Surname	Centre Number	Candidate Number
Other Names		0

wjec cbac

GCSE – NEW

3310U50-1

A16-3310U50-1

MATHEMATICS – NUMERACY
UNIT 1: NON-CALCULATOR
HIGHER TIER

SOLUTIONS

WEDNESDAY, 2 NOVEMBER 2016 – MORNING

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 continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π 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 **7***(e)*, 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.	9	
3.	7	
4.	8	
5.	9	
6.	5	
7.	12	
8.	15	
9.	2	
10.	8	
Total	80	

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Examiner only

1. The scale diagram opposite shows an Eisteddfod camping field.

The camping field is 100 metres long and 80 metres wide.

A river runs along the side *AB*.
There is a hedge along *AD*.
There is a fence along *BC*.
DC is an opening with access to the Eisteddfod camping field.

The scale used is **1 cm represents 10 metres**.

A barbecue area is to be built on the camping field.

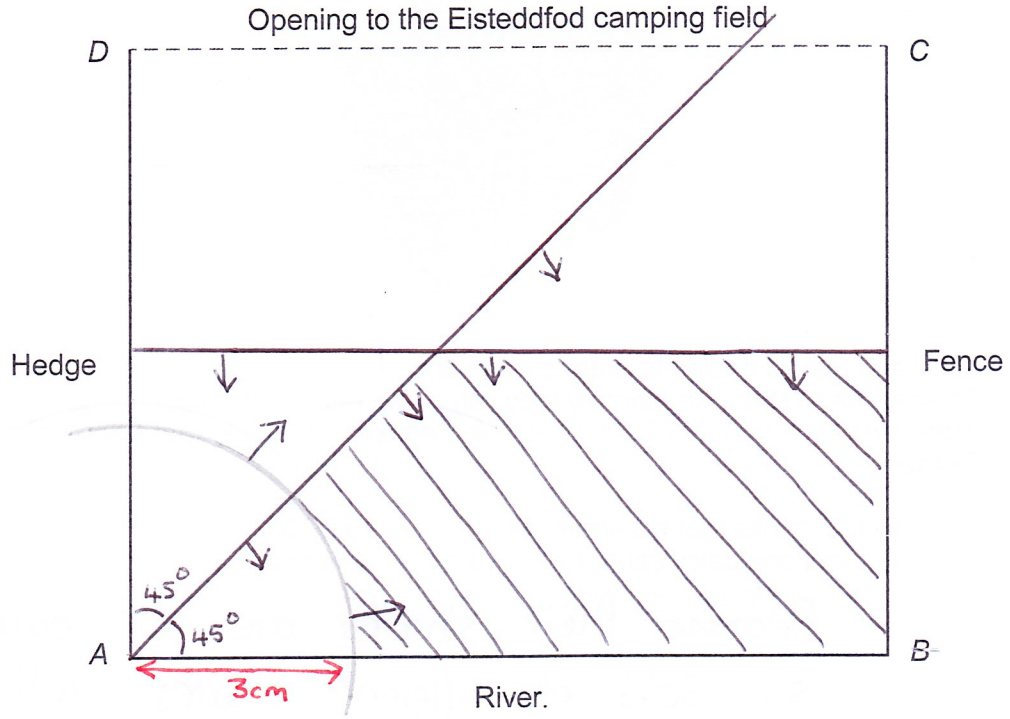
The barbecue area must be

- nearer to the river than to the opening to the Eisteddfod camping field,
- nearer to the river than to the hedge,
- more than 30 metres from the corner of the field where the hedge meets the river.

Draw suitable lines on the diagram and shade the region where the barbecue area could be built. [5]

Examin only

1 cm represents 10 metres



30m = 3cm

2. (a)

Lotty and Rafael decide to enter a prize draw.
They agree to share any money they win in the ratio 2 : 3 respectively.
After winning a total of £2000, they think again and decide that Lotty's share should be increased by 30%.

(i) Rafael thinks that his share will be reduced by 30%.
Without any calculation, explain why Rafael's thinking is incorrect. [1]

Because their shares are not equal, so 30% of different shares will not be the same.

(ii) Calculate the amount of money Lotty wins after the decision is made to increase her share. [4]

Originally 5 parts = 2000
1 part = $\frac{2000}{5}$ = £400
Lotty 2 parts = 2 × 400 = £800

After increase of 30%
10% of 800 = 80
30% of 800 = 3 × 80 = £240
∴ Lotty will get £800 + 240
= £1040

Examin only

(iii) Find the ratio that is now used to share the money between Lotty and Rafael. Express your answer in its simplest form. [3]

Lotty : Rafael

= 1040 : 960

= 104 : 96

= 52 : 48

= 13 : 12

Lotty's winnings : Rafael's winnings = 13 : 12

(b) In another prize draw, it was planned to give £5000 as the first prize. To make it more popular, the organisers decide to increase this first prize by 26%.

The most efficient method of calculating the amount of the increased first prize is

$$1{\cdot}26 \times 5000.$$

The second prize was planned to be £3000, but it is now decided to decrease this prize by 6%.

