

# Classroom to Campus: Math and Stats Challenge

## Grade 12 – MAP4C

### Topic C: Geometry and Trigonometry

Exploring Geometry in Construction through Deck Design

A high school is planning to construct a new outdoor seating area for students, combining a rectangular patio with a semicircular extension to create a unique and functional space. The design aims to optimize the use of materials while providing ample space for seating and activities.

The design specifications are not provided except:

- Rectangular Patio: Length ( $L$ ) and Width ( $W$ ): ( $L > W$ ).
  - The semicircular extension is attached to one of the shorter sides of the rectangular patio.
  - Semicircular Extension: Radius ( $R$ ): Equal to half of the width ( $W$ ) of the rectangular patio ensuring a seamless connection between the two shapes.
  - The combined area of the rectangular patio and the semicircular extension should be between 140 and 150 square metres.
  - The perimeter of the entire seating area, including the curved edge of the semicircle, should not exceed 60 metres.
- a) Create a scaled diagram of the seating area; determine possible dimensions and clearly label all dimensions and features.
- b) Calculate the appropriate dimensions ( $L$  and  $W$ ) of the rectangular patio that satisfy both the area and perimeter constraints. (Round your final answer to two decimal places. Include units.)
- c) Design a ramp to provide wheelchair access to the deck, adhering to accessibility standards that require a maximum slope of 1:12 (*rise:run*). If the deck is 42 decimetres above ground level, what is the minimum length of the ramp (in metres)? (Round your final answer to two decimal places. Include units.)
- d) If the deck requires support posts every 2 metres along its perimeter, how many posts are needed? (Provide your final answer as an integer.)

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