Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4351/02

MATHEMATICS (UNITISED SCHEME)

UNIT 1: Mathematics in Everyday Life

HIGHER TIER

A.M. MONDAY, 9 June 2014

1 hour 15 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.

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 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.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **3**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**3**	
2.	**3**	
3.	**9**	
4.	**5**	
5.	**2**	
6.	**7**	
7.	**5**	
8.	**4**	
9.	**8**	
10.	**3**	
11.	**4**	
12.	**6**	
13.	**6**	
Total	**65**	

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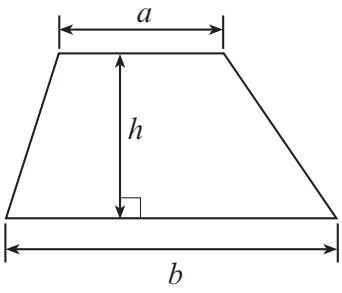
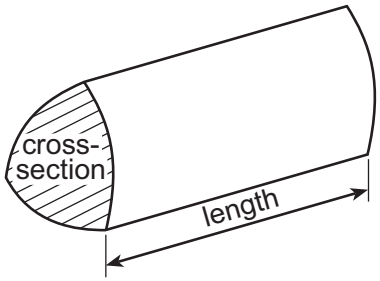
Formula List

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

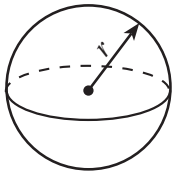


Volume of prism = area of cross-section × length



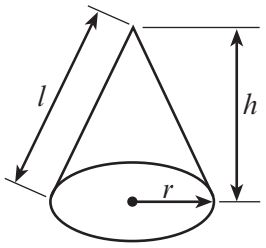
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

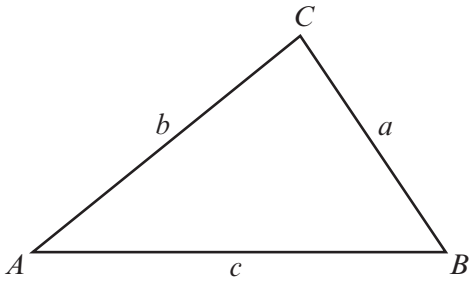


In any triangle ABC

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

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

Examiner only

1. Martha wants to test the following hypothesis.

'More men than women buy a daily newspaper.'

She plans to

- hand out a short questionnaire at a Women's Institute meeting,
- ask the following questions in the questionnaire,

(i) How old are you?

(ii) How often do you buy a newspaper?

Never ☐ 1-3 times ☐ 3-5 times ☐ More than 5 times ☐

- collect their replies at the next meeting.

Write down **three** unfavourable comments about this plan. [3]

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Turn over.

Examiner only

2. The diagram shows the positions of two ships *A* and *B*.
Ship *A* and ship *B* both receive a distress call at the same time.
Ship *A* locates the call on a bearing of 135°.
Ship *B* locates the call on a bearing of 215°.

On the diagram below show the position from where the distress call was sent. [3]

Examiner only

3. *You will be assessed on the quality of your written communication in this question.*

Bethan's current annual salary is £30 000.
After tax and other deductions, she receives 70% of this salary.
Over one year, her work involves travelling 8000 miles.
Her car travels 40 miles per gallon, and a gallon of petrol costs £6.25.

She is considering a new job, working from home.

Her new salary would be $\frac{2}{3}$ of her current salary, with the same percentage deduction.

Find the difference, in terms of money, that this change of job would make.
You must show all of your calculations. [9]

Examiner only

4. A currency exchange shop displays the following two posters.

Need some euros this Summer?

£1 will buy you 1·28 euros.

Back from holiday?
Need to change your euros into pounds?

1·50 euros will buy you £1.

Keith went to the exchange shop to buy 600 euros for his trip to Portugal.
The following day he realised that he would be unable to go on the trip.
He returned to the exchange shop and changed the 600 euros back into pounds.
The shop was displaying the same information as shown above.

How much money did Keith lose because of these two transactions? [5]

Examiner only

5. Calculate $\sqrt{(24{\cdot}6 - 13{\cdot}8)^3}$, correct to 3 significant figures. [2]

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6. *(a)* A company was set up with 500 workers.
At the end of each of the first three years the company employed more workers.
The number of additional workers employed each year was equal to two-fifths of the number of workers that were there at the start of that year.

