Surname	Centre Number	Candidate Number
First name(s)		0

Examiner only

REVISE .wales

GCSE

R.WM-MNH-U1-001

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MOCK PAPER A

MATHEMATICS AND NUMERACY (DOUBLE AWARD)

UNIT 1: FINANCIAL MATHEMATICS AND OTHER APPLICATIONS OF NUMERACY

HIGHER TIER

1 hour 45 minutes

ADDITIONAL MATERIALS

A calculator will be required for 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 all work written on the additional page.

Take π as $3{\cdot}14$ 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 **6**, 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.	**5**	
2.	**8**	
3.	**4**	
4.	**11**	
5.	**11**	
6.	**10**	
7.	**9**	
8.	**11**	
9.	**11**	
Total	**80**	

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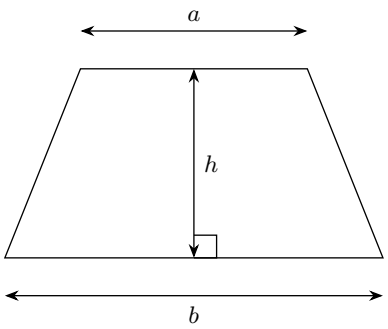
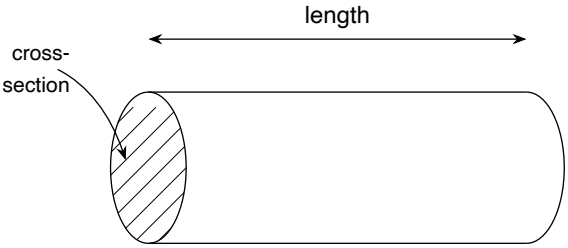
Formula List – HIGHER TIER

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

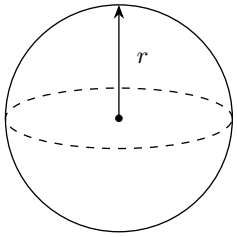


Volume of prism = area of cross-section $\times$ length



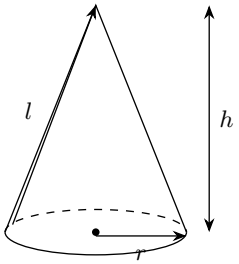
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

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

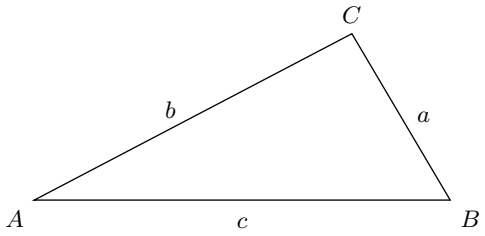


In any triangle ABC

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

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 $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

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.

1.

(a) The numbers 84 and 360 are written as products of their prime factors: [1]

$$84 = 2^2 \times 3 \times 7, \qquad 360 = 2^3 \times 3^2 \times 5.$$

Use these to write down the lowest common multiple (LCM) of 84 and 360.

LCM = ...

(b) Calculate $\frac{2}{3}$ of 87% of £540. Give your answer to the nearest penny. [1]

Answer = £ .....

(c) A school's exam-results booklet contains 480 pages. $\frac{3}{8}$ of the pages are graphs, and 35% of the *remaining* pages are tables. The rest of the pages are written commentary. How many pages of written commentary does the booklet contain? [3]

Pages of commentary = ...

2.

(a) Rhys earns a gross annual salary of £ $34{,}500$. His payslip rules are summarised in the table below. [4]

Item	Rule applied
Workplace pension	5% of gross salary (deducted first)
Income tax (band 1)	First £ $12{,}570$ is tax-free
Income tax (band 2)	Next £ $37{,}700$ taxed at 20%
National Insurance	8% of gross salary above £ $12{,}570$

Income tax is applied to gross salary *after* the pension deduction. NI is applied to gross salary (before any deductions).
Calculate Rhys's annual take-home pay.

Take-home pay = £ .....

