| Surname | Centre Number | Candidate Number |
|---|---|---|
| Other Names | | 0 |

# GCSE – NEW

3310U60-1

S17-3310U60-1

# MATHEMATICS – NUMERACY
## UNIT 2: CALCULATOR-ALLOWED
## HIGHER TIER

THURSDAY, 8 JUNE 2017 – MORNING

1 hour 45 minutes

| For Examiner's use only | | |
|---|---|---|
| **Question** | **Maximum Mark** | **Mark Awarded** |
| **1.** | **3** | |
| **2.** | **2** | |
| **3.** | **4** | |
| **4.** | **4** | |
| **5.** | **8** | |
| **6.** | **6** | |
| **7.** | **8** | |
| **8.** | **6** | |
| **9.** | **3** | |
| **10.** | **5** | |
| **11.** | **8** | |
| **12.** | **7** | |
| **13.** | **7** | |
| **14.** | **9** | |
| **Total** | **80** | |

### ADDITIONAL MATERIALS

A calculator will be required for this paper.

A ruler, a protractor and a pair of compasses may be required.

### INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take $\pi$ as 3·14 or use the $\pi$ button on your calculator.

### INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

In question **6**, the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.

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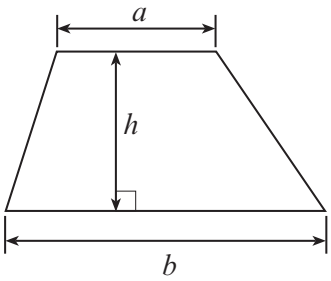
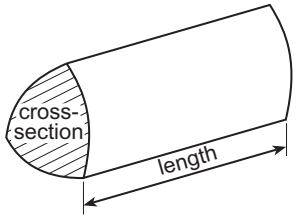
## Formula List - Higher Tier

**Area of trapezium** = $\frac{1}{2}(a + b)h$

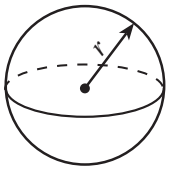



**Volume of prism** = area of cross-section × length



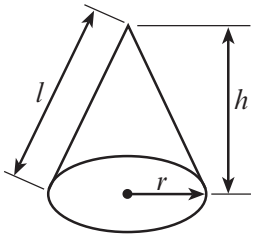

**Volume of sphere** = $\frac{4}{3}\pi r^3$

**Surface area of sphere** = $4\pi r^2$




**Volume of cone** = $\frac{1}{3}\pi r^2 h$

**Curved surface area of cone** = $\pi r l$

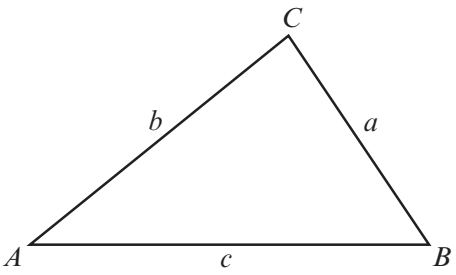



**In any triangle** $ABC$

**Sine rule** $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

**Cosine rule** $a^2 = b^2 + c^2 - 2bc\cos A$

**Area of triangle** = $\frac{1}{2}ab\sin C$




**The Quadratic Equation**

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

**Annual Equivalent Rate (AER)**

AER, as a decimal, is calculated using the formula $\left(1+\frac{i}{n}\right)^n - 1$, where $i$ is the nominal interest rate per annum as a decimal and $n$ is the number of compounding periods per annum.

Examiner only

**1.** Mali's scooter depreciated (decreased) in value by 24% in the **first** year.
In all further years, her scooter depreciated by 13% of its previous year's value.
She originally paid £850 for her scooter.
Calculate the value of Mali's scooter after 7 years. [3]

After 7 years, the value of Mali's scooter was £ .....

**2.** Sanjay stacks three boxes in a pile.
The heights of the boxes are 25 cm, 36 cm and 47 cm.
They are all measured correct to the nearest centimetre.
What is the greatest possible height of the stack of the three boxes? [2]

Greatest possible height of the stack of three boxes is ..... cm









**Turn over.**

Examiner only

**3.** *Organics4U* is planning to have its headquarters in Wales.
The manager has instructed Ffion to look for a site for the headquarters.

