MOUNT ANNAN HIGH SCHOOL

ASSESSMENT TASK NOTIFICATION

	Year 12 Stage 6
Subject: Mathematics Standard 2	**Focus Area:** Measurement
Weighting: 25%	**Date of Task:** 20th February 2025
Student Name:	**Task No.:** 1 **Type of Task:** Research Task

Outcomes addressed

A student:

MS2-12-3	Interprets the results of measurements and calculations and makes judgements about their reasonableness, including the degree of accuracy and the conversion of units where appropriate
MS2-12-4	Analyses two-dimensional and three-dimensional models to solve practical problems
MS2-12-9	Chooses and uses appropriate technology effectively in a range of contexts, and applies critical thinking to recognise times and methods for such use
MS2-12-10	Uses mathematical argument and reasoning to evaluate conclusions, communicating a position clearly to others and justify a response

Assessment Policy- ***This is a brief outline, you must check your assessment booklet for further details. Assessment task must be submitted on the due date.***

- **Failure to complete an assessment task will result in a zero mark.**
- Late submission of assessment items **will be awarded zero** unless there are very extenuating circumstances (Doctor's Certificate, etc.)
- Students found guilty of malpractice will be awarded a zero mark. If a piece of work is incomplete at the time of submission, it should be submitted as is, and you will be given a mark on what has been completed.
- See their teacher or head teacher on the **first day they return** back to school

Please see page 2 for specific task information

MOUNT ANNAN HIGH SCHOOL

ASSESSMENT TASK NOTIFICATION

Specific task information as needed:

What will task look like:	❑ The task will be a research task ❑ You need to complete this task on or before 20th February 2025. ❑ You need to answer all the questions. ALL working must be shown. ❑ If for some reason you cannot submit the task on the day you need to contact Mr Essex and submit a misadventure form.

What will be in the task	**This assessment task will assess your knowledge of the following topics:**
	• **Energy**
	  ○ Energy consumption and costs
	  ○ Interpreting energy ratings of household appliances and comparing running costs
	• **Right angled Trigonometry**
	  ○ Using the trig ratios to find an unknown side or angle
	  ○ Angles of elevation and depression
	  ○ bearings
	• **Non-right-angled trigonometry**
	  ○ Trig with obtuse angles
	  ○ Area of a triangle
	  ○ The Sine rule
	  ○ The Cosine rule
	  ○ Radial Surveys

Specific requirements	❑ You need search some web sites for this assignment. ❑ Answer ALL questions in the Assignment booklet online or on paper ❑ You will need a protractor and ruler for radial survey

Discriminating feature of Band 5 or 6 – Mathematics

Applies problem-solving strategies to a wide range of contexts.

Year 12 2025

Mathematics Standard 2

Research Task

Total Marks: 90

Name: _____

Teacher: _____

Measurement

Task Description:

During the holidays, you plan on visiting some sites of cultural or historical significance or major tourist attractions. You also plan on visiting a tower which is at least 300 metres tall (Note: this tower cannot be used in Part A of the task). You can choose any destination you wish, in the world, so long as it has 3 sites of significance as well as a tower of more than 300 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, Craigan.ford@det.nsw.edu.au, Robert.skoczylas1@det.nsw.edu.au or jady.walker@det.nsw.edu.au
- Questions need to be answered in this booklet (paper or electronic).

Part A: Cultural Triangle (13 marks)

1. Location: ……

   Site 1: ……

   Site 2: ……

   Site 3: ……

   Why have you chosen this location and these three sites?

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2. On Google Maps, locate each of the three sites of cultural/historical significance or major tourist destinations and insert a screen shot below, showing the triangle formed (note, triangle must not be a right-angled-triangle).

Insert of google maps image

3. Utilising the Distance Measuring Tool (right click or ctrl,shift,m) on google maps, find the length between the three sites of cultural/historical significance or major tourist destinations. Sketch your triangle below, labelling the vertices and showing the distance between the sites.

4. “Standing” at site 1, use the Cosine Rule to calculate the angle between the site 2 and site 3, correct to the nearest minute.

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5. Calculate the area of your triangle, in square kilometres, using the Area of a Triangle Rule and showing working.

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Part B: Height of a Tower (10 marks)

1. You see a tall tower (which you estimate to be at least 300 m tall in the location you are visiting. 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 $22°$.

   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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4. Where could you possibly be standing? Show on a map and state how you came up with this choice.