Write down the most efficient method of calculating the amount of the decreased second prize.
You are not expected to work out the answer. [1]

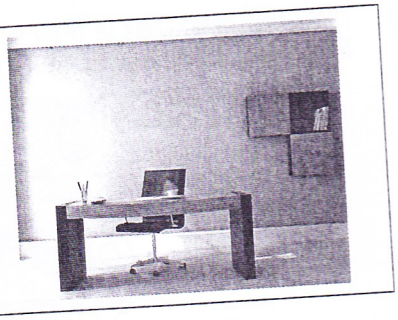
0·94 × 3000

3.

Stylish computer desk

Made of laminate wood.
Non-scratch top.

Length is exactly 2000 mm



Luc wants this new desk for his bedroom.

The desk is to fit on the straight wall between his wardrobe and his bookcase.

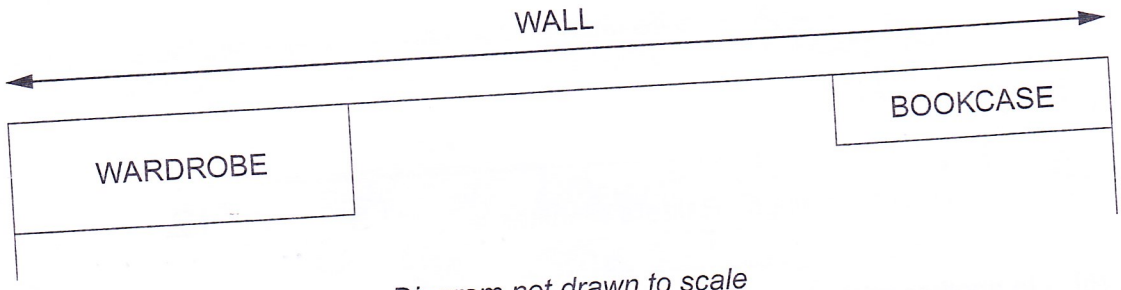


Diagram not drawn to scale

Luc has measured the length of

- the wall, which is 600 cm, correct to the nearest 10 cm,
- the bookcase, which is 147 cm, correct to the nearest 1 cm,
- the wardrobe, which is 250 cm, correct to the nearest 1 cm.

(a) What is the greatest possible length of the wall? [1]
Circle your answer.

600 cm 605 cm 645 cm 610 cm 650 cm

(b) What is the least possible length of the wardrobe?
Circle your answer.

249 cm 249·45 cm 249·49 cm 249·5 cm 250 cm

Examiner only

(c) Can Luc be certain that this desk will fit in the space available?

You must
- show all your calculations,
- give the greatest or least bounds of any measurements used in calculations or comparisons,
- give a reason for your answer. [5]

