Surname	Centre Number	Candidate Number
Other Names		0 .

wjec cbac

GCSE – NEW

3310U50-1

S17-3310U50-1

MATHEMATICS – NUMERACY
UNIT 1: NON-CALCULATOR
HIGHER TIER

SOLUTIONS

THURSDAY, 25 MAY 2017 – 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 **1***(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.	9	
2.	3	
3.	5	
4.	4	
5.	6	
6.	6	
7.	8	
8.	5	
9.	11	
10.	13	
11.	10	
Total	80	

3310U501
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MAY173310U50101

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1.

(a) Jasmine entered herself, Sophie and Bryn as a group in a talent contest.
Bryn only had a minor part.

Bryn, Sophie and Jasmine won the contest.
They shared the prize money in the ratio 2 : 6 : 7, with Bryn getting the smallest share.
Jasmine won £560, the largest share.

How much money did Bryn and Sophie each win? [4]

7 parts = £560

1 part = $\frac{560}{7}$ = £80

2 parts = 80 x 2 = £160

6 parts = 6 x 80 = £480

Bryn receives £ 160

Sophie receives £ 480

Examiner only

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

The talent contest is held once a year.
Every year, the cost of putting on the talent contest increases by 10% of the previous year's cost.
In summer 2014 the cost was £6600.

Calculate the cost of putting on the summer 2017 talent contest.
You must show all your working. [3 + 2 OCW]

