Surname	Centre Number	Candidate Number
Other Names		0

GCSE

3310U60-1

A17-3310U60-1

MATHEMATICS – NUMERACY
UNIT 2: CALCULATOR-ALLOWED
HIGHER TIER

WEDNESDAY, 8 NOVEMBER 2017 – MORNING

1 hour 45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**9**	
2.	**18**	
3.	**9**	
4.	**8**	
5.	**3**	
6.	**7**	
7.	**6**	
8.	**7**	
9.	**13**	
Total	**80**	

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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. Question numbers must be given for all work written on the continuation 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 **3**, the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.

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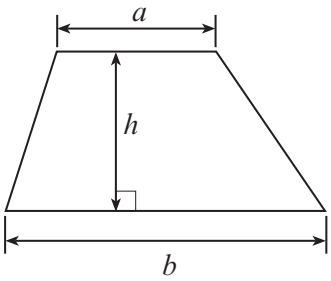
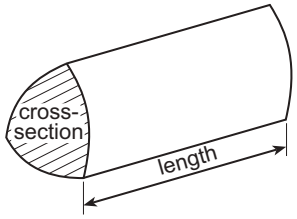
Formula List - Higher Tier

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

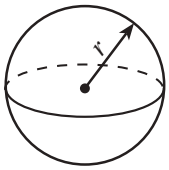


Volume of prism = area of cross-section × length



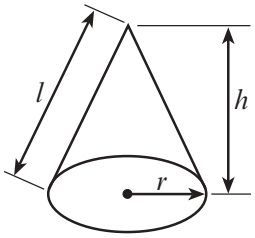
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

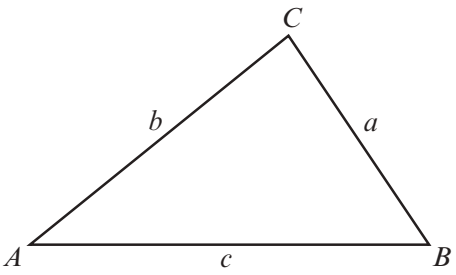


In any triangle ABC

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.

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Examiner only

1. Alptai is a ski resort.
The daily snowfall for January is given in the table below.

Daily snowfall, s (cm)	Number of days
$0 \leqslant s < 5$	10
$5 \leqslant s < 10$	16
$10 \leqslant s < 20$	4
$20 \leqslant s < 30$	0
$30 \leqslant s < 50$	1

(a) Calculate an estimate for the mean daily snowfall for the 31 days of January. [4]

(b) Circle either TRUE or FALSE for each of the following statements. [2]

The table above shows that there definitely was snowfall on each of the 31 days in January.	TRUE	FALSE
There were 16 days when the daily snowfall was less than 10 cm.	TRUE	FALSE
There was only 1 day with snowfall greater than or equal to 20 cm.	TRUE	FALSE
The modal group also contains the median daily snowfall.	TRUE	FALSE

Examiner only

(c) For the 28 days of February, the mean daily snowfall in Alptai was 9 cm.
On 1st February, the snowfall recorded in Alptai was 63 cm.
Calculate the mean daily snowfall for the 27-day period 2nd to 28th February. [3]

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2. *(a)* Bronwen and Alvaro decide to keep some alpacas on their farm in Patagonia.

Alvaro knows it is possible to keep between 4 and 6 alpacas on each acre of suitable farmland.
They have 13 hectares of farmland that they want to use to keep the alpacas.
Bronwen knows that 1 acre is 4046·86 m^2 and that 10 000 m^2 = 1 hectare.

Use this information to advise Bronwen and Alvaro on the number of alpacas they could keep on their farmland.
State any assumption that you make.
You must show all your working. [6]

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Assumption:

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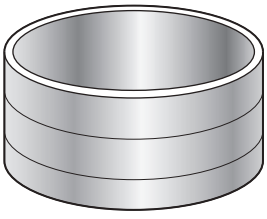
(b) Bronwen decides to place a cylindrical water container in the small paddock on the farm.