How many people worked for the company in the fourth year? [4]

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(b) Calculate the percentage increase in the number of workers from the first year to the fourth year. [3]

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Examiner only

7. *(a)* A company pays its sales staff a basic monthly salary of £500.
The sales staff also earn a monthly bonus that is equal to 10% of the **sales** that they make in that month.
On the graph paper below, draw a line that will show the total monthly income received by sales staff when their **sales** are between £0 and £6000. [3]

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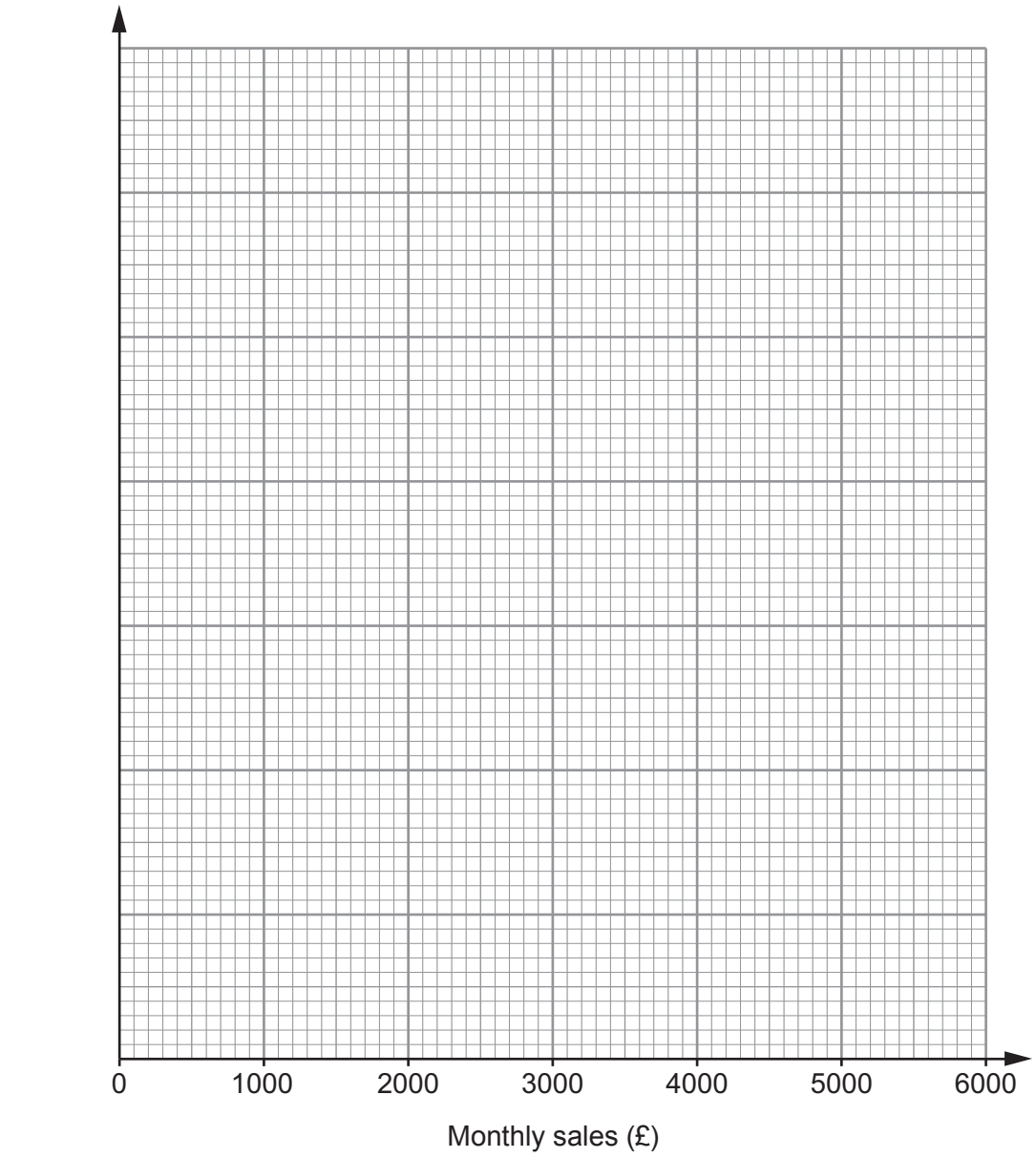
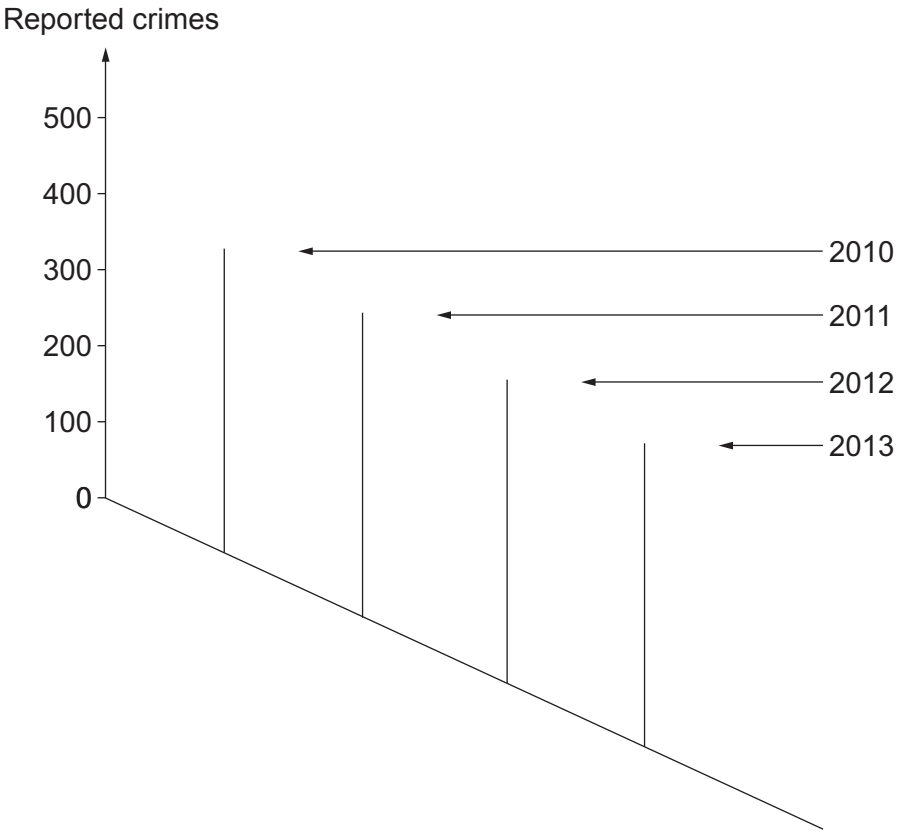