(b) Iestyn borrows £ $8{,}000$ over 3 years to buy a second-hand car. He repays the loan in 36 equal monthly instalments of £ $247{\cdot}80$. []

(i) Calculate the total amount Iestyn repays over the 3 years. [1]

Total repaid = £ .....

(ii) Calculate the total cost of borrowing the £ $8{,}000$. [1]

Cost of borrowing = £ .....

(iii) The lender quotes an APR of $8{\cdot}4$%. Calculate the equivalent "flat rate" percentage per year (cost of borrowing as a percentage of the original loan, divided by the number of years), and explain in one sentence why this flat rate is *lower* than the quoted APR of $8{\cdot}4$%. [2]

Flat rate per year = ... %

3. A washing machine is advertised in a shop window as shown below.

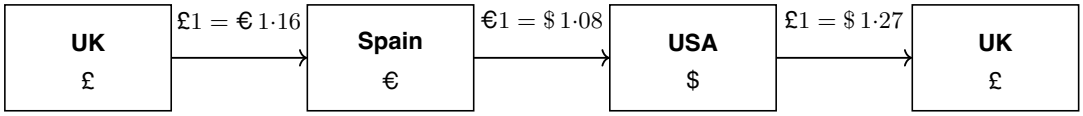
○ **Washing Machine**
£ 528 (including 20% VAT)

(a) Calculate the price of the washing machine before VAT was added. [2]

Pre-VAT price = £ .....

(b) The same washing machine can also be bought on a payment plan: a deposit of £ 60 followed by 18 monthly payments of £ 29·50. [2]
Calculate the difference between the payment-plan total and the cash price of £ 528, and state which is cheaper.

4. Bethan is planning a holiday from the United Kingdom to Spain, with a side stop to spend US dollars. The simplified route is shown below.



Bethan changes £ 750 into euros using the rate shown above. A bank charge of £ $4{\cdot}50$ is taken from her sterling *before* the exchange takes place.
In Spain she spends € 240. She then changes the remaining euros into US dollars at the rate shown, with no further charge. At the end of the trip she changes all of her US dollars back to sterling, again using the rate in the diagram.

(a) Calculate the amount, in pounds, that Bethan has at the end of the trip. Give your answer to the nearest penny. [4]

Final amount = £ .....

(b) Express the money she has *lost* on the round trip, excluding the €240 she spent in Spain, as a percentage of her original £750. Give your answer to 1 decimal place. [2]

Percentage loss = ... %

(c) A passenger flight leaves Cardiff Airport at $22{:}45$ on Saturday 28 March and lands in Dubai at $09{:}20$ on Sunday 29 March, local time. [3]
In the United Kingdom the clocks move forward by one hour at $01{:}00$ on Sunday 29 March. Dubai is normally 4 hours ahead of the United Kingdom but does not change its clocks.
Work out the actual flight duration, in hours and minutes.

Flight duration = ...

(d) Bethan's friend argues that they could have avoided the round-trip loss by simply keeping the £ 750 in sterling. **Compare the loss** Bethan incurred (calculated in part (b)) with the cost of the £ $4{\cdot}50$ bank charge alone. Comment on whether the friend is right that not changing currency at all would have been better. [2]

5. Two banks advertise the following savings accounts.

First Bank	**Mountain Building Soc.**
$3{\cdot}96$% per annum nominal rate compounded *monthly*	$3{\cdot}92$% per annum nominal rate compounded *daily* (365 days)

(a) Calculate the Annual Equivalent Rate (AER) for each account, to 3 decimal places, and state which account a saver should choose. [4]

Better account = ...

Two further investment accounts are also available, both opened with £ $6{,}000$.

- Account A pays $4{\cdot}2\%$ *simple* interest per year.
- Account B pays $3{\cdot}5\%$ *compound* interest per year.

(b) Show that after 3 years Account A has the larger balance. [3]

(c) In which year does Account B first overtake Account A in total balance? Show enough working to justify your answer. [2]

Year = ...