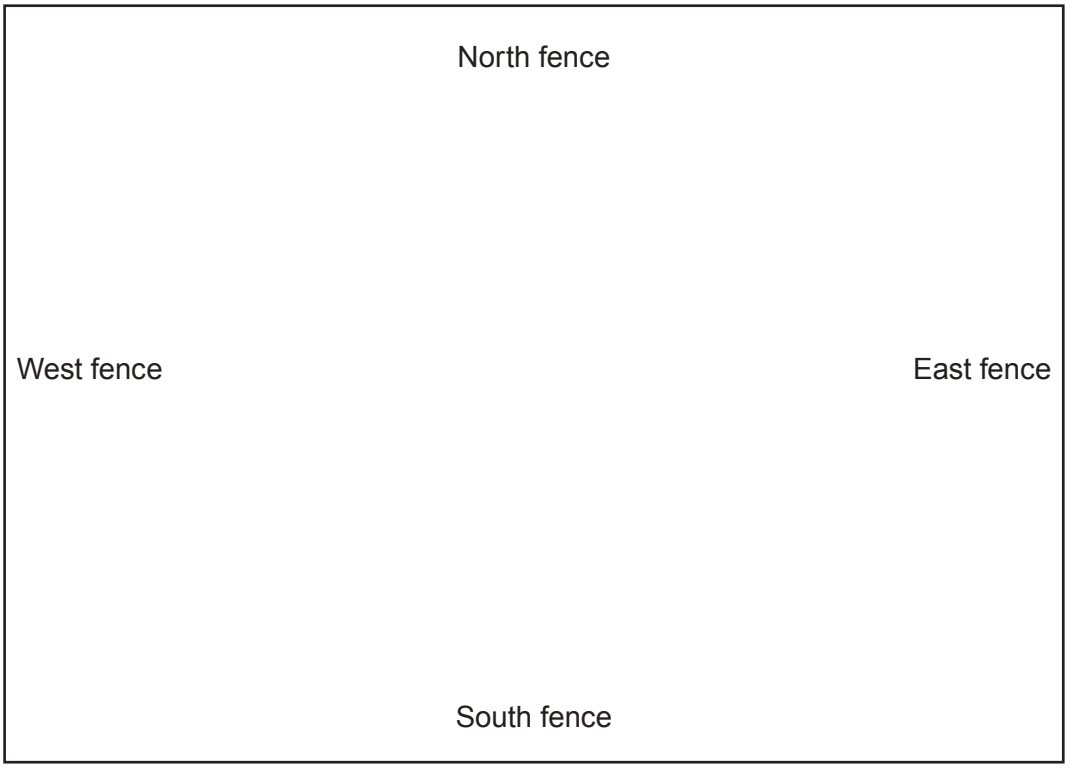


The water container has a diameter of 1·4 metres.

(i) The scale diagram opposite shows the small paddock on the farm.
The small paddock is rectangular, measuring 7 metres by 5 metres.

Examiner only

Scale 2 cm represents 1 m



Bronwen decides to place the centre of the water container so that it is:

- equidistant from the south fence and the east fence,
- 3 metres from the south fence.

Show the placement of the water container on the scale diagram of the small paddock above.
Your diagram should include an **accurate plan view** of the **water container**. [4]

(ii) The water container holds 900 litres of water when full.
Calculate the height of the water container in centimetres. [4]

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The height of the water container is ..... cm

Examiner only

(c) The currency widely used in Patagonia is the Argentine peso.

Alvaro sells alpaca fleeces from Patagonia.
His fleeces are priced in Argentine pesos.
Tom lives in Wales and buys fleeces from Alvaro.
Tom pays for the fleeces in pounds.

Tom's purchases are shown in the table below.

	Number of fleeces bought	Price per fleece, in Argentine pesos	Exchange rate
January 2015	80	19.20	£1 = 15.47 Argentine pesos
March 2016	20	22.30	£1 = 15.21 Argentine pesos
April 2017	100	24.50	£1 = 14.93 Argentine pesos

For each of Tom's 3 purchases he paid correct to the nearest penny.

How much did Tom pay for these 200 fleeces, in pounds?
Give your answer correct to the nearest penny.
You must show all your working. [4]

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Tom paid £ ..... , correct to the nearest penny

Examiner only

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

Handmade socks, knitted using pure cashmere wool, are very expensive to buy.