Examiner only

(b) A newspaper published the following graph.



Comment on how this graph could be misunderstood and give the reason for this. [2]

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Examiner only

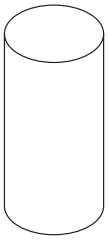
8. A water company engineer is investigating a leaking pipe.
He finds that, between 2:00 p.m. and 7:00 p.m., the volume of water that has leaked from the pipe was 8 litres, **measured correct to the nearest litre**.

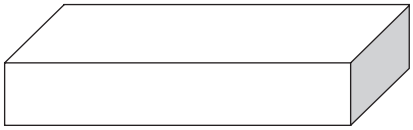
Calculate the greatest possible volume of water that would be lost in 7 days at this rate. [4]

Examiner only

9. Twelve spherical balls, each of diameter 10 cm, are to be packed into containers. There are two types of container available.

Container A	Container B
Cylinders: radius 5·5 cm and height 63 cm	Boxes: cuboids 42 cm by 32 cm by 11 cm





Diagrams not drawn to scale

(a) Calculate the volume of one spherical ball. [2]

(b) Compare the total volume of empty space when the 12 balls are packed into cylindrical containers, with the total volume of empty space when they are packed into box containers. Assume that the minimum number of containers required is used in each case. [6]

Examiner only

10. A building society is advertising the following savings scheme.

SUPER SAVER

Interest rate: 6% per annum
Interest is paid to you every 4 months

The building society must tell customers what the Annual Equivalent Rate (AER) is on this savings scheme.
The formula used to calculate this AER is

$$\text{AER} = \left[\left(1+\frac{R}{100N}\right)^{N} - 1\right] \times 100$$

Where R is the percentage interest rate per annum shown in the advert,
and N is the number of interest payments you receive in one year.

Calculate the AER on this Super Saver scheme.
Give your answer correct to 2 decimal places. [3]

Examiner only

11. Samir was test-driving a new model of car.

Samir travelled from point *A* to point *B* in 1 hour.

For $\frac{1}{3}$ of this **time** he travelled at a speed of 30mph.

For another $\frac{1}{3}$ of the **time** he travelled at 45mph.

For the final $\frac{1}{3}$ of the **time** he travelled at 60mph.

Samir travelled back from point *B* to point *A* along the same route.

For $\frac{1}{3}$ of this **distance** he travelled at 30mph.

For another $\frac{1}{3}$ of the **distance** he travelled at 45mph.

For the final $\frac{1}{3}$ of the **distance** he travelled at 60mph.

How long did the return journey take? [4]

Examiner only

12. A gardener is marking out the border of a flowerbed.
The flowerbed is in the shape of a sector *AOB* of a circle centre *O* as shown below.

The complete border is 28 metres long.
OA = *OB* = 8·6 m.

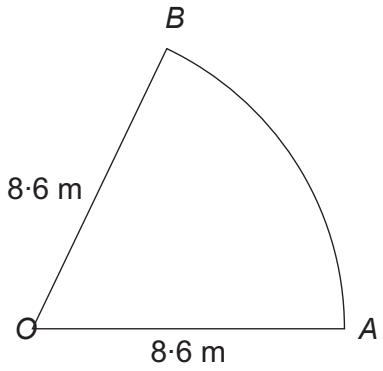


Diagram not drawn to scale

(a) Calculate the size of $A\hat{O}B$. [4]

(b) Calculate the area of the flowerbed. [2]

Examiner only

13. A Christmas decoration consists of a cone resting on a cube.

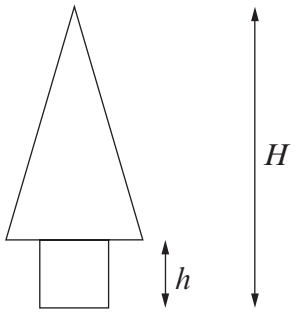


Diagram not drawn to scale

The height of the cube is h cm.
The height of the cone is four times the height of the cube.
The base radius of the cone is equal to the height of the cube.
The volume of the whole decoration is 648·6 cm^3.

Calculate the overall height H of the decoration. [6]

END OF PAPER

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

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