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**GCSE**

**MATHEMATICS - NUMERACY  
UNIT 1: NON - CALCULATOR  
HIGHER TIER**

**2<sup>nd</sup> SPECIMEN PAPER SUMMER 2017**

**1 HOUR 45 MINUTES**

**ADDITIONAL MATERIALS**

The use of a calculator is not permitted in this examination..  
A ruler, protractor and a pair of compasses may be required.

**INSTRUCTIONS TO CANDIDATES**

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 in this booklet.

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.

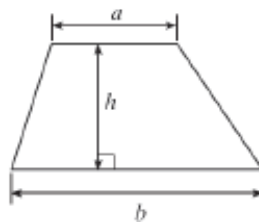
The number of marks is given in brackets at the end of each question or part-question.

The assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing in question 1.

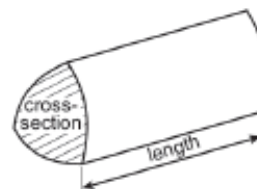
<b>For Examiner's use only</b>		
<b>Question</b>	<b>Maximum Mark</b>	<b>Mark Awarded</b>
<b>1.</b>	<b>5</b>	
<b>2.</b>	<b>8</b>	
<b>3.</b>	<b>1</b>	
<b>4.</b>	<b>4</b>	
<b>5.</b>	<b>5</b>	
<b>6.</b>	<b>8</b>	
<b>7.</b>	<b>4</b>	
<b>8.</b>	<b>8</b>	
<b>9.</b>	<b>6</b>	
<b>10.</b>	<b>6</b>	
<b>11.</b>	<b>6</b>	
<b>12.</b>	<b>4</b>	
<b>13.</b>	<b>11</b>	
<b>14.</b>	<b>4</b>	
<b>TOTAL</b>	<b>80</b>	

### Formula list – Higher tier

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



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



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

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



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

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

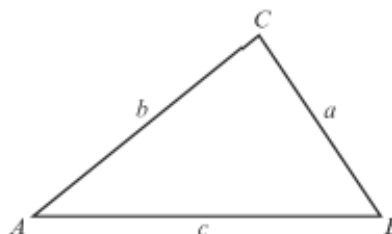


In any triangle  $ABC$ ,

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.



2. Derek works for a company which designs and fits kitchen cupboards. Kitchen cupboards and worktops are usually measured in mm.



- (a) A rectangular worktop needs to be covered in a special varnish. The worktop measures 3000 mm long by 700 mm wide. Calculate the area of the top surface of the worktop in  $\text{m}^2$ .

[2]

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- (b) A kitchen cupboard is in the shape of a cuboid. Its capacity is  $420\,000\text{ cm}^3$ . Internally, the cupboard measures 60 cm wide and 70 cm deep. Calculate the internal height of the cupboard in cm.

[2]

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(c) A kitchen worktop measures 301 cm, **correct to the nearest 1 cm**.



Derek needs to fit two of these worktops together along a wall measuring 605 cm, **correct to the nearest 5 cm**.

Unfortunately, he finds that the worktops do not fit.

Explain why this might have happened, and state the greatest possible difference between the lengths of the wall and the two worktops.

[4]

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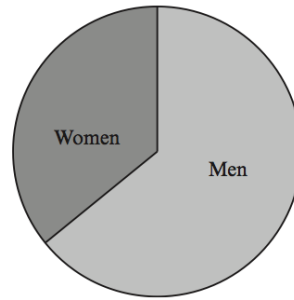
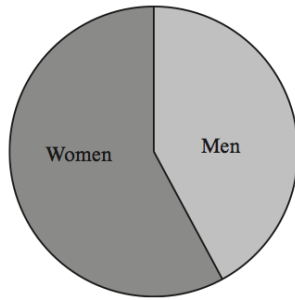
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3. Lucy has been given pie charts showing the number of computers sold by 2 different companies.