Insert image here

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Part C: Energy (12 Marks)

1. Your family needs to replace your refrigerator, 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 fridge will be turned on 24 hours a day, and the cost of electricity on your current plan is 28.8c/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 in 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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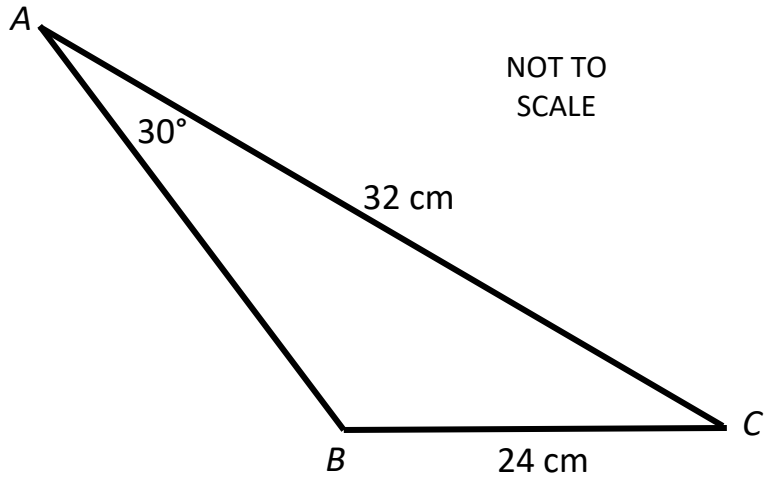
Part D: Bearings and Angles (5 Marks)

Question 1 (3 Marks)

The diagram shows a triangle *ABC* where *AC* = 32 cm, *BC* = 24 cm, ∠ *BAC* = 30° and angle *ABC* is obtuse.



Find the size of the obtuse angle *ABC* correct to the nearest degree.

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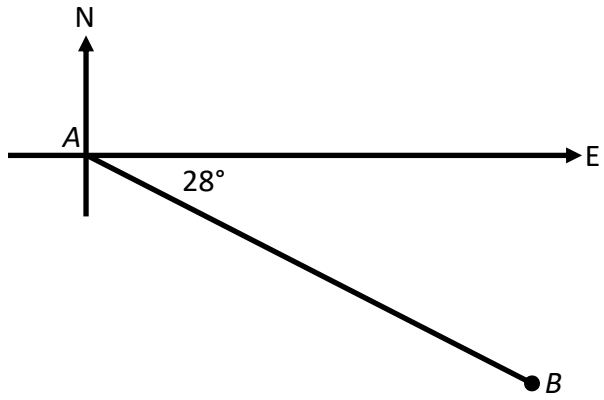
2.Consider the diagram below: (2 Marks)



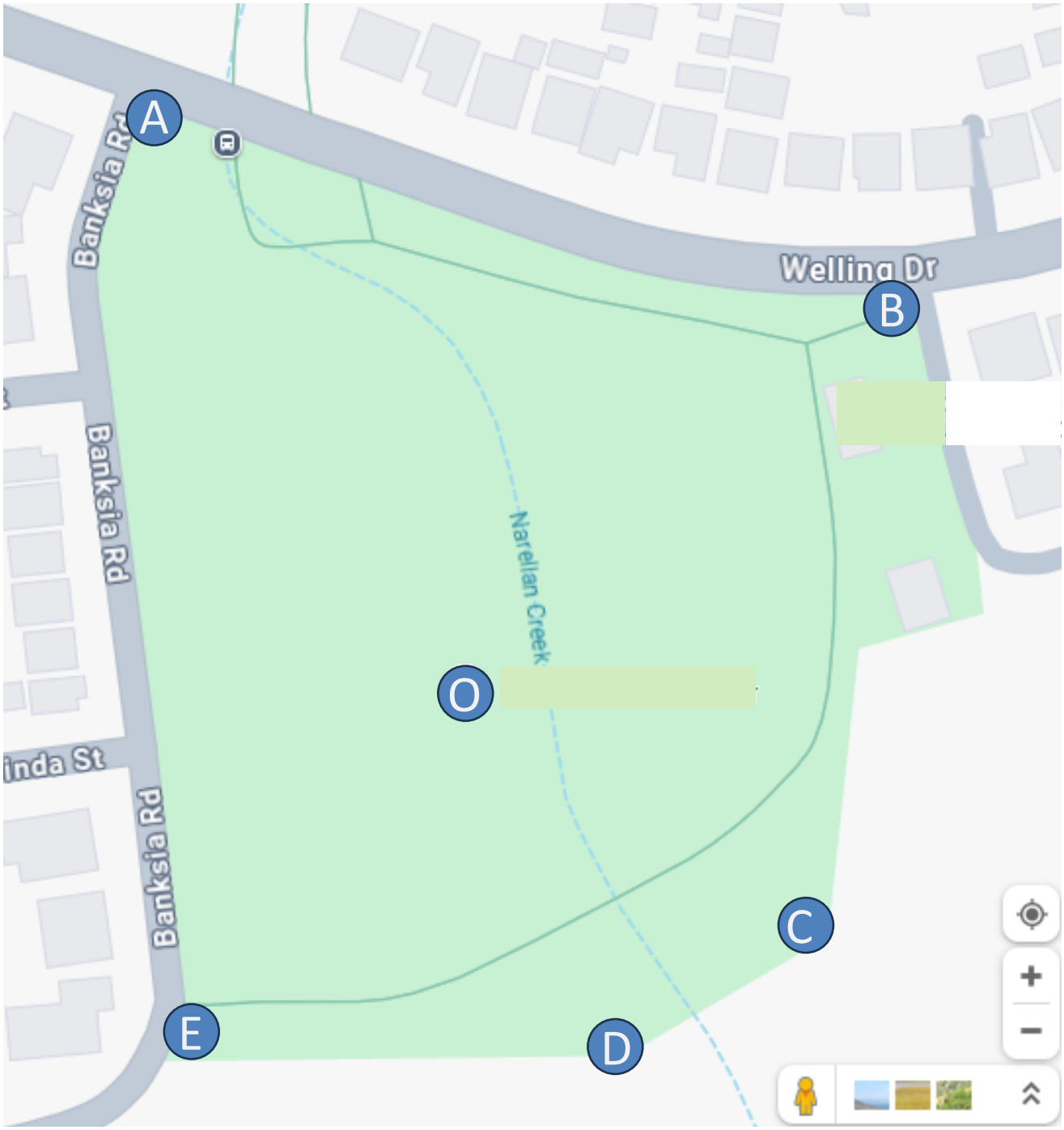
Find the true bearing and compass bearing of A from B.

