Surname	Centre Number	Candidate Number
First name(s)		0

GCSE

3310U40-1

A21-3310U40-1

THURSDAY, 4 NOVEMBER 2021 – MORNING

MATHEMATICS – NUMERACY
UNIT 2: CALCULATOR-ALLOWED
INTERMEDIATE TIER

1 hour 35 minutes

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 additional page at the back of the booklet. Question numbers must be given for the work written on the additional page.

Take π as 3·14 or use the π 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 **2***(b)*, the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**2**	
2.	**13**	
3.	**6**	
4.	**6**	
5.	**5**	
6.	**7**	
7.	**8**	
8.	**8**	
9.	**5**	
10.	**10**	
Total	**70**	

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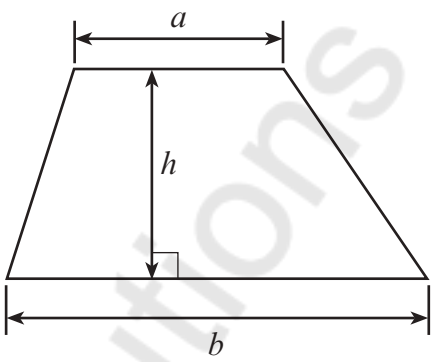
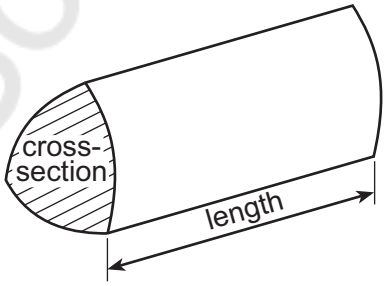
Formula List – Intermediate Tier