Here are the instructions that Ffion has been given by her manager.

'Find the point that is
- an equal distance between Wrexham and Aberporth, and
- an equal distance between Caernarfon and Swansea.

The new headquarters needs to be within 20 miles of this point.'

On the map below, shade the region, **in Wales**, that Ffion should identify for her manager. [4]

Examiner only

**4.**

Ursula is lying on her surfboard 180 metres away from the foot of a vertical cliff.
The height of the cliff is 146 metres.

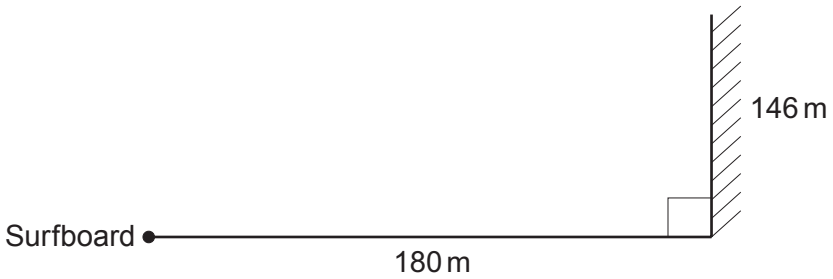



*Diagram not drawn to scale*

Ursula was told that if the angle of elevation of the top of the cliff from her lying position is between 42° and 45°, it is safe for her to attempt to stand on her surfboard.

Calculate the angle of elevation of the top of the cliff from Ursula's position lying on her surfboard.

State whether it is

- safe for Ursula to attempt to stand, or
- not safe as she is too near the cliff, or
- not safe as she is too far out at sea. [4]

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Examiner only

**5.** Marta buys a new television.

*(a)* Marta wants to fit the television in a bookcase on the wall.
In the shop she forgot to write down the length of the television.
She did write down the height and the diagonal of the screen.

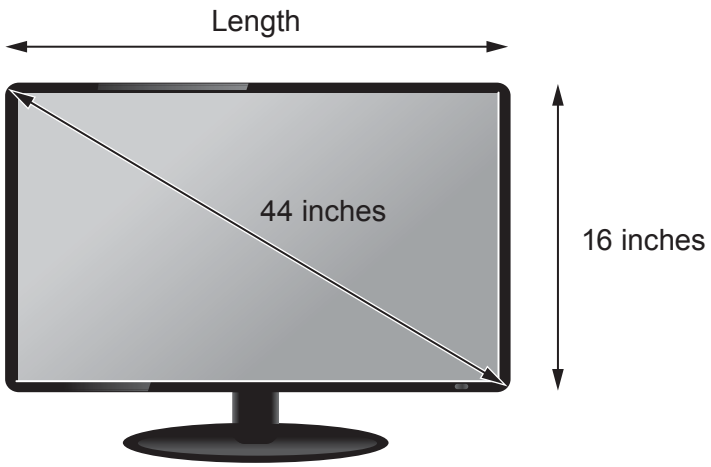


*Diagram not drawn to scale*

Marta needs to know the length of the screen before she opens the box, in case she wants to return the television.
Calculate the length of the screen.
Give your answer correct to 2 significant figures. [4]

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Length is ..... inches, correct to 2 significant figures.

Examiner only

*(b)* The television was reduced in the sale by 26% of its original price.
It cost Marta £710.40 in the sale.
What was the original price of the television? [2]

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Original price £ .....

*(c)* A television uses 1 unit of electricity every 10 hours.
A unit of electricity costs 9.8 p.

(i) Calculate the cost of having a television turned on for 24 hours.
Circle your answer. [1]

£23.52 £2.35 40.83 p 23.52 p 2.45 p

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(ii) On average, Marta watches 4 hours of television each day.
On average, how much **a week** does it cost her to watch television?
Circle your answer. [1]

27.44 p £27.44 £39.20 39.2 p 10.78 p

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Examiner only

**6.** *In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

Elin's old fish tank is leaking.

