HAWKER COLLEGE

Faculty 42 Assignment Cover Sheet

This sheet should be attached to the front of your assessment item.
Read it carefully, complete the appropriate details, and sign it.

Course: Specialist Mathematics **Unit: Trigonometry and Derivatives**	**Assessment Item Weighting:** WEIGHTING 20 %
Teachers name Steve Walker	**Class Codes:** 236T1S2, 482T1S2, 982T1S2
Assignment Topic: Trigonometric Functions	**Due Date: 28th August, 2015**
Student Name:	**Student ID:**

I certify that:

a) no part of this work has been copied from any other person's work, except where due acknowledgement has been made (including material from the internet, videos, DVDs and personal interviews);

b) this submission is based on my own research;

c) this piece of work has not been submitted for assessment in this or any other course.

In accordance with Hawker College and BSSS policies, I understand that:

a) plagiarism is a serious matter and that I may be called on to validate my information by other means (such as an oral test) if necessary – and I could be penalised if this declaration is false;

b) work submitted after the due date may be penalised and that I must apply for any extension prior to the due date;

c) I have the right to appeal the assigned mark/grade.

Student Signature	Date Submitted
Received by (Teacher)	Date: Time:

Request for Extension (To be completed by the Mathematics Executive Teacher) **Date**: ..... **Granted**: Y N ..... **Signature**	**This assignment is now due on**:

Receipt of Assignment

[Student to complete all details except Teacher's Signature, Date Received and Time Received, then remove and keep as proof of submission after teacher has signed]

Student name:		**Received by (Teacher name):**	
Course:	Specialist Maths	**Teacher signature:**	
Assignment name:	Matrix Applicatoin	**Time and Date received:**	

Trigonometry Assignment

Question 1 (Developing a model) - Temperatures

(a) Use an Atlas, Globe or a website to find a location that is on the opposite side of the globe, relative to Canberra, and in the northern hemisphere. The websites listed below may be of use.

http://www.worldatlas.com/aatlas/world.htm

http://www.worldatlas.com/aatlas/imageg.htm

Write your locations and their respective latitude and longitude.
Location 1: Canberra
Location 2:
(b) Your next task is to find average monthly temperatures for your two places. You may use average maximum, average minimum or overall average. State which you have used. You may get this data from any source you choose, but you must reference the site (or book) appropriately. You might find this site useful: http://www.climatemps.com/

Represent the data collected in a table that is neat and well organised, such as the one shown below. Make sure you acknowledge the site(s) that used to find the data.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Location 1												
Location 2												

(c) Plot the points of the two sets of data on the one set of axes, using months (M) as the independent variable and temperature (T) as the dependent variable. Use appropriate scales. Do this by hand.

(d) A sinusoidal curve, (sine curve) is generally used to model such cyclic data. A general equation for a sine curve is:

$$y = a\sin(bx + c) + D$$

With an Amplitude, a, Period = $2\pi/b$, Phase Shift = $-c/b$ and Vertical Translation, D.
Describe what the following mean with relation to our temperature context:
Amplitude
Period
Vertical Translation
Phase Shift
(e) Determine an appropriate value of D for your two curves by looking at your graph, (i.e. they should be different).

Location 1 Curve ... D =

Location 2 Curve ... D =

(f) Write a comment that explains how you identified D.

(g) Determine an appropriate value of A for your two curves by looking at your graph.

Location 1 Curve ... a =
Location 2 Curve ... a =

(h) Write a comment that explains how you identified a.

(i) Identify the period for both graphs, and any phase shift that may exist.

Location 1 Curve ... Period= Phase shift =
Location 2 Curve ... Period= Phase shift =

(j) Using algebra, find values for B and C for your graphs, show all working.

(k) State the final equations of your two curves.

Location 1 Curve...
Location 2 Curve...

(l) Using an appropriate graphing package, (eg. graphmatica, geogebra, wolframalpha, graphsketch.com) graph both curves on the one set of axes, include a title and legend, and use appropriate scale on your axes.

(m) Write a paragraph analysing the data you have collected.

Question 2 (Using the model) – Daylight Hours

Your next task is to find the daylight hours for your two places. You may get this data from any source you choose, but you must reference the site (or book) appropriately. You might find this site useful: http://www.climatemps.com/

Represent the data collected in a table (as per Question 1). Acknowledge the site(s) from which you collected the data.
Also, have a look at the applet found on this website. This interactive applet has a connection with sine curves:
http://astro.unl.edu/classaction/animations/coordsmotion/daylighthoursexplorer.html
You are to set up an investigation on daylight hours using the two different locations, explain what you are going to explore, carry out the investigation including establishing two sine models from your data and then summarise your results at the end.
Calculate the sine curve equations for both locations' daylight hours. Show all working and explain all considerations you make in deciding the equations.

State what the amplitude, phase shift and period mean in the context of daylight hours.

Construct, using an appropriate graphing program, a graph that displays both curves on the one set of axes; include one complete cycle (that is a year) of each.

Write at least 2 paragraphs that provide an analysis of the data about the daylight hours that you have collected. Include in your discussion how your models for each location are similar, how they are different, and how their relative positions to one another on the globe and the seasons influence each model.