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

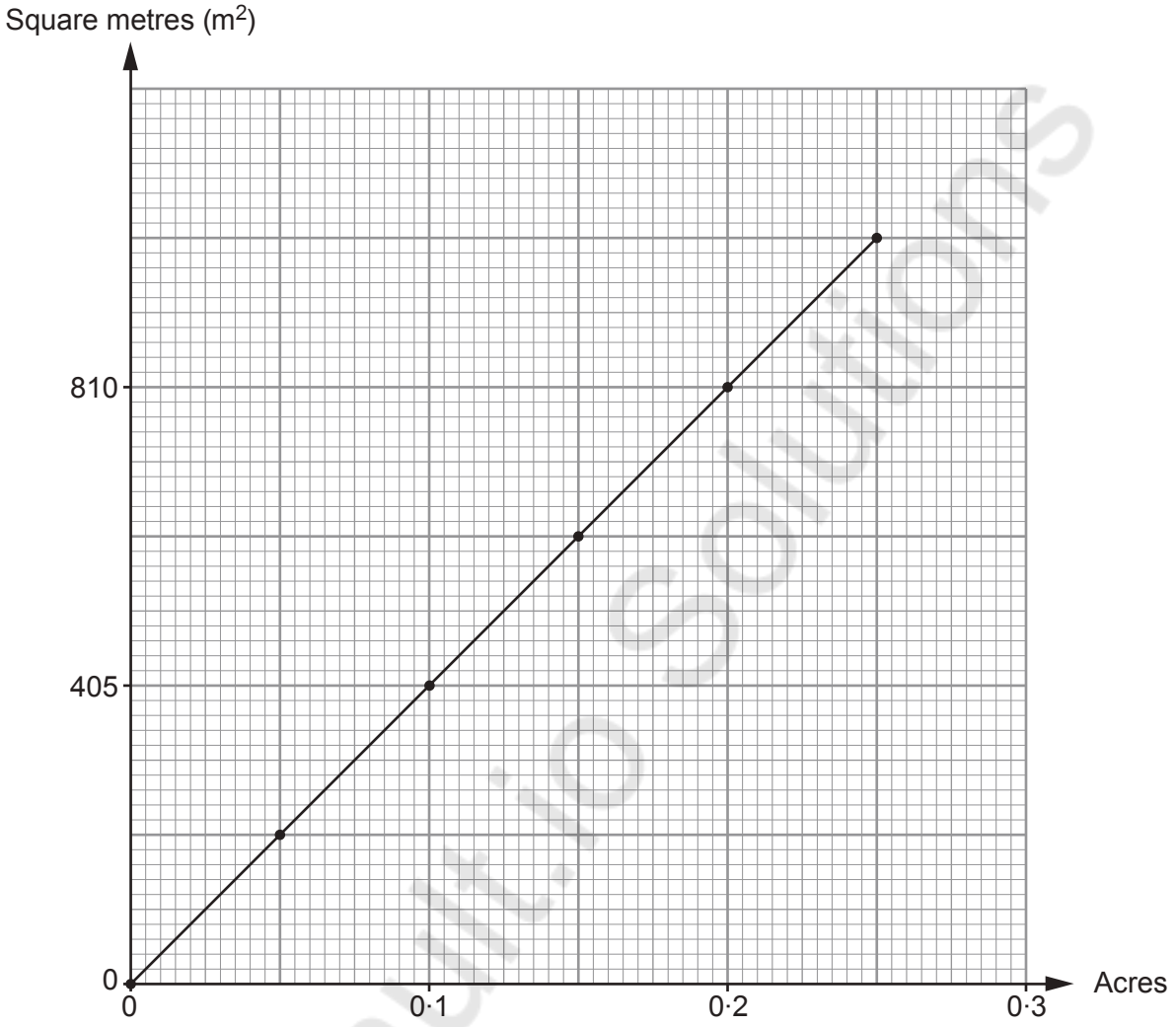


Volume of prism = area of cross-section × length



Examiner only

1. Dilwyn draws a conversion graph to help him understand his geography homework. He is looking at areas, in both square metres (m^2) and acres.



(a) Which of the following is equivalent to 0·05 acres? Circle your answer. [1]

607·5 m^2 202·5 m^2 6075 m^2 101·25 m^2 2025 m^2

0·1 acres = 405 m^2, so 1 acre = $\frac{405}{0.1}$ = 4050 m^2

= 0·05 × 4050 = 202·5 m^2

(b) Which of the following is equivalent to 0·3 acres? Circle your answer. [1]

1620 m^2 1012·5 m^2 1215 m^2 1417·5 m^2 810 m^2

0·3 × 4050 = 1215 m^2

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2. *(a)* Mr Khan has received his electricity bill.
However, he has splashed coffee over some of the entries.

Mr Khan
306 Heol Rowe

Period	Previous meter reading	Present meter reading	Number of units of electricity used
July, August and September 2021	34 560	35 180	620 units

Charge for electricity: 620 units at **18p per unit**	£ 111·60
Standing charge: 3 months at **£6 per month**	£18
Total charges:	£ 129·60
VAT at 5%:	£ 6·48

Amount to pay: £ 136·08

Complete Mr Khan's electricity bill to find the amount he has to pay. [6]

Units used = 35180 − 34560 = 620 units

620 × 18p = 11160p = £111·60

Standing charge = 3 months × £6 = £18

Total charges before VAT = 111·60 + £18 = £129·60

VAT at 5% = $\frac{5}{100}$ × 129·60 = £6·48

Final amount to pay = £129·60 + £6·48 = £136·08

Examiner only

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

Mr Khan currently has each of the following bills to pay:

- Water bill £234
- Gas bill £120
- Loan repayment £45

If Mr Khan waits until next month to pay these bills, he will pay a month's interest on each of the bills.
Interest is charged for the month as listed:

- Water 2%
- Gas 2·3%
- Loan 11%

Calculate the **total interest** Mr Khan will have to pay if he waits until next month to pay these bills.
You must show all your working. [5 + 2 OCW]

Water bill: 2% of 234 = £4.68

Gas bill: 2.3% of 120 = £2.76

Loan: 11% of 45 = £4.95

Total interest = 4.68 + 2.76 + 4.95 = £12.39

Examiner only

3. *(a)* Liam is following a recipe to make Welsh Cakes.
He places flour, butter and sugar in a mixing bowl.
These three ingredients have a total mass of 1920 g.