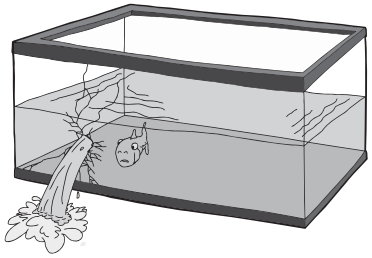

*Diagram not drawn to scale*

This old fish tank is in the shape of a cuboid.
The base of this tank measures 60 cm by 40 cm.
Before the leak, the height of the water level in Elin's old fish tank was 45 cm.

Elin decides to replace her fish tank with a cylindrical one.

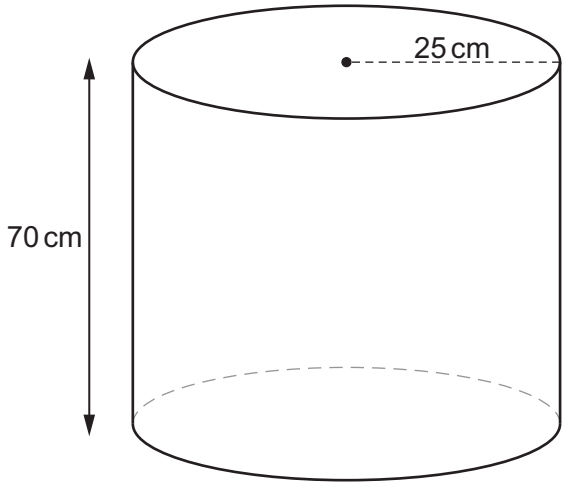


*Diagram not drawn to scale*

She selects a new cylindrical fish tank that has a radius of 25 cm and a height of 70 cm.

Will all the original contents, including the water and the fish, fit into this cylindrical tank?
You must show all your working. [4 + 2 OCW]

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Examiner only







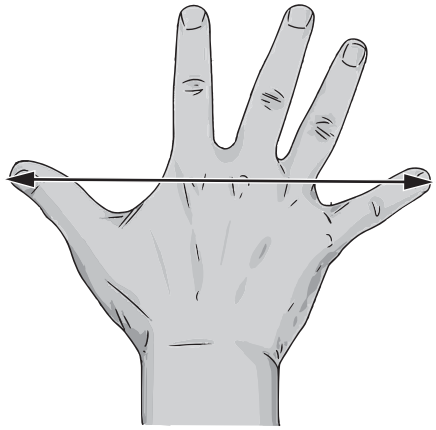


**Turn over.**

Examiner only

**7.** Simon plans to make gloves.

*(a)* One morning, Simon decided to carry out a survey to find the mean hand span of people in Wales.



He decided to sample systematically.
He decided to sample from the first 240 people who pass him in the street during the morning.

He wanted to take 20 people's hand span measurements.
Explain how Simon could use systematic sampling to obtain 20 measurements. [1]

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Examiner only

*(b)* Yesterday morning, Simon only managed to sample 10 people.
He calculated the mean hand span of these 10 people to be 22·8 cm.

Yesterday afternoon, Simon recorded the hand spans of a **further** 20 people.

The results for these 20 people are shown in the frequency table below.

| Hand span, to the nearest mm | Frequency |
|---|---|
| 20·0 cm to 20·8 cm | 2 |
| 20·9 cm to 21·7 cm | 3 |
| 21·8 cm to 22·6 cm | 10 |
| 22·7 cm to 23·5 cm | 5 |

Calculate an estimate of the mean of all **30 hand spans** that Simon measured yesterday. [6]

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*(c)* What could Simon do to improve his estimate of the mean hand span of people in Wales? [1]

