 1 – Research Retrieval Sheet – Years 9-10
			CARS Checklist Poster

Knowledge and understanding Number Knowledge and understanding • Technologies and society • Technologies context: Materials and technologies specialisations Processes and production skills • Investigating and defining	• Place and space • Interconnections • Identity and diversity • Problem solving • Systems • Interactions and impacts • Systems thinking • Design thinking • Technologies processes and production skills • Enterprise skills and innovation	**Module 2. The Challenge of Distance (50 mins)** **Content descriptions:** **V8.4** Year 7 - ACHGK043 ACHGK044 ACHGK045 ACHGK046 ACTDEK029 ACTDEK034 ACTDEP035 Year 8 - ACHGK048 ACHGK049 ACHGK050 ACHGK053 ACTDEK029 ACTDEK034 ACTDEP035 Year 9 - ACHGK066 ACHGS068 ACHGS069 ACTDEK040 ACTDEK041 ACTDEK046 ACTDEK047 ACTDEP048 Year 10 - ACHGK076 ACHGK077 ACHGK079 ACHGK081 ACHGS077 ACHGS078 ACTDEK040 ACTDEK041 ACTDEK046 ACTDEK047 ACTDEP048 **V9** Year 7 - AC9HG7K05 AC9HG7K06 AC9HG7K07 AC9HG7S01 AC9HG7S02 AC9HG7S03 AC9HG7S04 AC9HG8S04 AC9M7N09 AC9TDE8K01 AC9TDE8K02 AC9TDE8P01 Year 8 - AC9HG8K01 AC9HG8K03 AC9HG8K05 AC9HG8S01 AC9HG8S02 AC9HG8S03 AC9M8N05 AC9TDE8K01 AC9TDE8K02 AC9TDE8P01 Year 9 - AC9HG9K05 AC9TDE10K01 AC9TDE10K02 AC9TDE10K06 AC9TDE10P01 Year 10 - AC9HG10K05 AC9HG10K06 AC9HG10K08 AC9TDE10K01 AC9TDE10K02 AC9TDE10K06 AC9TDE10P01	**Formative** – student responses to activity sheet 2. **Resources** Healthcare in the Himalayas Drones to the Rescue Story Map Activity sheet 2 – Calculating Distances-Years 7-10 Bar Model method for modelling data (see Teachers' guide)

Knowledge and understanding
Number

Knowledge and understanding
- Technologies and society
- Technologies context:
  Materials and technologies
  specialisations

Processes and production skills
- Investigating and defining

- Place and space
- Interconnections
- Identity and diversity
- Problem solving
- Systems
- Interactions and impacts
- Systems thinking
- Design thinking
- Technologies processes and production skills
- Enterprise skills and innovation

Defining the challenges faced by communities in Nepal. (50 mins)

In this module students will use Geographical, Mathematical and Technologies skills to understand the challenge presented by the mountainous terrain and Technologies to understand the needs of the people who live in the mountains of Nepal.

Show the *Challenge of Distance* section of the Healthcare in the Himalayas Drones to the Rescue Story Map as a visual guide for students.

- Watch Nepal Flying Lab's Medical Delivery Challenge

- Discuss what goal Uttam Pudasaini is asking the students to achieve.

- Go through Activity sheet 2 – Calculating Distances-Yr7-10 with students and examine the Bar Model method that students will use in the activity. Students complete activity in pairs.

- Discuss the design of the drone attachment and consider if that would work in prototype form attached to a microdrone. Consider the competing factors that would have affected the design including mass and capacity of cargo, size of drone required to lift cargo, distances to travel, sustainability of solution, ethics of cargo carrier design, safety requirements etc. Ask students:

  - What competing factors did Uttam's team have to consider when they designed their drone cargo system?
  - What safety factors would Uttam and his team need to consider?
  - What ethical considerations need to be taken into account when delivering medical aid with a drone?

- Explain to students that during the next lesson, students will design a system for a drone to transport medical supplies and patient samples between the hospital in Pyuthan and the surrounding remote villages.

Formative – student responses to activity sheet 2.

Resources

Healthcare in the Himalayas Drones to the Rescue Story Map

Activity sheet 2 – Calculating Distances-Years 7-10

Bar Model method for modelling data (see Teachers' guide)

Unit Sequence

Strands and sub-strands	Core Concepts	Lesson Sequence	Activities and Assessment Opportunities
Knowledge and understanding Number Measurement Knowledge and understanding • Technologies and society • Technologies context: Materials and technologies specialisations • Digital systems Processes and production skills • Generating and designing • Evaluating	• Place and space • Understanding • Problem solving • Systems • Interactions and impacts • Systems thinking • Design thinking • Technologies processes and production skills • Enterprise skills and innovation	**Module 3. Design a solution (50 mins)** **Content descriptions:** **V8.4** Year 7 - ACHGK044 ACTDEK029 ACTDEK034 ACTDEP036 ACTDEP038 Year 8 - ACHGK048 ACHGK053 ACTDEK029 ACTDEK034 ACTDEP036 ACTDEP038 Year 9 - ACHGK066 ACHGS071 ACTDEK040 ACTDEK041 ACTDEK046 ACTDEK047 ACTDEP048 ACTDEP049 Year 10 - ACHGK081 ACHGS080 ACTDEK040 ACTDEK041 ACTDEK046 ACTDEK047 ACTDEP048 ACTDEP049 **V9** Year 7 - AC9HG7K06 AC9HG7S05 AC9M7N09 AC9M7M01 AC9M7M04 AC9M7M05 AC9TDE8K01 AC9TDE8K06 AC9TDE8P02 AC9TDE8P04 AC9TDI8K01AC9TDI8K02 AC9TDI8P07 Year 8 - AC9HG8K01 AC9HG8K05 AC9HG8S05 AC9M8N05 AC9M8M01 AC9M8M06 AC9TDE8K01 AC9TDE8K06 AC9TDE8P02 AC9TDE8P04 AC9TDI8K01 AC9TDI8K02 AC9TDI8P07 Year 9 - AC9HG9K05 AC9HG9S05 AC9M9M03 AC9TDE10K01 AC9TDE10K02 AC9TDE10K06 AC9TDE10P02 AC9TDE10P04 AC9TDI10K01AC9TDI10P07 Year 10 - AC9HG10K08 AC9HG10S05 AC9M10M03 AC9TDE10K01 AC9TDE10K02 AC9TDE10K06 AC9TDE10P02 AC9TDE10P04 AC9TDI10K01 AC9TDI10P07	**Formative –** - student success criteria statements - student designs (labelled diagrams) **Summative** - photos of design and planning process. **Resources** Healthcare in the Himalayas Drones to the Rescue Story Map Teacher reference: Demonstration of Mission Tips for creating a gender-inclusive learning environment

Knowledge and understanding

Number

Measurement

Knowledge and understanding
- Technologies and society
- Technologies context: Materials and technologies specialisations
- Digital systems

Processes and production skills
- Generating and designing
- Evaluating

- Place and space
- Understanding
- Problem solving
- Systems
- Interactions and impacts
- Systems thinking
- Design thinking
- Technologies processes and production skills
- Enterprise skills and innovation

Design an attachment for the drone to carry the medical supplies from the hospital to the village. (50 mins)

In this module students will use Geography, Technologies and Mathematics skills to design solutions to problems faced by communities in Nepal. Digital Technologies elements are optional depending on student cohort.

Show the *Design Your Own Solution* section of the Healthcare in the Himalayas Drones to the Rescue Story Map as a visual guide for students.

- Explain to the class that they will be simulating a mission in the Himalayas using the microdrone. Discuss as a class the type of items the drone would be carrying. Ask students:
  - How much weight can the drone carry before it becomes unstable?
  - Will the attachment affect the way the drone flies?
  - Will the delivery be safe when you land?
  - How will the hardware specifications will affect performance and what hardware and software will be needed to control the drone?
  - How will data be transmitted and secured between the drone and the networked locations to ensure others don't tamper with the code?
- Students create a success criteria statement, recording what the successful drone mission must accomplish. Students should consider the competing factors, safety characteristics and ethical considerations discussed in the previous lesson.
- Using a microdrone (or sub-2kg drone) as a model, in groups of 3, students
  - develop, modify and communicate design ideas by applying design thinking, creativity, innovation and enterprise skills to design a solution to allow a drone to safely carry and deliver cargo
  - could use pencil and paper or digital technologies to create design plans

Formative –
- student success criteria statements
- student designs (labelled diagrams)

Summative - photos of design and planning process

Resources

Healthcare in the Himalayas Drones to the Rescue Story Map

Teacher reference: Demonstration of Mission

Tips for creating a gender-inclusive learning environment

| Knowledge and understanding

Number

Measurement

Knowledge and understanding
• Technologies and society
• Technologies context: Materials and technologies specialisations
• Digital systems
Processes and production skills
• Generating and designing
• Evaluating | • Place and space
• Understanding
• Problem solving
• Systems
• Interactions and impacts
• Systems thinking
• Design thinking
• Technologies processes and production skills
• Enterprise skills and innovation | • may measure the drone and perform necessary calculations including length and mass
• consider a range of materials, components, tools and equipment needed for their solution and label their diagram with materials, design ideas and measurements using technical terms and graphical representation techniques. There are opportunities for students to use 3D printing software to design their solutions
• design and prototype the user experience of the drone interface for people in the remote villages
take photographs and screenshots of their design process and design plans.

• Ask students to reflect on their success criteria statement and consider how the design will affect the way the drone flies, how it will land with the medical cargo onboard (or lower it without landing) and whether it will meet the criteria for success. Students can adjust their designs, if required | **Formative** –
- student success criteria statements
- student designs (labelled diagrams)

Summative - photos of design and planning process.

Resources

Healthcare in the Himalayas Drones to the Rescue Story Map

Teacher reference: Demonstration of Mission

Tips for creating a gender-inclusive learning environment |
| Knowledge and understanding

Number

Measurement

Knowledge and understanding
• Digital systems
• Technologies and society
• Technologies context: Materials and technologies specialisations
Processes and production skills
• Producing and implementing
• Evaluating
• Collaborating and managing | • Place and space
• Understanding
• Problem solving
• Systems
• Interactions and impacts
• Systems thinking
• Design thinking
• Technologies processes and production skills
• Enterprise skills and innovation | **Module 4. Build a prototype (50 mins)**
Content descriptions:
V8.4
Year 7 - ACHGK044 ACTDEK029 ACTDEK034 ACTDEP037 ACTDEP038
Year 8 - ACHGK048 ACHGK053 ACTDEK029 ACTDEK034 ACTDEP037 ACTDEP038
Year 9 - ACHGK066 ACHGS071 ACTDEK040 ACTDEK041 ACTDEK046 ACTDEK047 ACTDEP048 ACTDEP050 ACTDEP051
Year 10 - ACHGK081 ACHGS080 ACTDEK040 ACTDEK041 ACTDEK046 ACTDEK047 ACTDEP048 ACTDEP050 ACTDEP051
V9
Year 7 - AC9HG7K06 AC9HG7S05 AC9M7N09 AC9M7M01 AC9M7M04 AC9M7M05 AC9TDE8K01 AC9TDE8K01 AC9TDE8K06 AC9TDE8P02 AC9TDE8P04
Year 8 - AC9HG8K01 AC9HG8K05 AC9HG8S05 AC9M8N05 AC9M8M01 AC9M8M06 AC9TDE8K01 AC9TDE8K06 AC9TDE8P02 AC9TDE8P04
Year 9 - AC9HG9K05 AC9HG9S05 AC9M9M03 AC9TDE10K01 AC9TDE10K02 AC9TDE10K06 AC9TDE10P03 AC9TDE10P04
Year 10 - AC9HG10K08 AC9HG10S05 AC9M10M03 AC9TDE10K01 AC9TDE10K02 AC9TDE10K06 AC9TDE10P03 AC9TDE10P04 | **Formative** – student prototypes
- student reflections on success criteria statements

Summative - photos and video of building process

Resources

Healthcare in the Himalayas Drones to the Rescue Story Map

Teacher reference: Demonstration of Mission

Teacher notes

Tips for creating a gender-inclusive learning environment |

Knowledge and understanding	• Place and space	*Build an attachment for the drone to carry the medical supplies from the hospital to the village. (50 mins)*	**Formative** – student prototypes
Number	• Understanding	In this module students will use Geography knowledge, Technologies and Mathematics skills to implement solutions to problems faced by communities in Nepal. Set up an area in the classroom that will simulate the route between Pyuthan hospital and the village in Majhkot. The village should be higher than the hospital. See Teacher notes and video of flight example.	- student reflections on success criteria statements
Measurement	• Problem solving		**Summative** - photos and video of building process
Knowledge and understanding	• Systems		
• Digital systems	• Interactions and impacts	Show the *Build a Prototype* section of the Healthcare in the Himalayas Drones to the Rescue Story Map as a visual guide for students.	**Resources**
• Technologies and society	• Systems thinking	• In groups, using available design material, groups follow their design plans and build their drone cargo carrier. Students:	Healthcare in the Himalayas Drones to the Rescue Story Map
• Technologies context: Materials and technologies specialisations	• Design thinking	• build the cargo carrier and attach it to their drone. There are opportunities for students to use a 3D printer to create their solutions.	Teacher reference: Demonstration of Mission
Processes and production skills	• Technologies processes and production skills	• test the success of the drone and attachment by connecting the microdrone (or sub-2kg drone) to the tablet device and manually flying the simulated drone course between the hospital and village.	Teacher notes
• Producing and implementing	• Enterprise skills and innovation	• reflect on their success criteria statement	Tips for creating a gender-inclusive learning environment
• Evaluating		• change design to create a successful flight and annotate their design plans	
• Collaborating and managing		• take photographs of the construction process and annotated design plans.	

Years 7 — 10 Lesson Sequence

Unit Sequence			
Strands and sub-strands	**Core Concepts**	**Lesson Sequence**	**Activities and Assessment Opportunities**

Knowledge and understanding
Measurement
Processes and Production Skills
  • Investigating and defining
  • Generating and designing
  • Producing and implementing
  • Evaluating
	• Place and space
	• Understanding
	• Fluency
	• Problem solving
	• Specification
	• Algorithms
	• Implementation
	• Impact
	• Interactions
	• Systems thinking
	• Design thinking
	• Computational thinking
	• Enterprise skills and innovation
		Module 5. Deliver a simulated solution (2 x 50 mins)
		Content descriptions:
		V8.4
		Year 7 - ACHGK044 ACHGS052 ACHGS053 ACHGS054 ACTDIK023 ACTDIP027 ACTDIP028 ACTDIP029 ACTDIP030 ACTDIP031
		Year 8 - ACHGK048 ACHGS060 ACHGS061 ACHGS062 ACTDIK023 ACTDIP027 ACTDIP028 ACTDIP029 ACTDIP030 ACTDIP031
		Year 9 - ACHGK066 ACHGS070 ACHGS071 ACTDIK034 ACTDIK038 ACTDIK039 ACTDIK040 ACTDIK041 ACTDIK042
		Year 10 - ACHGK081 ACHGS079 ACHGS080 ACTDIK034 ACTDIK038 ACTDIK039 ACTDIK040 ACTDIK041 ACTDIK042
		V9
		Year 7 - AC9HG7K06 AC9HG7S05 AC9HG7S06 AC9M7M01 AC9M7M04 AC9M7M05 AC9TDI8K01AC9TDI8K02 AC9TDI8P04 AC9TDI8P05 AC9TDI8P06 AC9TDI8P07 AC9TDI8P08 AC9TDI8P09 AC9TDI8P10 AC9TDI8P11
		Year 8 - AC9HG8K01 AC9HG8K05 AC9HG8S05 AC9HG8S06 AC9M8M01 AC9M8M06 AC9TDI8K01AC9TDI8K02 AC9TDI8P04 AC9TDI8P05 AC9TDI8P06 AC9TDI8P07 AC9TDI8P08 AC9TDI8P09 AC9TDI8P10 AC9TDI8P11
		Year 9 - AC9HG9K05 AC9HG9S05 AC9HG9S06 AC9TDI10K01 AC9TDI10P04 AC9TDI10P05 AC9TDI10P06 AC9TDI10P08 AC9TDI10P09 AC9TDI10P10 AC9M9M03
		Year 10 - AC9HG10K08 AC9HG10S05 AC9HG10S06 AC9TDI10K01 AC9TDI10P04 AC9TDI10P05 AC9TDI10P06 AC9TDI10P08 AC9TDI10P09 AC9TDI10P10 AC9M10M03
		
		In this module students will use Technologies and Mathematics skills to implement digital solutions to problems faced by communities in Nepal.
			Formative –
			- drawn drone flight path
			- coded drone flight path
			Summative –
			- successful completion of drone safety checklist
			- photos and video of mission
			- screen capture of code
			- demonstration of successful drone mission
			Resources
			Pre-flight Safety Checklist
			Tips for creating a gender-inclusive learning environment

Knowledge and understanding

Measurement

Processes and Production Skills

- Investigating and defining
- Generating and designing
- Producing and implementing
- Evaluating

- Place and space
- Understanding
- Fluency
- Problem solving
- Specification
- Algorithms
- Implementation
- Impact
- Interactions
- Systems thinking
- Design thinking
- Computational thinking
- Enterprise skills and innovation

Design and Implement a Flight Path for a Drone Mission Simulation – Setting up the Drone Mission

Complete drone safety checklist in groups of 2 or 3 (10 mins)

- Using either Epicollect 5 and She Maps mini-drone checklist or a (laminated) printout of the Pre-flight Safety Checklist, lead students through their drone safety checklist.