*RG computers*

*LF computers*



Lucy says

'More men buy RG computers than LF computers.'

Explain how this could be true.

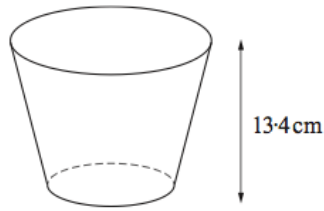
[1]

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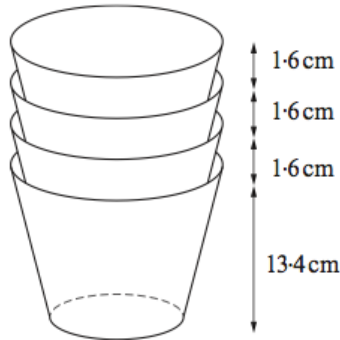
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4. Coffee is often sold in a carton.  
The height of one coffee carton is 13.4 cm.



*Diagram not drawn to scale*

A stack of 4 empty coffee cartons is shown below.



*Diagram not drawn to scale*

- (a) What is the total height of a stack of 21 coffee cartons?  
Circle your answer. [1]

32 cm      33.34 cm      33.6 cm      45.4 cm      47 cm

- (b) The height of a stack of  $x$  coffee cartons is 61.4 cm.  
By forming an equation, or otherwise, calculate the number of coffee cartons  
in the stack. [3]

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5. The three Welsh castles, shown below, are all within walking distance of each other.