He checks the recipe and finds that:

- the mass of sugar is $\frac{3}{16}$ of the total mass of these three ingredients,
- for every 90 g of sugar he needs to add one egg and 50 g of sultanas.

Calculate the number of eggs and the mass of sultanas that Liam needs to make his Welsh Cakes. [4]

Sugar $= \frac{1}{5} \times 1920 = 384$kg

How many groups of 90g of sugar are in 384g:

$\frac{384}{90} = 4.266$

No. of egg = 4 eggs

Mass of sultanas = $4 \times 50g = 200g$ of sultanas

Number of eggs 4

Mass of sultanas 200 g

(b) Serena is making a sauce.
The mass of flour Serena has in her mixing bowl is double the mass of butter.
The total mass of flour and butter is 852 g.

Calculate the mass of the flour in Serena's mixing bowl. [2]

$\frac{852 \times 2}{3} = 568g$

Examiner only

4. Ms Ritter is buying a new dining table.
She has seen a table with a circular top and another with a rectangular top.

The circular top has a diameter of 1·5 m.
The rectangular top measures 2 m by 0·8 m.

(a) Which of the table tops has the greater perimeter?
You must show all your working. [3]

Circular table:
Circumference $= \pi \times$ diameter $= 3.14 \times 1.5\text{m} = 4.71\text{m}$

Rectangular table:

Perimeter $= 2 \times (L + W) = 2 \times 2 + 0.8$
$= 2 \times 2.8 = 5.6\text{m}$.

Rectangular table has ↑ greater perimeter

(b) Does the table top with the greater perimeter also have the greater area?
You must show all your working. [3]

Circular table:

Radius $= 1.5 \div 2 = 0.75\text{m}$

Area $= \pi \times r^2 = 3.14 \times (0.75)^2 = 3.14 \times 0.5625$
$= 1.76625\text{m}^2$
$\approx 1.77\text{m}^2$

Rectangular table:

$L = 2\text{m}$ $W = 0.8\text{m}$ Area $= L \times W$

$2 \times 0.8 = 1.6\text{m}^2$ (does not have the > area)

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5. *(a)* A bottle contains 250 grams of sun cream.

A website recommends that one application of sun cream is 1 ounce.

1 gram = 1000 milligrams
1 ounce ≈ 28 350 milligrams

Use this recommendation to answer the following question.

How many applications of sun cream are there in this bottle?
You must show all your working. [3]

Divide total grams by grams per application

$\frac{250g}{28.35g/oz} = 8.82$

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(b) Marie wants to buy some sun cream.

Small bottle
100 ml for £1.42

Large bottle
250 ml for £3.65

Which of the two bottles of sun cream offers the better value for money?