Design and Implement a Flight Path for a Drone Mission Simulation – Plan the Drone Mission

Draw drone flight path and step out path in groups of 2 or 3 (20 mins

- Students create a user story to determine the path the drone will need to fly. For example, *'the villagers live in hilly areas. The drone will need to avoid obstacles. The drone will need to have a safe area to take off from for the return journey.'*
- Students design their flight path using drawing tools and take it in turns to step out their mission to determine distance and types of turns required by their drone to complete the mission.
- Remind students that their flight path will need to indicate where the drone increases elevation to get up to the village.
- Students design algorithms involving nested control structures or logical operators and represent them as flowcharts and pseudocode.
- Students trace algorithms to predict output for given inputs and to identify errors, modifying and communicating alternative code designs as required.
- Students should test their mission and validate algorithms and programs by comparing their output against their trace test and debug unexpected errors.

Formative –

- drawn drone flight path
- coded drone flight

Summative –

- successful completion of drone safety checklist
- photos and video of mission
- screen capture of code
- demonstration of successful drone mission

Resources

Pre-flight Safety Checklist

Tips for creating a gender-inclusive learning environment

Knowledge and understanding	• Place and space	Design and Implement a Flight Path for a Drone Mission Simulation – Code the Drone Mission	Formative –
	• Understanding		- drawn drone flight path
Measurement	• Fluency	*Code and test (iteratively) drone flight path in groups of 2 or 3 (40 mins)*	**-** coded drone flight
Processes and Production Skills	• Problem solving		
	• Specification	• Using your app of choice, students connect the microdrone (or sub-2kg drone) to the tablet device and program sections of their flight path and test the code iteratively until they have programmed the whole mission.	Summative –
• Investigating and defining	• Algorithms		- successful completion of drone safety checklist
• Generating and designing	• Implementation	• Remind students that their code will need to increase elevation to get up to the village.	- photos and video of mission
• Producing and implementing	• Impact	• Students should modify and debug programs by applying algorithms and data structures to improve the efficiency of their code including with the attachment on the drone.	- screen capture of code
• Evaluating	• Interactions		- demonstration of successful drone mission
	• Systems thinking	• Students should take photos and videos of their mission and capture a screen shot of their code.	
	• Design thinking	• Students should evaluate their solutions against the design criteria, user stories and consider possible future impact and opportunities for enterprise solutions and prepare to demonstrate and explain their solution to the class.	**Resources**
	• Computational thinking		Tips for creating a gender-inclusive learning environment
	• Enterprise skills and innovation	**Design and Implement a Flight Path for a Drone Mission Simulation – Complete the Drone Mission**	
		Demonstrate drone mission in groups of 2 or 3 (30 mins)	
		• Student groups take it in turns to demonstrate their successfully coded missions carrying their cargo carriers and explain to the class how their solution meets needs of the people in the surrounding villages considering sustainability factors, possible future impact and opportunities for enterprise.	

Extension

If you would like to deepen the learning from of this lesson and/or provide extension for students, we recommend that:

- Students use sophisticated control structures and logical operators to automate and streamline their code to make it more efficient considering future impact of their solution.
- Students create a business proposal to present a case for an enterprise solution to solve the problem.

ACTIVITY SHEETS

Healthcare in the Himalayas

Drones to the Rescue

ACTIVITY SHEET 1: RESEARCH RETRIEVAL SHEET

YEARS 7-8

www.shemaps.com

ACTIVITY SHEET 1: RESEARCH RETRIEVAL SHEET

My inquiry question:

_____

_____

_____

1. Source a map showing the location of Nepal in relation to Australia. Download and save it for your infographic. (Keep a copy of the website so you can give credit.)

2. Source a picture of the flag of Nepal. Download and save it for your infographic. (Keep a copy of the website so you can give credit.)

3. What is the total land area of Nepal (km2)? _____

4. How does that compare to the total land area of Australia? _____

5. What is the population of Nepal? _____

6. How does that compare to the population of Australia? _____

7. What are the comparative population densities for Nepal and Australia? (People per km2)
    Nepal: _____   Australia: _____

8. What influences the Nepalese people who live in remote Himalayan villages? Consider the economic, cultural, spiritual and aesthetic value of where they live for example, working for industries located in remote places, connections to cultural and family groups, spiritual meaning of places and the perceived beauty of the area.

_____

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_____

_____

_____

9.   What challenges the Nepalese people who live in remote Himalayan villages face? Consider access to food, water and shelter and supporting infrastructure such as electricity, health services, sanitation, education and transportation.

_____

_____

10. Explain the diversity of the Himalayan mountains of Nepal including vegetation, elevation and geomorphological processes that contributed to their formation

_____

11. Identify the interconnections and effects of erosion and sedimentation produced by human activities on the quality of the environment in the remote Himalayan villages. Consider sanitation and transportation requirements and the impact they have on the landscape.

_____

_____

12a.   What significant event occurred in Nepal in 2015?

_____

_____

12b.   How did this impact people living in the remote mountain villages? Consider the environmental, economic and social impacts.

_____

_____

12c.   What services developed as a result of this significant event?

_____

_____

13.   Research other facts of interest that you'd like to include in your presentation.

_____

_____

References:

Keep a note of all images and sources of information used for your presentation.

Healthcare in the Himalayas

Drones to the Rescue

ACTIVITY SHEET 1: RESEARCH RETRIEVAL SHEET

YEARS 9 - 10

ACTIVITY SHEET 1: RESEARCH RETRIEVAL SHEET

My inquiry question:

_____

_____

_____

1. Source a map showing the location of Nepal in relation to Australia. Download and save it for your infographic. (Keep a copy of the website so you can give credit.)

2. Source a picture of the flag of Nepal. Download and save it for your infographic. (Keep a copy of the website so you can give credit.)

3. What is the total land area of Nepal (km2)? _____

4. What is the total land area of Australia (km2)? _____

5. What is the population of Nepal? _____

6. What is the population of Australia? _____

7. What are the comparative population densities for Nepal and Australia? (People per km2)

   Nepal: _____   Australia: _____

8. What are the Gross Domestic Product (GPD), Human Development Index (HDI) and Physical Quality of Life Index (PQLI) for Nepal compared with Australia? _____

9. Nepal GDP: _____ Australia GDP: _____

   Nepal HDI: _____ Australia HDI: _____

   Nepal PQLI: _____ Australia PQLI: _____

10. Which of the United Nations Sustainable Development Goals 2015-2030 are most relevant for the people living in remote Himalayan villages?

_____

11.   What challenges the Nepalese people who live in remote Himalayan villages face? Consider access to food, water and shelter and supporting infrastructure such as electricity, health services, sanitation, information and communication technologies, and transportation. Consider factors such as the Multidimensional Poverty Index (MDI), Press Freedom Index (PFI) and Fragile States Index (FSI) along with GDP, HDI and PQLI.

_____

_____

_____

12a.   What significant event occurred in Nepal in 2015?

_____

12b.   How did this impact people living in the remote mountain villages? Consider the environmental, economic and social impacts.

_____

_____

12c.   What services developed as a result of this significant event both locally and internationally?

_____

_____

_____

12d.   Has Nepal's Fragile States Index improved since 2015? State your reasoning.

_____

_____

_____

13.   Research other facts of interest that you'd like to include in your presentation.

_____

_____

_____

References:

Keep a note of all images and sources of information used for your presentation.

Healthcare in the Himalayas

Drones to the Rescue

ACTIVITY SHEET 2: CALCULATING DISTANCES

www.shemaps.com

ACTIVITY SHEET 2: CALCULATING DISTANCES

Using the map below, answer the following questions:

1. What is the elevation gain from the Pyuthan Hospital to the village of Majhkot? (You'll find this in the StoryMap) _____

2. Using a ruler, or a piece of string, estimate the distance between the Pyuthan Hospital and the village of Majhkot if you were to walk along the path (red). _____

3. Using a ruler, or a piece of string, estimate the distance between the Pyuthan Hospital and the village of Majhkot if you were to fly a drone (green). _____

4. Use the Bar Model Method to visualise the difference in distance between the drone flight and the walking distance to Pyuthan for the people living in Majhkot.

5. What percentage of the walking track is the drone flight path?

Pyuthan Hospital route to Majhkot
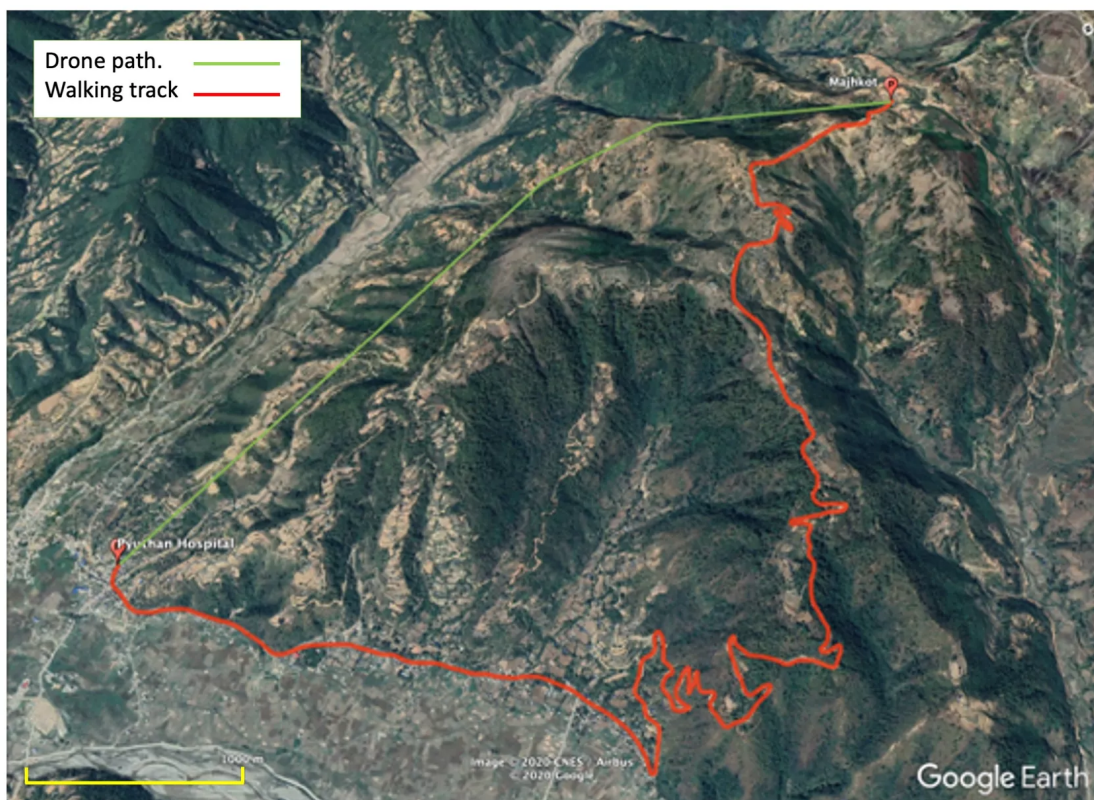
Time for some research! We want to work out average walking speed. In groups, time how long it takes each student to walk a set distance (e.g. around the oval, 100m down the football pitch). Use a table to record results for your class and calculate the average walking speed in km/hr.

6.   What is the average walking speed of your class?

_____

7.   At this rate, how long would it take to travel between Pyuthan Hospital and the village of

Majhkot? _____

8.   How might average walking speed change in the Himalayas?

_____

9.   The average flying speed of a DJI Phantom 4 Pro drone (like the one Uttam has) is 50 km/hr. How long would it take the drone to fly from Pyuthan Hospital to the village of Majhkot? _____

10. What might slow this down?

_____

11. Which method of transport would be faster to deliver medical supplies, and what is the time difference between the two options?

_____

12. Can you think of any other factors that might be important when deciding which mode of transport to use?

_____

TEACHER NOTES

HEALTHCARE IN THE HIMALAYAS - TEACHER NOTES

The classroom set-up

When flying microdrones indoors, the classroom should always be set up prior to any flying activity. Depending on your room size, there are two recommended room setup floor plans to guide you.

1. Safety first! Separate the classroom and establish a 'flight zone' for mission testing and a 'safe zone' where students can work on their code. No batteries should be in the drones within the 'safe zone', and students should not enter the 'flight zone' whilst there is an active drone in the air. Preferably, the drones should fly in the direction of a wall and not towards students.

2. When battery is in the drone and synched to the device, place the drone upside down on its landing mat. This will prevent accidental take off.