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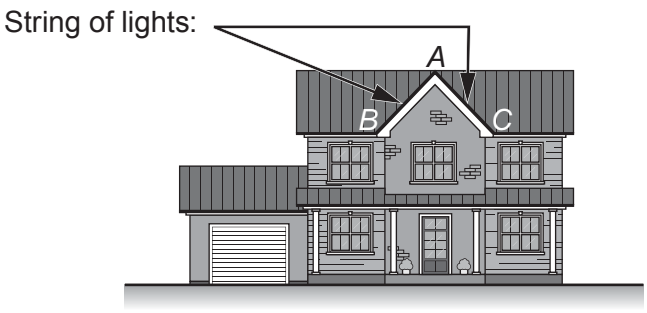
**Turn over.**

Examiner only

**8.** The diagram below shows where Levi wants to attach a string of lights to his house.




Levi wants to attach a single string of lights from *B* to *A* and then from *A* to *C*.
The diagram below shows the measurements Levi has taken.

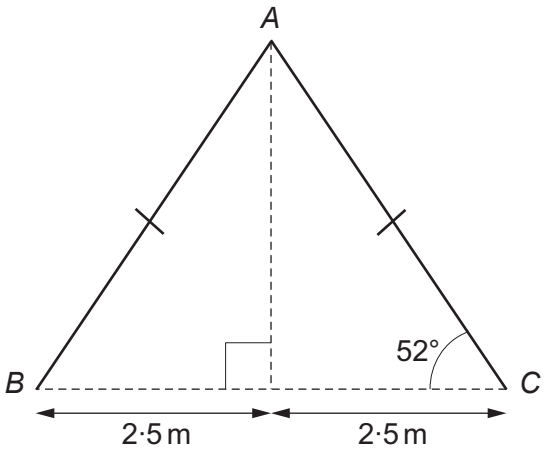



*Diagram not drawn to scale*

He spends £410 at the electrical store buying a string of lights.
After putting up the lights, Levi finds he has 6 metres of the string of lights left over at one end.

How much did the electrical store charge Levi, per metre, for the string of lights? [6]

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Examiner only

Examiner only

**9.** The table shows the number of Year 11 pupils attending schools in Cwmifan.

| School | Cwrt Haf | Cwmifan High | Henclwyd |
|---|---|---|---|
| Number of Year 11 pupils | 307 | 239 | 144 |

In total there are 690 Year 11 pupils attending these three schools.

A new youth theatre has been set up in Cwmifan.
On the opening night, a total of 80 Year 11 pupils from these three schools are going to be invited to attend.

Use a stratified sampling method to calculate the number of Year 11 pupils from each school who should be invited.
You must show all your working. [3]

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| School | Cwrt Haf | Cwmifan High | Henclwyd |
|---|---|---|---|
| Number that should be invited | | | |

Examiner only

**10.** Fatima wants to invest some money in a savings account.
She has picked up leaflets from two building societies advertising their high-interest savings accounts.

| 'Bannau' account | 'Eryri' account |
|---|---|
| Nominal annual rate of 3·85% | Nominal annual rate of 3·86% |
| Interest paid monthly | Interest paid every 6 months |

By comparing AERs, which account will offer Fatima the better interest rate on her investment? You must show all your working. [5]

Examiner only

**11.** A company produces metal badges to be worn by its employees.
The badge is made up of two parts.
One part is in the shape of a sector of a circle as shown in the diagram.

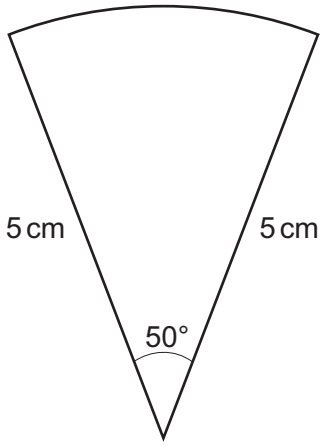


*Diagram not drawn to scale*

*(a)* The perimeter of the sector is decorated with a coloured edging strip.
Calculate the length of edging strip needed to decorate the sector. [3]

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*(b)* The other part is in the shape of a quarter-circle of radius 3 cm.