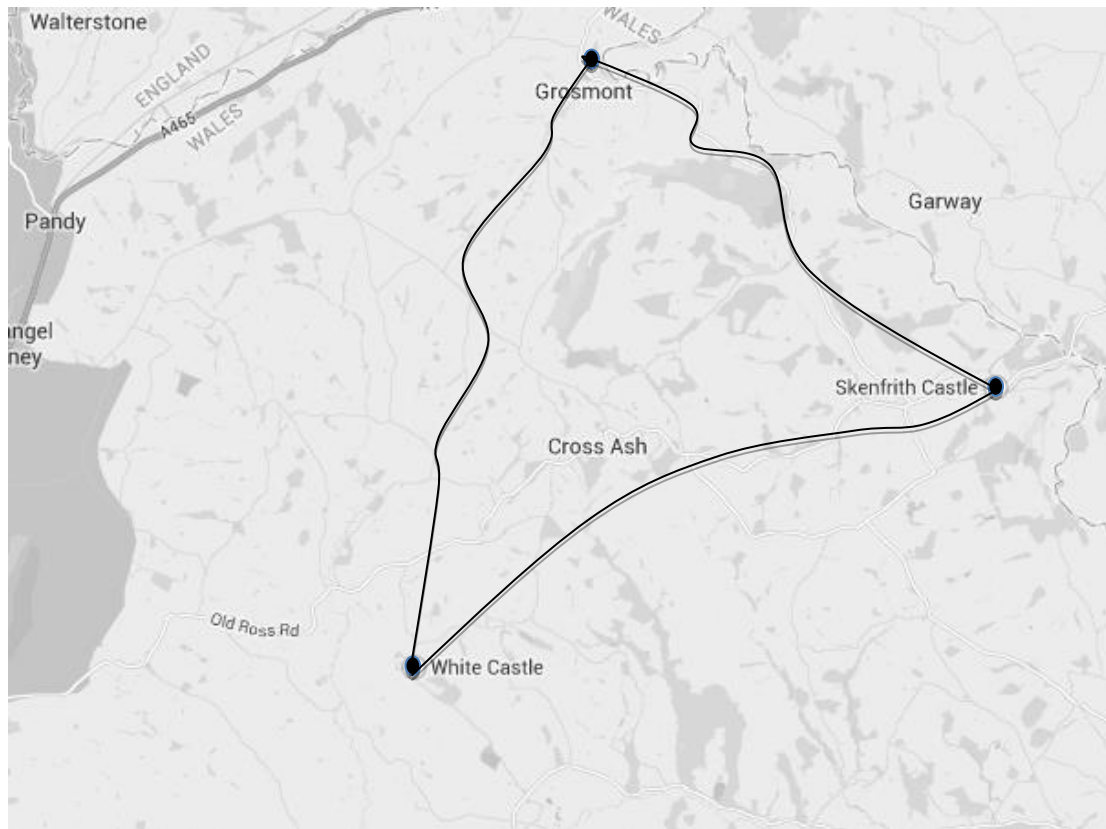
White Castle

Skenfrith Castle

Grosmont Castle



These castles are shown on the map below.  
The black lines represent the **footpaths** between the castles.





- (a) **By road**, White Castle is 11 km from Skenfrith Castle.  
Complete the sentence below.

The map scale is approximately 1 cm to represent ..... km.

[3]

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- (b) Treasure has been buried at a position X.  
X is the position that meets both the following criteria:

- X is equidistant from Grosmont Castle and Skenfrith Castle.
- X is equidistant from White Castle Castle and Skenfrith Castle.

Find the treasure by marking X on the map.

[2]

6. Yolanda and Emyr set up a gardening business together. They decide to calculate the charge for the time that they spend on a gardening job using the following method.

### Gardening by Yolanda and Emyr



- START with a standard charge of £15
- ADD a fee of £10 for every **complete** hour worked
- ADD an additional fee of 20p for every **additional minute** worked
- MULTIPLY the total charge so far by 2
- EQUALS the final charge

(a) Calculate the charge for a gardening job that takes  $2\frac{1}{4}$  hours.

[2]

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(b)(i) The fourth bullet point in calculating the charge reads:

- MULTIPLY the total charge so far by 2.

Why do you think this is included in Emyr and Yolanda's method for calculating a charge for gardening?

[1]

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(ii) Write a formula for working out the total charge, £ $T$ , for gardening that takes  $h$  hours and  $m$  minutes.

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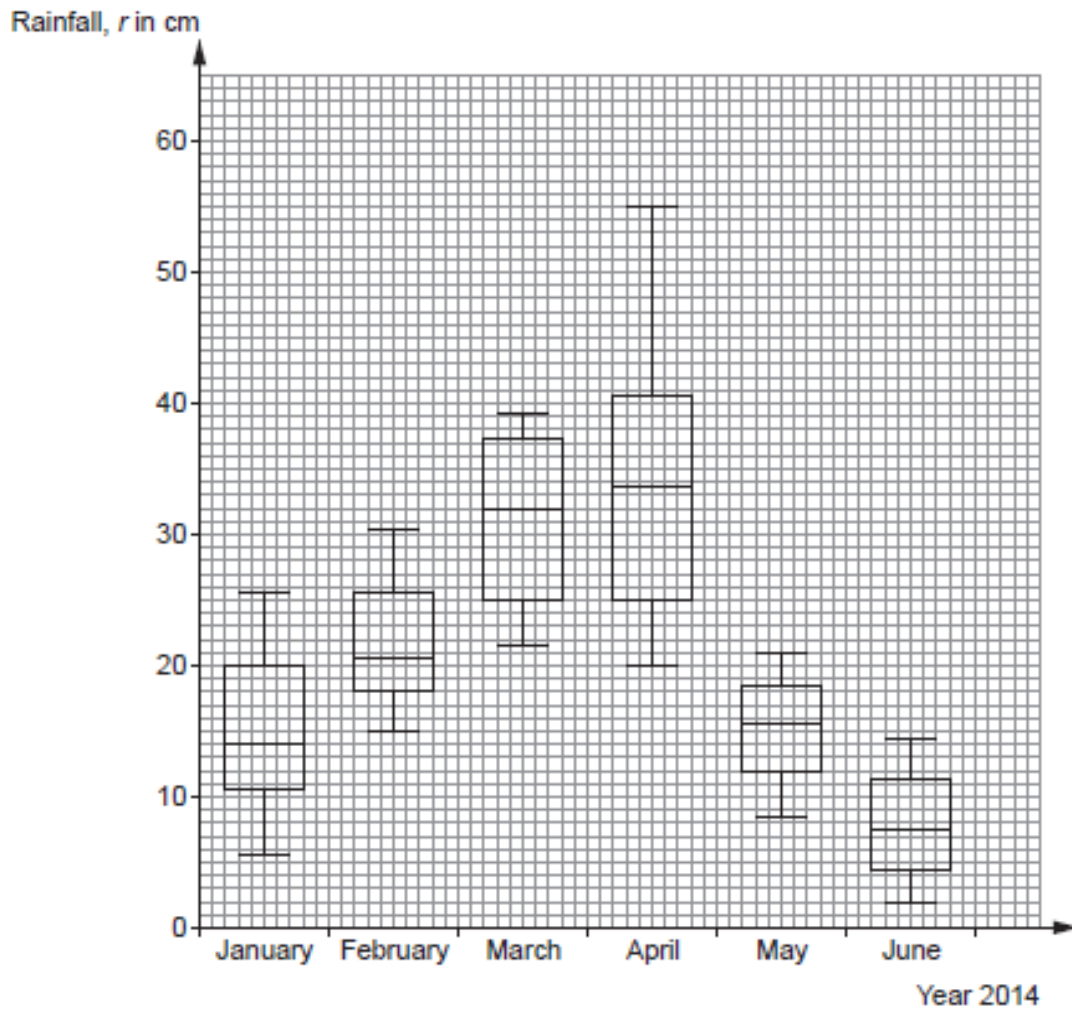
(c) Yolanda notices that there is a problem with the method for calculating the charge.  
They spent 2 hours gardening for Mr Rees, and they spent 1 hour 55 minutes gardening for Ms Elmander.