SETUP A

- - - - **Safety line**

——→ **Flight direction**

🔋 **Battery station**

📍 **Landing pad**
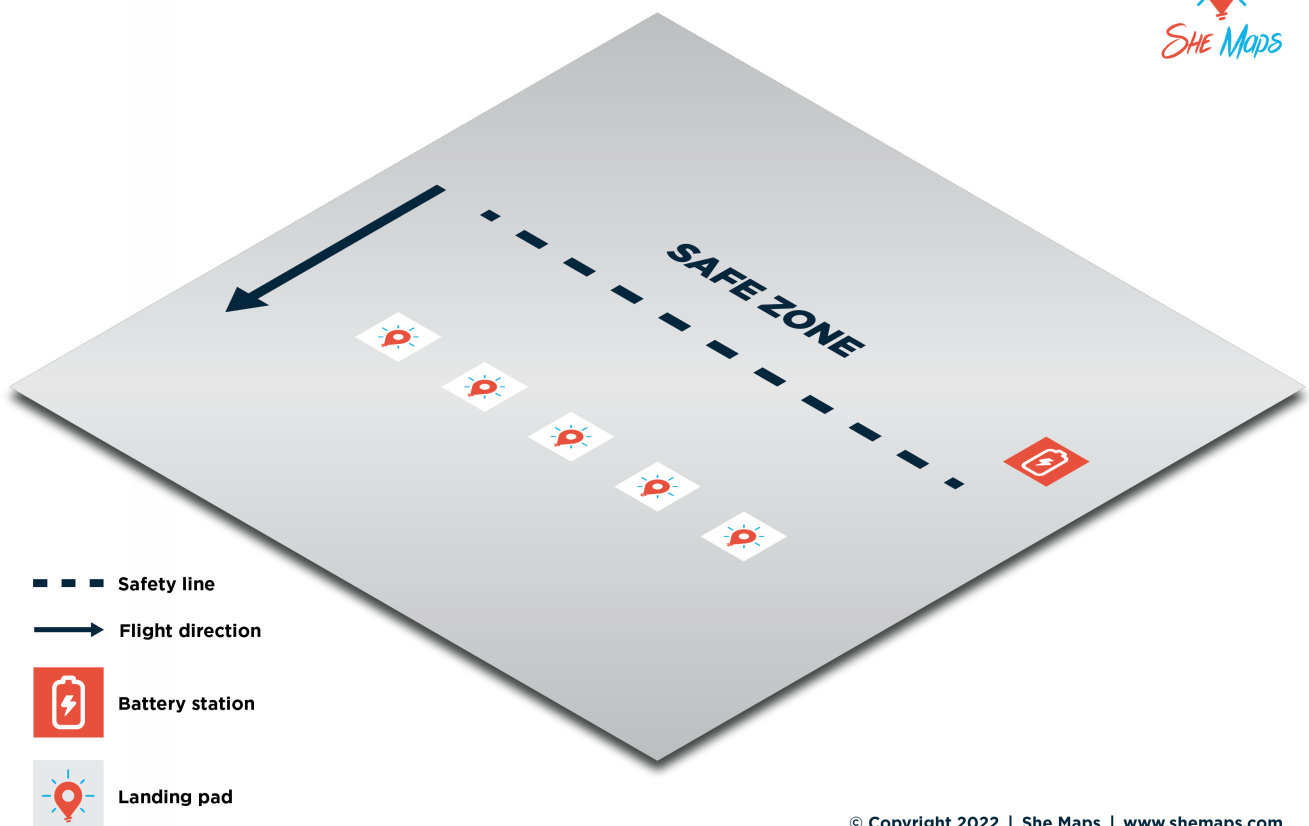
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SETUP B

Safety line

Flight direction

Battery station

Landing pad
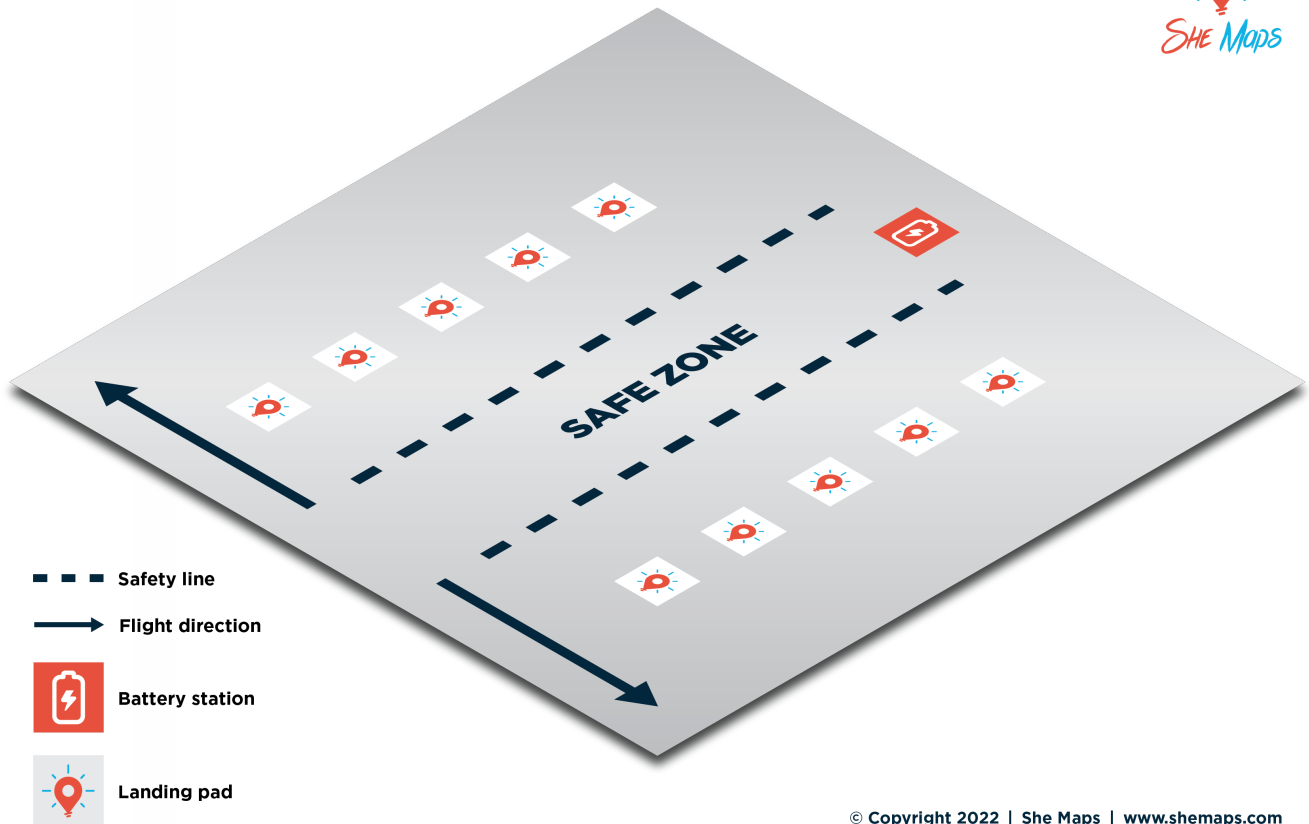
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The course

1. A "mountainous region" for the simulated course can be made from a variety of materials. These can include:

- pool noodles,
- cones,
- desks,
- material drapes or
- other building materials.

It should consist of obstacles that challenge the teams to fly in different ways. This should include direction and height (remembering for safety that drones should not fly above shoulder height).

2. Use two landing pads to establish the location of the Pyuthan Hospital and the village of Majhkot in your classroom. If safe to do so, you could put the location of Majhkot on top of a desk to simulate the increase in elevation in the Himalayas.

Tip

Secure the landing pads with tape so they don't move under the draft of the propellers.

EXAMPLE OF MANUAL FLIGHT

SAFE ZONE

- - - - **Safety line**

⟶ **Flight direction**

🔋 **Battery station**

Take off pad

Elevated landing pad
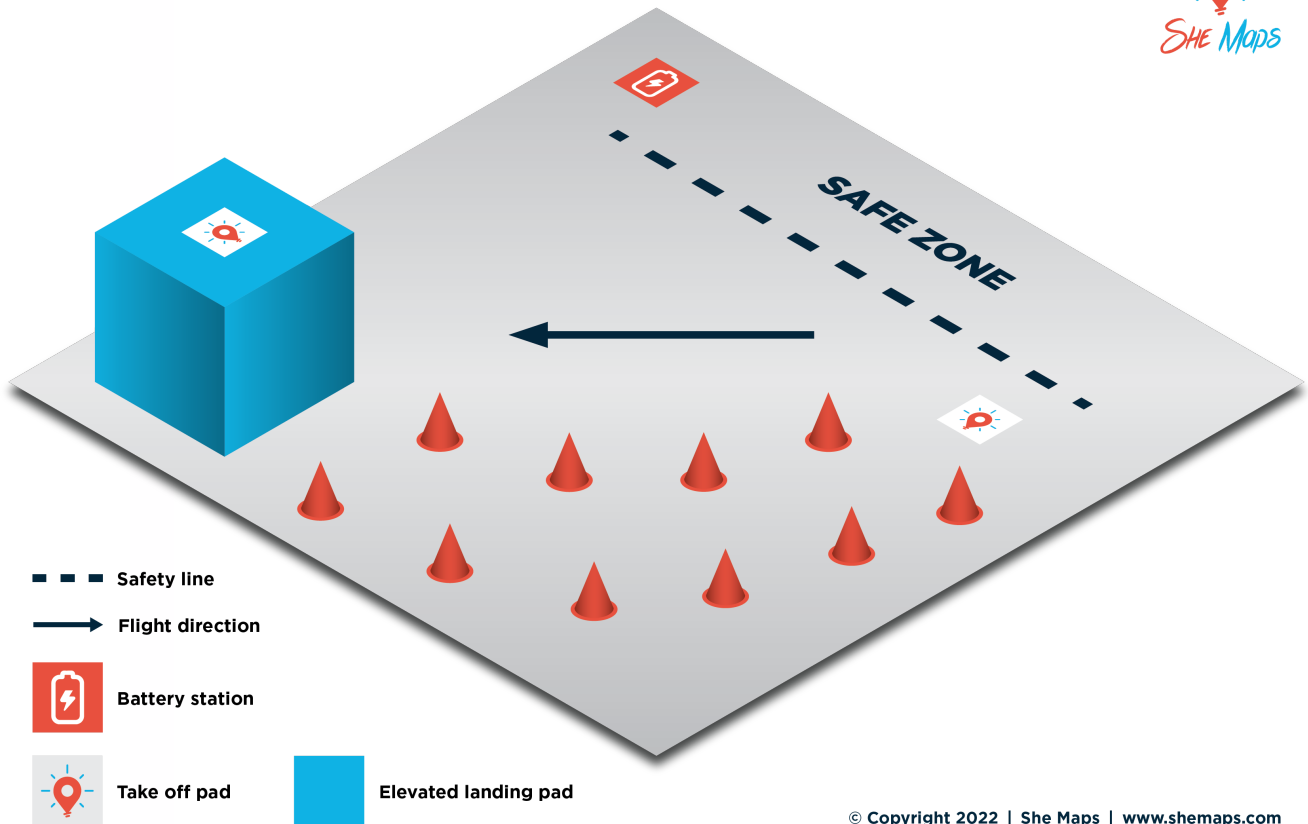
Watch **this video** to see a simple example of a course. Consider adding in a lesson where you all design your classroom simulated course. Send us photos of your course. We'd love to see how creative you are!

The cargo carrier

The medical supply carrier can be constructed from items such as:

- string/wool
- lego or building blocks
- egg cartons
- cardboard
- sticky tape
- blu-tac or similar.

ASSESSMENT RUBRICS

ASSESSMENT RUBRICS YEARS 7-8

Digital Technologies (V9)			
Years 7 and 8			
Assessable element	**Above Standard**	**At Standard**	**Below Standard**
select appropriate hardware for particular tasks	select drone and tablet device or computer along with required software and complete thorough safety checks for drone mission	select drone and tablet device or computer along with required software and complete safety checks for drone mission	select drone and tablet device or computer along with required software and complete limited safety checks for drone mission
explain how data is transmitted and secured in networks, and identify cyber security threats	explain in detail how data is transmitted and secured between the drone and the controlling software, and identify cyber security threats including possible interception due to insecure password protocols	explain how data is transmitted and secured between the drone and the controlling software, and identify cyber security threats including possible interception	describe limited information about how data is transmitted and secured between the drone and the controlling software, or identify cyber security threats
decompose real-world problems	decompose the journey the drone will travel considering factors such as terrain, elevation and wind-gusts and draw a detailed diagram to track each part of the journey	decompose the journey the drone will travel and draw a diagram to track each part of the journey	decompose parts of the journey the drone will travel and draw a limited diagram to track each part of the journey
design and trace algorithms	design efficient algorithms needed to navigate from the hospital to the village and back, articulate them with pseudocode and trace them by walking the code to ensure accuracy and efficiency	design algorithms needed to navigate from the hospital to the village and back, articulate them with pseudocode and trace them by walking the code to ensure accuracy	design limited algorithms needed to navigate from the hospital to the village and back and trace them by walking segments of the journey
implement algorithms in a general-purpose programming language *develop and modify creative digital solutions*	implement algorithms in a general-purpose programming language such as Python or Java Script to develop simulated drone delivery and modify to achieve a successful and efficient mission	implement algorithms in a general-purpose programming language such as Python or Java Script to develop simulated drone delivery and modify to achieve a successful mission	implement algorithms in a drone app to develop simulated drone delivery and modify to achieve success for part of the mission
evaluate alternative solutions against user stories and design criteria	evaluate each attempt at completing the mission and modify solutions to ensure they meet the needs of the people who live in the village and successfully complete the mission explaining sustainability of the solution including the economic, social and environmental impacts	evaluate each attempt at completing the mission and modify solutions to ensure they meet the needs of the people who live in the village and successfully complete the mission	evaluate the mission against the needs of the people who live in the village and complete segments of the mission

Design and Technologies (V9)

Years 7 and 8

Assessable element	Above Standard	At Standard	Below Standard
explain how people design, innovate and produce products and services for preferred futures	explain and justify how Uttam Pudasaini and his team design drone delivery solutions to meet the needs of communities in remote Himalayan village explain comprehensively Nepal Flying Labs address economic, social, and environmental sustainability	explain how Uttam Pudasaini and his team design, innovate and produce drone delivery solutions to meet the needs of communities in remote Himalayan village explain how Nepal Flying Labs address economic, social, and environmental sustainability	describe limited ways Uttam Pudasaini and his team design drone delivery solutions to meet the needs of communities in remote Himalayan village describe limited ways Nepal Flying Labs address economic, social, and environmental sustainability
they explain how the features of technologies impact on design decisions	explain comprehensively how the features of drone and battery technologies and weight and strength of materials required for cargo carrier impact on design decisions	explain how the features of drone and battery technologies and weight and strength of materials required for cargo carrier impact on design decisions	describe some features of drone and battery technologies and weight and strength of materials required for cargo carrier impact on design decisions
develop design criteria that include sustainability	develop considered success criteria that include a range of sustainability considerations	develop success criteria. that include sustainability considerations	develop limited success criteria that include some sustainability considerations
create design ideas, processes and solutions, based on analysis of needs or opportunities	create sophisticated and efficient design ideas, processes and solutions for a cargo carrier for a simulated drone delivery of medical supplies based on analysis of needs of people in the remote Himalayan villages	create design ideas, processes and solutions for a cargo carrier for a simulated drone delivery of medical supplies based on analysis of needs of people in the remote Himalayan villages	create limited or incomplete design ideas, processes and solutions for a cargo carrier for a simulated drone delivery of medical supplies based on analysis of needs of people in the remote Himalayan villages
create and adapt design ideas, processes and solutions based on analysis of needs or opportunities, and justify their decisions against developed design criteria that include sustainability	create and adapt design ideas, processes and solutions to iterate and improve a cargo carrier for a simulated drone delivery of medical supplies based on analysis of needs or opportunities, and justify their decisions against developed design criteria that include sustainability	create and adapt design ideas, processes and solutions for a cargo carrier for a simulated drone delivery of medical supplies based on analysis of needs or opportunities, and justify their decisions against developed design criteria that include sustainability	create and adapt limited design ideas, processes and solutions for a cargo carrier for a simulated drone delivery of medical supplies based on analysis of needs or opportunities, and provide fragmented justification for their decisions against limited design criteria
communicate design ideas and solutions to audiences using technical terms and graphical representation techniques, including using digital tools	communicate comprehensive design ideas and solutions for the drone cargo carrier to the teacher and class using sophisticated technical terms and graphical representation techniques including labelled diagrams created with software	communicate design ideas and solutions for the drone cargo carrier to the teacher and class using technical terms and graphical representation techniques including labelled diagrams created with software	communicate fragmented design ideas and solutions for the drone cargo carrier to the teacher and class using limited technical terms and graphical representation techniques including labelled diagrams

Design and Technologies (V9)

Years 7 and 8

Assessable element	Above Standard	At Standard	Below Standard
independently and collaboratively document and manage production processes to safely produce designed solutions	independently and collaboratively document and manage sophisticated production processes to safely and skillfully produce a drone cargo carrier	independently and collaboratively document and manage production processes to safely produce a drone cargo carrier	document and manage limited production processes to safely produce a limited drone cargo carrier

Geography (V9)

Year 7

Assessable element	Above Standard	At Standard	Below Standard
describe how the characteristics of places are perceived and valued differently by people	explain how the characteristics of the Himalayas are perceived and valued differently by Nepalese people depending upon where they live	describe how the characteristics of the Himalayas are perceived and valued differently by Nepalese people	describe limited details about how the Himalayas are perceived and valued by Nepalese people
describe the importance of environments to people	explain the importance of environments to Nepalese people	describe the importance of environments to Nepalese people	describe limited details about the importance of environments to Nepalese people
describe the features of a distribution	explain the features of the distribution of people in the Himalayas	describe the features of the distribution of people in the Himalayas	describe fragmented ideas about the distribution of people in the Himalayas
explain the interconnections between people and places and environments, and describe how these interconnections change places or environments	explain with considered reasoning the interconnections between the Nepalese people and places and environments in the Himalayas, and explain how these interconnections change the villages or environments in Nepal	explain the interconnections between the Nepalese people and places and environments in the Himalayas, and describe how these interconnections change the villages or environments in Nepal	describe limited interconnections between the Nepalese people and places and environments in the Himalayas
describe a response or strategy to address a geographical phenomenon or challenge	describe in detail a response or strategy to address the 2015 earthquake in Nepal for example, how drones were used to transport medical samples between remote villages and the Pyuthan hospital in the Himalayas and explain why the response was initiated	describe a response or strategy to address the 2015 earthquake in Nepal for example, how drones were used to transport medical samples between remote villages and the Pyuthan hospital in the Himalayas	describe limited details about a response or strategy to address the 2015 earthquake in Nepal for example, how drones were used to transport medical samples between remote villages and the Pyuthan hospital in the Himalayas.