Desk is exactly 2000 mm = 200 cm

WALL MINIMUM = 595 cm

WARDROBE MAXIMUM = 250·5 cm

BOOKCASE MAXIMUM = 147·5 cm

∴ Minimum space available for the desk = Wall Min − Wardrobe max − Bookcase max

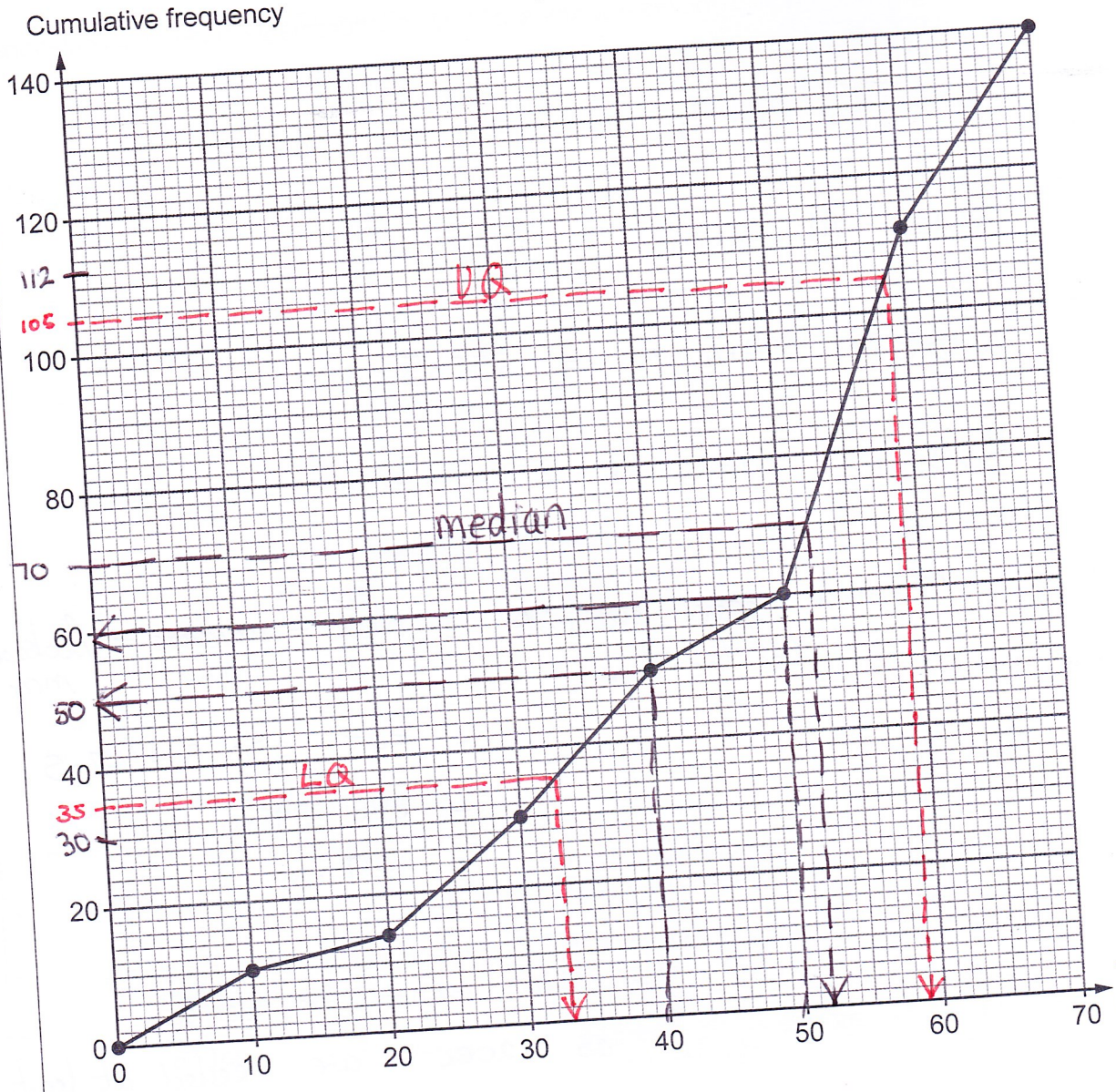
= 595 − 250·5 − 147·5

= 595 − 398

= 197 cm

∴ No Luc cannot be certain as 200 cm are needed at least.

4. *(a)* 140 girls were asked how long they spent revising for their GCSE examinations.
The cumulative frequency diagram shows the results.



(i) Estimate the median time the girls spent revising.
Circle your answer.

35 hours | 40 hours | 48 hours | 52 hours | 70 hours

(ii) Calculate the number of girls who spent between 40 and 50 hours revising.
Circle your answer.

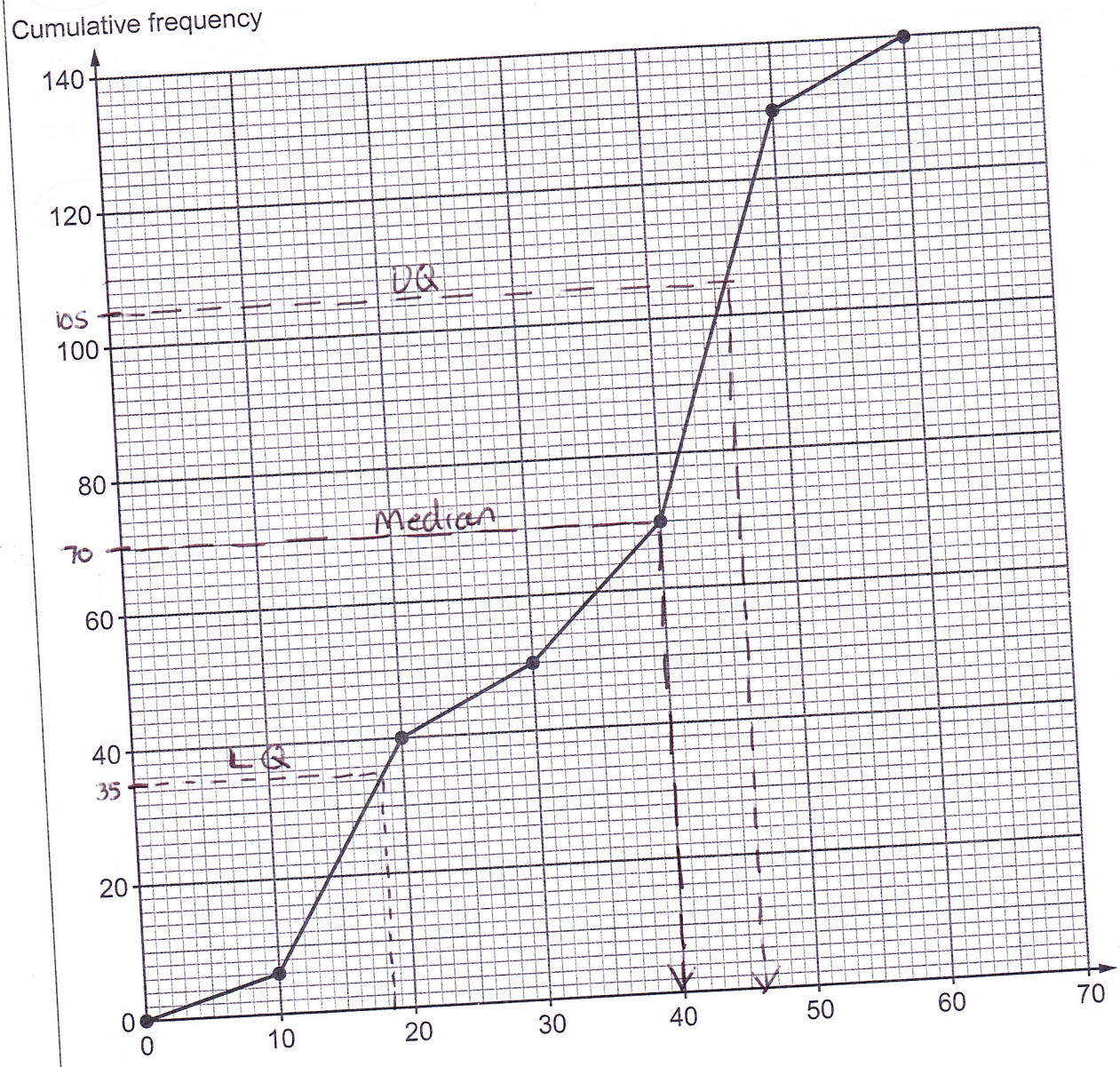
0 girls | 5 girls | 10 girls | 15 girls | 20 girls