Rowena buys cashmere wool in 20 g balls.
Each ball of cashmere wool costs her £1.42.
She pays her sister £8 to knit each pair of socks.
135 g of cashmere wool is used to knit each pair of socks.

Rowena sells 40 pairs of cashmere socks for £18.95 per pair.
What is her percentage profit?
Give your answer correct to 2 significant figures.
You must show all your working. [7 + 2 OCW]

Rowena's percentage profit when selling all 40 pairs of socks is ..... %,
correct to 2 significant figures.

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Examiner only

4. Bethan has a plan of her rectangular lawn, which she has labelled *ABCD*.
She wants to cut out a triangular flowerbed from her lawn, labelled *GHD*.
Bethan decides that *AG* : *GD* should be 1 : 2 and that *DH* = *HC*.

She has made a sketch shown below.

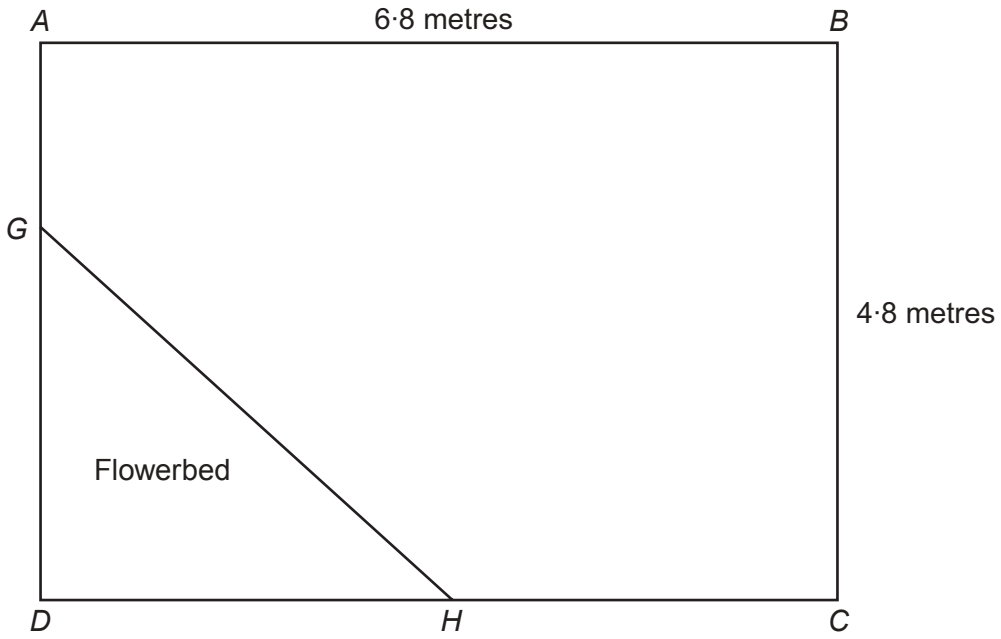

Diagram not drawn to scale

(a) Calculate the length of *GH*. [4]

Examiner only

(b) The flowerbed, *GHD*, is to have a flexible edging strip placed around its perimeter. The edging strip costs £3.50 per metre and can only be bought in strips of complete metres.

- How much will the edging strip cost Bethan?
- What length of strip will be left over? Give your answer in centimetres. [4]

Cost £ .....

..... cm left over

Turn over.

Examiner only

5. Teleri needs £8000 to pay a deposit for a new house.
She already has £7500.

Teleri decides to invest the £7500 in a bank account that pays interest at a rate of 0·31% every month.
She does not plan to make any further payments into this account.

Calculate the number of months Teleri will need to wait until she has enough money in the account to pay the deposit of £8000. [3]

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Examiner only

6. The diagram below shows the locations of the ports of Lindat, Molk and Nuir.
Lindat is due south of Nuir, and Nuir is due west of Molk.