Geography (V9)

Year 7

Assessable element	Above Standard	At Standard	Below Standard
develop questions about a geographical phenomenon or challenge	develop considered questions for an inquiry for example, *What are the factors that affect the liveability of Nepal and what challenges are faced by people living in remote Himalayan villages?*	develop questions for an inquiry for example, *What are the factors that affect the liveability of Nepal?*	develop questions with guidance to frame research about Nepal
collect, organise and represent relevant data and information, using primary research methods and secondary research materials	collect, organise and represent extensive data and detailed information, using primary research methods and secondary research materials to answer the prompts on Activity sheet -Research Retrieval Sheet - Years 7-8 along with additional detailed information	collect, organise and represent relevant data and information, using primary research methods and secondary research materials to answer the prompts on Activity sheet - Research Retrieval Sheet - Years 7-8	collect, organise and represent limited data and fragmented information, using provided sources to answer the prompts on Activity sheet -Research Retrieval Sheet - Years 7-8
identify similarities and differences, and describe patterns in data and information	describe similarities and differences, and explain patterns in data and information relating to land area and population density of Nepalese people with additional data such as GDP and PQLI.	identify similarities and differences, and describe patterns in data and information relating to land area and population density of Nepalese people	identify limited data and information about the Nepalese people
draw conclusions about the impact of the geographical phenomenon or challenge on people, places and environments	draw considered conclusions about the impact of the liveability of remote Himalayan regions on people, places and environments and how the earthquake might have impacted liveability and present these conclusions in an engaging slideshow presentation about Nepal	draw conclusions about the impact of the liveability of remote Himalayan regions on people, places and environments and present these conclusions in a slideshow presentation about Nepal	list limited information about the liveability of remote Himalayan regions and present it in a slideshow presentation about Nepal
develop a strategy for action	develop a considered and well-designed strategy to deliver medical supplies via drone as part of modules 2 and 3	develop a strategy to deliver medical supplies via drone as part of modules 2 and 3	develop a limited strategy to deliver medical supplies via drone as part of modules 2 and 3
use geographical knowledge, concepts, terms and relevant findings from sources to create descriptions, explanations and responses	use geographical knowledge, concepts, terms and relevant findings from sources to create detailed descriptions, justified explanations and responses and present these in an engaging slideshow presentation about Nepal	use geographical knowledge, concepts, terms and relevant findings from sources to create descriptions, explanations and responses and present these in a slideshow presentation about Nepal	use limited geographical knowledge, concepts, terms and findings from sources to create fragmented descriptions, and responses and present these in a slideshow presentation about Nepal

Geography (V9)

Year 8

Assessable element	Above Standard	At Standard	Below Standard
explain how the interactions of people and environmental processes impact on the characteristics of places	explain comprehensively the geographical diversity of the Himalayas and how the interactions of Nepalese people with each other and other countries and environmental processes such as erosion and earthquakes impact on the characteristics of the Himalayas	explain how the interactions of Nepalese people and environmental processes such as erosion and earthquakes impact on the characteristics of the Himalayas	describe limited details about how the interactions of Nepalese people and environmental processes such as erosion or earthquakes impact on the characteristics of the Himalayas
describe the effects of human activity or hazards on environment	describe the effects of human activity, erosion and the 2015 earthquake on the Himalayas	describe the effects of human activity or erosion or the 2015 earthquake on the Himalayas	describe limited effects of human activity or erosion or the 2015 earthquake on the Himalayas
explain the features of a distribution and identify implications	explain and justify reasoning about the features of the distribution of people across remote regions of the Himalayas and describe implications	explain the features of the distribution of people across remote regions of the Himalayas and identify implications	describe limited features of the distribution of people across remote regions of the Himalayas and identify implications
explain responses or strategies to address a geographical phenomenon or challenge, referring to environmental, economic or social factors	explain Nepal Flying Labs strategies in response to the Nepal earthquake in 2015, referring to environmental, economic and social factors with included information on safety or ethics	explain Nepal Flying Labs strategies in response to the Nepal earthquake in 2015, referring to environmental, economic or social factors	describe limited information about Nepal Flying Labs strategies in response to the Nepal earthquake in 2015
develop relevant questions about a geographical phenomenon or challenge	develop well-considered questions for an inquiry for example, *How did the earthquake of 2015 affect the people of Nepal, how did it impact the liveability of remote Himalayan villages and how was their economy impacted?*	develop relevant questions for an inquiry for example, *How did the earthquake of 2015 affect the people of Nepal and how did it impact the liveability of remote Himalayan villages?*	develop limited questions for an inquiry for example, *How did the earthquake of 2015 affect the people of Nepal?*
collect, organise and represent relevant and reliable data and information using primary research methods and secondary research materials	collect, organise and represent extensive reliable data and detailed information, using primary research methods and secondary research materials to answer the prompts on Activity sheet -Research Retrieval Sheet - Years 7-8 along with detailed additional information	collect, organise and represent relevant and reliable data and information, using primary research methods and secondary research materials to answer the prompts on Activity sheet -Research Retrieval Sheet - Years 7-8	collect, organise and represent limited data and fragmented information, using provided sources to answer the prompts on Activity sheet -Research Retrieval Sheet - Years 7-8
interpret and analyse data and information to explain patterns and trends and infer relationships	interpret and analyse data and information about Nepal and its people to explain patterns and trends and infer relationships with additional data such as GDP and PQLI	interpret and analyse data and information about Nepal and its people to explain patterns and trends and infer relationships	interpret and analyse limited data and information about Nepal and its people to describe fragmented patterns and trends

Geography (V9)			
Year 8			
Assessable element	**Above Standard**	**At Standard**	**Below Standard**
draw reasoned conclusions about the impact of the geographical phenomenon or challenge	draw well-reasoned conclusions about the impact of the 2015 earthquake on the liveability of remote Himalayan regions on people, places and environments and present these conclusions in an engaging slideshow presentation about Nepal	draw reasoned conclusions about the impact of the 2015 earthquake on the liveability of remote Himalayan regions on people, places and environments and present these conclusions in a slideshow presentation about Nepal	list limited information about the liveability of remote Himalayan regions and present it in a slideshow presentation about Nepal
decide on appropriate strategies for action and explain potential impacts	decide on appropriate strategies for action to deliver medical supplies via drone as part of modules 2 and 3 and explain potential impacts considering safety and other elements such as ethics and technical ability of people in the remote Himalayan villages	decide on appropriate strategies for action to deliver medical supplies via drone as part of modules 2 and 3 and explain potential impacts considering safety	decide on fragmented strategies for action to deliver medical supplies via drone as part of modules 2 and 3
use geographical knowledge, methods, concepts, terms and reference findings from sources to create descriptions, explanations and responses	use geographical knowledge, concepts, terms and reference detailed findings from varied sources to create detailed descriptions, justified explanations and responses and present these in an engaging slideshow presentation about Nepal	use geographical knowledge, concepts, terms and reference findings from sources to create descriptions, explanations and responses and present these in a slideshow presentation about Nepal	use limited geographical knowledge, concepts, terms and reference findings from limited sources to create descriptions and responses and present these in a slideshow presentation about Nepal

Mathematics (V9)

Year 7

Assessable element	Above Standard	At Standard	Below Standard
use mathematical modelling to solve practical problems involving rational numbers, percentages and ratios, in financial and other applied contexts, justifying choices of representation	use mathematical modelling to efficiently solve calculations of the drone flight path involving rational numbers, percentages and ratios justifying choices of representation while planning the flight path of the drone	use mathematical modelling to solve calculations of the drone flight path involving rational numbers, percentages and ratios justifying choices of representation while planning the flight path of the drone	use mathematical modelling to solve limited calculations of the drone flight path involving rational numbers, percentages or ratios while planning the flight path of the drone
apply knowledge of angle relationships and the sum of angles in a triangle to solve problems, giving reasons	apply knowledge of angle relationships and the sum of angles in a triangle to solve challenging problems for the drone mission, giving considered reasons	apply knowledge of angle relationships and the sum of angles in a triangle to solve problems for the drone mission, giving reasons	apply limited knowledge of angle relationships and the sum of angles in a triangle to solve problems for the drone mission
use formulas for the areas of triangles to solve problems	identify when and where to use formulas for the areas of triangles to solve problems for the drone mission	use formulas for the areas of triangles to solve problems for the drone mission	use limited formulas for the areas of triangles while attempting to solve problems for the drone mission

Year 8

Assessable element	Above Standard	At Standard	Below Standard
use mathematical modelling to solve practical problems involving ratios and percentages in measurement contexts	use effective mathematical modelling to solve calculations of the drone flight path with measurements, ratios and percentages while planning and coding the mission	use mathematical modelling to solve calculations of the drone flight path with measurements, ratios and percentages while planning and coding the mission	use fragmented mathematical modelling to solve limited calculations of the drone flight path with measurements, ratios and percentages while planning and coding the mission
use appropriate metric units when solving measurement problems involving the perimeter and area of composite shapes	use appropriate metric units to efficiently solve measurement problems involving the drone mission	use appropriate metric units to solve measurement problems involving the drone mission	use appropriate metric units with assistance to solve measurement problems involving the drone mission
use Pythagoras' theorem to solve measurement problems involving unknown lengths of right-angle triangles	use Pythagoras' theorem to accurately and efficiently measurement problems involving unknown lengths of right-angle triangles for the drone mission	use Pythagoras' theorem to solve measurement problems involving unknown lengths of right-angle triangles for the drone mission	use Pythagoras' theorem to solve limited measurement problems involving unknown lengths of right-angle triangles for the drone mission

ASSESSMENT RUBRIC YEARS 9-10

Digital Technologies (V9)			
Years 9 and 10			
Assessable element	**Above Standard**	**At Standard**	**Below Standard**
explain the control and management of networked digital systems and the security implications of the interaction between hardware, software and users	explain in detail the control and management of a networked drone system and the well-considered security implications of the interaction between hardware, software and users considering data security and effective strategies to mitigate interception	explain the control and management of a networked drone system and the security implications of the interaction between hardware, software and users considering data security and strategies to mitigate interception	describe the control and management of a networked drone system and limited security implications of the interaction between hardware, software and users
define and decompose complex problems in terms of functional and non-functional requirements	define and decompose complex problems in terms of well-defined functional operation of the drone, take-off and landing sites, operation in high-wind areas and non-functional requirements such as user story and user experience considering sustainability including economic, social and environmental sustainability factors	define and decompose complex problems in terms of functional operation of the drone, take-off and landing sites and non-functional requirements such as user story and user experience considering sustainability including economic, social and environmental sustainability factors	define and decompose complex problems in limited terms of functional and non-functional requirements considering limited sustainability factors
design and evaluate user experiences and algorithms	design and evaluate user experiences for people in remote Himalayan villages considering technical ability of those interacting with the drone and design efficient algorithms to control the drone flight such as distance drone will need to travel, angles needed to yaw the drone, take off and land commands and required elevation to reach the village considering further elements such as wind factor and sustainability factors including battery life	design and evaluate user experiences for people in remote Himalayan villages and design algorithms to control the drone flight such as distance drone will need to travel, angles needed to yaw the drone, take off and land commands and required elevation to reach the village	design and evaluate limited user experiences for people in remote Himalayan villages and design incomplete or fragmented algorithms to control the drone flight
design and implement modular programs, using algorithms and data structures involving modular functions that reflect the relationships of real-world data and data entities	design and implement efficient modular programs, using algorithms and effective data structures involving modular functions that reflect the relationships of real-world data and data entities required for accurate completion of the mission	design and implement modular programs, using algorithms and data structures involving modular functions that reflect the relationships of real-world data and data entities required for accurate completion of the mission	design and implement incomplete or fragmented modular programs, using algorithms and limited data structures involving modular functions that reflect the relationships of real-world data and data entities required for accurate completion of the mission

Digital Technologies (V9)

Years 9 and 10

Assessable element	Above Standard	At Standard	Below Standard
test and predict results and implement digital solutions	test and predict results and implement digital solutions to effectively and efficiently complete the mission	test and predict results and implement digital solutions to complete the mission	design and implement incomplete or fragmented modular programs, using algorithms and limited data structures involving modular functions that reflect the relationships of real-world data and data entities required for accurate completion of the mission complete sections of the mission
evaluate information systems and their solutions in terms of risk, sustainability and potential for innovation and enterprise	evaluate Nepal Flying Labs drone systems and their own drone solutions in terms of risk, sustainability and justify potential for innovation and enterprise	evaluate Nepal Flying Labs drone systems and their own drone solutions in terms of risk, sustainability and potential for innovation and enterprise	describe Nepal Flying Labs drone systems and their own drone solutions in terms of risk, sustainability or potential for innovation and enterprise

Design and Technologies (V9)

Years 9 and 10

Assessable element	Above Standard	At Standard	Below Standard
explain how people working in design and technologies occupations consider factors that impact on design decisions and the technologies used to produce products and services	explain and justify how Uttam Pudasaini and his team consider economic, social, ethical, technical and environmental sustainability factors that impact on design decisions and the technologies used to produce drone delivery solutions to meet the needs of communities in remote Himalayan village	explain how Uttam Pudasaini and his team consider economic, social, ethical, technical and environmental sustainability factors that impact on design decisions and the technologies used to produce drone delivery solutions to meet the needs of communities in remote Himalayan village	describe limited ways Uttam Pudasaini and his team consider economic, social, ethical, technical or environmental sustainability factors that impact on design decisions and the technologies used to produce drone delivery solutions to meet the needs of communities in remote Himalayan village
identify the changes necessary to designed solutions to realise preferred futures they have described	describe the changes Nepal Flying Labs would need to make to the drone for it to realise economic, social, ethical, technical and environmental sustainability in their drone delivery service	identify any changes Nepal Flying Labs would need to make to the drone for it to realise economic, social, ethical, technical and environmental sustainability in their drone delivery service	list limited changes Nepal Flying Labs would need to make to the drone to realise economic, social, ethical, technical or environmental sustainability in their drone delivery service