Examiner only

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

25 girls spent between 30 and 50 hours revising. 30 girls	TRUE	(FALSE)
No girls spent more than 80 hours revising.	(TRUE)	FALSE
The modal group is between 50 and 60 hours spent revising. most number of girls	(TRUE)	FALSE
20 girls spent more than 60 hours revising. 140 - 112 = 28 girls	TRUE	(FALSE)

(b) 140 boys were asked how long they spent revising for their GCSE examinations. The cumulative frequency diagram below shows the results.



Examiner only

Trefor makes two statements.

1. The boys' interquartile range is greater than the girls' interquartile range.

2. On average, boys spent more time revising.

Are both Trefor's statements correct?
Show calculations and give reasons to support your answers. [4]

Statement 1: Boys Lower Quartile = 18 hrs
Upper Quartile = 46 hrs
Interquartile Range = 46 − 18 = 28 hours

GIRLS Lower Quartile = 33 hrs
Upper Quartile = 59 hrs
Interquartile range = 59 − 33 = 26 hrs

Statement 2: Boys median = 40 hrs Girls median = 52 hrs

Median is a measure of average

∴ On average girls spent more time revising

∴ only the first statement is correct.

∴ NO both statements are not correct.

5. Petra is organising a prom for her year group.
The number of people attending the prom is likely to be between 20 and 80.

The cost of holding the prom at *Hotel Afonwen* would be as follows.

- Hire of the room: £100
- Food: £15 per person
- Welcome drink on arrival: £3 per person
- Decorations: £2 per person

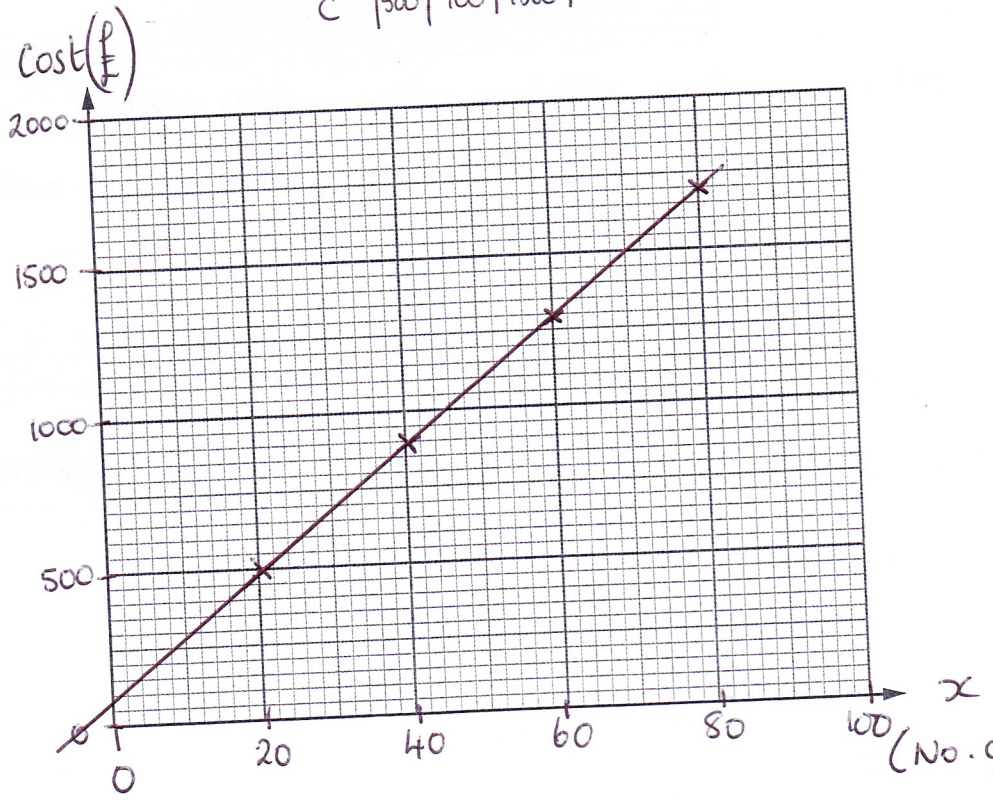
(a) Draw a graph to illustrate the total cost of holding the prom for between 20 and 80 people. Use the graph paper below. [4]

Cost = $100 + 15x + 3x + 2x$

$C = 20x + 100$

where x is the number of people

x	20	40	60	80
C	500	900	1300	1700



Examiner only

(b) Petra decides to share all the costs equally between the people attending.