(d) **Show that, for any equal starting balance**, Account B will eventually exceed Account A. You may use the fact that $(1{\cdot}035)^n$ grows without bound as $n \to \infty$. [2]

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

Three friends, Amelia, Bree and Carys, run a market stall together. At the end of the day they share the takings in the ratio $5 : 4 : 3$ (Amelia : Bree : Carys).
After receiving her share, Bree spends 15% of it on a present for her sister. She then has £$91{\cdot}80$ left from the day.

(a) Calculate, with full working, the total amount the stall took on the day. Write your method out in sentences, explaining each step.

[6 + 2 OCW]

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Total takings = £ . . . . . .

(b) Hence find how much Amelia received. [2]

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Amelia received £ . . . . . .

7. A supermarket wants to find out customer opinion about a new self-service checkout. The average number of customers per day at each of its three branches is shown below.

Branch	Weekday customers/day	Weekend customers/day
Cardiff	2,640	5,280
Newport	1,680	2,640
Swansea	2,160	3,600

The supermarket plans to ask a stratified sample of 150 customers in total across one typical weekday at all three branches.

(a) Explain why a stratified sample by branch would be more appropriate than asking 150 customers chosen at random from just the Cardiff branch. [2]

(b) Calculate the number of customers that should be sampled at each branch, in proportion to the weekday customer count. [2]

Cardiff = ...

Newport = ...

Swansea = ...

Separately, a survey was carried out among 120 Year 11 pupils at a Welsh school. They were asked which of three languages they study at GCSE: Welsh (W), French (F) and Spanish (S).

- 72 study Welsh, 48 study French, 36 study Spanish.
- 20 study both Welsh and French; 15 both Welsh and Spanish; 12 both French and Spanish.
- 6 study all three.

(c) Complete the Venn diagram below, including the number who study none of the three. [4]

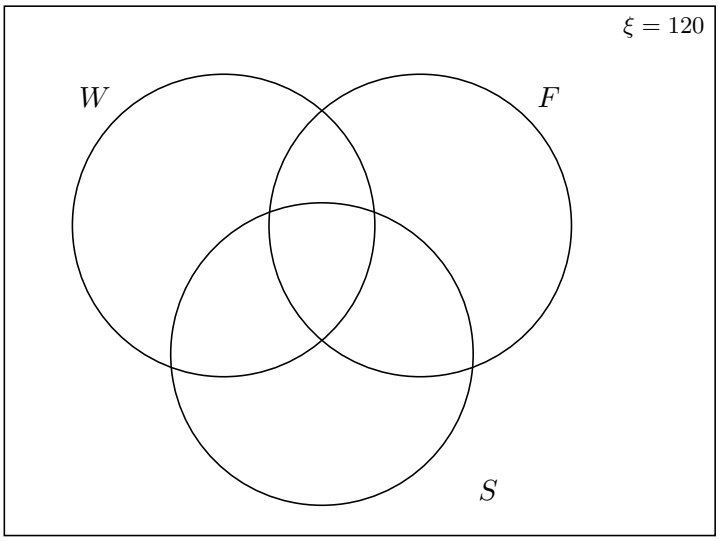

Diagram not drawn to scale

(d) A pupil who studies Welsh is chosen at random. Find the probability that this pupil also studies at least one of the other two languages. Give your answer as a fraction in its simplest form. [1]

Probability = ...

8. The illuminance I, in lux, on a desk from a lamp is *directly* proportional to the wattage W of the bulb and *inversely* proportional to the square of the distance d, in metres, from the bulb to the desk.
Two measurements are recorded in the table below.

Bulb wattage W	Distance d (m)	Illuminance I (lux)
12	4	9
20	6	$?$

(a) Find an equation connecting I, W and d. [3]

$I =$ .....

(b) A 20 W bulb is placed 6 m from a desk. Find the illuminance on the desk, giving your answer as a fraction in its simplest form. [2]

$I =$ ..... lux

A rectangular paved area is to be laid in a garden, as shown below.