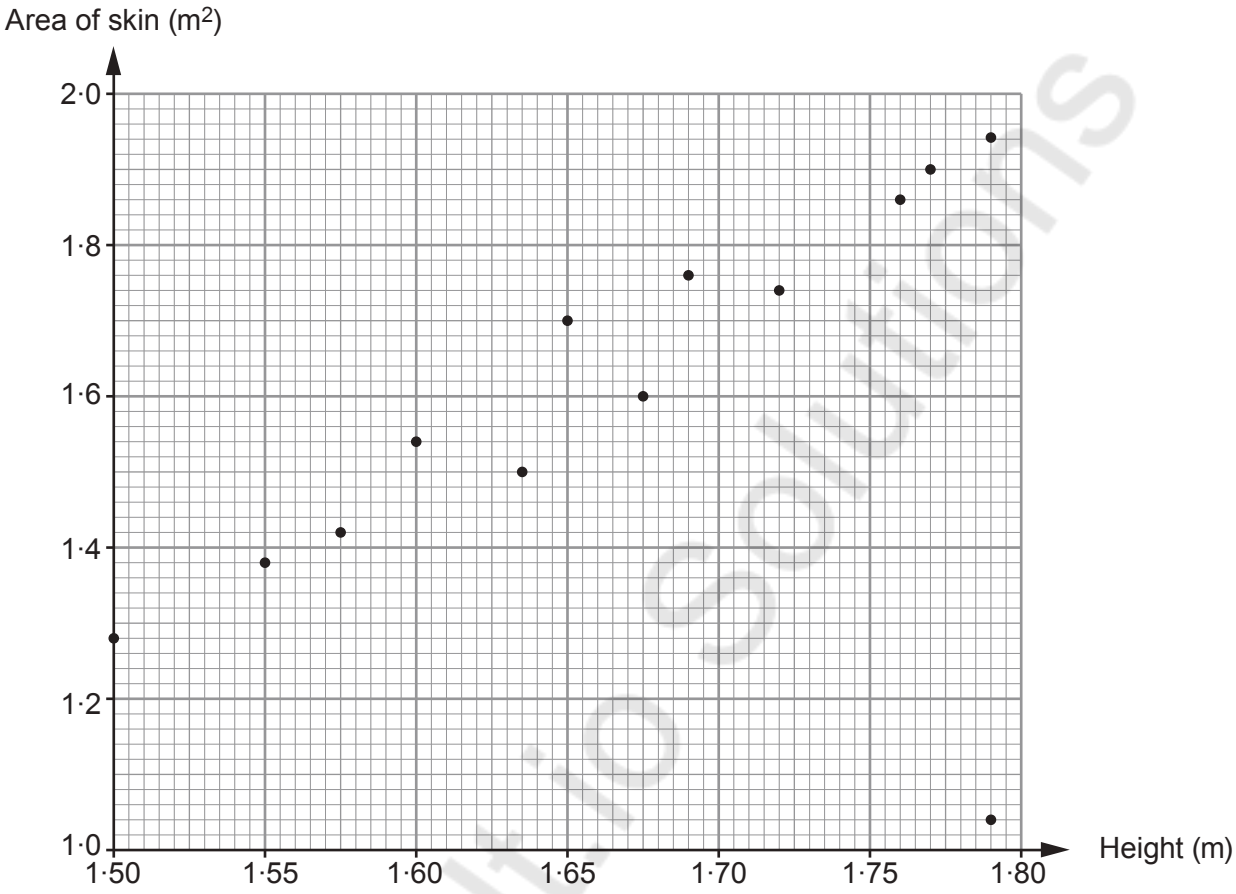
Small bottle ☐ Large bottle ☐

You must show all your working. [2]

Compare Price per ml of each:
Small bottle (100 ml for £1.42) = $\frac{1.42}{100}$ = 0.0142 per ml
Large bottle = $\frac{3.65}{250}$ = 0.0146 per ml
Small bottle offers better value for money

Examiner only

6. In a science lesson, 13 students calculated an estimate of the area of their skin.
The results are shown on the scatter diagram below.



(a) Arwyn is the only student who made an error in his calculation.
He is one of the tallest students.
What is Arwyn's calculated estimate of the area of his skin?
Circle your answer. [1]

1·79 m² 1·94 m² 1·02 m² 1·20 m² 1·04 m²

(b) Which term best describes the correlation between a person's height and the estimate of the area of their skin?
Circle your answer. [1]

No correlation Spread Certain Positive Negative

Examiner only

(c) Garth is 5 cm taller than Ella.
The calculated estimate of the area of Ella's skin is 1·54 m^2.
How tall is Garth? [2]

1·54m^2 corresponds to a height of about 1·6m
If Garth is 5cm taller than Ella, 1·60m + 0·05m
= 1·65m