Mr Rees paid less than Ms Elmander.  
Explain why this happens.

[2]

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7. The information shown below was found in a holiday brochure for a small island.



The information shows monthly data about the rainfall in centimetres.

- (a) Looking at the rainfall, which month had the most changeable weather?  
You must give a reason for your answer.

[1]

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

[2]

If you don't want much rain, the time to visit the island is in June.	TRUE	FALSE
The greatest difference in rainfall is between the months of February and March	TRUE	FALSE
The interquartile range for May is approximately equal to the interquartile range for June.	TRUE	FALSE
The range of rainfall in February was approximately 15 cm.	TRUE	FALSE
During June, there were more days with greater than 7.5 cm of rainfall than there were days with less than 7.5 cm of rainfall.	TRUE	FALSE

(c) In July 2014, the interquartile range for the rainfall was 10 cm and the range was 40 cm.

Is it possible to say whether July has more or less rainfall than June?

You must give a reason for your answer.

[1]

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8. Two different European Political Parties are proposing changing the rules for income tax payments for the tax year April 2018 to April 2019.

Income Tax proposed by the **Yellow Party**

April 2018 to April 2019

taxable income = gross income – personal allowance

- **personal allowance is €5000**
- **basic rate of tax 10% on the first €10 000 of taxable income**
- **middle rate of tax 25% is payable on all taxable income over €10 000 and up to €30 000**
- **higher rate tax 50% is payable on all taxable income over €30 000**

Income Tax proposed by the **Orange Party**

April 2018 to April 2019

taxable income = gross income – personal allowance

- **personal allowance is €10 000**
- **basic rate of tax 20% on the first €20 000 of taxable income**
- **higher rate tax 40% is payable on all other taxable income**

- (a) During the tax year 2018 to 2019, Janina’s gross income is likely to be €55 000.

Which party’s tax proposal would result in Janina paying the least tax, and by how much?