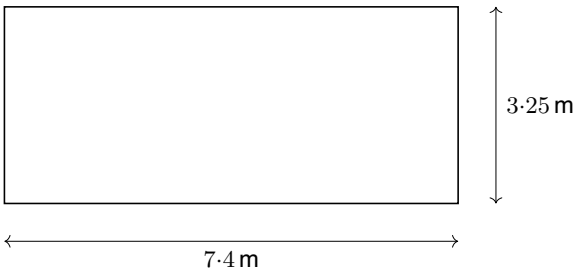

Diagram not drawn to scale

The length is measured to the nearest 10 cm. The width is measured to the nearest 5 cm. Paving slabs cost £$38{\cdot}50$ per square metre, charged to the nearest £$0{\cdot}50$.

(c) Write down the upper and lower bounds of the length and the width. [2]

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(d) Calculate the upper bound of the total cost of paving the area. [2]

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Upper bound = £ . . . . . .

(e) To what accuracy can the total cost be stated so that the answer is reliable whether the upper or lower bound is used? Justify your answer. [2]

9. A cyclist completes a training ride from her home to the next village and back. The distance from her home to the village is $12{\cdot}6$ km.

- She leaves home at $09{:}00$ and rides at a constant speed, arriving at the village at $09{:}28$.
- She rests in the village for 15 minutes.
- She rides back at a constant speed, arriving home at $10{:}19$.

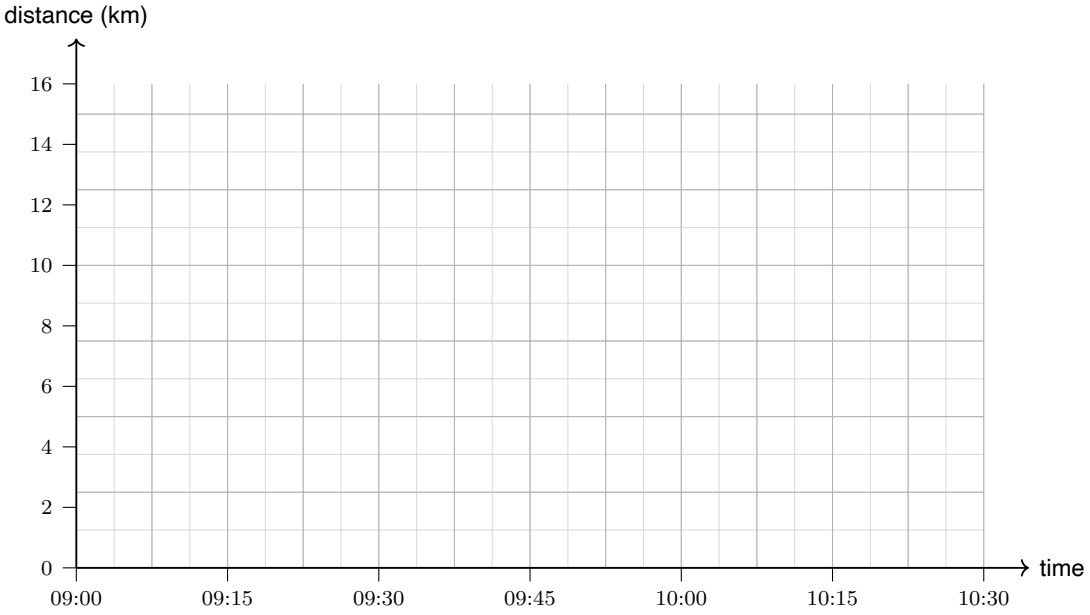
(a) Calculate her average speed on the outward leg in km/h. [2]

Outward speed = ... km/h

(b) Calculate her average speed for the *whole* ride, in miles per hour. Use 5 miles $= 8$ kilometres. [4]

Average speed = ... mph

(c) On the grid below, sketch the distance-time graph for the cyclist's journey, labelling the key values. [2]



(d) A youth football club has three age groups with a total of 150 players. The ratio of Under-12s to Under-14s to Under-16s is $4 : 5 : 6$. [3]
At the start of the new season:

- 5 new Under-12 players join the club,
- some Under-14 players leave the club,
- no other changes occur.

The new ratio of Under-12 to Under-14 players is $5 : 4$.
Calculate how many Under-14 players left the club.

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Players who left = ...