Surname	Centre Number	Candidate Number
First name(s)		0



#### **GCSE**

3310U50-1



### **TUESDAY, 3 NOVEMBER 2020 - MORNING**

# MATHEMATICS – NUMERACY UNIT 1: NON-CALCULATOR HIGHER TIER

1 hour 45 minutes

#### **ADDITIONAL MATERIALS**

The use of a calculator is not permitted in this examination. 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  $\pi$  as 3·14.

#### 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.

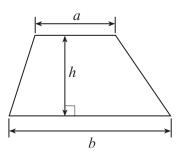
In question **2**(*b*), the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.



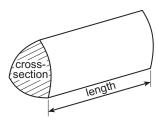
For Examiner's use only						
Question	Maximum Mark	Mark Awarded				
1.	4					
2.	13					
3.	3					
4.	3					
5.	6					
6.	6					
7.	5					
8.	5					
9.	8					
10.	10					
11.	9					
12.	8					
Total	80					

#### Formula List - Higher Tier

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



Volume of prism = area of cross-section × length

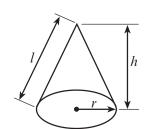


Volume of sphere =  $\frac{4}{3}\pi r^3$ Surface area of sphere =  $4\pi r^2$ 



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

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

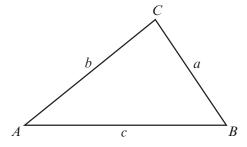


In any triangle ABC

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  $a \ne 0$  are given by  $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$ 

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

#### **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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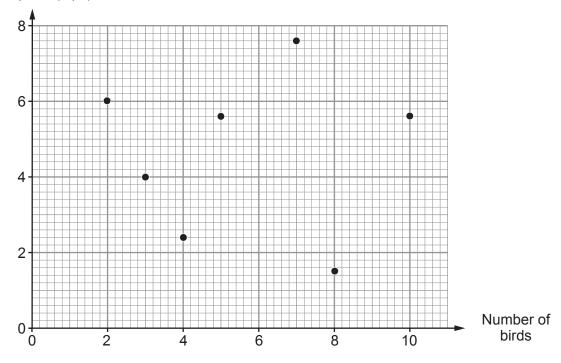


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(i)	The nusurshir Mark, w	mber of he on Monvith the let	ours of sui day. ter S, the p oe a position ber of ho	point or	on Sund	ay was do	ouble the n	(hours)
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(b) At 3 p.m. each day last week, Rosie recorded the wind speed and the number of birds feeding in her garden.

Wind speed (mph)

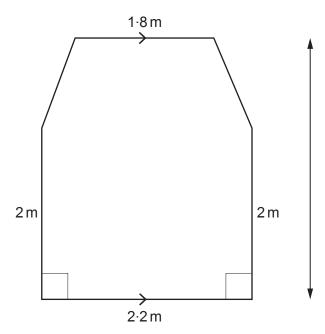


On Wednesday last week, the wind speed at 3 p.m. was a quarter of that on Friday. Complete the following table. [2]

Day	Wind speed (mph)
Wednesday	
Friday	

Examiner only





Overall length of the groundsheet

Diagram not drawn to scale

The area of the groundsheet is  $6.8\,\text{m}^2$ . The width of the groundsheet is  $2.2\,\text{m}$ . Calculate the overall length of the groundsheet.

[4]
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3.	The scale	diagram	below	shows	Hav	dn's garden	1
<b>U</b> .	THE SCALE	alagiani		3110443	I IUV	arro garacri	

His garden is 27 metres long and 18 metres wide. The scale used is **1 cm represents 3 metres**.

Haydn is planting a tree in his garden.

He decides that the tree must be planted:

- 15 metres from the fence,
- equidistant from the house and the fence.

Draw suitable lines on the diagram and show where Haydn should plant the tree.