Summer 2014 Cost = £6600

2015 Cost = 6600 × 1·10

2016 Cost = 6600 × $1{\cdot}10^2$

2017 Cost = 6600 × $1{\cdot}10^3$

Without calculator

2015 Cost = 6600 + 660 = £7260

2016 Cost = 7260 + 726 = £7986

2017 Cost = 7986 + 798·60 = £8784·60

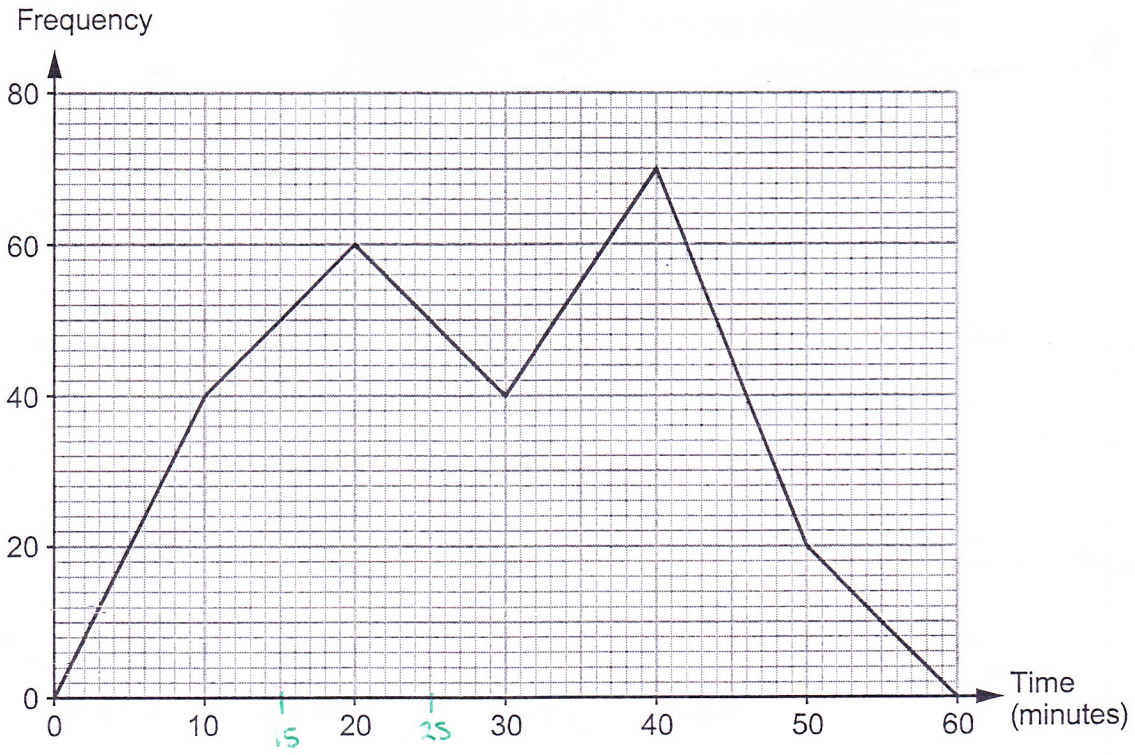
7986·00
+ 798·60
£8784·60

3310U501
05

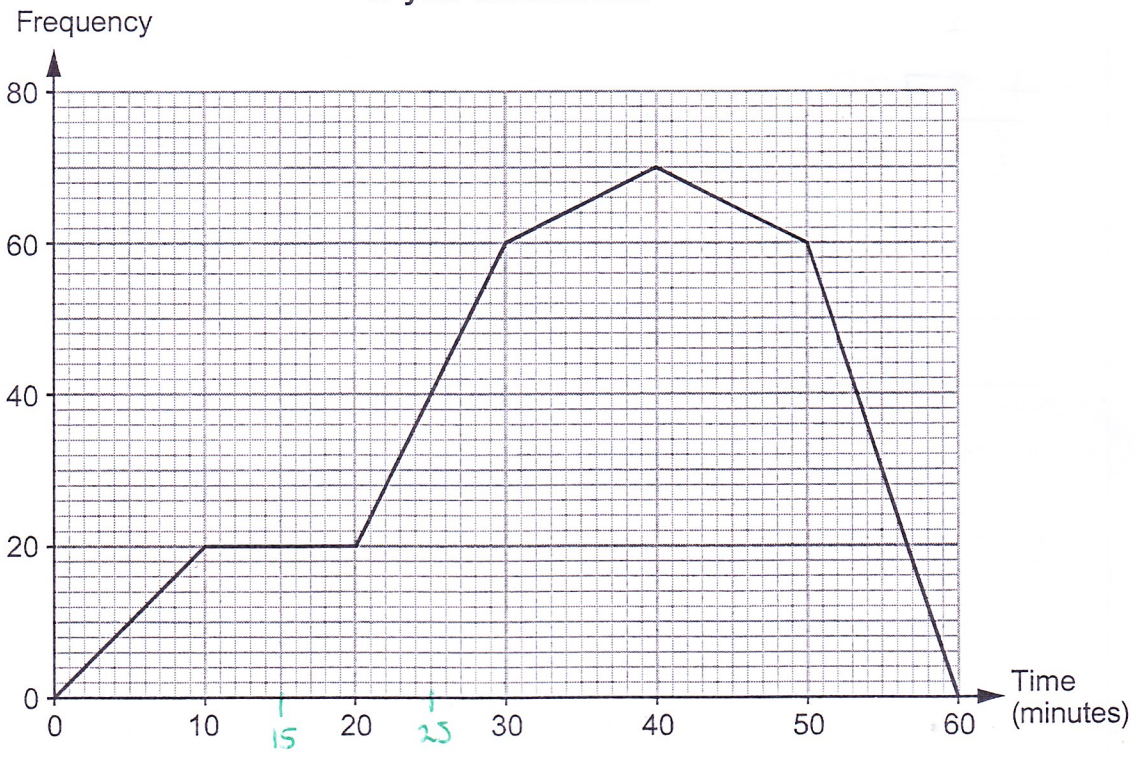
Examiner only

2. A survey was carried out to find how much time a group of 16-year-old students and a group of 18-year-old students spent using social media.
The frequency polygons below, which use equal time intervals, illustrate the results.

16-year-old students



18-year-old students



Examiner only

(a) How many 16-year-old students took part in the survey?
Circle your answer. [1]

60 70 210 230 2300

20 + 20 + 60 + 70 + 60

(b) How many more 16-year-old students than 18-year-old students spent between 15 minutes and 25 minutes using social media?
Circle your answer. [1]

20 40 60 100 250

16 yr olds 60
18 yr olds 20
60 - 20

(c) Wesley says,

'The 16-year-old students generally spent about the same time using social media as the 18-year-old students.'

Using the frequency polygons, how would you explain to Wesley that his statement is not true? [1]

The vast majority of the 18 year olds spent around 40 mins using social media as can be seen by the polygon peak for 18 year olds.

Whilst a good number of 16 year olds also spend around 40mins using social media there are far more of them than 18 year olds who spend only around 20 mins.

Hence Wesley is not correct in his assertion.