Design and Technologies (V9)

Years 9 and 10

Assessable element	Above Standard	At Standard	Below Standard
design solutions based on a critical evaluation of needs or opportunities *evaluate the features of technologies and their appropriateness for purpose* *establish detailed criteria for success, including sustainability considerations*	comprehensively critically evaluate the needs of people in remote Himalayan villages and create detailed design plans for the drone delivery service comprehensively evaluate the features of different technologies and their appropriateness for carrying cargo via drone including impact on weight of drone and drone battery establish considered and detailed success criteria for the drone delivery service, including a range of sustainability considerations	critically evaluate the needs of people in remote Himalayan villages and create design plans for the drone delivery service evaluate the features of different technologies and their appropriateness for carrying cargo via drone including impact on weight of drone and drone battery establish detailed success criteria for the drone delivery service, including sustainability considerations	review the needs of people in remote Himalayan villages and create limited design plans for the drone delivery service evaluate some features of technologies and their appropriateness for carrying cargo via drone establish limited success criteria for the drone delivery service, including some sustainability considerations
create and connect design ideas and processes of increasing complexity and justify decisions	create and connect sophisticated design ideas and processes of increasing complexity for a cargo carrier for a simulated drone delivery of medical supplies based on analysis of needs of people in the remote Himalayan villages and justify decisions with data	create and connect design ideas and processes of increasing complexity for a cargo carrier for a simulated drone delivery of medical supplies based on analysis of needs of people in the remote Himalayan villages and justify decisions	create fragmented design ideas and processes for a cargo carrier for a simulated drone delivery of medical supplies based on analysis of needs of people in the remote Himalayan villages
select and use appropriate technologies skillfully and safely to produce high-quality designed solutions suitable for the intended purpose	select and use appropriate technologies skillfully and safely to produce a sophisticated and high-quality prototype of a cargo carrier for a simulated drone delivery of medical supplies based on analysis of needs of people in the remote Himalayan villages	select and use appropriate technologies skillfully and safely to produce a high-quality prototype of a cargo carrier for a simulated drone delivery of medical supplies based on analysis of needs of people in the remote Himalayan villages	select and use appropriate technologies safely to produce a prototype of a cargo carrier for a simulated drone delivery of medical supplies based on analysis of needs of people in the remote Himalayan villages
when producing designed solutions for identified needs or opportunities, evaluate the features of technologies and their appropriateness for purpose	when producing the medical cargo carrier for identified needs of remote Nepalese villagers, students critically evaluate the features of technologies including the drone and battery technologies and weight and strength of materials and only select those most suited for their appropriateness for delivering medical supplies/samples	when producing the medical cargo carrier for identified needs of remote Nepalese villagers, students evaluate the features of technologies including the drone and battery technologies and weight and strength of materials and their appropriateness for delivering medical supplies/samples	when producing the medical cargo carrier for identified needs of remote Nepalese villagers, students evaluate limited features of technologies for delivering medical supplies/samples

Design and Technologies (V9)

Years 9 and 10

Assessable element	Above Standard	At Standard	Below Standard
use criteria for success, including sustainability considerations to evaluate their ideas and designed solutions and processes	use criteria for success, including sustainability considerations to critically evaluate their medical cargo carrier and processes created to produce them, for example amount of electricity and resources used to 3D print the carrier	use criteria for success, including sustainability considerations to evaluate their medical cargo carrier and processes created to produce them	use limited criteria for success, including sustainability considerations to review their medical cargo carrier and processes created to produce them
communicate and document projects	communicate and document design and construction processes for the medical cargo carrier using sophisticated technical terms and graphical representation techniques including detailed labelled diagrams created with software	communicate and document design and construction processes for the medical cargo carrier using technical terms and graphical representation techniques including labelled diagrams created with software	communicate and document fragmented design and construction processes for the medical cargo carrier

Geography (V9)

Year 9

Assessable element	Above Standard	At Standard	Below Standard
analyse interconnections between people, places and environments and explain how these interconnections influence people, and change places and environments	analyse interconnections between the Nepalese people, places and environments in the Himalayas and explain and justify how these interconnections influence people living in remote Himalayan villages, and change places, services and environments in Nepal	analyse interconnections between the Nepalese people, places and environments in the Himalayas and explain how these interconnections influence people living in remote Himalayan villages, and change places and environments in Nepal	analyse interconnections between the Nepalese people, places and environments in the Himalayas and describe limited ways these interconnections influence people living in remote Himalayan villages
analyse alternative strategies to a geographical challenge using environmental, social and economic criteria	analyse alternative strategies providing detailed explanations, using environmental, social, ethical, technical and economic criteria, to address the 2015 earthquake in Nepal for example, how drones were used to transport medical samples between remote villages and the Pyuthan hospital in the Himalayas compared with helicopters or plane drops	analyse alternative strategies, using environmental, social and economic criteria, to address the 2015 earthquake in Nepal for example, how drones were used to transport medical samples between remote villages and the Pyuthan hospital in the Himalayas compared with helicopters or plane drops	describe some strategies, using environmental, social and economic criteria, to address the 2015 earthquake in Nepal for example, how drones were used to transport medical samples between remote villages and the Pyuthan hospital in the Himalayas

Geography (V9)

Year 9

Assessable element	Above Standard	At Standard	Below Standard
use initial research to identify geographically significant questions to frame an inquiry	use initial research to identify geographically significant and well-considered questions to frame an inquiry, for example, *How are the people of Nepal interconnected locally and globally economically and socially, and in what ways do international organisations assist Nepal?*	use initial research to identify geographically significant questions to frame an inquiry, for example, *How are the people of Nepal interconnected locally and globally?*	use initial research using given sources to develop questions with guidance to frame research about Nepal
evaluate a range of primary and secondary sources to select and collect relevant and reliable geographical information and data	evaluate a range of primary and secondary sources to select and collect relevant and reliable geographical information and data including GDP, HDI and PQLI about Nepal to answer the prompts on Activity sheet - Research Retrieval Sheet - Years 9-10 along with additional detailed information	evaluate a range of primary and secondary sources to select and collect relevant and reliable geographical information and data including GDP, HDI and PQLI about Nepal to answer the prompts on Activity sheet - Research Retrieval Sheet - Years 9-10	evaluate provided sources to select and collect limited geographical information and data about Nepal to provide fragmented answers to the prompts on Activity sheet - Research Retrieval Sheet - Years 9-10
record and represent multi-variable data in a range of appropriate digital and non-digital forms, including a range of maps that comply with cartographic conventions	record and represent significant and well-considered multi-variable data in a range of appropriate digital and non-digital forms, including a range of maps that comply with cartographic conventions and prepare these for a slideshow about Nepal	record and represent multi-variable data in a range of appropriate digital and non-digital forms, including a range of maps that comply with cartographic conventions and prepare these for a slideshow about Nepal	record and represent multi-variable data in a range of appropriate digital and non-digital forms, including a range of maps that comply with cartographic conventions and prepare these for a slideshow about Nepal
use a range of methods and digital technologies to interpret and analyse maps, data and other information to propose explanations for patterns, trends, relationships and anomalies across time and space, and to predict outcomes. *synthesise data and information to draw reasoned conclusions*	use a range of methods and digital technologies to interpret and analyse and range of maps, GDP, HDI, PQLI and other relevant data and other information to propose considered explanations for patterns, trends, relationships and anomalies prior to and following the 2015 earthquake and across regions of Nepal, and to predict outcomes for people in Nepal synthesise data and information to draw well-reasoned conclusions in preparation for a slideshow about Nepal	use a range of methods and digital technologies to interpret and analyse maps, GDP, HDI and PQLI data and other information to propose explanations for patterns, trends, relationships and anomalies prior to and following the 2015 earthquake and across regions of Nepal, and to predict outcomes for people in Nepal synthesise data and information to draw reasoned conclusions in preparation for a slideshow about Nepal	use manual methods or digital technologies to interpret maps, limited GDP, HDI and PQLI data and other information to propose explanations for patterns, trends, relationships and anomalies prior to and following the 2015 earthquake and across regions of Nepal, and to predict outcomes for people in Nepal synthesise data and limited information to draw fragmented conclusions about Nepal

Geography (V9)			

Year 9

Assessable element	Above Standard	At Standard	Below Standard
present findings, arguments and explanations using relevant geographical terminology and digital representations in a range of appropriate communication forms	present detailed findings, well-constructed arguments and detailed explanations using relevant geographical terminology and digital representations in a range of appropriate communication forms including photographs, video footage, sound, text, tables, etc in an engaging slideshow about Nepal	present findings, arguments and explanations using relevant geographical terminology and digital representations in a range of appropriate communication forms such as photographs, video footage, sound, text, tables, etc in a slideshow about Nepal	present limited findings, using limited relevant geographical terminology and digital representations in communication forms such as photographs, video footage, sound, text, tables, etc in a fragmented slideshow about Nepal
propose action in response to a geographical challenge, taking account of environmental, economic and social factors, and predict the outcomes and consequences of their proposal	propose a considered and well-designed strategy to deliver medical supplies via drone as part of modules 2 and 3 taking account of environmental, economic and social factors, and predict the outcomes and consequences of their proposal	propose a strategy to deliver medical supplies via drone as part of modules 2 and 3 taking account of environmental, economic and social factors, and predict the outcomes and consequences of their proposal	propose a limited strategy to deliver medical supplies via drone as part of modules 2 and 3 taking account of environmental, economic or social factors

Year 10

Assessable element	Above Standard	At Standard	Below Standard
identify, analyse and explain significant interconnections between people, places and environments and explain changes that result from these interconnections and their consequences	identify, analyse and explain and justify why significant interconnections between Nepalese people, the Himalayas and environments and explain changes that result from these interconnections and their consequences including those caused by tourism and the earthquake of 2015	identify, analyse and explain significant interconnections between Nepalese people, the Himalayas and environments and explain changes that result from these interconnections and their consequences including those caused by tourism or the earthquake of 2015	identify, and describe limited interconnections between Nepalese people, the Himalayas and environments and describe changes that result from these interconnections
evaluate alternative views on a geographical challenge and alternative strategies to address this challenge using environmental, economic, political and social criteria	evaluate alternative views on the 2015 earthquake and alternative strategies to address this challenge including Nepalese Flying Labs response to the 2015 earthquake using detailed and well-considered environmental, economic, political and social criteria including ethics	evaluate alternative views on the 2015 earthquake and alternative strategies to address this challenge including Nepalese Flying Labs response to the 2015 earthquake using environmental, economic, political and social criteria	describe limited information about Nepal Flying Labs strategies in response to the Nepal earthquake in 2015 using environmental, economic, political or social criteria
use initial research to develop and modify geographically significant questions to frame an inquiry	use initial research to develop and modify geographically significant questions to frame an inquiry, for example, *How do infrastructure and services affect the wellbeing of the people of Nepal?* and *How are organisations adding to the PQLI factor through their services?*	use initial research to develop and modify geographically significant questions to frame an inquiry, for example, *How do infrastructure and services affect the wellbeing of the people of Nepal?*	use initial research to develop and modify geographically significant questions with guidance to frame an inquiry

Year 10			
Assessable element	**Above Standard**	**At Standard**	**Below Standard**
critically evaluate a range of primary and secondary sources to select and collect relevant, reliable and unbiased geographical information and data	critically evaluate a range of primary and secondary sources to select and collect relevant, reliable and unbiased geographical information and data including GDP, HDI and PQLI about Nepal to answer the prompts on Activity sheet - Research Retrieval Sheet - Years 9-10 along with additional detailed information	critically evaluate a range of primary and secondary sources to select and collect relevant, reliable and unbiased geographical information and data including GDP, HDI and PQLI about Nepal to answer the prompts on Activity sheet - Research Retrieval Sheet - Years 9-10	evaluate primary and secondary sources to select and collect limited geographical information and data about Nepal to provide fragmented answers to the prompts on Activity sheet -Research Retrieval Sheet - Years 9-10
record and represent multi-variable data in of the most appropriate digital and non-digital forms, including a range of graphs and maps that use suitable scales and comply with cartographic conventions	record and represent significant and well-considered multi-variable data in the most appropriate digital and non-digital forms, including a range of maps that use suitable scales and comply with cartographic conventions and prepare these for a slideshow about Nepal	record and represent multi-variable data in the most appropriate digital and non-digital forms, including a range of maps that use suitable scales and comply with cartographic conventions and prepare these for a slideshow about Nepal	record and represent limited multi-variable data in digital and non-digital forms, including maps that comply with cartographic conventions and prepare these for a slideshow about Nepal
use a range of methods and digital technologies to interpret and analyse maps, data and other information to make generalisations and inferences, propose explanations for significant patterns, trends, relationships and anomalies across time and space and at different scales, and predict outcomes	use a range of methods and digital technologies to interpret and analyse maps, GDP, HDI, PQLI and other data and information to make generalisations and inferences, propose considered explanations for significant patterns, trends, relationships and anomalies prior to and following the 2015 earthquake and across regions of Nepal, and to predict outcomes for people in Nepal	use a range of methods and digital technologies to interpret and analyse maps, GDP, HDI and PQLI data and other information to make generalisations and inferences, propose explanations for significant patterns, trends, relationships and anomalies prior to and following the 2015 earthquake and across regions of Nepal, and to predict outcomes for people in Nepal	use manual methods or digital technologies to interpret maps, limited GDP, HDI and PQLI data and other information to make generalisations to propose explanations for patterns, trends, relationships and anomalies prior to and following the 2015 earthquake and across regions of Nepal, and to predict outcomes for people in Nepal
analyse and synthesise data and other information to draw reasoned conclusions, taking into account alternative perspectives	analyse and synthesise detailed data and other information to draw well-reasoned conclusions, taking into account alternative perspectives and formulate the data and information for a slideshow about Nepal	analyse and synthesise data and other information to draw reasoned conclusions, taking into account alternative perspectives and formulate the data and information for a slideshow about Nepal	analyse and synthesise data and limited information to draw fragmented conclusions about Nepal
present findings, arguments and explanations using relevant geographical terminology and graphic representations and digital technologies in a range of selected and appropriate communication forms	present detailed findings, well-constructed arguments and detailed explanations using relevant geographical terminology and graphic representations and digital technologies in a range of selected and appropriate communication forms such as photographs, video footage, sound, text, tables, etc in an engaging slideshow about Nepal	present findings, arguments and explanations using relevant geographical terminology and graphic representations and digital technologies in a range of selected and appropriate communication forms such as photographs, video footage, sound, text, tables, etc in a slideshow about Nepal	present limited findings and fragmented arguments and explanations using limited relevant geographical terminology and digital representations in communication forms such as photographs, video footage, sound, text, tables, etc in a fragmented slideshow about Nepal

Year 10

Assessable element	Above Standard	At Standard	Below Standard
evaluate their findings and propose action in response to a contemporary geographical challenge, taking account of environmental, economic, political and social considerations	evaluate their findings and propose a considered and well-designed strategy to deliver medical supplies via drone as part of modules 2 and 3 taking account of environmental, economic, political and social considerations	evaluate their findings and propose a strategy to deliver medical supplies via drone as part of modules 2 and 3 taking account of environmental, economic, political and social considerations	propose a limited strategy to deliver medical supplies via drone as part of modules 2 and 3 taking account of environmental, economic, political or social factors
explain the predicted outcomes and consequences of their proposal	explain and justify the predicted outcomes and consequences of their proposal in detail	explain the predicted outcomes and consequences of their proposal	describe limited predicted outcomes and consequences of their proposal

Mathematics (V9)

Year 9

Assessable element	Above Standard	At Standard	Below Standard
use Pythagoras' Theorem and trigonometry to find unknown sides of right-angled triangles	identify when and where to use Pythagoras' Theorem and trigonometry to find unknown sides of right-angled triangles to assist planning calculations for the drone for flight mission	use Pythagoras' Theorem and trigonometry to find unknown sides of right-angled triangles to assist planning calculations for the drone for flight mission	use Pythagoras' Theorem and limited trigonometry with assistance to find unknown sides of right-angled triangles to assist planning calculations for the drone for flight mission
explain the predicted outcomes and consequences of their proposal	explain and justify the predicted outcomes and consequences of their proposal in detail	explain the predicted outcomes and consequences of their proposal	describe limited predicted outcomes and consequences of their proposal

Year 10

Assessable element	Above Standard	At Standard	Below Standard
use trigonometry to calculate unknown angles in right-angled triangles	skillfully use trigonometry to calculate unknown angles in right-angled triangles to assist planning calculations for the efficient drone for flight mission	use trigonometry to calculate unknown angles in right-angled triangles to assist planning calculations for the drone for flight mission	use limited trigonometry to calculate unknown angles in right-angled triangles to assist planning fragmented calculations for the drone for flight mission

CURRICULUM MAPPING

HEALTHCARE IN THE HIMALAYAS

GEOGRAPHY / TECHNOLOGIES / MATHEMATICS UNIT

Students will learn the challenges faced by communities living in remote mountainous regions in Nepal and how it can make it difficult to transport essential items such as food and medicine to some communities. Access to healthcare is a challenge in many remote regions of Nepal, as patients and healthcare workers have to walk for hours or even a full day along steep, winding tracks between the village and the nearest hospital. Students will consider how drones could be useful to transport supplies over difficult terrain to provide safe and timely solutions to healthcare needs.