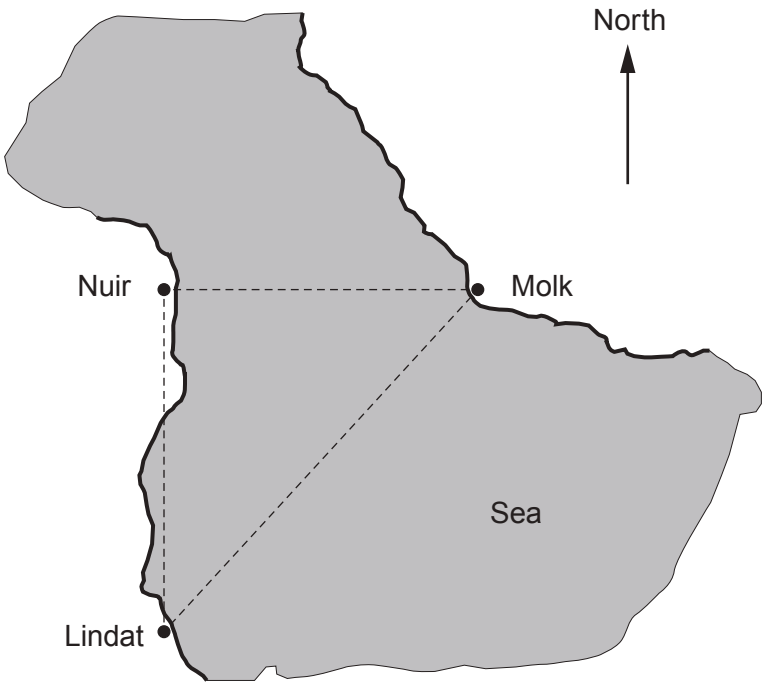

Diagram not drawn to scale

Agnetha lives in Molk.
She travels from Molk to Lindat by ship.

- Lindat is 24 km due south of Nuir.
- The ship sails directly to Lindat on a bearing of 211°.
- The ship has an average speed of 20 km/h.
- The ship leaves at 11:45 a.m.

Calculate Agnetha's arrival time in Lindat. [7]

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Examiner only

Examiner only

7. Iestyn opened a savings account on 1 August 2017, investing £2800.
On 1 October 2017, he viewed his savings account online.
The table below shows all the transactions that had taken place since he opened the account.

Date	Details	Paid in (£)	Paid out (£)	Balance (£)
01/08/17	Account opened	2800.00		2800.00
31/08/17	Interest	14.00		2814.00
30/09/17	Interest	14.07		2828.07

(a) Calculate the nominal interest rate per annum. [3]

(b) Calculate the AER the account was paying.
Give your answer as a percentage, correct to 2 decimal places. [3]

Examiner only

8. A baker makes cake slices to sell in her shop.
All of the cake slices are identical. They have been cut from a cylindrical cake of radius 10 cm and depth 4 cm.

Piped icing is placed on the curved surface of each cake slice, as shown in the diagram.
It connects opposite vertices of this curved surface, and follows the shortest path between these vertices.

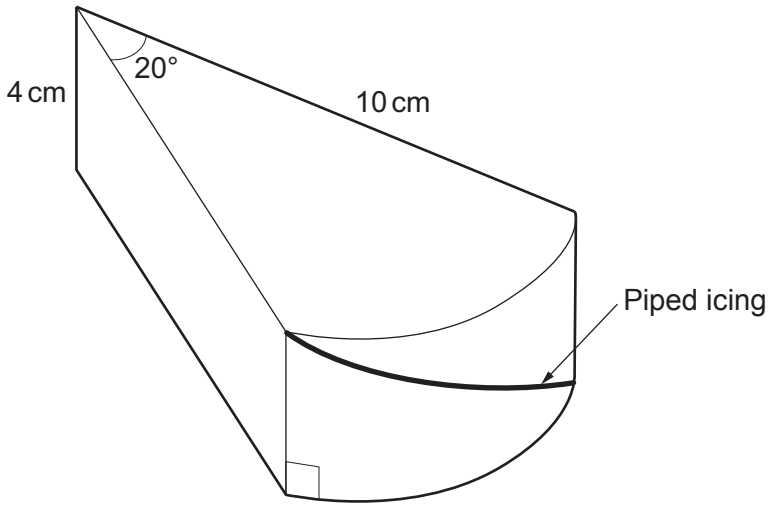

Diagram not drawn to scale

What length of piped icing will be needed to decorate all the slices that make up a whole cylindrical cake? [7]

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Length of piped icing needed for a whole cake = ... cm

Examiner only

9. An engineering company employs 85 staff.
The company plans to carry out a survey on staff health.
It will conduct the survey using a sample of 15 of its staff, stratified by job type.