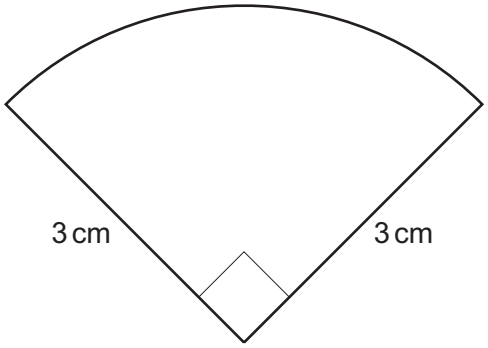


*Diagram not drawn to scale*

Examiner only

To make the badge, the two pieces are joined together with the sector in front of the quarter-circle, as shown in the diagram.
The badge has a vertical line of symmetry.

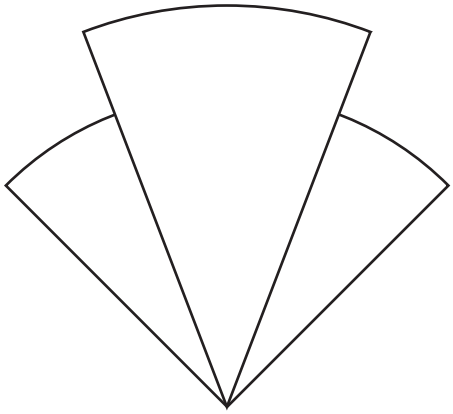

*Diagram not drawn to scale*

The visible surface of the front of the badge is painted.
Calculate the area that is painted. [5]

Examiner only

**12.** A plan view of Lowri's garden is shown below.

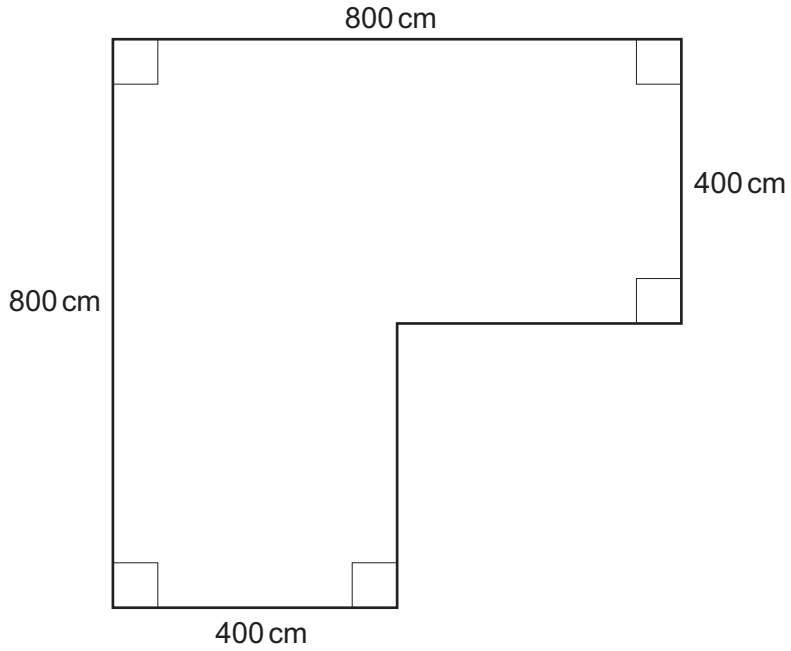


*Diagram not drawn to scale*

All the measurements are correct to the nearest 10 cm.

*(a)* Calculate the greatest possible area of Lowri's garden. [4]

Examiner only

*(b)* Lowri plans to spread grass seed over her garden using a spreading tool.
Over **each square metre**, the spreading tool spreads 30 g of grass seed, correct to the nearest 5 g.

