Embedding career education in the Victorian Curriculum F–10

Mathematics, Level 10

An existing learning activity linked to a particular learning area or capability in the Victorian Curriculum F–10 can be easily adapted to incorporate career education, enriching students’ career-related learning and skill development.

1. Identify an existing learning activity

**Curriculum area and level:** Mathematics, Level 10

**Relevant content description:** Solve right-angled triangle problems including those involving direction and angles of elevation and depression [(VCMMG346)](https://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG346)

**Existing activity:** Applying Pythagoras theorem and trigonometry to real-world scenarios.

**Summary of adaptation, change, addition:** Investigating ways trigonometry is used in engineering.

2. Adapt the learning activity to include a career education focus

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| Existing learning activity | Adaptations, changes or extensions that can be made |
| Teacher provides example diagrams involving the interpretation of angles of elevation and depression and demonstrates use of sine, cosine or tangent to find missing angles.  Students review example diagrams during classroom demonstration. | Teacher introduces the work of an engineer, including various types of engineering, such as civil, structural, software, mechanical.  Teacher groups students and has them find descriptions of each type of engineering occupations.  Teacher reviews the method for the interpretation of angles of elevation and depression and demonstrates use of sine, cosine or tangent to find missing angles using several contextualised engineering examples.  Students review Pythagoras theorem and some examples the interpretation of angles of elevation and depression using sine, cosine or tangent |
| Teacher discusses practical situations in which angles might be derived, e.g. finding the angle that a ladder leaning against a vertical wall makes with the floor.  Teacher sets students a variety of practical problems, including those involving angles of elevation and depression.  Students complete problems from an appropriate text or online source, including those involving angles of elevation and depression. | Teacher groups students into teams each specialising in a type of engineer. Teacher asks each team to consider how their type of engineer might need to use Pythagoras theorem and trigonometry to solve problems in their work.  Possible examples include electrical engineers find heights and/or angles of elevation for overhead electrical wires; and software engineers find angle trajectories and line lengths when creating digital graphics.  In teams, students research a type of engineering in more detail, and describe the work done by a given type of engineer. They research how their type of engineer might need to use Pythagoras theorem and trigonometry to solve problems in their work, and then compose a mathematical problem (complete with diagram/s) that requires the use of trigonometry to solve it. |
| Teacher assesses solutions by marking set exercises together with class.  Students have work checked or marked by classroom teacher and review by comparing responses and working in class. | Students work with others and the teacher to solve peers’ sample trigonometric ‘engineering problems’, and review solutions.  Teacher reinforces the links between the trigonometry studied at school, and its useful application in work. |

Considerations when adapting the learning activity

* Teachers should endeavour to use natural examples that illustrate the use of Pythagoras theorem and trigonometry in various engineering contexts.
* Where there is a school Careers Practitioner, teacher could engage their help in sourcing appropriate examples of the range of engineering roles available.
* This activity would be enhanced if students could interview an engineer about the ways they use Pythagoras theorem in their work life and learn more about their role and career journey. Teachers will need to facilitate this, with the help of the school Careers Practitioner if possible. The Careers Practitioner can also work with students to demonstrate how to identify and contact people to learn more about specific careers.
* An explicitly taught review of trigonometric methods should remind students of these concepts and techniques prior to the groupwork.

Additional resources to help when adapting the learning activity

* Career Trend, ‘[Jobs that use Pythagorean theorem](https://careertrend.com/info-8466810-jobs-use-pythagorean-theorem.html)’
* AMSI, ‘[TIMES modules](http://amsi.org.au/teacher_modules/Introductory_trigonometry.html)’ (for teachers)
* AMSI Careers, ‘[Engineering and resources](https://careers.amsi.org.au/search-careers/engineering-resources)’
* Engineers Australia, ‘[Areas of Practice](https://www.engineersaustralia.org.au/Engineering-Registers/National-Engineering-Register/NER-Areas-Of-Practice)’

Benefits for students

Know yourself – self-development:

* Working in a team requires students to use communication skills, interact effectively and work well with others.
* Students more clearly recognise links between maths at school and its application in real occupational contexts, thus fostering attitudes conducive to lifelong learning.

Know your world – career exploration:

* Researching the scenarios through which people might utilise trigonometry in industrial problems in a variety of contexts helps students to better understand work.
* By working in teams, using research skills and sharing knowledge of roles and occupations in a range of high-demand engineering occupations, students explorethe labour market.

Manage your future – be proactive:

* By researching various engineering roles and the real-world use of trigonometry, students are better equipped to make informed career choices.