Garth is 1·65 m tall

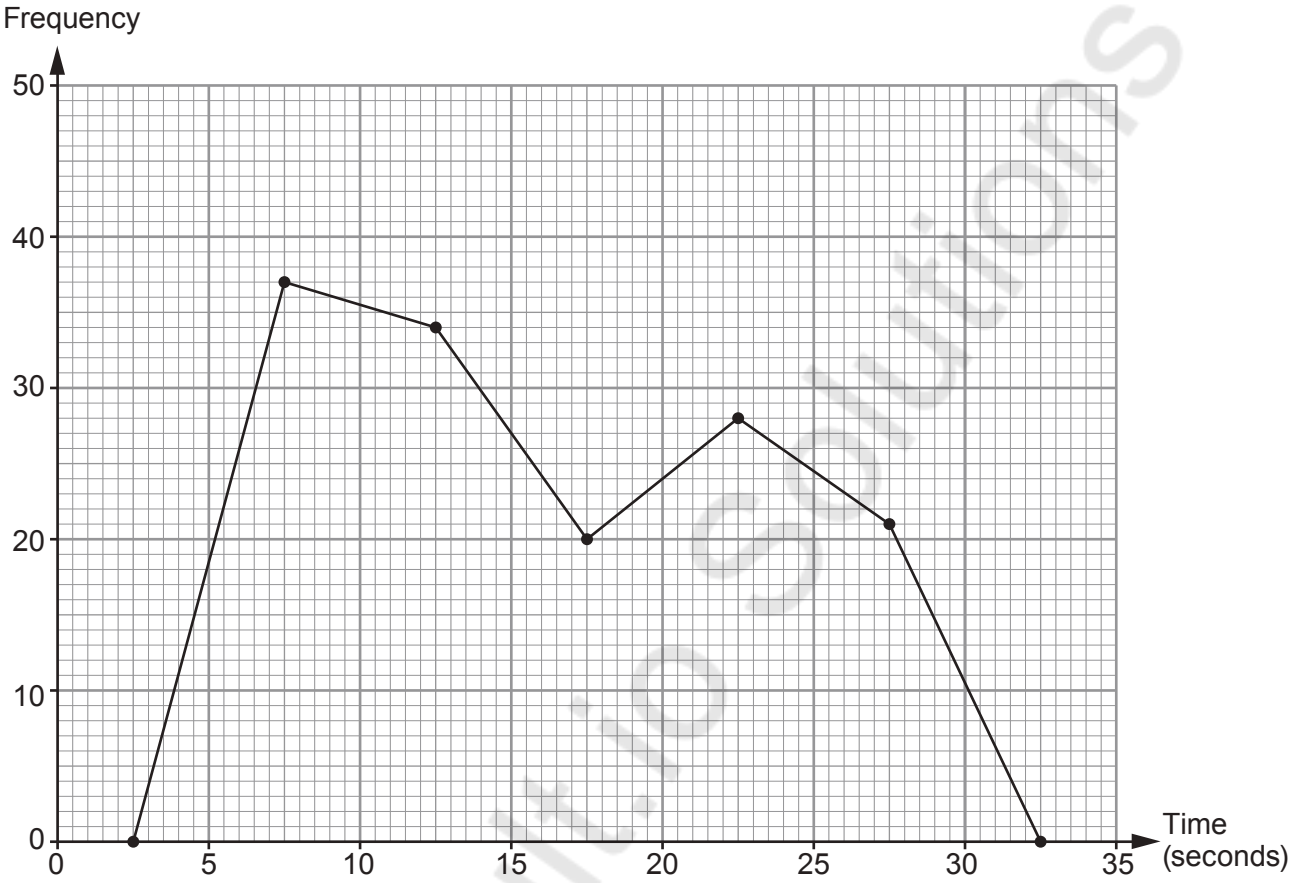
(d) Bryn is 1·50 m tall.
Abigail is 18% taller than Bryn.
Find Abigail's calculated estimate of the area of her skin. [3]

Height = 1·18 × 1·5 = 1·77m
Area of skin = 1·9m^2

Abigail's estimate of the area of her skin is 1·9 m^2

Examiner only

7. On Monday, Mrs Griffin recorded the time each of her students took to start a task.
She records her data in groups of equal width.
Mrs Griffin displays the results in a frequency polygon, as shown below.