- Let £P be the price paid per person.
- Let N be the number of people attending the prom.

Write a formula for P, in terms of N. [3]

$P = \frac{20N + 100}{N}$ N replaces the x from before

(c) Hiring a larger room at *Hotel Afonwen* costs £200.
The cost per person for food, welcome drinks and decorations remains the same.
If the total cost is £2240, how many people attend? [2]

$20N + 100 = 2240$

$20N = 2240 - 100$

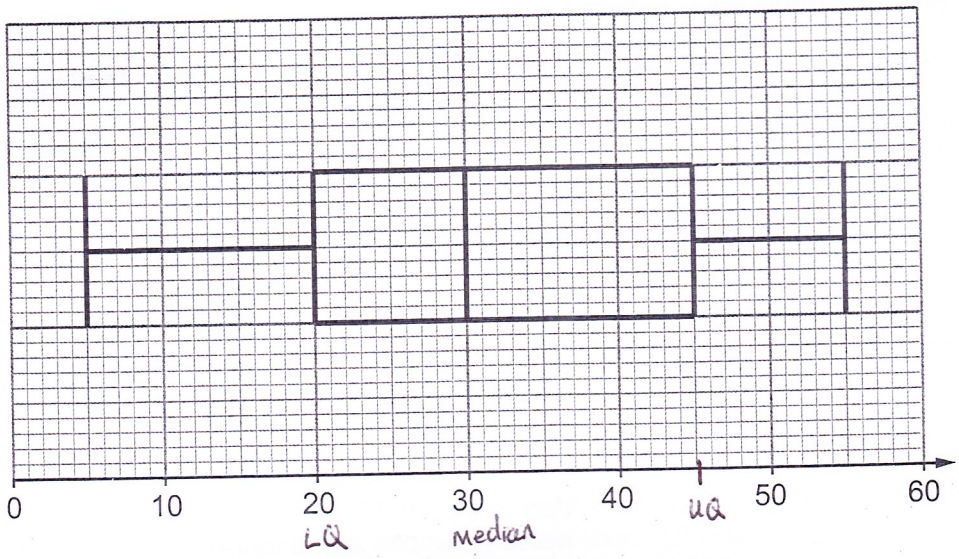
$20N = 2140$

$2N = 214$

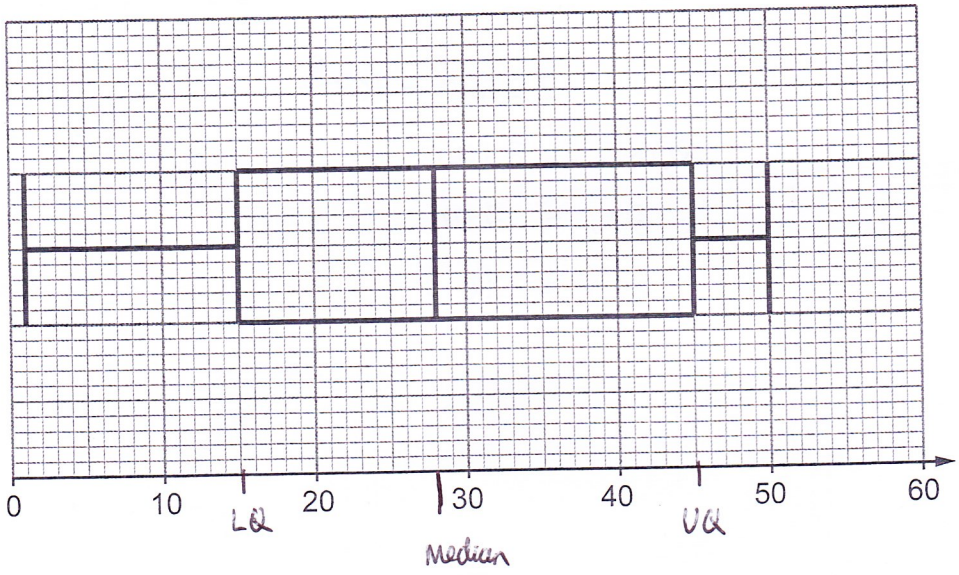
$N = 107$

6. The following box-and-whisker plots illustrate the daily rainfall for April 2016 in Trefwen and in Nawrby.

April rainfall in Trefwen



April rainfall in Nawrby



Examine only

(a) Complete the following table. [4]

