

Year 12 2025

Mathematics Standard 1

Research Task

Total Marks: 50

Name: _____

Teacher: _____

Measurement

Task Description:

During the holidays, you plan on visiting a tower which is at least 100 to 250 metres tall. You can choose any destination you wish, in the world, so long as the tower is between 100 to 250 metres in height. As you are a keen mathematician, you decide to create some activities involving trigonometry to keep engaged and thinking.

Presentation:

- Your work may be presented on paper (including printed maps and diagrams) or electronically via OneNote classroom or send it your teacher as an email attachment, Bikram.singh7@det.nsw.edu.au or saji.philip@det.nsw.edu.au
- Questions need to be answered in this booklet (paper or electronic).

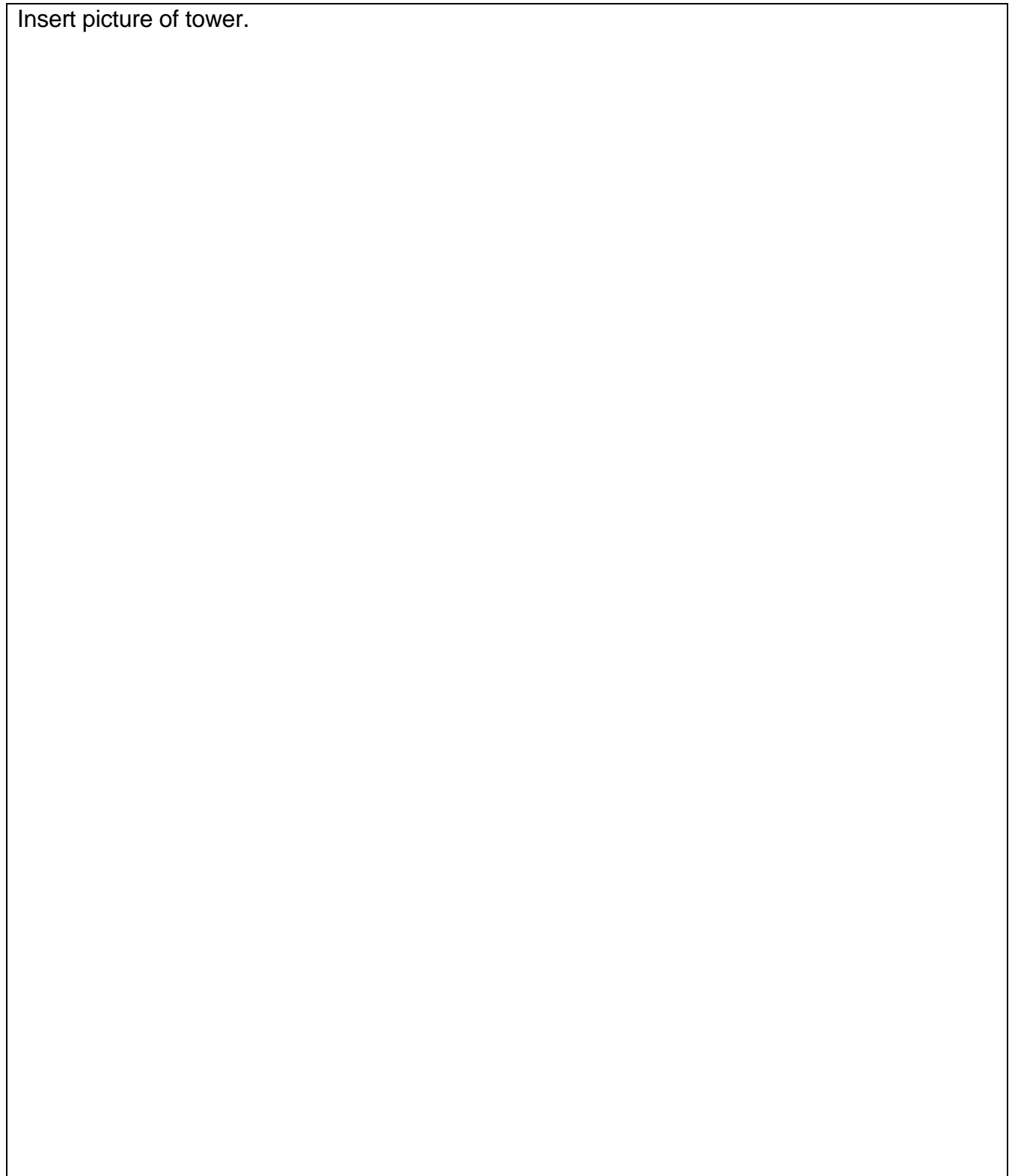
Part A: Height of a Tower (10 marks)

1. Research the tower to get the recorded height and list below, along with a picture of the tower.

Name and Location:

Height:

Insert picture of tower.