[3]

1 cm represents 3 metres

Hedge Fence

Wall



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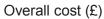
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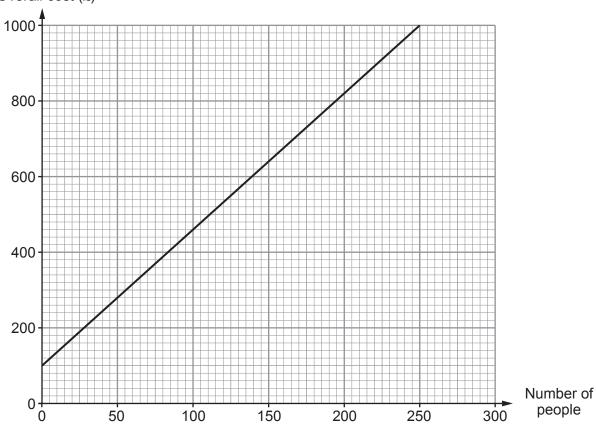
4.		600 pupils in oupils are to		ed to discu	ss change	s to the sc	hool unifor	m.	
	There are 6	eacher has a 600 rows of perpublic	oupil name	s in the sp					
	The headteacher uses a systematic sampling method.								
	(a) The	first pupil se	lected on t	he headte	acher's lis	t is a boy v	vhose nam	e is in the	25th row.
		the row nun		e spreadsl	neet of the	other 7 pu	ıpils who v	vould be se	elected. [2]
	Pupil	1st	2nd	3rd	4th	5th	6th	7th	8th
	Row in the	25th							
	spreadsheet								
	(b) Expla	ain how the	headteach	er selecte	d the first p	pupil.			[1]
								•••••	



#### **5.** Meinir is planning a charity event to be held at a hotel.

A section of a straight line graph showing the hotel charges for this event is shown below. These charges include a single payment for the room hire and the cost of one drink for each person attending.





Meinir decides to pay the room hire cost herself. She decides to price the tickets so that she will be able to make £500 to give to charity.



(a)	Calculate the selling price of each ticket if Meinir plans the event for 50 people.	[3]	01
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(b)	Calculate the selling price of each ticket if Meinir plans the event for 400 people.	[3]	
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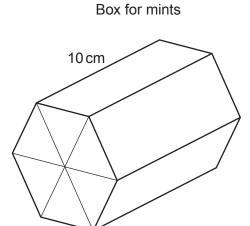


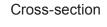
(a)	A square piece of card measures 1 m by 1 m.
	Calculate the area of this piece of card.  Give your answer in <b>standard form</b> in mm <sup>2</sup> . [2]
	mm²
(b)	Some fabric shrinks when it is washed.
	A piece of fabric is washed twice.
	After the first wash, the area of the fabric is 75% of the area of the original piece of fabric. After the second wash, the area of the fabric is 90% of the area of the fabric after the first wash.
	After these two washes, the area of the fabric is 2700 cm <sup>2</sup> .
	Calculate the area of the original piece of fabric. [4]
•••••	

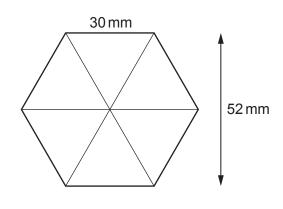


Examiner only

7. A box for mints is to be made in the shape of a hexagonal prism. The cross-section of the box is a regular hexagon. The volume of the box must be greater than 230 000 mm<sup>3</sup>.







Diagrams not drawn to scale

Using the measurements above, show that this would make a suitable box for the mints. You must show all your working.	5]
	••••



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Examiner only

To co 9000	omplete the work on time, bricklayers will need to lay bricks in 10 hours.	
<i>(</i> )		
(a)	Calculate how many bricklayers would be needed to lay 9000 bricks in 10 hours. You must show all your working.	
		•••
		•••
		•••
(b)	Give one assumption that you made in answering part (a).	