Students will:

- evaluate the fastest system for medical delivery in remote areas of Nepal

- design and construct a model drone attachment that will successfully simulate a method to carry medical supplies

- manually and autonomously fly a drone to simulate delivery of the medical supplies

- understand how drones can be used to overcome humanitarian challenges.

Years 7 and 8 V8.4

Years 7 and 8 Digital Technologies Achievement Standard V8.4

By the end of Year 8, *students distinguish between different types of networks and defined purposes*. They explain how text, image and audio data can be represented, secured and presented in digital systems.

Students plan and manage digital projects to create interactive information. *They define and decompose problems in terms of functional requirements and constraints. Students design user experiences and algorithms incorporating branching and iterations, and test, modify and implement digital solutions. They evaluate information systems and their solutions in terms of meeting needs, innovation and sustainability. They analyse and evaluate data from a range of sources to model and create solutions.* They use appropriate protocols when communicating and collaborating online.

CONTENT DESCRIPTIONS		YEARS 7 AND 8
Digital Technologies – Knowledge and Understanding		
Digital systems	Investigate how data is transmitted and secured in wired, wireless and mobile networks, and how the specifications affect performance	ACTDIK023
Digital Technologies – Processes and Production Skills		
Investigating and defining	Define and decompose real- world problems taking into account functional requirements and economic, environmental, social, technical and usability constraints	ACTDIP027
Generating and designing	Design the user experience of a digital system, generating, evaluating and communicating alternative designs	ACTDIP028
	Design algorithms represented diagrammatically and in English, and trace algorithms to predict output for a given input and to identify errors	ACTDIP029
Producing and implementing	Implement and modify programs with user interfaces involving branching, iteration and functions in a general-purpose programming language	ACTDIP030
Evaluating	Evaluate how student solutions and existing information systems meet needs, are innovative, and take account of future risks and sustainability	ACTDIP031

Years 7 and 8 Design and Technologies Achievement Standard V8.4

By the end of Year 8, **students explain factors that influence the design of products, services** and environments **to meet present and future needs. They explain the contribution of design and technology innovations and enterprise to society. Students explain how the features of technologies impact on designed solutions and influence design decisions** for each of the prescribed technologies contexts.

Students create designed solutions for each of the prescribed technologies contexts **based on an evaluation of needs or opportunities. They develop criteria for success, including sustainability considerations, and use these to judge the suitability of their ideas and designed solutions and processes. They create and adapt design ideas, make considered decisions and communicate to different audiences using appropriate technical terms and a range of technologies and graphical representation techniques.** Students apply project management skills to document and use project plans to manage production processes. **They independently and safely produce effective designed solutions for the intended purpose.**

CONTENT DESCRIPTIONS		YEARS 7 AND 8
Design and Technologies – Knowledge and Understanding		
Technologies and society	Investigate the ways in which products, services and environments evolve locally, regionally and globally and how competing factors including social, ethical and sustainability considerations are prioritised in the development of technologies and designed solutions for preferred futures	ACTDEK029
Materials and technologies specialisation	Analyse ways to produce designed solutions through selecting and combining characteristics and properties of materials, systems, components, tools and equipment	ACTDEK034
Design and Technologies – Processes and Production Skills		
Investigating and defining	Critique needs or opportunities for designing and investigate, analyse and select from a range of materials, components, tools, equipment and processes to develop design ideas	ACTDEP035
Generating and designing	Generate, develop, test and communicate design ideas, plans and processes for various audiences using appropriate technical terms and technologies including graphical representation techniques	ACTDEP036
Producing and implementing	Select and justify choices of materials, components, tools, equipment and techniques to effectively and safely make designed solutions	ACTDEP037
Evaluating	Independently develop criteria for success to evaluate design ideas, processes and solutions and their sustainability	ACTDEP038

Year 7 Geography Achievement Standard V8.4

By the end of Year 7, *students describe geographical processes that influence the characteristics of places and how the characteristics of places are perceived and valued differently. They explain interconnections between people and places and environments and describe how these interconnections change places and environments. They describe alternative strategies to a geographical challenge referring to environmental, economic and social factors.*

Students identify geographically significant questions to frame an inquiry. They evaluate a range of primary and secondary sources to locate useful information and data. They record and represent data and the location and distribution of geographical phenomena in a range of forms, including large-scale and small- scale maps that conform to cartographic conventions. They interpret and analyse geographical maps, data and other information to propose simple explanations for spatial distributions, patterns, trends and relationships, and draw conclusions. Students present findings and arguments using relevant geographical terminology and digital technologies in a range of communication forms. They propose action in response to a geographical challenge, taking account of environmental, economic and social factors, and describe the expected effects of their proposal.

Year 8 Geography Achievement Standard V8.4

By the end of Year 8, *students explain geographical processes that influence the characteristics of places and explain how places are perceived and valued differently. They explain interconnections within environments and between people and places and explain how they change places and environments. They compare alternative strategies to a geographical challenge, taking into account environmental, economic and social factors.*

Students identify geographically significant questions from observations to frame an inquiry. They evaluate a range of primary and secondary sources to locate useful and reliable information and data. They select, record and represent data and the location and distribution of geographical phenomena in a range of appropriate digital and non-digital forms, including maps at different scales that conform to cartographic conventions. They analyse geographical maps, data and other information to propose explanations for spatial distributions, patterns, trends and relationships, and draw reasoned conclusions. Students present findings, arguments and ideas using relevant geographical terminology and digital technologies in a range of appropriate communication forms. They propose action in response to a geographical challenge, taking account of environmental, economic and social factors, and predict the outcomes of their proposal.

CONTENT DESCRIPTIONS		YEAR 7	YEAR 8
Knowledge and Understanding - Place and liveability	Factors that influence the decisions people make about where to live and their perceptions of the liveability of places	ACHGK043	
	The influence of accessibility to services and facilities on the liveability of places	ACHGK044	
	The influence of environmental quality on the liveability of places	ACHGK045	
	The influence of social connectedness and community identity on the liveability of places	ACHGK046	
Knowledge and Understanding – Landforms and landscapes	Different types of landscapes and their distinctive landform features		ACHGK048
	Spiritual, aesthetic and cultural value of landscapes and landforms for people, including Aboriginal and Torres Strait Islander Peoples		ACHGK049
	Geomorphic processes that produce landforms, including a case study of at least one landform		ACHGK050
	Causes, impacts and responses to a geomorphological hazard		ACHGK053
Inquiry and Skills	Develop geographically significant questions and plan an inquiry, using appropriate geographical methodologies and concepts	ACHGK053	ACHGS055
	Evaluate sources for their reliability and usefulness and select, collect and record relevant geographical data and information, using ethical protocols, from appropriate primary and secondary sources	ACHGS048	ACHGS056
	Represent data in a range of appropriate forms, for example climate graphs, compound column graphs, population pyramids, tables, field sketches and annotated diagrams, with and without the use of digital and spatial technologies	ACHGS049	ACHGS057
	Represent spatial distribution of different types of geographical phenomena by constructing appropriate maps at different scales that conform to cartographic conventions, using spatial technologies as appropriate	ACHGS050	ACHGS058
	Interpret geographical data and other information using qualitative and quantitative methods, and digital and spatial technologies as	ACHGS051	ACHGS059

CONTENT DESCRIPTIONS		YEAR 7	YEAR 8
Inquiry and Skills	appropriate, to identify and propose explanations for spatial distributions, patterns and trends, and infer relationships		
	Apply geographical concepts to draw conclusions based on the analysis of the data and information collected	ACHGS052	ACHGS060
	Present findings, arguments and ideas in a range of communication forms selected to suit a particular audience and purpose; using geographical terminology and digital technologies as appropriate	ACHGS053	ACHGS061
	Reflect on their learning to propose individual and collective action in response to a contemporary geographical challenge, taking account of environmental, economic and social considerations, and predict the expected outcomes of their proposal	ACHGS054	ACHGS062

Year 7 Mathematics Achievement standard V8.4

By the end of Year 7, students solve problems involving the comparison, addition and subtraction of integers. They make the connections between whole numbers and index notation and the relationship between perfect squares and square roots. They solve problems involving percentages and all four operations with fractions and decimals. They compare the cost of items to make financial decisions. Students represent numbers using variables. They connect the laws and properties for numbers to algebra. They interpret simple linear representations and model authentic information. Students describe different views of three-dimensional objects. They represent transformations in the Cartesian plane. They solve simple numerical problems involving angles formed by a transversal crossing two lines. Students identify issues involving the collection of continuous data. They describe the relationship between the median and mean in data displays.

Students use fractions, decimals and percentages, and their equivalences. They express one quantity as a fraction or percentage of another. Students solve simple linear equations and evaluate algebraic expressions after numerical substitution. They assign ordered pairs to given points on the Cartesian plane. Students use formulas for the area and perimeter of rectangles and calculate volumes of rectangular prisms. ***Students classify triangles and quadrilaterals. They name the types of angles formed by a transversal crossing parallel line***. Students determine the sample space for simple experiments with equally likely outcomes and assign probabilities to those outcomes. They calculate mean, mode, median and range for data sets. They construct stem-and-leaf plots and dot-plots

Year 8 Mathematics Achievement standard V8.4

By the end of Year 8, students solve everyday problems involving rates, ratios and percentages. They describe index laws and apply them to whole numbers. They describe rational and irrational numbers. Students solve problems involving profit and loss. They make connections between expanding and factorising algebraic expressions. Students solve problems relating to the volume of prisms. They make sense of time duration in real applications. ***They identify conditions for the congruence of triangles*** and deduce the properties of quadrilaterals. Students model authentic situations with two-way tables and Venn diagrams. They choose appropriate language to describe events and experiments. They explain issues related to the collection of data and the effect of outliers on means and medians in that data.

Students use efficient mental and written strategies to carry out the four operations with integers. They simplify a variety of algebraic expressions. They solve linear equations and graph linear relationships on the Cartesian plane. Students convert between units of measurement for area and volume. They perform calculations to determine perimeter and area of parallelograms, rhombuses and kites. They name the features of circles and calculate the areas and circumferences of circles. Students determine the probabilities of complementary events and calculate the sum of probabilities.

CONTENT DESCRIPTIONS		YEAR 7	YEAR 8
Data representation and interpretation	Identify and investigate issues involving numerical data collected from primary and secondary sources	ACMSP169	
Measurement and Geometry	Establish the formulas for areas of rectangles, triangles and parallelograms, and use these in problem-solving	ACMMG159	
	Demonstrate that the angle sum of a triangle is 180° and use this to find the angle sum of a quadrilateral	ACMMG166	
	Classify triangles according to their side and angle properties and describe quadrilaterals	ACMMG165	
	Develop the conditions for congruence of triangles		ACMMG201

Years 7 and 8 Version 9

Years 7 and 8 Digital Technologies Achievement standard V9

By the end of Year 8 *students develop and modify creative digital solutions, decompose real-world problems, and evaluate alternative solutions against user stories and design criteria.* Students acquire, interpret and model data with spreadsheets and represent data with integers and binary. *They design and trace algorithms and implement them in a general-purpose programming language. Students select appropriate hardware for particular tasks, explain how data is transmitted and secured in networks, and identify cyber security threats.* They select and use a range of digital tools efficiently and responsibly to create, locate and share content; and to plan, collaborate on and manage projects. Students manage their digital footprint.

CONTENT DESCRIPTIONS		YEARS 7 AND 8
Digital Technologies – Knowledge and understanding		
Digital systems	explain how hardware specifications affect performance and select appropriate hardware for particular tasks and workloads	AC9TDI8K01
	investigate how data is transmitted and secured in wired and wireless networks including the internet	AC9TDI8K02
Digital Technologies – Processes and production skills		
Investigating and defining	define and decompose real world problems with design criteria and by creating user stories	AC9TDI8P04
Generating and designing	design algorithms involving nested control structures and represent them using flowcharts and pseudocode	AC9TDI8P05
	trace algorithms to predict output for a given input and to identify errors	AC9TDI8P06
	design the user experience of a digital system	AC9TDI8P07
	generate, modify, communicate and evaluate alternative designs	AC9TDI8P08

CONTENT DESCRIPTIONS		YEARS 7 AND 8
Producing and implementing	implement, modify and debug programs involving control structures and functions in a general purpose programming language	AC9TDI8P09
	trace algorithms to predict output for a given input and to identify errors	AC9TDI8P06
	design the user experience of a digital system	AC9TDI8P07
	generate, modify, communicate and evaluate alternative designs	AC9TDI8P08
	implement, modify and debug programs involving control structures and functions in a general purpose programming language	AC9TDI8P09
Evaluating	evaluate existing and student solutions against the design criteria, user stories and possible future impact	AC9TDI8P10
Collaborating and managing	select and use a range of digital tools efficiently, including unfamiliar features, to create, locate and communicate content, consistently applying common conventions	AC9TDI8P11

Years 7 and 8 Design and Technologies Achievement standard V9

By the end of Year 8 *students explain how people design, innovate and produce products, services* and environments *for preferred futures.* For each of the 4prescribed technologies contexts *they explain how the features of technologies impact on design decisions, and create designed solutions based on analysis of needs or opportunities. Students create and adapt design ideas, processes and solutions, and justify their decisions against developed design criteria that include sustainability. They communicate design ideas and solutions to audiences using technical terms and graphical representation techniques, including using digital tools. They independently and collaboratively document and manage production processes to safely produce designed solutions.*

CONTENT DESCRIPTIONS		YEARS 7 AND 8
Design and Technologies – Knowledge and understanding		
Technologies and society	analyse how people in design and technologies occupations consider ethical, security and sustainability factors to innovate and improve products, services and environments	AC9TDE8K01
	analyse the impact of innovation, enterprise and emerging technologies on designed solutions for global preferred futures	AC9TDE8K02
Technologies context: Materials and technologies specialisations	analyse and make judgements on how characteristics and properties of materials, systems, components, tools and equipment can be combined to create designed solutions	AC9TDE8K06
Design and Technologies – Processes and production skills		
Investigating and defining	analyse needs or opportunities for designing; develop design briefs; and investigate, analyse and select materials, systems, components, tools and equipment to create designed solutions	AC9TDE8P01
Generating and designing	generate, test, iterate and communicate design ideas, processes and solutions using technical terms and graphical representation techniques, including using digital tools	AC9TDE8P02
Producing and implementing	select, justify, test and use suitable technologies, skills and processes, and apply safety procedures to safely make designed solutions	AC9TDE8P03
Evaluating	develop design criteria independently including sustainability to evaluate design ideas, processes and solutions	AC9TDE8P04

Year 7 Geography Achievement standard V9

By the end of Year 7, **students describe how the characteristics of places are perceived and valued differently by people. They describe the importance of environments to people. They describe the features of a distribution. They explain the interconnections between people and places and environments, and describe how these interconnections change places or environments. Students describe a response or strategy to address a geographical phenomenon or challenge.**

Students develop questions about a geographical phenomenon or challenge. They collect, organise and represent relevant data and information, using primary research methods and secondary research materials. They identify similarities and differences, and describe patterns in data and information. They draw conclusions about the impact of the geographical phenomenon or challenge on people, places and environments. They develop a strategy for action. Students use geographical knowledge, concepts, terms and relevant findings from sources to create descriptions, explanations and responses.