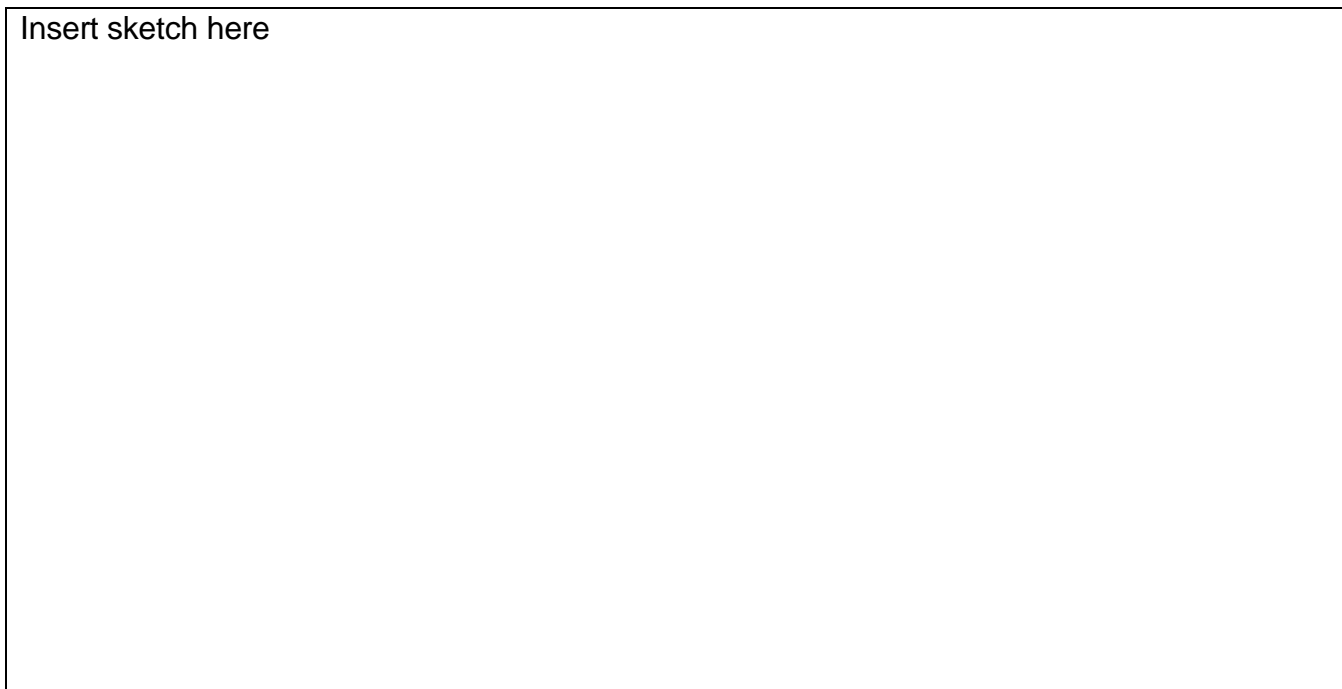


2. On a day out you see the top of the tower. You decide to measure the angle of elevation and find that it is 25° .

You decide to work out how far you are away from the tower using trigonometry.

Sketch a neat, fully labelled diagram of the information, and calculate the distance between yourself and the base of the tower, to the nearest metre.

Insert sketch here



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3. Would it be possible to accurately measure the horizontal distance between you and the base of the tower in real life? Give reasons and examples.