(i) True bearing =…….

(ii) Compass bearing =……..

PART E: Radial survey (50 marks)

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



1. Draw boundary lines for the reserve, after marking a centre point in each marker.

2. Draw radial lines for the central point (O) to each vertex of the reserve.

3. The council surveyors have only given you the following information:

   - AE = 216 m
   - OE = 108 m
   - AB = 183 m
   - OB = 133 m
   - OD = 92 m
   - Area ΔOCD = 2392 m^2

   Show this information on the diagram above

4. Measure each of the angles around the centre (O) and mark on the diagram.

5. Use your **radial survey measurements**, the **Sine and Cosine Rules** and other **Triangle Properties** to find the following. Show all working, answering to the **nearest centimetre**. Note: you may need to measure other angles to assist with your calculations.
   a) AO

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b) ED

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c) OC

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e) BC

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6. Mark on the diagram a North line from the centre (O) and then list the true bearing of each of the vertices.

   a) Bearing of A ……..

   b) Bearing of B ……

   c) Bearing of C ……

   d) Bearing of D ……..

   e) Bearing of E ……..

7. Given the length of AE = 216 m, calculate the scale of the map used above.
   Write your answer in the form 1 : ……..

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8. Use the formula $\boldsymbol{A = \frac{1}{2}ab\sin C}$ to find the area of the following. Show all working, answering in **square metres** correct to **5 significant figures**.

a) ΔAOE

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b) ΔEOD

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c) ΔBOC

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d) ΔAOB

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

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

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

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12. The council decides that they need to returf the reserve. After excavation work, they need to add a turf underlay before laying the turf. For best results, the underlay needs to be 50 mm in depth. Turf underlay costs \$64 per tonne and it is known that $1\ \mathrm{m}^3 = 1.4\ \mathrm{t}$.
    a) How much turf underlay would be required, to the nearest tonne?

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    b) What would it cost council for the turf underlay?

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13. Turf costs \$16 m^2. The council decides to purchase 10% more than required. How much will the turf cost?

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Marking Guidelines

Part A: Cultural Triangle		Marks
1	Location and 3 sites listed Location or sites listed	**2** **1**
	Statement about choice of location and sites	**1**
2	Image inserted, showing triangle formed between sites Image inserted but no triangle shown	**2** **1**
3	Triangle drawn with 3 lengths Triangle drawn with some lengths	**2** **1**
4	Correct use of cosine rule corrects to the nearest minutes Cosine rule with angle correct to the nearest degree. Apply cosine rule in the triangle	**3** **2** **1**
5	Calculating the area correctly using area rule, answer in square kilometres Calculating the area correctly using area rule, Find the area with wrong side or wrong angle	**3** **2** **1**