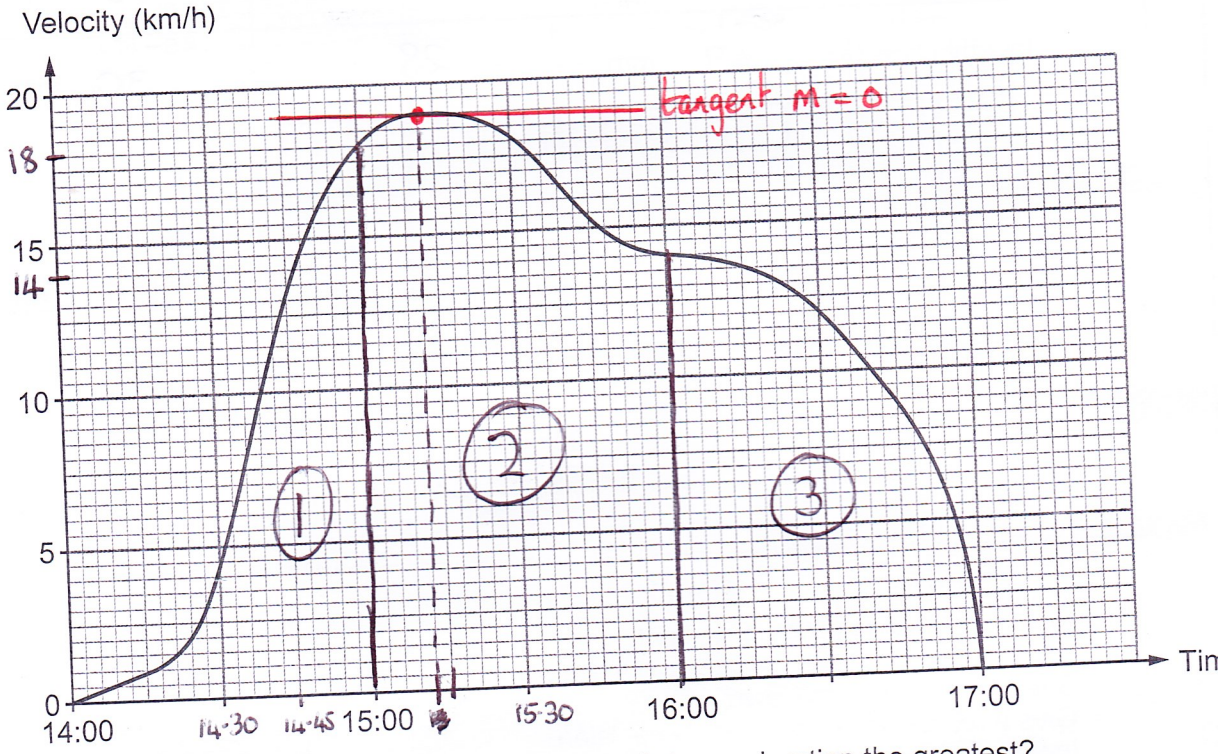
	Range	Median	Interquartile range
Trefwen	55-5 50 mm	30 mm	45-20 25 mm
Nawrby	50-1 49 mm	28 mm	45-15 30 mm

(b) Iona is going on holiday next April.
She is hoping for good weather, with hardly any rain.
She decides to go to Nawrby.
Give a reason to support Iona's decision.
Include values for both Trefwen and Nawrby. [1]

Median rainfall at Nawrby = 28mm
at Trefwen = 30mm

7. Siân went for a ride on her bike.

She started her ride at 14:00.
The graph below shows information about her bike ride.



(a) During which quarter-hour period was Siân's acceleration the greatest?

14·30 to 14·45 because gradient steepest.

(b) At about what time did Siân stop accelerating?

acc = 0 when gradient of tangent = 0
This occurs at about 15·12

(c) Siân usually finds cycling at a velocity of 18 km/h very comfortable.
Express 18 km/h in metres per second.

18 km/h = 18 000 m/h

$= \frac{18000}{60}$ m/min

$= \frac{180\cancel{00}}{6\cancel{0} \times 6\cancel{0}}$ m/sec

$= \frac{180}{36} = \frac{30}{6} = 5$ m/s

Exami only

(d) Using her velocities at 14:00, 15:00 and 16:00, calculate an estimate for the total distance Siân travelled **between 14:00 and 16:00**. [3]

TOTAL Distance = area under graph

$= \frac{bh}{2} + \frac{(a+b)h}{2}$

$= \frac{1 \times 18}{2} + \frac{(18+14)1}{2}$

$= 9 + 16$

$= 25$

Distance travelled 25 km

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

Siân estimated the distance she travelled between 16:00 and 17:00 as **5 miles**.
Is Siân's estimate reasonable?
You must justify your answer and show your working. [3 + 2 OCW]

Area (3) $\approx$ area of triangle

$\approx \frac{bh}{2}$

$= \frac{1 \times 14}{2}$

$= 7$ km

Now 5 miles $\approx$ 8 km
(1 mile $\approx$ 1·6 km)

Since actual distance covered is a bit bit more than the area of the triangle the actual distance could be around 8km or 5 miles