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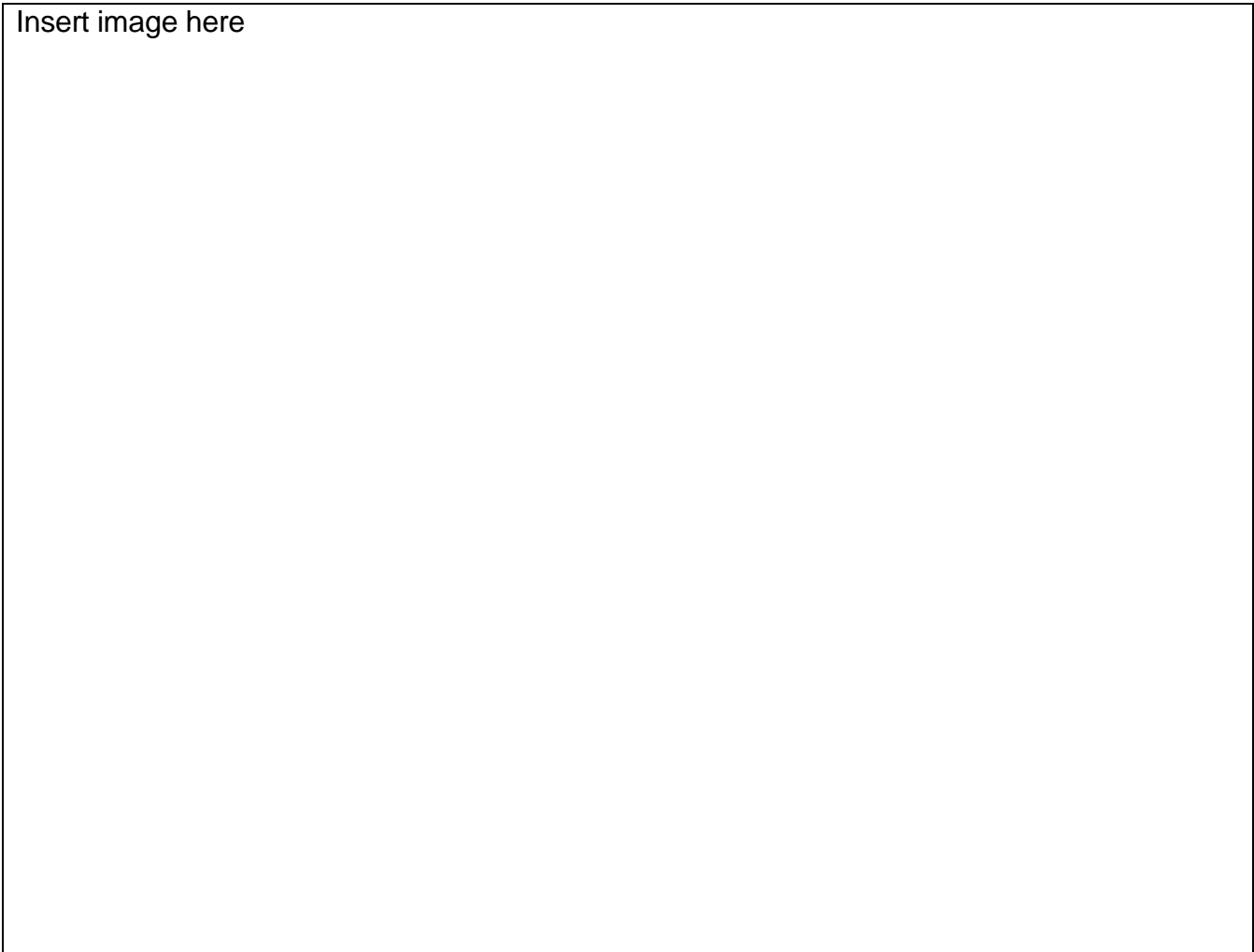
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4. Using your answer to question 2, where could you possibly be standing? Show one possible location on a Google map image and state how you came up with this choice.

Insert image here



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Part B: Energy (12 Marks)

1. Your family needs to replace your chest freezer (a freezer that is separate to a fridge), as it is not working properly. Given your mathematical expertise, your parents or carers put you in charge of working out which is the best option for your family.

You go to Harvey Norman and look at two brands. Each is approximately the same size and big enough for a family. You are not only interested in the cost of the appliance, but also its energy rating.

Appliance 1:

Brand:.....

Size:

Cost:

Power consumption (kWh/year):

Energy efficiency :

Screenshot/image of appliance and energy rating

Appliance 2:

Brand:.....

Size:

Cost:

Power consumption (kWh/year):

Energy efficiency :

Screenshot/image of appliance and energy rating

2. Given the freezer will be turned on 24 hours a day, and the cost of electricity on your current plan is 27.2c/kWh, calculate:

a) Total cost of Appliance 1 for 1 year

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b) Total cost of Appliance 2 for 1 year

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3. Given that the upfront cost is not a limiting factor, which appliance do you decide will be best for your family? Give reasons including features of appliance and cost over the life of the appliance.