(a) On Monday, how many students started the task? [2]

37 + 34 + 20 + 28 + 21 = 140 students

(b) Which is the modal group of the times taken to start the task?
Circle your answer.

7·5 seconds 20 to 25 seconds 5 to 10 seconds

15 to 20 seconds 37 seconds [1]

Examiner only

(c) In which group is the median time taken to start the task? [2]

10 to 15 seconds

(d) Mrs Griffin had set a target that students should start the task within 30 seconds.
Was the target met?
You must give a reason for your answer. [1]

Yes ✓ No ☐ Can't tell ☐

last students started in 25 to 30 second range

(e) On Tuesday, the same students started the same task again.
25% of them started the task within 10 seconds.

Is this an improvement on the number of students who started the task within 10 seconds on Monday?
You must show all your working. [2]

Yes ☐ No ☐

Total no. of students = 140

Monday total w.in 10secs = 0 + 37 = 37 students

$\frac{37}{140} \times 100 = 26.4$

25% is less than 26.4%

No, it was not an improvement

Examiner only

8.

Terra Rose currency exchange	
Buying currency	**Notes available**
£1 buys $1.36 (US dollars)	$5, $10, $20, $50, $100

Nerys is going on holiday to the USA for 13 days and then to Italy for 7 days.
She has saved a total of £500 to buy US dollars ($) and euros (€).

Nerys takes $\frac{13}{20}$ of her savings to buy US dollars from *Terra Rose* currency exchange.

She wants to buy as many dollars as possible.

Nerys plans to use all her remaining money to buy euros.

How many dollars will Nerys buy?
How much money, correct to the nearest penny, will she have left to buy euros?
You must show all your working. [8]

$\frac{13}{20} \times 500 = £325$ (Convert to dollars at £1)

$= \$1.36$

$£325 \times 1.36 = 442$

$\frac{442}{5} \times 5 = 88 \times 5 = \$440$ //

How much did that cost her in pounds?

$\$440 \div 1.36 = £323.53$

Money left to buy euros:

$500 - 323.53 = £176.47$ //

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Nerys will buy $ 440

She will have £ 1767 left to buy euros.

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9. Elwyn makes 10 full jugs of fresh lemonade.
Each jug is cylindrical with internal measurements as follows:

- height 28 cm,
- base radius 5 cm.

Diagram not drawn to scale

Elwyn's drinking glasses each hold a serving of 170 cm^3 of lemonade.

He serves 80 people lemonade.

How many **full** jugs of lemonade does Elwyn have left over?
You must show all your working. [5]

Volume = $\pi r^2 h$ $r = 5cm$ $h = 28cm$

$= 3.14 \times 25 \times 28 = 3.14 \times 700 = 2198$

Volume of ten jugs $= 10 \times 700\pi = 21,991.15$

Volume needed to serve 80 people

Each person get $170cm^3$:

$80 \times 170 = 13,600\ cm^3$

Left over $= 21991.15 - 13,600 =$

$= 8,391.15$

$= \frac{8391.15}{2199.11} = 3.816$

So Elwyn has 3 full jugs

Number of full jugs of lemonade left over is 3

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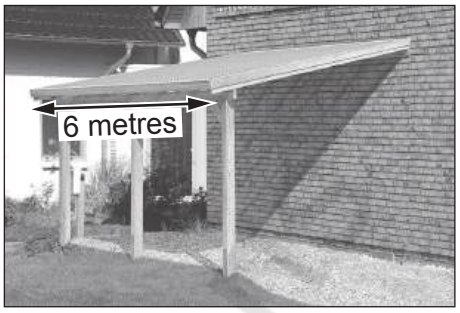
Examiner only