Lowri has exactly 1·5 kg of grass seed.
Can she be **certain** that she has enough grass seed?
You must show all your calculations. [3]

Examiner only

**13.** The front views of two mathematically similar milk cartons are shown below.

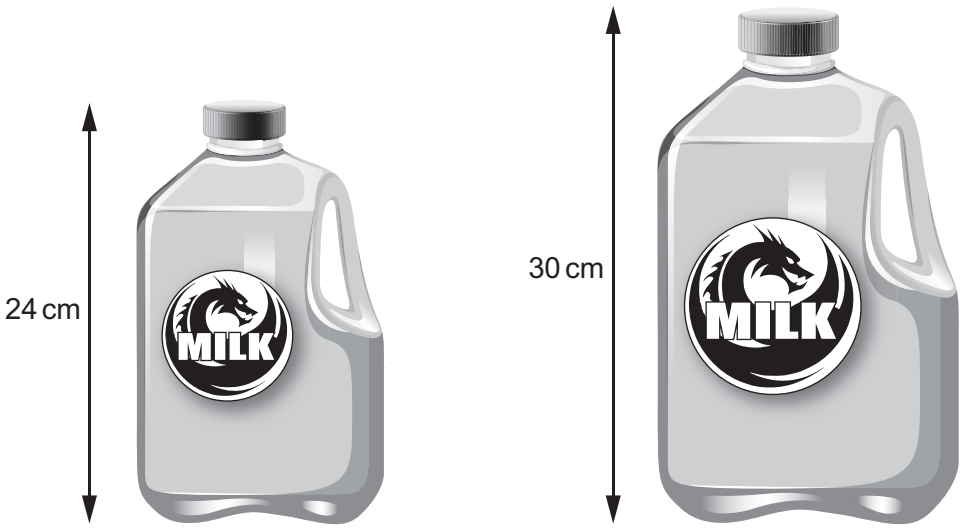


*Diagram not drawn to scale*

*(a)* Circle either TRUE or FALSE for each statement given below. [1]

| STATEMENT | | |
|---|---|---|
| The ratio of the lengths of the cartons is the same as the ratio of the heights of the cartons. | TRUE | FALSE |
| The ratio of the volumes of the cartons is the same as the ratio of the heights of the cartons. | TRUE | FALSE |

*(b)* It is claimed that the larger carton contains double the amount of milk contained in the smaller carton.
Show that this claim is not true.
Explain your answer. [3]

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Examiner only

*(c)* Another similar milk carton has a label with an area that is one quarter of the area of the label on the carton of height 24 cm.


*Diagram not drawn to scale*

Calculate the height of this new carton. [3]

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Examiner only

**14.** The diagram shows a 5 m wide section of road that has a uniform gradient.
The shaded area represents level ground.
Two cyclists, Delyth and Ioan, approach this section of road.

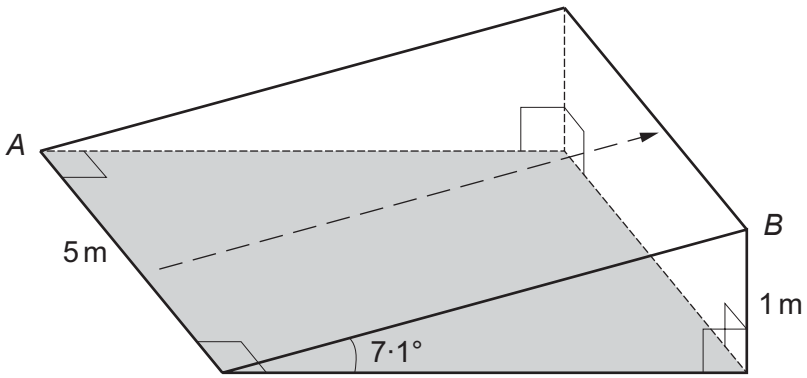


*Diagram not drawn to scale*

Delyth cycles straight up the middle of the road as shown by the arrow.
Ioan thinks this section of road is too steep to cycle straight up, so he decides to cycle from *A* to *B* in a straight line.

*(a)* How far does Ioan cycle in going from *A* to *B*? [6]

Examiner only

*(b)* Show that Ioan's route up this section of road is less steep than Delyth's route. You must show all your working. [3]

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**END OF PAPER**

| Question number | Additional page, if required. Write the question number(s) in the left-hand margin. |
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| | |

Examiner only