(a) Circle either TRUE or FALSE for each statement given below. [2]

STATEMENT		
Choosing every 4th person on an alphabetical list of office staff is a suitable method of randomly choosing the office staff required for the sample.	TRUE	FALSE
Numbering the cleaning staff, placing the numbers in a hat and drawing out numbers at random is a suitable method of choosing the cleaners required for the sample.	TRUE	FALSE
There are 9 managers employed by the company. The calculation to find the number of managers in the sample is $\frac{9}{85} \times 15 = 1{\cdot}59$. This answer means there will **definitely** be 2 managers in the sample.	TRUE	FALSE
The proportion of the staff in each job type in the sample will be **exactly** the same as the proportion of the staff in each job type in the company as a whole.	TRUE	FALSE

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Examiner only

(b) 50 engineers are employed by the company.
Use the following extract from a table of random digits to choose 9 engineers for the sample.
You must start with the first number in the list.
Describe clearly how you are using the numbers to select the sample. [3]

29974 55479 07248 33999 17038 02475 49979 01218

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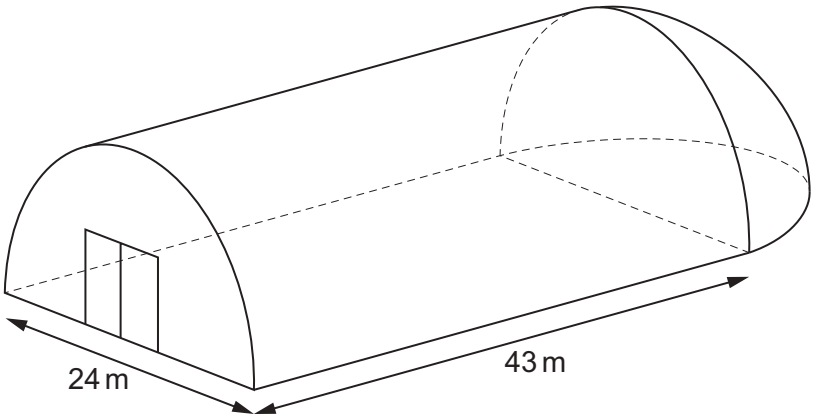
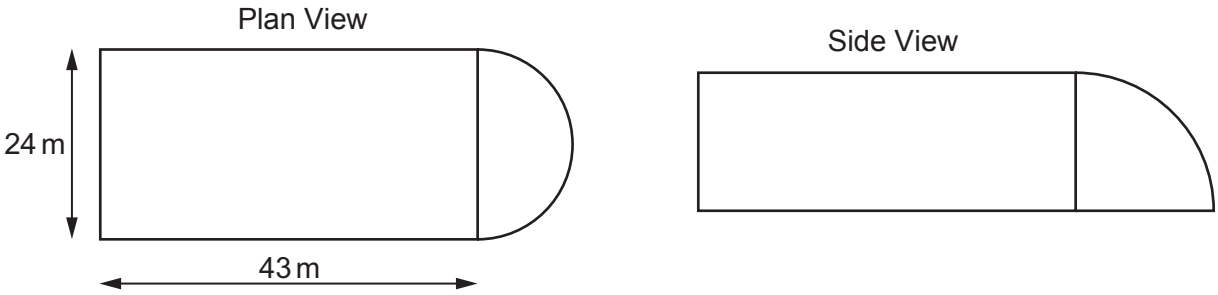
Examiner only

(c) The engineering company has a storage building, as shown below.
The building is in the form of half a cylinder, with half a hemisphere attached at one end.





Diagrams not drawn to scale

The company needs to paint all the exterior surfaces of the building, including the doors.

The measurements on the diagram are given **correct to the nearest metre**.
The paint comes in tins that cover an area of 40 m^2, **correct to the nearest m^2**.

Calculate the smallest number of tins that would guarantee having enough paint to cover these exterior surfaces. [8]

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

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