You must show all your working

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(b) Samuli plays rugby for an international team.  
He is likely to earn €200 000 during the tax year 2018 to 2019.  
Without any calculations, explain why Samuli might favour the Orange Party's  
proposal for income tax.

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11. (a) At the National Eisteddfod in August each year, a concert is performed on the opening night.

Of those performing this year:

- 39 are primary school children,
- 73 are secondary school children,
- 128 are adults.



In order to gather opinions from the performers about the backstage facilities, the organisers decide to question a stratified sample of 40 people.

Find how many secondary school children should be selected.

You must show all your working.

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Number of secondary school children .....

- (b) Rhodri calculates that 7 primary school children should be selected.  
Rhodri selects the first 7 primary school children to get off the bus that brings them to the concert.

Explain why this does not represent a random sample of the primary school children.

[1]

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- (c) Of the 128 adult performers, 52 are male and 76 are female.  
Gwen decides to interview a stratified sample of **16 adults** and has exactly 16 copies of the questionnaire ready for them.

Using these numbers, she calculates that she should interview 7 male performers and 10 female performers, making a total of **17 adults**.

Explain how this has happened.

[2]

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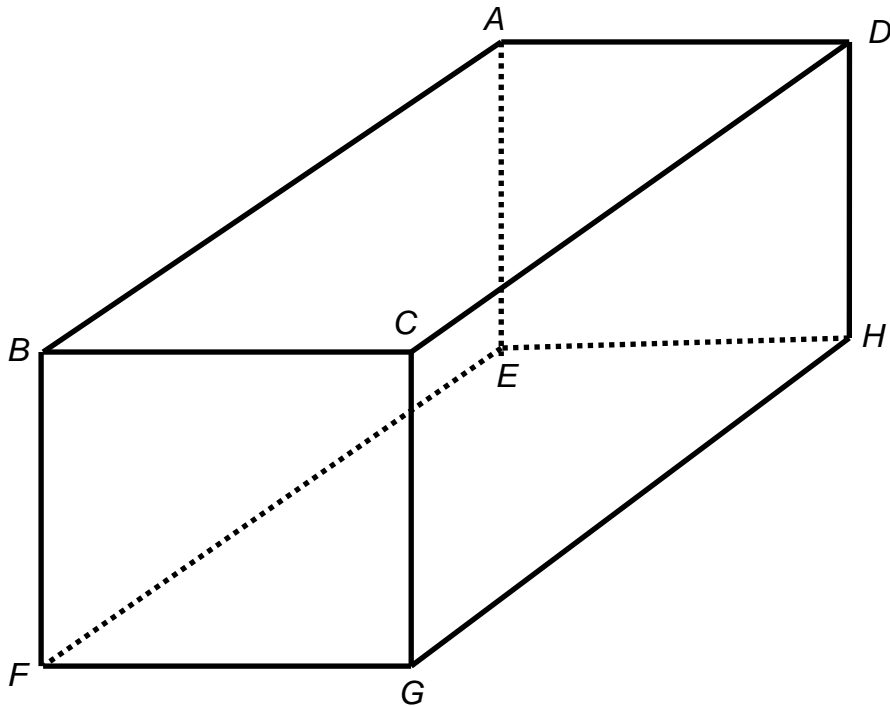
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12. Anwen is designing an indoor play centre.

The cuboid  $ABCDEFGH$  represents a diagram of the room to be used for the play centre.



*Diagram not drawn to scale*

Anwen measures the vertical height of the room to be 5 m.  
She measures the distance along the floor from  $E$  to  $F$  to be 9 m.  
The distance from  $E$  to  $G$  is 12 m.

Anwen is thinking of purchasing a long straight slide for the play centre.  
The total length of the slide, including space to get on and off, is 12.5 m.

Would it be possible to fit the slide into the room?  
You must show all your working.