(a) After owning the car for a year, Carwyn had the car valued.  He calculated that the car had lost 0·138 of its value at the start of the year.  Express 0·138 as a fraction in its lowest terms.  (b) Carwyn bought the motorcycle for £9600.  At the end of each year of owning the motorcycle, Carwyn had the motorcycle valued.  Each year the motorcycle lost $\frac{1}{5}$ of its value at the start of the year.	the motorcycle for £9600. ch year of owning the motorcycle, Carwyn role valued. notorcycle lost $\frac{1}{5}$ of its value at the start of seed the method $9600 \times \frac{1}{5} \times \frac{1}{5}$ to calculate the value of the motorcycle ars.	yn ow	rns a car and a motorcycle.	HIMD T
(b) Carwyn bought the motorcycle for £9600.  At the end of each year of owning the motorcycle, Carwyn had the motorcycle valued.  Each year the motorcycle lost ½ of its value at the start of	the motorcycle for £9600. ch year of owning the motorcycle, Carwyn role valued. notorcycle lost $\frac{1}{5}$ of its value at the start of seed the method $9600 \times \frac{1}{5} \times \frac{1}{5}$ to calculate the value of the motorcycle ars.	value He c	ed. alculated that the car had lost 0·138 of its value at the	
At the end of each year of owning the motorcycle, Carwyn had the motorcycle valued.  Each year the motorcycle lost $\frac{1}{5}$ of its value at the start of	ch year of owning the motorcycle, Carwyn vole valued. In the order value of the start of seed the method $9600 \times \frac{1}{5} \times \frac{1}{5}$ to calculate the value of the motorcycle ars.	Expr	ess 0·138 as a fraction in its lowest terms.	[3
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At the end of each year of owning the motorcycle, Carwyn had the motorcycle valued.  Each year the motorcycle lost $\frac{1}{5}$ of its value at the start of	ch year of owning the motorcycle, Carwyn vole valued. In the order value of the start of seed the method $9600 \times \frac{1}{5} \times \frac{1}{5}$ to calculate the value of the motorcycle ars.			
At the end of each year of owning the motorcycle, Carwyn had the motorcycle valued.  Each year the motorcycle lost $\frac{1}{5}$ of its value at the start of	ch year of owning the motorcycle, Carwyn vcle valued. In the order cycle lost $\frac{1}{5}$ of its value at the start of seed the method $9600 \times \frac{1}{5} \times \frac{1}{5}$ to calculate the value of the motorcycle ars.			
At the end of each year of owning the motorcycle, Carwyn had the motorcycle valued.  Each year the motorcycle lost $\frac{1}{5}$ of its value at the start of	ch year of owning the motorcycle, Carwyn vole valued. In the order value of the start of seed the method $9600 \times \frac{1}{5} \times \frac{1}{5}$ to calculate the value of the motorcycle ars.			
At the end of each year of owning the motorcycle, Carwyn had the motorcycle valued.  Each year the motorcycle lost $\frac{1}{5}$ of its value at the start of	ch year of owning the motorcycle, Carwyn vcle valued. In a control of the motorcycle lost $\frac{1}{5}$ of its value at the start of seed the method $9600 \times \frac{1}{5} \times \frac{1}{5}$ to calculate the value of the motorcycle ars.			
Each year the motorcycle lost $\frac{1}{5}$ of its value at the start of the year.	sed the method $9600 \times \frac{1}{5} \times \frac{1}{5}$ to calculate the value of the motorcycle ars.	At th	e end of each year of owning the motorcycle, Carwyn	
	ars.	Each the y	year the motorcycle lost $\frac{1}{5}$ of its value at the start of ear.	
(i) Carwyn used the method $9600 \times \frac{1}{5} \times \frac{1}{5}$ to calculate th	ars.	(i)	Carwyn used the method $9600 \times \frac{1}{5} \times \frac{1}{5}$ to calculate the	value of the motorcycle
after 2 years.	hy Carwyn's method is incorrect. [1			
Explain why Carwyn's method is incorrect.			Explain why Carwyn's method is incorrect.	[1
			Carw At the had t	valued. He calculated that the car had lost 0·138 of its value at the start of the year.  Express 0·138 as a fraction in its lowest terms.  Carwyn bought the motorcycle for £9600. At the end of each year of owning the motorcycle, Carwyn had the motorcycle valued.  Each year the motorcycle lost $\frac{1}{5}$ of its value at the start of the year.  (i) Carwyn used the method $9600 \times \frac{1}{5} \times \frac{1}{5}$ to calculate the after 2 years.

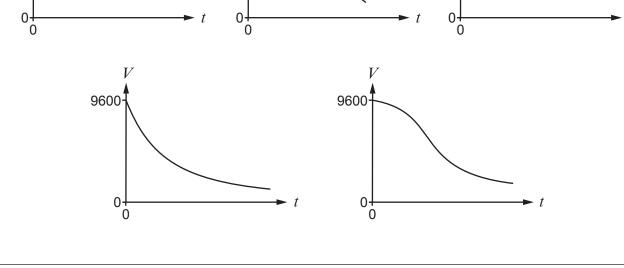


has owned the motorcycle for *t* years.

