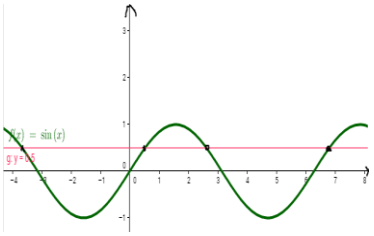
Week 1
Term 3
2021

HAWKER COLLEGE
Engage | Inspire | Achieve

Learning Brief
SM2

Goals



By the end of this unit, students:

- understand the concepts and techniques in trigonometry, real and complex numbers, and matrices
- apply reasoning skills and solve problems in trigonometry, real and complex numbers, and matrices
- communicate their arguments and strategies when solving problems
- construct proofs of results
- interpret mathematical information and ascertain the reasonableness of their solutions to problems

This week:
The basic trigonometric functions:

- find all solutions of $f\big(a(x-b)\big)=c$ where f is one of sin, cos or tan

Theoretical Components

Read through examples and make notes.

Mathspace Lessons:

- Solving Trig Equations
  - https://bit.ly/3iI9FeO
  - https://bit.ly/2Tqcczv
- Exact Values Trig - https://bit.ly/35jkg7J
- General Solutions to Trig Equations - https://bit.ly/2SzyAq3

Watch the following videos:

- Simple Example (with general solution): https://goo.gl/gj5uzM
- Solving Trig Eq by factoring: https://goo.gl/ZAYt8i
  https://goo.gl/3oDqbc
  https://goo.gl/t6Nc3m

Notes and Worked Examples on Trig Equations:
http://goo.gl/pP4OFx

Intuitive Explanation of Reciprocal Trig Functions: https://goo.gl/QwpN66

Practical Components

Check Google Drive S2/WK01 folder:

- WK01 Ex 1Solve Trigonometric Equations (deg_rad)
  Questions: Attempt all questions.

Investigation

See next page!!!

20 marks (see the rubric)

Q/F/O
Quiz/Forum/Other

More practice: http://goo.gl/vUJfkB

Further reading & investigation: Have a Sine or Haversine

Investigation

ACT Sports and Recreation team are working on a project to design a roller coaster track to be constructed at Hawker College student carpark.

They must comply with certain restrictions or a set of constraints. They are seeking engineers who could design a blueprint for the track using piece-wise sine and cosine functions only. According to a department spokesperson, her people can easily “fit” a curve to a set of points; however, the resulting curve does not necessarily satisfy constraints involving slopes, concavity, extreme values, smoothness, updateability, etc. Furthermore, design engineers must first build a scaled-down test model, and thus they need the function description for the scale model.

Hence your task is to define a piecewise function -- that is, a function defined in pieces over the interval [0,15], whose graph satisfies the following constraints for the roller coaster track (each unit represents 10 meters).

1. The entrance onto the track is at the point (0,10) and the exit is at (15,0). There are just two local extreme values, a minimum at (4,2) and a maximum at (8,8). (You do not have to consider designing the stairs leading to the entrance)

2. The slope of the curve at the entrance and exit points must be zero to facilitate getting on and off the roller coaster car.

3. IMPORTANT: The curve must be smooth, meaning that the piecewise function must knit together without any “kinks” in the track over its entire domain.

4. For continued customer interest, maintenance, and future customization, YOU MUST build the roller coaster track out of pieces. Based on the given constraints, you must also decide how many functions you will “knit together” to build the track.