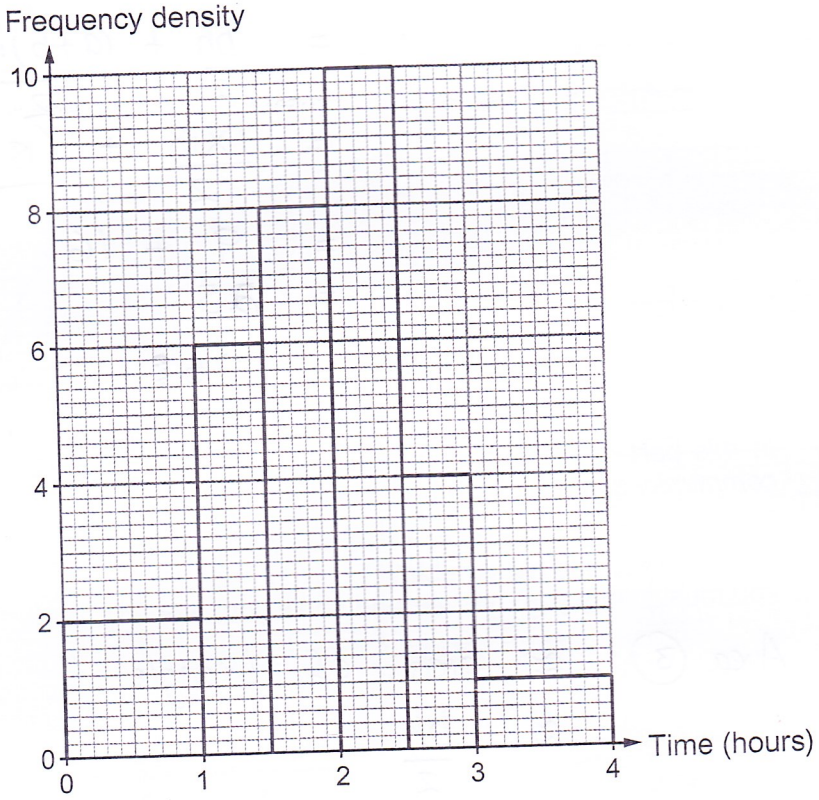
$\therefore$ Sian's estimate is reasonable

8. The *Big Fish Cymru* annual fishing competition is held on the west coast of Wales.

Information about **last year's** competition is displayed in the *Big Fish Cymru* booklet.
A section of this booklet is shown below.

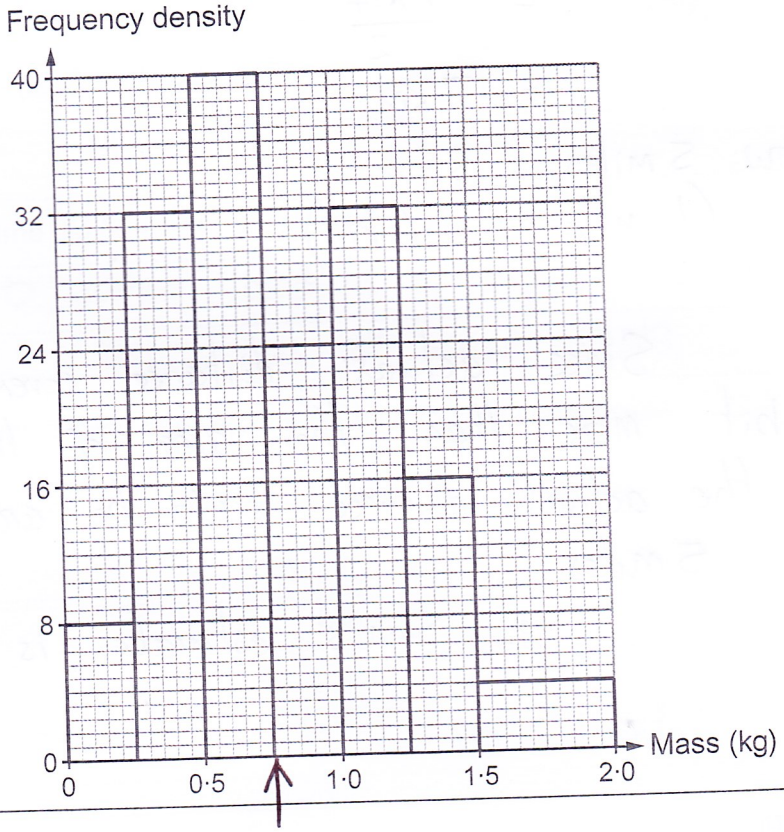
The competition organisers recorded the time taken for **each** angler to catch their **first** fish.

This is shown in the histogram on the right.



The competition organisers also recorded the mass of every fish caught.

This is shown in the histogram on the right.



(a) Last year, how many of the fish caught had a mass of less than 250 g? [1]

Area of 1st bar = $8 \times 0.25 = 2$

(b) Last year, the final angler to catch their first fish did so after $3\frac{1}{2}$ hours.

How many **other** anglers took more than 3 hours to catch their first fish? [1]

Last Bar Area = $1 \times 1 = 1$ ∴ No other anglers.