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PART C: Field survey (28 marks)

The local council is performing maintenance at Wandarrah Reserve. They require a field survey to be carried out using the park map below to calculate the costs involved.



1. Draw boundary lines for the reserve. Use a ruler for all lines drawn.
2. You will be traversing along line AE. Draw the traverse line in accurately.
3. Measure how long the scale line is and complete the working below.

$$\underline{\quad} \text{ cm} = 50\text{m}$$

$$1 \text{ cm} = \underline{\quad\quad} \text{ m}$$

4. Using the scale, calculate the length of the traverse line that you selected.
5. From your traverse line, draw the offset lines to the remaining vertices. Make sure the lines meet at 90 degrees to the traverse line.
6. Use your scale, write the measurements of all the offset lines on the diagram.

7. Use your radial survey to calculate the area of the park. There should be six shapes for you to calculate. Clearly mark each shape number on the offset survey.

a) Shape 1

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b) Shape 2

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c) Shape 3

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d) Shape 4

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e) Shape 5

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f) Shape 6

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8. Calculate the total area of Wandarrah Reserve, correct to one decimal place.

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9. Would this area be the same, larger or smaller than the actual area of the reserve? Give reasons.

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10. Explain how you could modify this traverse survey to calculate a more accurate area. Use examples or diagrams to support your explanation.

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11. Turf costs \$16 m². The council decides to purchase 10% more than required. How much will the turf cost, to the nearest dollar?

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Marking Guidelines

Part A: Height of a Tower		Marks
1	Name and location of tower and height listed with picture	2
	Name or location and height	1
2	Sketch drawn showing all information and distance calculated correctly to the nearest metre	2
	Sketch drawn showing information and attempt to calculate distance	1
3	Statement about accurate measurement with substantial reasoning	3
	Statement about accurate measurement with suitable reasoning	2
	Statement about accuracy	1
4	Correct calculations showing possible location and image inserted	3
	Correct calculations showing possible location	2
	Attempt to calculate possible location or show in image	1

Total : / 10

Part B: Energy		Marks
1	All information required for Appliance 1 with screenshots	2
	Some information only	1
	All information required for Appliance 2 with screenshots	2
	Some information only	1
	Different brands chosen for appliances	1
2	Correct calculation of cost for 1 year for Appliance 1	2
	Attempt to calculate cost for 1 year	1
	Correct calculation of cost for 1 year for Appliance 2	2
	Attempt to calculate cost for 1 year	1
3	Valid statement with substantial reasoning	3
	Valid statement with some reasoning	2
	Statement with limited reasoning	1

Total: /12

Part C: Traverse survey		
1	Accurately draws boundary lines of the reserve	1
2	Accurately draws traverse line.	1
3	Measures the scale line and puts it into the first missing number. Uses the scale to get the unitary ratio to find out how long 1 cm is on the park. Attempts to calculate the scale	2 1
4	Correctly measures the length of the traverse line.	1
5	Accurately draws offset lines.	1
6	Correctly measures all offset lines	1
7	Correctly finds the area of Shape 1 Attempts to find the area of Shape 1	2 1
	Correctly finds the area of Shape 2 Attempts to find the area of Shape 2	2 1
	Correctly finds the area of Shape 3 Attempts to find the area of Shape 3	2 1
	Correctly finds the area of Shape 4 Attempts to find the area of Shape 4	2 1
	Correctly finds the area of Shape 5 Attempts to find the area of Shape 5	2 1
	Correctly finds the area of Shape 6 Attempts to find the area of Shape 6	2 1
8	Correctly calculates the area of the reserve Attempts to calculate the area of the reserve	2 1
9	Statement made with relevant reasoning Statement made with irrelevant or no reasoning	2 1
10	Clear explanation about how to modify traverse survey with examples Limited explanation	2 1
11	Correct cost calculated including 10% extra, to the nearest dollar Correct cost calculated including 10% extra Attempt to calculate cost	3 2 1

Total: /28

12. Find the size of $\angle ABC$ using trigonometry. Show all working out.

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12	Finds the two minor angles and adds them together to get $\angle ABC$.	5
	Makes one mistake	4
	Makes two mistakes	3
	Makes three mistakes	2
	Does not make an attempt	1