Sample virtual program for Stage 4 Mathematics:

## Considerations for programming virtual classrooms

Guiding questions for establishing learning expectations and communication processes

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| Guiding question |  |
| What are your students going to learn? (Learning intentions) | Students will learn how to apply Pythagoras’ Theorem and represent solutions using exact values. |
| How are they going to learn it? (Resources and Strategies) | It is envisaged that all concepts will be introduced by the staff member via video conferencing and Microsoft Whiteboard; however, materials to supplement learning and independent learning activities have been provided for self-paced study. |
| Target date for completion | 5 to 7 lesson sequence |
| How are you going to know that they learned it? (Success criteria) | * Students understand irrational numbers and surds
* Students use and interpret terminology, notations and representations for right-angled triangles
* Students can apply Pythagoras’ Theorem to find unknown lengths of right-angled triangles
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| Collecting evidence of student learning (Verification) | Activities provide formative assessment opportunities as student responses are collected. Students are provided with assessment as learning opportunities during interactive activities. |
| Feedback (Evaluation) | Staff can use video conferencing and Microsoft Whiteboard to lead student discussion and pose assessing and advancing questions. Staff can use these platforms to respond to student misconceptions identified through the formative assessment activities. |
| Communication | Staff can facilitate discussion and collaboration though video conferencing, like Zoom, and collaborative platforms, like Microsoft Whiteboard. |

### Model 2 – Sharing resources for students to view/read and reflect on

It is envisaged that the following sequence of lessons would be facilitated by the peer discussion and conferencing, asynchronous discussion and mini-whiteboard activities from the [Digital learning selector – Learning activities](https://app.education.nsw.gov.au/digital-learning-selector/LearningActivity/Browser?cache_id=240cd).

Staff may like to access this [Desmos tutorial](https://learn.desmos.com/graphing) in preparation for this lesson sequence.

### Properties of Right-angled Triangles: Pythagoras’ Theorem

Stage 4 Mathematics

During this sequence of lessons students will extend their understanding of the number system and learn to apply it to solve problems involving right-angled triangles.

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| Lesson sequence |  |  |
| 1 | 1. Students are introduced to rational and irrational numbers. The staff member can introduce the concept of rational numbers as numbers that can be written in the form $\frac{a}{b}$, whereas irrational numbers cannot. The staff member may like to use Microsoft Whiteboard to collaborate with students and video conferencing applications, like Zoom, to facilitate discourse. The mathsisfun.com activity can supplement students understanding.
2. Students investigate square roots of numbers and teacher leads discussion, via Microsoft Whiteboard and video conferencing software, to determine surds and rational numbers, ie. The square root of square numbers results in a rational number, whereas the square root of a number that is not a square number results in a surd, which is irrational. Students should be challenged to attempt the openmiddle.com activity which requires students reasoning.
 | Students read the article on Irrational Numbers on the [Maths is Fun](https://www.mathsisfun.com/irrational-numbers.html) website.Students can attempt this [short online quiz](https://au.mathgames.com/skill/8.24-identify-rational-and-irrational-numbers) to determine their understanding of rational and irrational numbers. Students attempt this [open middle activity](https://www.openmiddle.com/rational-and-irrational-roots) to demonstrate their understanding of rational, irrational and surds. |
| 2 | 1. Students are challenged to *perfectly* construct a line of length $\sqrt{41}$ cm. Staff may like to use Microsoft Whiteboard and video conferencing to facilitate the above challenge and field student responses to the problem above.
2. The staff member may like to facilitate the Desmos activity listed. The activity requires students to explain their reasoning for selecting the longest interval drawn on a pin board. The activity provides insights into students thinking and raises any misconceptions prior to introduction of Pythagoras’ Theorem.
 | Students attempt the following [sequence of Desmos activities](https://bit.ly/33aSRmH) which provide insights into students’ reasoning.  |
| 3 | 1. Students are introduced to the language, notations and definitions of right angled triangles. The staff member may like to use Microsoft Whiteboard and video conferencing to introduce right-angled notation, the Hypotenuse and its characteristics. Students learning can be supplemented by the amsi.org article listed.
2. Staff may like to use this Desmos activity <https://bit.ly/2vVT7d9> to introduce the concept of Pythagoras Theorem. This activity uses Minecraft to construct the squares of the sides of the triangle. Students learning may be supplemented by the amsi.org article listed.
3. Students may like to follow the bbc.co.uk slideshow listed to construct an informal proof of Pythagoras’ Theorem and cement their understanding.
4. Students reflect on their learning of the concepts by completing a Frayer Model. <https://bit.ly/2VZqq9C>
 | Students read the **Standard Notation** and **Right-Angled triangles** sub-sections of the **Content** section of the [AMSI website](https://amsi.org.au/teacher_modules/pythagoras_theorem.html).Students read **The Theorem** sub-section of the Content section of the [AMSI website](https://amsi.org.au/teacher_modules/pythagoras_theorem.html).Students can attempt this informal proof of Pythagoras’ Theorem by following the instruction outlined in the [slideshow on this webpage](https://www.bbc.co.uk/bitesize/topics/zkbc87h/articles/zgf8ng8)Students create a [Frayer model](https://bit.ly/2vRXA0n) to summarise their learning |
| 4 | 1. Students are given opportunities to apply their learning of Pythagoras’ Theorem. The Desmos activities listed provide opportunities for students to apply their learning independently.
 | Students attempt the following [Desmos activity](https://bit.ly/2Iv4qvA) that provides visual representations to their responsesStudents can attempt the following [Desmos activity](https://bit.ly/2TVxMbC) that extends students by challenging them to apply Pythagoras’ Theorem flexibly and within real world contexts |
| 5 - 7 | 1. Students apply their learning of Pythagoras’ Theorem. The Spider and the fly, is a problem-solving investigation which may take students a few lessons to complete. The staff member may like to introduce this activity and discuss the problem before students starting working independently.
 | Students complete the problem solving activity [Spider and the Fly](https://education.nsw.gov.au/content/dam/main-education/teaching-and-learning/curriculum/key-learning-areas/mathematics/media/documents/mathematics-s4-spider-and-the-fly-rl.docx) using visual nets of solids, measurement and Pythagoras’ Theorem. [Rectangular prism net foldable printable worksheet](https://lrt.ednet.ns.ca/PD/BLM/pdf_files/geometry_3D/nets/net_rect_prism.pdf) to support students with this activity.**Note:** the links to these activities will automatically download a word document. |

## Resource 1: if you have any resources or appendix they would be here

Further resources available to support the teaching of this unit from the learning from home website are:

[Pythagoras Problem](https://education.nsw.gov.au/content/dam/main-education/teaching-and-learning/curriculum/key-learning-areas/mathematics/media/documents/mathematics-s4-pythagoras-problem-rl.docx) – A goal free problem for students to explore on Pythagoras’ Theorem

[Pythagoras Practice](https://education.nsw.gov.au/content/dam/main-education/teaching-and-learning/curriculum/key-learning-areas/mathematics/media/documents/mathematics-s4-pythagoras-practice-rl.docx) – A worksheet on Pythagoras’ Theorem that also incorporates perimeter and area

**Note:** the links to these activities will automatically download a word document.