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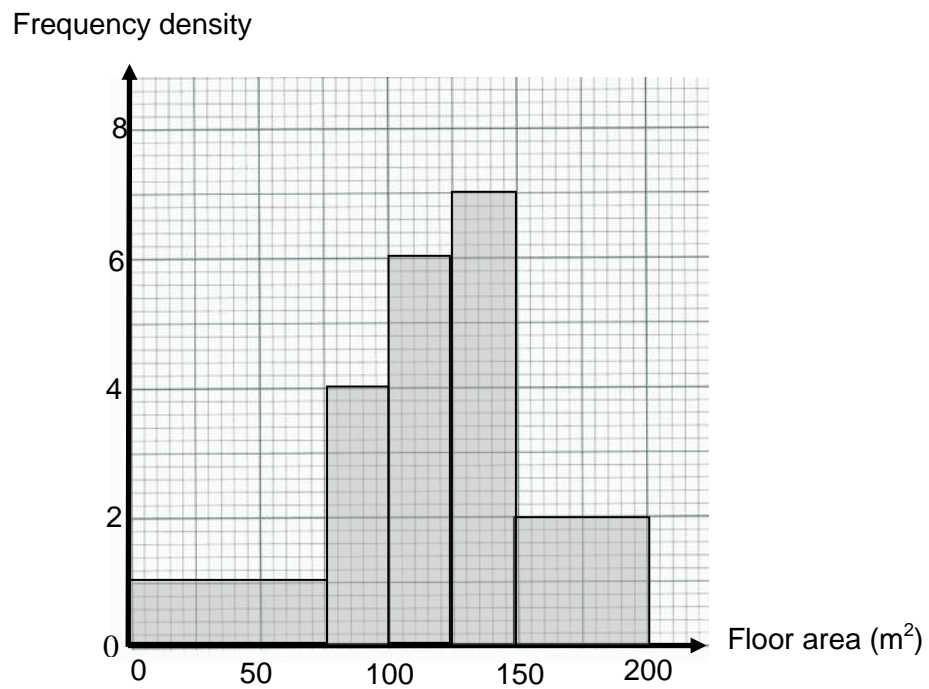
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13. The histogram illustrates the floor areas of the offices available to let by *Office Space Wales* letting agency.



(a) Calculate the number of offices available that have a floor area greater than  $75\text{m}^2$ .

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(b) *Office Space Wales* charges a £200 arrangement fee when any of the offices with a floor area of up to  $100 \text{ m}^2$  are let. Assuming that all of the offices under  $100 \text{ m}^2$  are let, how much will *Office Space Wales* receive in arrangement fees for these offices?

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(c) Circle either TRUE or FALSE for each of the following statements.

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There are definitely no offices available with less than $10 \text{ m}^2$ of space.	TRUE	FALSE
The modal class of office space is between $125 \text{ m}^2$ and $150 \text{ m}^2$ .	TRUE	FALSE
The number of offices over $100 \text{ m}^2$ is double the number under $100 \text{ m}^2$ .	TRUE	FALSE
There is enough information in the histogram to allow us to calculate an exact value for the mean office space.	TRUE	FALSE
The number of offices under $50 \text{ m}^2$ is definitely the same as the number over $175 \text{ m}^2$ .	TRUE	FALSE

(d) It is reported that the median size of office space available to let is  $80 \text{ m}^2$ . Is this true for the offices that are available to let by *Office Space Wales*? You must give a reason for your answer.

[2]

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14. Dafydd is an engineer working at the Welsh Science Research Centre.  
During an experiment, Dafydd knows that a certain chemical particle loses half of its mass every second.  
The initial mass of the particle is 80 grams.

(a) The mass of the particle after 8 seconds is

- 0.15625 g      0.3125 g      0.625 g      5 g      10 g

[1]

(b) Dafydd needs to write down a formula for finding the final mass,  $f$  grams, of the particle after  $t$  seconds.  
What formula should he write?

[3]

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(c) Comment on the mass of the particle after a long time, such as a whole day, has passed.

[1]

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**END OF PAPER**