Year 8 Geography Achievement standard V9

By the end of Year 8, **students explain how the interactions of people and environmental processes impact on the characteristics of places.** They explain how the characteristics of places are perceived and valued differently by people. **They describe the effects of human activity or hazards on environments. They explain the features of a distribution and identify implications.** They explain the interconnections between people and places and environments. They explain how these interconnections change places or environments. **Students explain responses or strategies to address a geographical phenomenon or challenge, referring to environmental, economic or social factors.**

Students develop relevant questions about a geographical phenomenon or challenge. They collect, organise and represent relevant and reliable data and information using primary research methods and secondary research materials. They interpret and analyse data and information to explain patterns and trends and infer relationships. They draw reasoned conclusions about the impact of the geographical phenomenon or challenge. They decide on appropriate strategies for action and explain potential impacts. Students use geographical knowledge, methods, concepts, terms and reference findings from sources to create descriptions, explanations and responses.

CONTENT DESCRIPTIONS		YEAR 7	YEAR 8
Knowledge and understanding			
Place and liveability	factors that influence the decisions people make about where to live, including perceptions of the liveability of places and the influence of environmental quality	AC9HG7K05	
	the location and distribution of services and facilities, and implications for liveability of places	AC9HG7K06	
	the cultural connectedness of people to places and how this influences their identity, sense of belonging and perceptions of a place, in particular the cultural connectedness of First Nations Australians to Country/Place	AC9HG7K07	
Landscapes and landforms	geomorphological processes that produce different landscapes and significant landforms		AC9HG8K01
	the spiritual, aesthetic and cultural value of landscapes and landforms for people, including Country/Place of First Nations Australians		AC9HG8K03
	the causes and impacts of a geomorphological hazard on people, places and environments, and the effects of responses		AC9HG8K05
Skills			
Questioning and researching using geographic methods	develop questions for a geographical inquiry related to a phenomenon or challenge	AC9HG7S01	AC9HG8S01
	collect, organise and represent data and information from primary research methods, including fieldwork and secondary research materials, using geospatial technologies and digital tools as appropriate	AC9HG7S02	AC9HG8S02
Interpreting and analysing geographical data and information	interpret and analyse geographical data and information to identify similarities and differences, explain patterns and trends and infer relationships	AC9HG7S03	AC9HG8S03

CONTENT DESCRIPTIONS		YEAR 7	YEAR 8
Concluding and decision-making	draw conclusions based on the analysis of the data and information	AC9HG7S04	AC9HG8S04
	identify a strategy for action in relation to environmental, economic, social or other factors, and explain potential impacts	AC9HG7S05	AC9HG8S05
Communicating	create descriptions, explanations and responses, using geographical knowledge and methods, concepts, terms and reference sources	AC9HG7S06	AC9HG8S06

Year 7 Mathematics Achievement standard V9

By the end of Year 7, students represent natural numbers in expanded form and as products of prime factors, using exponent notation. They solve problems involving squares of numbers and square roots of perfect square numbers. Students solve problems involving addition and subtraction of integers. They use all 4 operations in calculations involving positive fractions and decimals, choosing efficient calculation strategies. Students choose between equivalent representations of rational numbers and percentages to assist in calculations. *They use mathematical modelling to solve practical problems involving rational numbers, percentages and ratios, in financial and other applied contexts, justifying choices of representation.* Students use algebraic expressions to represent situations, describe the relationships between variables from authentic data and substitute values into formulas to determine unknown values. They solve linear equations with natural number solutions. Students create tables of values related to algebraic expressions and formulas, and describe the effect of variation.

They apply knowledge of angle relationships and the sum of angles in a triangle to solve problems, giving reasons. Students use formulas for the areas of triangles and parallelograms and the volumes of rectangular and triangular prisms *to solve problems.* They describe the relationships between the radius, diameter and circumference of a circle.They describe the relationships between the radius, diameter and circumference of a circle. Students classify polygons according to their features and create an algorithm designed to sort and classify shapes. They represent objects two-dimensionally in different ways, describing the usefulness of these representations. Students use coordinates to describe transformations of points in the plane.

They plan and conduct statistical investigations involving discrete and continuous numerical data, using appropriate displays. Students interpret data in terms of the shape of distribution and summary statistics, identifying possible outliers. They decide which measure of central tendency is most suitable and explain their reasoning. Students list sample spaces for single step experiments, assign probabilities to outcomes and predict relative frequencies for related events. They conduct repeated single-step chance experiments and run simulations using digital tools, giving reasons for differences between predicted and observed results.

Year 8 Mathematics Achievement standard V9

By the end of Year 8, students recognise irrational numbers and terminating or recurring decimals. They apply the exponent laws to calculations with numbers involving positive integer exponents. Students solve problems involving the 4 operations with integers and positive rational numbers. *They use mathematical modelling to solve practical problems involving ratios, percentages and rates in measurement and financial contexts*. Students apply algebraic properties to rearrange, expand and factorise linear expressions. They graph linear relations and solve linear equations with rational solutions and one-variable inequalities, graphically and algebraically. Students use mathematical modelling to solve problems using linear relations, interpreting and reviewing the model in context. They make and test conjectures involving linear relations using digital tools.

Students use appropriate metric units when solving measurement problems involving the perimeter and area of composite shapes, and volume of right prisms. *They use Pythagoras' theorem to solve measurement problems involving unknown lengths of right-angle triangles.* Students use formulas to solve problems involving the area and circumference of circles. They solve problems of duration involving 12- and 24-hour cycles across multiple time zones. Students use 3 dimensions to locate and describe position. They identify conditions for congruency and similarity in shapes and create and test algorithms designed to test for congruency and similarity. Students apply the properties of quadrilaterals to solve problems.

They conduct statistical investigations and explain the implications of obtaining data through sampling. Students analyse and describe the distribution of data. They compare the variation in distributions of random samples of the same and different size from a given population with respect to shape, measures of central tendency and range. Students represent the possible combinations of 2 events with tables and diagrams, and determine related probabilities to solve practical problems. They conduct experiments and simulations using digital tools to determine related probabilities of compound events.

	CONTENT DESCRIPTIONS	YEAR 7	YEAR 8
Number	use mathematical modelling to solve practical problems involving rational numbers and percentages, including financial contexts; formulate problems, choosing representations and efficient calculation strategies, using digital tools as appropriate; interpret and communicate solutions in terms of the situation, justifying choices made about the representation	AC9M7N09	
	use mathematical modelling to solve practical problems involving rational numbers and percentages, including financial contexts; formulate problems, choosing efficient calculation strategies and using digital tools where appropriate; interpret and communicate solutions in terms of the situation, reviewing the appropriateness of the model		AC9M8N05
Measurement	solve problems involving the area of triangles and parallelograms using established formulas and appropriate units	AC9M7M01	
	identify corresponding, alternate and co interior relationships between angles formed when parallel lines are crossed by a transversal; use them to solve problems and explain reasons		

CONTENT DESCRIPTIONS		YEAR 7	YEAR 8
Measurement	identify corresponding, alternate and co interior relationships between angles formed when parallel lines are crossed by a transversal; use them to solve problems and explain reasons	AC9M7M04	
	demonstrate that the interior angle sum of a triangle in the plane is 180° and apply this to determine the interior angle sum of other shapes and the size of unknown angles	AC9M7M05	
	solve problems involving the area and perimeter of irregular and composite shapes using appropriate units		AC9M8M01
	use Pythagoras' theorem to solve problems involving the side lengths of right-angled triangles		AC9M8M06

Years 9 and 10 V8.4

Years 9 and 10 Digital Technologies Achievement standard V8.4

By the end of Year 10, *students explain the control and management of networked digital systems and the security implications of the interaction between hardware, software and users.* They explain simple data compression, and why content data are separated from presentation.

Students plan and manage digital projects using an iterative approach. *They define and decompose complex problems in terms of functional and non-functional requirements. Students design and evaluate user experiences and algorithms. They design and implement modular programs, including an object-oriented program, using algorithms and data structures involving modular functions that reflect the relationships of real-world data and data entities.* They take account of privacy and security requirements when selecting and validating data. *Students test and predict results and implement digital solutions. They evaluate information systems and their solutions in terms of risk, sustainability and potential for innovation and enterprise.* They share and collaborate online, establishing protocols for the use, transmission and maintenance of data and projects.

CONTENT DESCRIPTIONS		YEARS 9 AND 10
Digital Technologies – Knowledge and Understanding		
Digital systems	Investigate the role of hardware and software in managing, controlling and securing the movement of and access to data in networked digital systems	ACTDIK034
Digital Technologies – Processes and Production Skills		
Investigating and defining	Define and decompose real- world problems precisely, taking into account functional and non-functional requirements and including interviewing stakeholders to identify needs	ACTDIK038
Generating and designing	Design the user experience of a digital system by evaluating alternative designs against criteria including functionality, accessibility, usability, and aesthetics	ACTDIK039
	Design algorithms represented diagrammatically and in structured English and validate algorithms and programs through tracing and test cases	ACTDIK040
Producing and implementing	Implement modular programs, applying selected algorithms and data structures including using an object-oriented programming language	ACTDIK041
Evaluating	Evaluate critically how student solutions and existing information systems and policies, take account of future risks and sustainability and provide opportunities for innovation and enterprise	ACTDIK042

Years 9 and 10 Design and Technologies Achievement standard V8.4

By the end of Year 10, *students explain how people working in design and technologies occupations consider factors that impact on design decisions and the technologies used to produce products, services* and environments. *They identify the changes necessary to designed solutions to realise preferred futures they have described. When producing designed solutions for identified needs or opportunities, students evaluate the features of technologies and their appropriateness for purpose for one or more of the technologies contexts.*

Students create designed solutions for one or more of the technologies contexts based on a critical evaluation of needs or opportunities. They establish detailed criteria for success, including sustainability considerations, and use these to evaluate their ideas and designed solutions and processes. They create and connect design ideas and processes of increasing complexity and justify decisions. Students communicate and document projects, including marketing for a range of audiences. They independently and collaboratively apply sequenced production and management plans when producing designed solutions, making adjustments to plans when necessary. *They select and use appropriate technologies skillfully and safely to produce high-quality designed solutions suitable for the intended purpose.*

CONTENT DESCRIPTIONS		YEARS 9 AND 10
Design and Technologies – Knowledge and Understanding		
Technologies and society	Critically analyse factors, including social, ethical and sustainability considerations, that impact on designed solutions for global preferred futures and the complex design and production processes involved	ACTDEK040
	Explain how products, services and environments evolve with consideration of preferred futures and the impact of emerging technologies on design decisions	ACTDEK041
Materials and technologies specialisation	Investigate and make judgments on how the characteristics and properties of materials, systems, components, tools and equipment can be combined to create designed solutions	ACTDEK046
	Investigate and make judgments, within a range of technologies specialisations, on how technologies can be combined to create designed solutions	ACTDEK047

CONTENT DESCRIPTIONS	YEARS 9 AND 10
Design and Technologies – Processes and Production Skills	
Investigating and defining Critique needs or opportunities to develop design briefs and investigate and select an increasingly sophisticated range of materials, systems, components, tools and equipment to develop design ideas	ACTDEP048
Generating and designing Develop, modify and communicate design ideas by applying design thinking, creativity, innovation and enterprise skills of increasing sophistication	ACTDEP049
Producing and implementing Work flexibly to effectively and safely test, select, justify and use appropriate technologies and processes to make designed solutions	ACTDEP050
Evaluating Evaluate design ideas, processes and solutions against comprehensive criteria for success recognising the need for sustainability	ACTDEP051

Year 9 Geography Achievement standard V8.4

By the end of Year 9, students explain how geographical processes change the characteristics of places. *They analyse interconnections between people, places and environments and explain how these interconnections influence people, and change places and environments*. They predict changes in the characteristics of places over time and identify the possible implications of change for the future. *Students analyse alternative strategies to a geographical challenge using environmental, social and economic criteria.*

Students use initial research to identify geographically significant questions to frame an inquiry. They evaluate a range of primary and secondary sources to select and collect relevant and reliable geographical information and data. They record and represent multi-variable data in a range of appropriate digital and non-digital forms, including a range of maps that comply with cartographic conventions. They use a range of methods and digital technologies to interpret and analyse maps, data and other information to propose explanations for patterns, trends, relationships and anomalies across time and space, and to predict outcomes. Students synthesise data and information to draw reasoned conclusions. They present findings, arguments and explanations using relevant geographical terminology and digital representations in a range of appropriate communication forms. Students propose action in response to a geographical challenge, taking account of environmental, economic and social factors, and predict the outcomes and consequences of their proposal.

Year 10 Geography Achievement standard V8.4

By the end of Year 10, students explain how interactions between geographical processes at different scales change the characteristics of places. *Students identify, analyse and explain significant interconnections between people, places and environments and explain changes that result from these interconnections and their consequences.* They predict changes in the characteristics of places and environments over time, across space and at different scales and explain the predicted consequences of change. *They evaluate alternative views on a geographical challenge and alternative strategies to address this challenge using environmental, economic, political and social criteria.*

Students use initial research to develop and modify geographically significant questions to frame an inquiry. They critically evaluate a range of primary and secondary sources to select and collect relevant, reliable and unbiased geographical information and data. Students record and represent multi-variable data in of the most appropriate digital and non-digital forms, including a range of graphs and maps that use suitable scales and comply with cartographic conventions. They use a range of methods and digital technologies to interpret and analyse maps, data and other information to make generalisations and inferences, propose explanations for significant patterns, trends, relationships and anomalies across time and space and at different scales, and predict outcomes. They analyse and synthesise data and other information to draw reasoned conclusions, taking into account alternative perspectives. Students present findings, arguments and explanations using relevant geographical terminology and graphic representations and digital technologies in a range of selected and appropriate communication forms. They evaluate their findings and propose action in response to a contemporary geographical challenge, taking account of environmental, economic, political and social considerations. They explain the predicted outcomes and consequences of their proposal.