(c) The number of anglers taking part this year was three times as many as took part last year.
How many anglers took part in the competition this year? [4]

LAST year area total for bars in 1st histogram

$= (1 \times 2) + (0.5 \times 6) + (0.5 \times 8) + (0.5 \times 10) + (0.5 \times 4)$

$= 2 + 3 + 4 + 5 + 1$

$= 15$ anglers last year

Now 15×3

Number of anglers this year was 45

(d) The median mass of the fish caught this year was 0·9 kg.

What is the difference, in kg, between the median mass of the fish caught this year and the median mass of the fish caught last year? [5]

Last year no. of fish caught = total area of all bars in 2nd histogram

$= (0.25 \times 8) + (0.25 \times 32) + (0.25 \times 40) + (0.25 \times 24) + (0.25 \times 32) + (0.25 \times 16) + (0.5 \times 4)$

$= 2 + 8 + 10 + 6 + 8 + 4 + 2$

$= 40$ Median = 20'th result in ascending order which is after 3rd bar.

= 0·75 kg

∴ $0.9 - 0.75$

Difference in mass is 0·15 kg

(e) Approximately 10% of the anglers this year caught their first fish within 1 hour.

(i) How does this percentage compare with last year's percentage?
You must show all your working. [3]

Last Year

1st hour : no. of anglers = $1 \times 2 = 2$

$\therefore$ % of total anglers = $\frac{2}{15} = \frac{20}{150} = \frac{6\frac{2}{3}}{100}$

$\therefore 6\frac{2}{3}\%$

This year 10% of anglers caught their first fish within 1 hour.
This is more than last year by $3\frac{1}{3}\%$.

(ii) Do you think it is fair to compare last year's competition results with this year's competition results?
You must give a reason for your answer. [1]

NOT really. With 3 x as many anglers this year, the chances are that fish will be caught more quickly.

9. Circle TRUE or FALSE for each of the following statements. [2]

Selecting the first name on each class register will give a random sample.	TRUE	(FALSE) all names should ha ch
The ratio of boys to girls in a school is 2 : 3. The pupil committee of 30 pupils is selected using a gender stratified sample. There are 10 boys and 20 girls on the school committee.	TRUE	(FALSE) should be 12 : 18
A telephone survey is carried out to find which political party people support. The sample of people surveyed is **not** a random sample of the whole population.	(TRUE) not all people have phones	FALSE
A stratified sample always considers proportions according to given criteria.	(TRUE)	FALSE
A random sample of people means everyone has an equal chance of being selected.	(TRUE)	FALSE

10. The shaded part of the diagram below shows the top surface of an engine part.

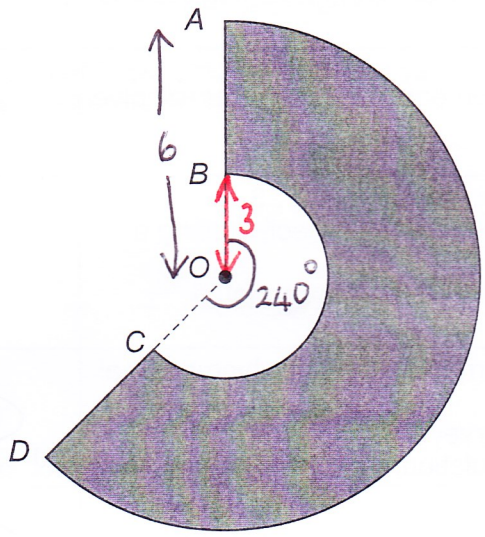


Diagram not drawn to scale

The measurements taken by a motor engineer are:

- reflex angle $B\hat{O}C = 240°$,
- $AO = OD = 6\,\text{cm}$,
- $BO = OC = 3\,\text{cm}$.

(a) The length of the major arc AD is to be sealed by attaching a flexible anti-rust strip. Each flexible anti-rust strip is of length 35 cm. What length of the anti-rust strip will be left over after sealing the length of the major a AD? Give your answer in terms of π, in its simplest form. [

Arc length AD $= \frac{240}{360} \times \pi D$

$= \frac{2}{3} \times \pi \times 12$

$= 8\pi$ cm

Length of anti-rust strip left over = $35 - 8\pi$ cm

Examin only

(b) The top surface of the engine part is to be painted.
The paint costs 15p per cm^2.

(i) Calculate the cost of the paint to be used.
Give your answer in terms of π, in its simplest form. [4]

Area shaded $= \frac{240}{360}\pi R^2 - \frac{240}{360}\pi r^2$

$= \frac{2}{3}\pi \times 6^2 - \frac{2}{3}\pi \times 3^2$

$= 24\pi - 6\pi$

$= 18\pi \ cm^2$

Cost $= 18\pi \times 15$

$= 270\pi$ p

$= £2{\cdot}70\pi$

(ii) Using $\pi = 3$, calculate how much it costs to paint the top surface of 20 engine parts.
Give your answer in pounds. [1]

Cost $= 20 \times 2{\cdot}70\pi$

$= £81\pi$

$\approx 81 \times 3$

$\approx £243$

Paint cost is £ 243

END OF PAPER