Checklist for Question 2

- locations and references listed
- what is being investigated clearly stated
- graphs included
- sine curve equations developed-amplitude, phase shift, period,etc
- graphed on graphing program as stipulated
- analysis paragraphs (2)

Question 3 (Interpreting the model) – Tides

1. Tides are often cited as examples of periodic behaviour. The period of these oscillations is the time needed to complete one complete cycle. Using the period of the Moon it actually takes close to 12 hours and 25 minutes, which is about 12.42 hours (2 decimal places).

Assume that successive high tides occur at intervals of 12 hours and that the height of the tide can be modelled by a sine or cosine function. Ships dock at a wharf where the tide is measured by the height of the water up the pylons. At low tide the height is 3.8 metres and at high tide it is 9.4 metres.

(a) Find the amplitude, period and vertical translation.

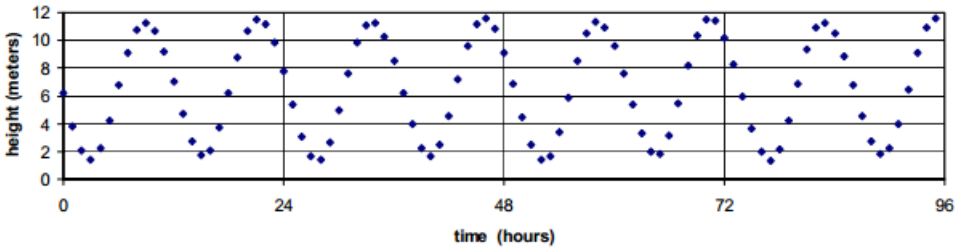
(b) Use these to draw a graphical model of the tidal fluctuations.

(c) Express the height of the tide, *h* metres, as a function of the time *t* hours after high tide.

(d) If low tide, in a particular month, occurs at 2pm at what time will the height of the tide be 6 metres?

(e) Ships which need a depth of *w* metres are permitted to enter the harbour only if the depth of water at the entrance is at least *w* metres for a continuous period of four hours. Find, correct to one decimal place, the largest value which satisfies this condition.

2. Your final task is to construct a sinusoidal function which fits the below graph. (In this case, do not assume that successive high tides occur at intervals of 12 hours you need to be more accurate than this.)



You will need some basic numerical facts to begin with: the graph oscillates between the heights of 1.5 metres and 11.5 metres and, to calculate the period accurately, it crosses the mean position at height 6.5 metres at t = 0 hours and at t = 92 hours.
Find a sine function which has these properties.
Construct a graph of your function using an appropriate graphing program.

Marking Criteria

Question 1 - Temperatures

Excellent work will look like/include...

Locations in the world given(1), and identified clearly (1) and are close to being opposite (1)	3
Average monthly temperature data sourced and cited correctly (2). You will have stated what the data pertains to (i.e. is average maximum, minimum or overall average) (1). Data is displayed neatly (1) using a table, with columns and rows labelled appropriately (1)	5
Graph of temperatures is drawn correctly (2). Axes are labelled appropriately and correctly using the given conditions (1). An appropriate scale is used (1). Both graphs on the one set of axes (1). A legend is used to identify the two different curves (1). The graph has a title and is very neat (1)	7
A description of Amplitude, Phase shift, Period and Vertical Translation is given and is correct within the given context of temperatures and months. The explanations show depth of understanding within the context and the relationship of these variables within the sine curve (2 for each)	8
The values for a, b, c and D are found (8), are accurate and at all times you have explained in full how this determination has been made. This includes full algebraic or other mathematical reasoning and written descriptions about how these values relate to your identified curves (8)	16
The curves are reproduced using technology (2); graphs are labelled correctly on the axis (1), title (1) and legend (1). An appropriate scale has been used (1). Graphs are high quality, clear and easy to read (2)	8
The analysis paragraph includes: comparison between the two locations in shape (2), comparison between the two locations from the equations (2), seasonal differences/similarities (2) and latitude differences/similarities (2). The paragraph is well structured, uses correct grammar, spelling and punctuation (2)	10
	57

Question 2 - Daylight Hours

Excellent work will look like/include...

Aim of investigation given including an explanation of what is going to be investigated	6
Daylight hours' data sourced and cited correctly (2). Data is displayed neatly (1) using a table, with columns and rows labelled appropriately (1)	4
Sine curve equations are generated correctly for both places (4), detailed working is included explaining how all components of the equation have been derived (8).	12
A description of Amplitude, Phase shift, Period and Vertical Translation is given and is correct within the given context of daylight hours. The explanations show depth of understanding within the context and the relationship of these variables within the sine curve, (2 for each).	8
The 2 analysis paragraphs include at least: comparison between the two places in shape (2), comparison between the two places from the equations (2), a comment on seasonal differences/similarities (2) and this is justified by use of the graph (2). The paragraphs are well structured, uses correct grammar, spelling and punctuation. Paragraphs read well, include beginning and concluding sentence and are not simply a list of answers. (4)	13
	43

Question 3 - Tides

Excellent work will look like/include...

1.Amplitude, period and vertical translation given and correct	3
Graph drawn neatly, accurately and labelled appropriately	4
Function expressed accurately using correct notation(2), detailed working is included explaining how all components of the equation have been derived (3)	5
Time given correctly (2), detailed working is included(2)	4
Depth accurate to one decimal place (1), clear justification and working is included(3) (Tide)	4
2.Function expressed accurately using correct notation(2), detailed working is included explaining how all components of the equation have been derived (3)	5
The curves is reproduced using technology and accurately matches given graph (2), graphs is labelled correctly and an appropriate scale has been used (3)	5
	30