Total: / 13

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

Total : / 10

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

Total: /12

Part D: Bearings and Angles		Marks
1	Finding obtuse angle using sine rule Finding the acute angle using sine rule Apply Sine rule in the diagram	**3** **2** **1**
2	Correct True bearing Correct Compass bearing	**1** **1**

Total: /5

Part E: Radial survey		
1	Identifies centre point in each marker and accurately draws boundary lines of the reserve Draws boundary lines inaccurately or without centre point identified	**2** **1**
2	Identifies centre point in marker O and accurately draws radial lines from each vertex to the centre Draws radial lines inaccurately or without centre point identified	**2** **1**
3	All information shown on the diagram in the correct position Information displayed on the diagram inaccurate or not complete	**2** **1**
4	Correctly measures all angles and writes them on the map Correctly measures most angles and writes them on the map Correctly measures some angles and writes them on the map	**3** **2** **1**
5	Correctly calculates the length of AO with answer to the nearest centimetre Correctly calculates the length of AO Attempts to calculate the length of AO	**3** **2** **1**
	Correctly calculates the length of ED Attempts to calculate the length of ED	**2** **1**
	Correctly calculates the length of OC Attempts to calculate the length of OC	**2** **1**
	Correctly calculates the length of CD Attempts to calculate the length of CD	**2** **1**
	Correctly calculates the length of BC Attempts to calculate the length of BC	**2** **1**
6	Marks North line on diagram and correctly calculates bearing of all vertices Marks North line on diagram and correctly calculates bearing of most vertices Marks North line on diagram and correctly calculates bearing of some vertices	**3** **2** **1**
7	Correctly calculates scale and writes in the form 1 : ……. Calculates scale Attempts to calculate scale	**3** **2** **1**
8	Correctly calculates the area of triangle AOE correct to 5 significant figures Correctly calculates the area of triangle AOE Attempts to calculate the area of triangle AOE	**3** **2** **1**
	Correctly calculates the area of triangle EOD Attempts to calculate the area of triangle EOD	**2** **1**
	Correctly calculates the area of triangle BOC	**2**

	Attempts to calculate the area of triangle BOC	**1**
	Correctly calculates the area of triangle AOB Attempts to calculate the area of triangle AOB	**2** **1**
9	Correctly calculates the area of the reserve Attempts to calculate the area of the reserve	**2** **1**
10	Statement made with detailed reasoning Statement made with relevant reasoning Statement made with irrelevant or no reasoning	**3** **2** **1**
11	Clear explanation about how to modify radial survey with examples Clear explanation about how to modify radial survey with no examples Limited explanation	**3** **2** **1**
12	Correct amount calculated in tonnes Attempt to calculate tonnes based on correct volume or equivalent merit Correct calculation of volume Attempt to calculate volume	**4** **3** **2** **1**
	Correct calculation of cost	**1**
13	Correct cost calculated including 10% extra Attempt to calculate cost	**2** **1**

Total: /50

Comments and Feedback

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Performance Band Descriptions for Mathematics Standard 2

Band 6	• Demonstrates extensive knowledge and skills appropriate to the course • Applies appropriate mathematical concepts, skills and techniques consistently and accurately in a wide range of familiar and unfamiliar contexts • Selects and uses a wide variety of problem-solving strategies to solve mathematical problems • Demonstrates mathematical reasoning and justification, and interprets and analyses mathematical models • Communicates effectively using appropriate mathematical language, notation, diagrams and graphs
Band 5	• Demonstrates thorough knowledge and skills appropriate to the course • Applies appropriate mathematical concepts, skills and techniques accurately in a range of familiar and unfamiliar contexts • Selects and uses a variety of problem-solving strategies to solve mathematical problems • Demonstrates mathematical reasoning and interprets mathematical models • Communicates using appropriate mathematical language, notation, diagrams and graphs
Band 4	• Demonstrates sound knowledge and skills appropriate to the course • Uses mathematical concepts, skills and techniques in familiar contexts and some unfamiliar contexts • Uses problem-solving strategies to solve mathematical problems • Uses some mathematical reasoning and mathematical models • Communicates using some appropriate mathematical language, notation, diagrams and graphs
Band 3	• Demonstrates basic knowledge and skills appropriate to the course • Uses mathematical concepts, skills and techniques in familiar contexts • Uses some mathematical reasoning • Uses some mathematical language, notation, diagrams and graphs
Band 2	• Demonstrates limited knowledge and skills appropriate to the course • Uses basic mathematical concepts, skills and techniques to solve problems with limited accuracy • Uses some mathematical language and simple diagrams
Band 1	