Boorowa Central School

Excellence through Respect, Responsibility and Participation

Assessment Task Notification

All tasks should be clearly outlined in the notice and give information pertaining to the nature of the task, the outcomes being assessed and the marking schedule giving individual component weightings.

Teacher: Mr Corcoran	**Course:** Mathematics Advanced
Task and Number: 2 Investigation Task	**Task Weighting: 30%**
Date Issued:14/6/19	**Date Due: Wednesday 3/7/19**
Syllabus component: Trigonometry (T1 & 2)	

Syllabus outcomes being assessed:

MA11-1 uses algebraic and graphical techniques to solve, and where appropriate, compare alternative solutions to problems

MA11-3 uses the concepts and techniques of trigonometry in the solution of equations and problems involving geometric shapes.

MA11-8 uses appropriate technology to investigate, organise, model and interpret information in a range of contexts.

MA11-9 provides reasoning to support conclusions which are appropriate to the context.

Description of task:

Context:

There is to be an outdoor concert held in NSW. You are required to find a vacant piece of land to host it. The land is to be designed to include a stage, which is a shaped as a sector in one corner. The chosen piece of land must be in the shape of an irregular quadrilateral, which will encompass seating and standing areas for the crowd.

Note: the quadrilateral must not be a rectangle or a square.

Task:

1. Find a vacant piece of land in NSW using Google Maps (https://www.google.com.au/maps), this piece of land must be able to fit an irregular quadrilateral that has a total area between 5000 and 15 000m^2. You can assume that the piece of land you chose is completely level (flat).
2. Using the measure distance tool on Google Maps, outline the shape of the quadrilateral, clearly determining the distance of each of the 4 edges, one diagonal length and the area of the quadrilateral, ensuring that this area meets the given requirements.

   (Google Maps Support page provides instruction for this tool: https://support.google.com/maps/answer/1628031?co=GENIE.Platform%3DDesktop&hl=en)
3. Create a scale diagram of the chosen quadrilateral using DESMOS (https://www.desmos.com/geometry) being sure to mark in the one diagonal length.
4. Confirm the area of your quadrilateral using the trigonometric formula for the area of a triangle. You will need to use your scale diagram that you created to determine the interior angles. You must show all working for this.
5. Determine the location and size of the stage for your concert. The stage must be in one of the corners of your quadrilateral, should take up no more than 15% of the total area and be in the shape of a sector. The area of the stage is to be found using formula for the area of a sector. You will need to show all of the measurements required for this formula on your diagram. You must also show all working to confirm that the stage meets the given requirements.

6. Investigate a different corner for your stage. This stage must be of the same area as the one created in Step 5. Find the radius of the stage and justify your answer with appropriate mathematical reasoning.

7. If lights are to be placed along the curved perimeter, determine the number of lights required on the stage of your choice if one light is positioned every 30cm along the perimeter. Compare and contrast the two stages with consideration for the location, shape and lighting requirements.

8. A big screen is to be positioned behind the stage to display the artists during the concert and each audience member must be able to view the screen. The dimensions of the screen are 5m by 3m. On your scale diagram, using a single interval, construct the positioning of the big screen on your stage

9. The audience for the concert is to be arranged into a seating section and a standing section. The seating section will be closest to the stage and extends the sector formed by the stage. The standing section is located behind the seating section and extends another 20 metres beyond the seating section.

Consider an audience member towards the back of the seated section and another towards the back of the standing section. Clearly represent these audience members as points on the scale diagram, so that both points are collinear with a point at the centre of the base of the screen.

If the angle of elevation to the bottom of the screen for each seated audience member is less than 15°, their view is distorted by the audience members in front.
Similarly, if the angle of elevation for the standing audience members is less than 8°, their view is distorted by the audience members in front.

By considering each of the audience members above make informed decisions regarding the size of the seated section and the height at which the bottom of the screen must be above the ground to allow for the above conditions. You may assume that the eye-level of a seated audience member is 1.4 metres and a standing member is 1.7 metres.

Fully justify your answer with supporting mathematics.

Submission of Task requirements:

Hard Copy submitted

- A screenshot of Google Maps indicating the area of land being used.
- A scale diagram of your design, using graphing software, which includes all measurements.
- All working and calculations required, either written by hand or typed.
- All reasoning and justification, either written by hand or typed.

Note: If a student is absent for an assessment task or fails to submit a task when it is due, then a medical certificate or other acceptable explanation must be presented on the first day the student returns to school or a zero mark is awarded.

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Assessment Task - Marking Criteria

1.	Land site chosen, satisfying set conditions	/2
2.	Google maps image of chosen land with quadrilateral drawn showing the borders of the block, with area clearly visible.	/1
	Distances of each edge of border, and one diagonal, listed to the nearest metre included.	/3
3.	Scale diagram drawn using Desmos software	/6
	Appropriate scale chosen and stated.	/1
4.	Area of scaled diagram found using trig 'area of a triangle' rule.	/4
	Scaled area confirmed with real area given by Google maps.	/1
5.	Area of stage found using 'area of a sector' rule.	/2
	Scaled area converted to actual area.	/1
	Area satisfies condition of being <15% of total block area, working shown.	/2
	Stage shown on scaled diagram.	/2
6.	Scaled and actual radius of an alternate stage calculated, working shown.	/3
7.	Actual perimeter of both stages calculated, working shown.	/4
	Number of lights required, working shown.	/2
	Stages compared and contrasted.	/4
8.	Screen interval shown on scale diagram, working shown.	/2
9.	Diagram showing elevations of sitting audience member and standing audience member, distances to stage and screen.	/4
	Values for height of base of screen and size of seated section.	/6
	Total	/50