10. Mr Read is building a shelter against his house.

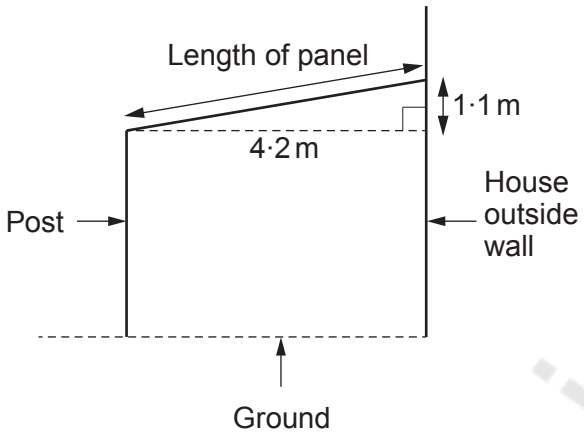


(a) The length of the shelter is 6 m.

He has drawn a sketch of the side view of the shelter, as shown below.

Mr Read has started to place some panels on his roof.
When fitted to the roof, each panel needs to slightly overlap the next panel.
The plan view of placing the first 3 panels is also shown below.

Side view



Incomplete plan view showing first 3 panels

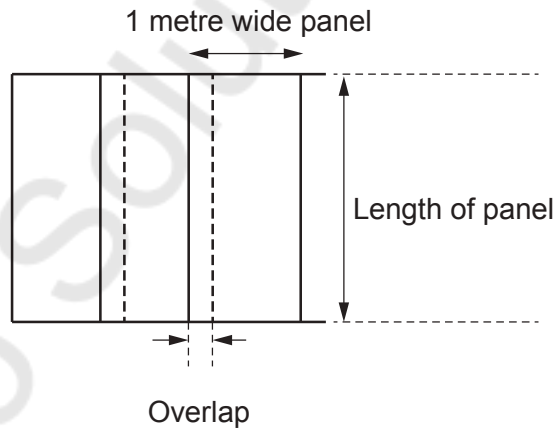


Diagram not drawn to scale

The shelter roof panels are 1 metre wide and can be bought in different lengths.

Length of panel	4·1 m	4·2 m	4·3 m	4·4 m	4·5 m	4·6 m
Cost per panel	£21	£22	£23	£24	£25	£26

Mr Read bought the cheapest suitable panels to build his shelter roof.
Calculate the cost of all of the panels Mr Read bought.
You **must** show all your working. [6]

Length of Panel = $\sqrt{4.2^2 + 1.1^2} = \sqrt{18.85} = 4.34$m

To cover 6m w overlapping Panels,

1 is 6 × 0.9 = 6.4m

7 Panels = 7 × £24 = £168

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(b)

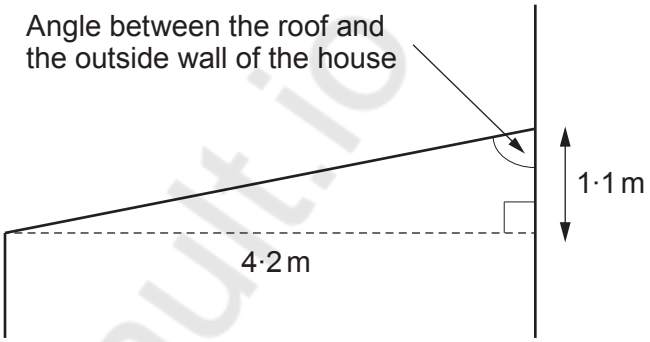

Diagram not drawn to scale

Calculate the size of the angle between the shelter roof and the outside wall of the house. Give your answer correct to 3 significant figures. [4]

Opp side = 1.1m (Vertical height)
Adj side = 4.2m (horizontal distance)

$\tan(\theta) = \frac{\text{Adj}}{\text{Opp}} = \frac{4.2}{1.1}$

$\theta = \tan^{-1}\frac{4.2}{1.1} = 3.818 = \tan^{-1}(3.818)$
$= 75.3°$

END OF PAPER

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

Examiner only