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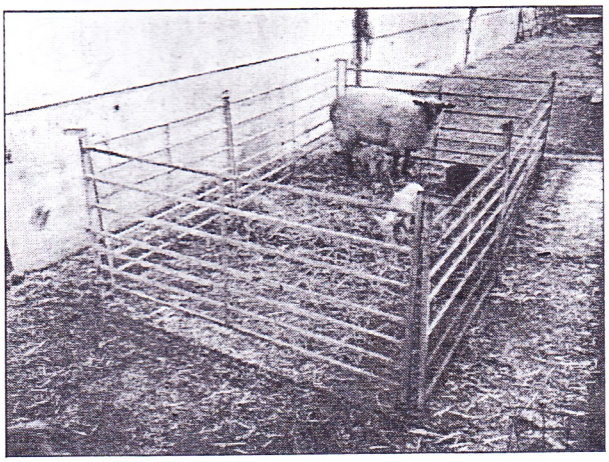
3. Bethan builds a rectangular sheep pen.



(a) The perimeter fence of the sheep pen is 18 m long.
The length of Bethan's sheep pen is two times its width.
Find the length and width of this sheep pen.
You must show your working. [2]

$x + 2x + x + 2x = 18$

$6x = 18$

$x = \frac{18}{6}$

$x = 3m$

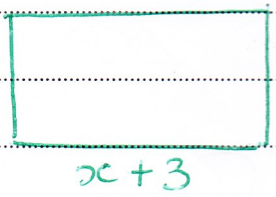
Length is 6 metres

Width is 3 metres

Examiner only

(b) Bethan decides to build a new sheep pen.
The perimeter fence of the new sheep pen is 16 m long.
The length of the new sheep pen is 3 metres longer than the width.

Form an equation and solve it to find the dimensions of this new sheep pen. [3]



$x + x + 3 + x + x + 3 = 16$

$4x + 6 = 16$

$4x = 16 - 6$

$4x = 10$

$x = 10/4$

$x = 2.5\text{m}$

Length is 5.5 metres

Width is 2.5 metres

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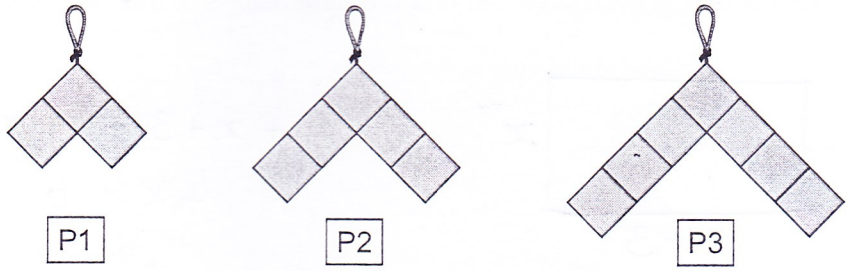
4. Josef has a job in a workshop that makes decorations.

He has made the following three decorations using small squares of stained glass.



Josef labels these patterns P1, P2 and P3 in order.

Josef continues to make decorations following the pattern he has started.

(a) How many **more** squares would he need to make pattern P22 than to make pattern P18? [1]

+2 each successive pattern

So (+2) x 4 = +8

8 more squares

(b) Josef has 22 squares.

Josef states,

'I think I can make one complete decoration using **all** 22 squares, with none left over.'

Is Josef correct?

Yes ☐ No ☑

Give a reason for your answer. [1]

There is always an odd nomber of squares in a pattern.

Examiner only

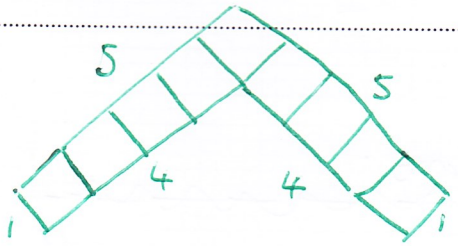
(c) Each small square of stained glass measures 0·5 cm by 0·5 cm.
The perimeter of one of Josef's decorations is 10 cm.
Complete the label that Josef would use for this decoration. [2]

P 4

Number of 0·5 distances to make 10cm

$= \frac{10}{0.5} = \frac{20}{1} = 20$

So Perimeter is 20 sides.