9600

Circle your answer.

Examiner only Write down a **formula** for the value V, in pounds, of Carwyn's motorcycle after he [3] Which one of the following best represents the graph of V against t? [1] 9600 0 0





9600-

(ii)

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Fr	equency	density			gram.			
<b>A</b>								
0						100	Waiting time (minute	es)
0		20	40	60	80	100		
(a) 15 C	5 patients omplete	s had to w the scale	vait up to 2 on the fre	0 minutes quency de	nsity axis.			[2
•••••								
<i>"</i> "	how that	there we	re 80 patie	ents in total	who waited	d to see a	doctor on this Tuesda	
<i>(b)</i> S								[



Examiner only

Calculate an estimate of the inter-quartile range of the waiting times recorded. (c) You must show all your working. [5] Estimate of the inter-quartile range = ...... minutes One Saturday, the waiting time for each patient was recorded. The inter-quartile range of the waiting times for this Saturday was smaller than the inter-(d) quartile range for the Tuesday. The management used this fact to conclude that waiting times were shorter on Saturdays than on Tuesdays. Was the management correct to come to this conclusion? Yes No Explain your answer. [1]



- 11. Môr-Dda is a company that makes buoys for use at sea.
  - (a) Môr-Dda makes 4 types of buoy.Each week, they make the following numbers of each type of buoy.

Type of buoy	Deep sea	Harbour	Navigation	Shoreline
Number made each week	18	27	23	4

This week,  $M\hat{o}r$ -Dda plans to take a sample of the buoys it makes to check on the quality of their production.

It plans to take a stratified sample of 12 buoys, based on the type of buoy.

Calculate th You must sh	e number of each now all your workir	type of buoy that ng.	should be include	d in the sample.	[4]
					••••••••
					••••••••••••
					•••••••
Type of buoy	Deep sea	Harbour	Navigation	Shoreline	
Number in the					

sample

(b) The design for a new buoy is shown below. It is made up of a cone attached to a hemisphere.

The base radius of the cone and the radius of the hemisphere are both 2 m.

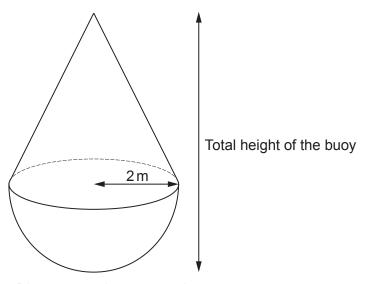


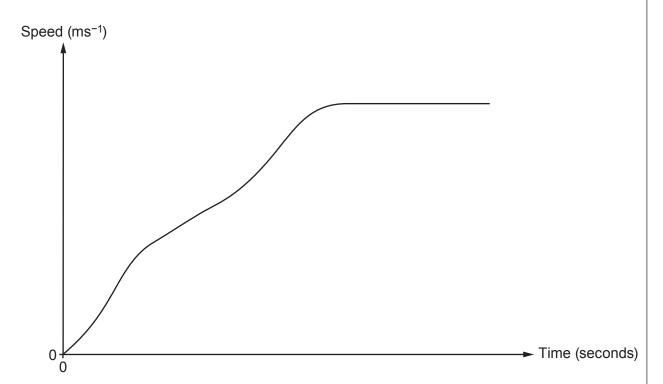
Diagram not drawn to scale

Calculate the total height of the buoy.	[5]
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Total height of the buoy = m	



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12. Eleri's cycle computer shows a speed-time graph for the first 60 seconds of her cycle ride.



The cycle computer has also generated the following table, showing Eleri's speed after every 10 seconds, for the first 40 seconds of her ride.

Time (seconds)	0	10	20	30	40
Speed (ms <sup>-1</sup> )	0	3	4.6	6·4	8

(a)	You must use 4 strips of equal width.	ie. [3]
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(b) A	ofter 40 seconds, Eleri's speed remained constant.	
C	Calculate an estimate of Eleri's average speed over the first <b>60 seconds</b> of her ride. Give your answer in ms <sup>-1</sup> , correct to 2 significant figures. You must show all your working.	
Y	ou must show all your working.	[5]
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