CONTENT DESCRIPTIONS		YEAR 9	YEAR 10
Geographical Knowledge and Understanding			
Geographies of interconnections	The way transportation and information and communication technologies are used to connect people to services, information and people in other places	ACHGK066	
Geographies of human wellbeing	Different ways of measuring and mapping human wellbeing and development, and how these can be applied to measure differences between places		ACHGK076
	Reasons for spatial variations between countries in selected indicators of human wellbeing		ACHGK077
	Reasons for, and consequences of, spatial variations in human wellbeing on a regional scale within India or another country of the Asia region		ACHGK079
	The role of international and national government and non-government organisations' initiatives in improving human wellbeing in Australia and other countries		ACHGK081

CONTENT DESCRIPTIONS		YEAR 9	YEAR 10
Skills			
Observing, questioning and planning	Develop geographically significant questions and plan an inquiry that identifies and applies appropriate geographical methodologies and concepts	ACHGS063	ACHGS072
Collecting, recording, evaluating and representing	Evaluate sources for their reliability, bias and usefulness and select, collect, record and organise relevant geographical data and information, using ethical protocols, from a range of appropriate primary and secondary sources	ACHGS064	ACHGS073
	Represent multi-variable data in a range of appropriate forms, for example scatter plots, tables, field sketches and annotated diagrams, with and without the use of digital and spatial technologies	ACHGS065	ACHGS074
	Represent spatial distribution of geographical phenomena by constructing special purpose maps that conform to cartographic conventions, using spatial technologies as appropriate	ACHGS066	ACHGS075
Interpreting, analysing and concluding	Interpret and analyse multi-variable data and other geographical information using qualitative and quantitative methods, and digital and spatial technologies as appropriate, to make generalisations and inferences, propose explanations for patterns, trends, relationships and anomalies, and predict outcomes	ACHGS067	ACHGS076
	Apply geographical concepts to synthesise information from various sources and draw conclusions based on the analysis of data and information, taking into account alternative points of view	ACHGS068	ACHGS077
	Identify how geographical information systems (GIS) might be used to analyse geographical data and make predictions	ACHGS069	ACHGS078
Communicating	Present findings, arguments and explanations in a range of appropriate communication forms, selected for their effectiveness and to suit audience and purpose; using relevant geographical terminology, and digital technologies as appropriate	ACHGS070	ACHGS079
Reflecting and responding	Reflect on and evaluate findings of an inquiry to propose individual and collective action in response to a contemporary geographical challenge, taking account of environmental, economic, political and social considerations; and explain the predicted outcomes and consequences of their proposal	ACHGS071	ACHGS080

Year 9 Mathematics Achievement standard V8.4

By the end of Year 9, students solve problems involving simple interest. They interpret ratio and scale factors in similar figures. Students explain similarity of triangles. They recognise the connections between similarity and the trigonometric ratios. Students compare techniques for collecting data from primary and secondary sources. They make sense of the position of the mean and median in skewed, symmetric and bi-modal displays to describe and interpret data.

Students apply the index laws to numbers and express numbers in scientific notation. They expand binomial expressions. They find the distance between two points on the Cartesian plane and the gradient and midpoint of a line segment. They sketch linear and non-linear relations. Students calculate areas of shapes and the volume and surface area of right prisms and cylinders. ***They use Pythagoras' Theorem and trigonometry to find unknown sides of right-angled triangles.*** Students calculate relative frequencies to estimate probabilities, list outcomes for two-step experiments and assign probabilities for those outcomes. They construct histograms and back-to-back stem- and-leaf plots.

Year 10 Mathematics Achievement standard V8.4

By the end of Year 10, students recognise the connection between simple and compound interest. They solve problems involving linear equations and inequalities. They make the connections between algebraic and graphical representations of relations. Students solve surface area and volume problems relating to composite solids. They recognise the relationships between parallel and perpendicular lines. Students apply deductive reasoning to proofs and numerical exercises involving plane shapes. They compare data sets by referring to the shapes of the various data displays. They describe bivariate data where the independent variable is time. Students describe statistical relationships between two continuous variables. They evaluate statistical reports.

Students expand binomial expressions and factorise monic quadratic expressions. They find unknown values after substitution into formulas. They perform the four operations with simple algebraic fractions. Students solve simple quadratic equations and pairs of simultaneous equations. They use triangle and angle properties to prove congruence and similarity. ***Students use trigonometry to calculate unknown angles in right-angled triangles.*** Students list outcomes for multi-step chance experiments and assign probabilities for these experiments. They calculate quartiles and inter-quartile ranges.

CONTENT DESCRIPTIONS		YEAR 9	YEAR 10
Data representation and interpretation	Identify everyday questions and issues involving at least one numerical and at least one categorical variable, and collect data directly and from secondary sources	ACMSP228	
Measurement and Geometry	Investigate Pythagoras' Theorem and its application to solving simple problems involving right angled triangles	ACMMG222	
	Use similarity to investigate the constancy of the sine, cosine and tangent ratios for a given angle in right-angled triangles	ACMMG223	
	Apply trigonometry to solve right-angled triangle problems	ACMMG224	
	Solve right-angled triangle problems including those involving direction and angles of elevation and depression		ACMMG245

Years 9 and 10 Version 9

Years 9 and 10 Digital Technologies Achievement standard V9

By the end of Year 10 *students develop and modify innovative digital solutions, decompose real-world problems, and critically evaluate alternative solutions against stakeholder elicited user stories.* Students acquire, interpret and model complex data with databases and represent documents as content, structure and presentation. *They design and validate algorithms and implement them, including in an object-oriented programming language. Students explain how digital systems manage, control and secure access to data; and model cyber security threats and explore a vulnerability.* They use advanced features of digital tools to create interactive content, and to plan, collaborate on, and manage agile projects. Students apply privacy principles to manage digital footprints.

CONTENT DESCRIPTIONS		YEARS 9 AND 10
Digital Technologies – Knowledge and understanding		
Digital systems	investigate how hardware and software manage, control and secure access to data in networked digital systems	AC9TDI10K01
Digital Technologies – Processes and production skills		
Investigating and defining	define and decompose real world problems with design criteria and by interviewing stakeholders to create user stories	AC9TDI10P04
Generating and designing	design algorithms involving logical operators and represent them as flowcharts and pseudocode	AC9TDI10P05
	validate algorithms and programs by comparing their output against a range of test cases	AC9TDI10P06
	design and prototype the user experience of a digital system	AC9TDI10P07
	generate, modify, communicate and critically evaluate alternative designs	AC9TDI10P08
Producing and implementing	implement, modify and debug modular programs, applying selected algorithms and data structures, including in an object oriented programming language	AC9TDI10P09
Evaluating	evaluate existing and student solutions against the design criteria, user stories, possible future impact and opportunities for enterprise	AC9TDI10P10

Years 9 and 10 Design and Technologies Achievement standard V9

By the end of Year 10 *students explain how people consider factors that impact on design decisions and the technologies used to design and produce products, services* and environments *for sustainable living. They explain the contribution of innovation, enterprise skills and emerging technologies to global preferred futures.* For one or more of the technologies contexts, *students explain the features of technologies and their appropriateness for purpose, and create designed solutions based on an analysis of needs or opportunities. Students create, adapt and refine design ideas, processes and solutions and justify their decisions against developed design criteria that include sustainability. They communicate design ideas, processes and solutions to a range of audiences, including using digital tools.* Students independently and collaboratively develop and apply production and project management plans, adjusting processes when necessary. *They select and use technologies skilfully and safely to produce designed solutions.*

CONTENT DESCRIPTIONS		YEARS 9 AND 10
Design and Technologies – Knowledge and understanding		
Technologies and society	analyse how people in design and technologies occupations consider ethical, security and sustainability factors to innovate and improve products, services and environments	AC9TDE10K01
	analyse the impact of innovation, enterprise and emerging technologies on designed solutions for global preferred futures	AC9TDE10K02
Technologies context: Materials and technologies specialisations	analyse and make judgements on how characteristics and properties of materials, systems, components, tools and equipment can be combined to create designed solutions	AC9TDE10K06
Design and Technologies – Processes and production skills		
Investigating and defining	analyse needs or opportunities for designing; develop design briefs; and investigate, analyse and select materials, systems, components, tools and equipment to create designed solutions	AC9TDE10P01
Generating and designing	apply innovation and enterprise skills to generate, test, iterate and communicate design ideas, processes and solutions, including using digital tools	AC9TDE10P02
Producing and implementing	select, justify, test and use suitable technologies, skills and processes, and apply safety procedures to safely make designed solutions	AC9TDE10P03
Evaluating	develop design criteria independently including sustainability to evaluate design ideas, processes and solutions	AC9TDE10P04

Year 9 Geography Achievement standard V9

By the end of Year 9, students explain how peoples' activities or environmental processes change the characteristics of places. They explain the effects of human activity on environments, and the effects of environments on human activity. They explain the features of biomes' distribution and identify implications for environments. **They analyse the interconnections between people and places and environments.** They identify and explain how these interconnections influence people, and change places and environments. Students analyse strategies to address a geographical phenomenon or challenge using environmental, social or economic criteria.

Students develop a range of questions about a geographical phenomenon or challenge. They collect, represent and compare relevant and reliable geographical data and information by using a range of primary research methods and secondary research materials in a range of formats. They interpret and analyse data and information to explain patterns and trends and infer relationships. They draw evidence-based conclusions about the impact of the geographical phenomenon or challenge. They develop and evaluate strategies, predict impacts and make a recommendation. Students use geographical knowledge, concepts, terms and digital tools as appropriate to develop descriptions, explanations and responses that acknowledge research findings.

Year 10 Geography Achievement standard V9

By the end of Year 10, students explain how the interactions of people and environmental processes at different scales change the characteristics of places. They explain the effects of human activity on environments, and the effect of environments on human activity, over time. **They evaluate the implications of a distribution. They evaluate the extent of interconnections occurring between people and places and environments**. They analyse changes that result from these interconnections and their consequences. Students evaluate strategies to address a geographical phenomenon or challenge, using environmental, social and economic criteria.

Students develop a range of relevant questions about a geographical phenomenon or challenge. They collect, represent and compare relevant and reliable geographical data and information by using a range of primary research methods and secondary research materials, using appropriate formats. They interpret and analyse data and information to make generalisations and predictions, explain significant patterns and trends, and infer relationships. They draw evidence-based conclusions, based on relevant data and information, about the impact of the geographical phenomenon or challenge. They develop and evaluate strategies using criteria, recommend a strategy and explain the predicted impacts. Students use geographical knowledge, concepts, terms and digital tools as appropriate to develop descriptions, explanations and responses that synthesise research findings.

CONTENT DESCRIPTIONS		YEAR 9	YEAR 10
Knowledge and understanding			
Geography of interconnections	the ways changing transportation and technologies are used to connect people to services, information and people in other places	AC9HG9K05	
Geographies of human wellbeing	the methods used to measure spatial variations in human wellbeing and development, and how these can be applied to determine differences between places at the global scale		AC9HG10K05
	reasons for, and consequences of, spatial variations in human wellbeing at a regional and national scale, drawing on studies such as from within India or another country in Asia		AC9HG10K06
	responses of international and national government and non government organisations to improve human wellbeing in Australia, within India and another country in the Pacific		AC9HG10K08
Skills			
Questioning and researching using geographic methods	develop a range of questions for a geographical inquiry	AC9HS5S01	AC9HG10S01
	collect, represent and compare data and information from primary research methods including fieldwork and secondary research materials, using geospatial technologies and digital tools as appropriate	AC9HG9S02	AC9HG10S02
Interpreting and analysing geographical data and information	evaluate geographical data and information to make generalisations and predictions, explain patterns and trends and infer relationships	AC9HG9S03	AC9HG10S03
Concluding and decision-making	evaluate data and information to justify conclusions	AC9HG9S04	AC9HG10S04
	develop and evaluate strategies using environmental, economic or social criteria; recommend a strategy and explain the predicted impacts	AC9HG9S05	AC9HG10S05
Communicating	create descriptions, explanations and responses, using geographical knowledge and geographical tools as appropriate, and concepts and terms that incorporate and acknowledge research findings	AC9HG9S06	AC9HG10S06

Year 9 Mathematics Achievement standard V9

By the end of Year 9, students recognise and use rational and irrational numbers to solve problems. They extend and apply the exponent laws with positive integers to variables. Students expand binomial products, and factorise monic quadratic expressions. They find the distance between 2 points on the Cartesian plane, and the gradient and midpoint of a line segment. Students use mathematical modelling to solve problems involving change in financial and other applied contexts, choosing to use linear and quadratic functions. They graph quadratic functions and solve monic quadratic equations with integer roots algebraically. Students describe the effects of variation of parameters on functions and relations, using digital tools, and make connections between their graphical and algebraic representations.

They apply formulas to solve problems involving the surface area and volume of right prisms and cylinders. Students solve problems involving ratio, similarity and scale in two-dimensional situations. They determine percentage errors in measurements. **Students apply Pythagoras' theorem and use trigonometric ratios to solve problems involving right-angled triangles.** They use mathematical modelling to solve practical problems involving direct proportion, ratio and scale, evaluating the model and communicating their methods and findings. Students express small and large numbers in scientific notation. They apply the enlargement transformation to images of shapes and objects, and interpret results. Students design, use and test algorithms based on geometric constructions or theorems. They compare and analyse the distributions of multiple numerical data sets, choose representations, describe features of these data sets using summary statistics and the shape of distributions, and consider the effect of outliers. Students explain how sampling techniques and representation can be used to support or question conclusions or to promote a point of view. They determine sets of outcomes for compound events and represent these in various ways. Students assign probabilities to the outcomes of compound events. They design and conduct experiments or simulations for combined events using digital tools.

Year 10 Mathematics Achievement standard V9

By the end of Year 10, students recognise the effect of approximations of real numbers in repeated calculations. They use mathematical modelling to solve problems involving growth and decay in financial and other applied situations, applying linear, quadratic and exponential functions as appropriate, and solve related equations, numerically and graphically. Students make and test conjectures involving functions and relations using digital tools. They solve problems involving simultaneous linear equations and linear inequalities in 2 variables graphically and justify solutions.

Students interpret and use logarithmic scales representing small or large quantities or change in applied contexts. They solve measurement problems involving surface area and volume of composite objects. **Students apply Pythagoras' theorem and trigonometry to solve practical problems involving right-angled triangles.** They identify the impact of measurement errors on the accuracy of results. Students use mathematical modelling to solve practical problems involving proportion and scaling, evaluating and modifying models, and reporting assumptions, methods and findings. They use deductive reasoning, theorems and algorithms to solve spatial problems. Students interpret networks used to represent practical situations and describe connectedness. They plan and conduct statistical investigations involving bivariate data. Students represent the distribution of data involving 2 variables, using tables and scatter plots, and comment on possible association. They analyse inferences and conclusions in the media, noting potential sources of bias. Students compare the distribution of continuous numerical data using various displays, and discuss distributions in terms of centre, spread, shape and outliers. They apply conditional probability to solve problems involving compound events. Students design and conduct simulations involving conditional probability, using digital tools.experiments.

CONTENT DESCRIPTIONS		YEAR 9	YEAR 10
Measurement	solve spatial problems, applying angle properties, scale, similarity, Pythagoras' theorem and trigonometry in right-angled triangles	AC9M9M03	
	solve practical problems applying Pythagoras' theorem and trigonometry of right-angled triangles, including problems involving direction and angles of elevation and depression		AC9M10M03
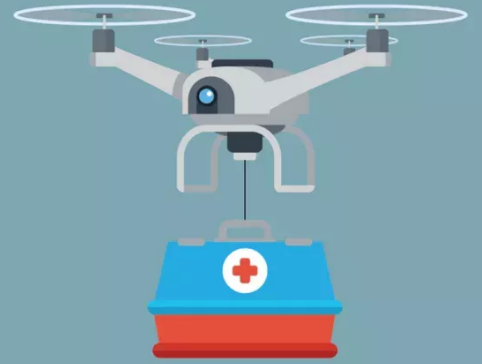
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