5 + 5 + 4 + 4 + 1 + 1

= 20

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Exami
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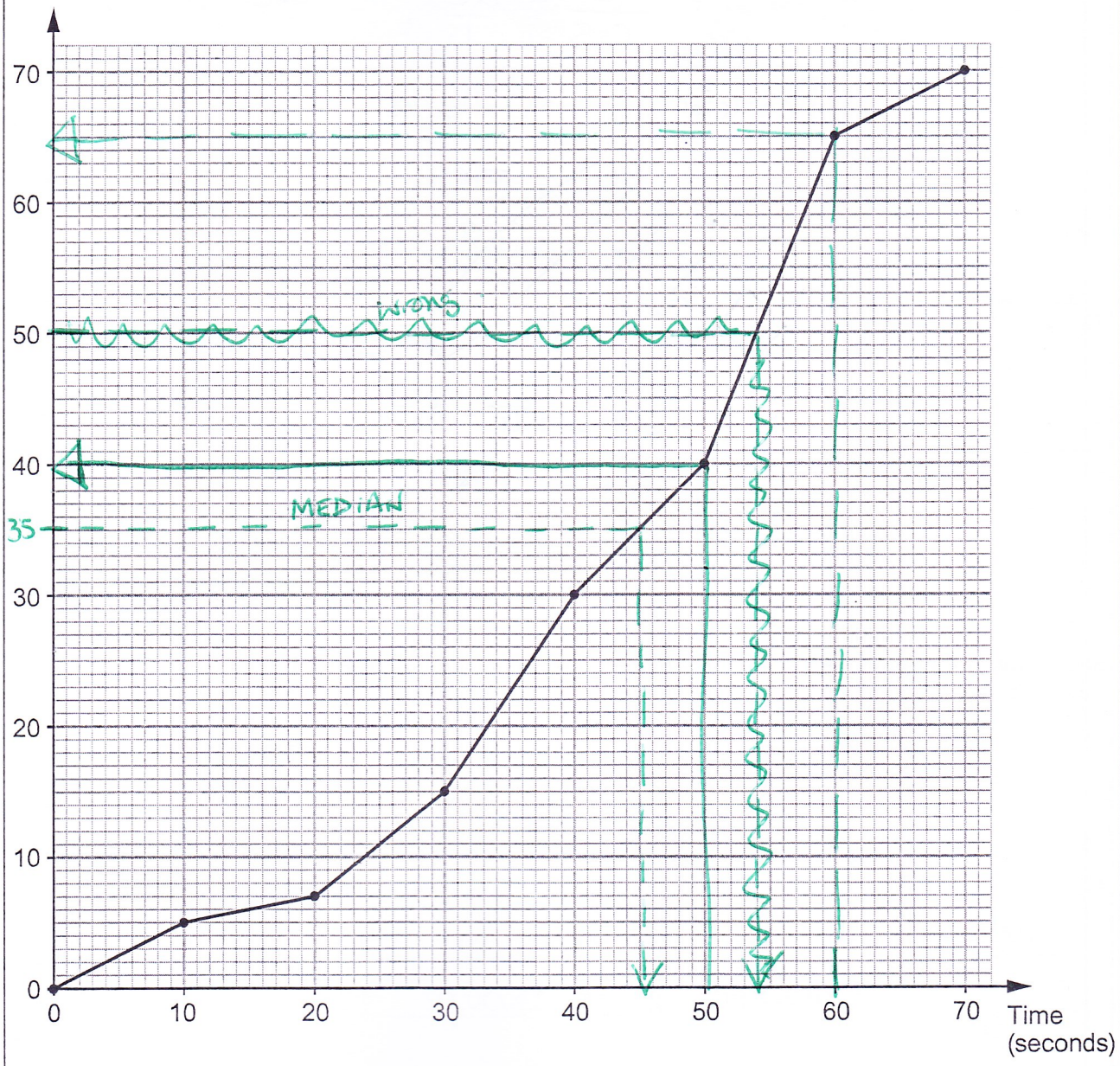
5. *Cambria Airlines* has planes that can carry up to 70 passengers.
For safety, the crew practise the emergency exit procedures with a group of 70 passengers.
Every 10 seconds the safety officer records the total number of passengers who have left the plane.
He has displayed the results in the cumulative frequency diagram shown below.



(a) Estimate the median time taken by the passengers to leave the plane. [1]

70 results
Median = 35th

45 seconds

Examiner only

(b) How many passengers took more than 50 seconds to leave the plane? Circle your answer. [1]

10 20 30 40 50

40 passengers took less than 50 secs ∴ 30 took more than 50 secs

(c) *Cambria Airlines* has a policy that states the following.

'In the event of an emergency exit procedure, at least 90% of the 70 passengers must have left the plane within 1 minute.'

Did the practice emergency exit procedure meet the requirements of the airline's policy? You must show all your working. [4]

90% of 70 = $\frac{70}{10} \times 9$ = 63 passengers

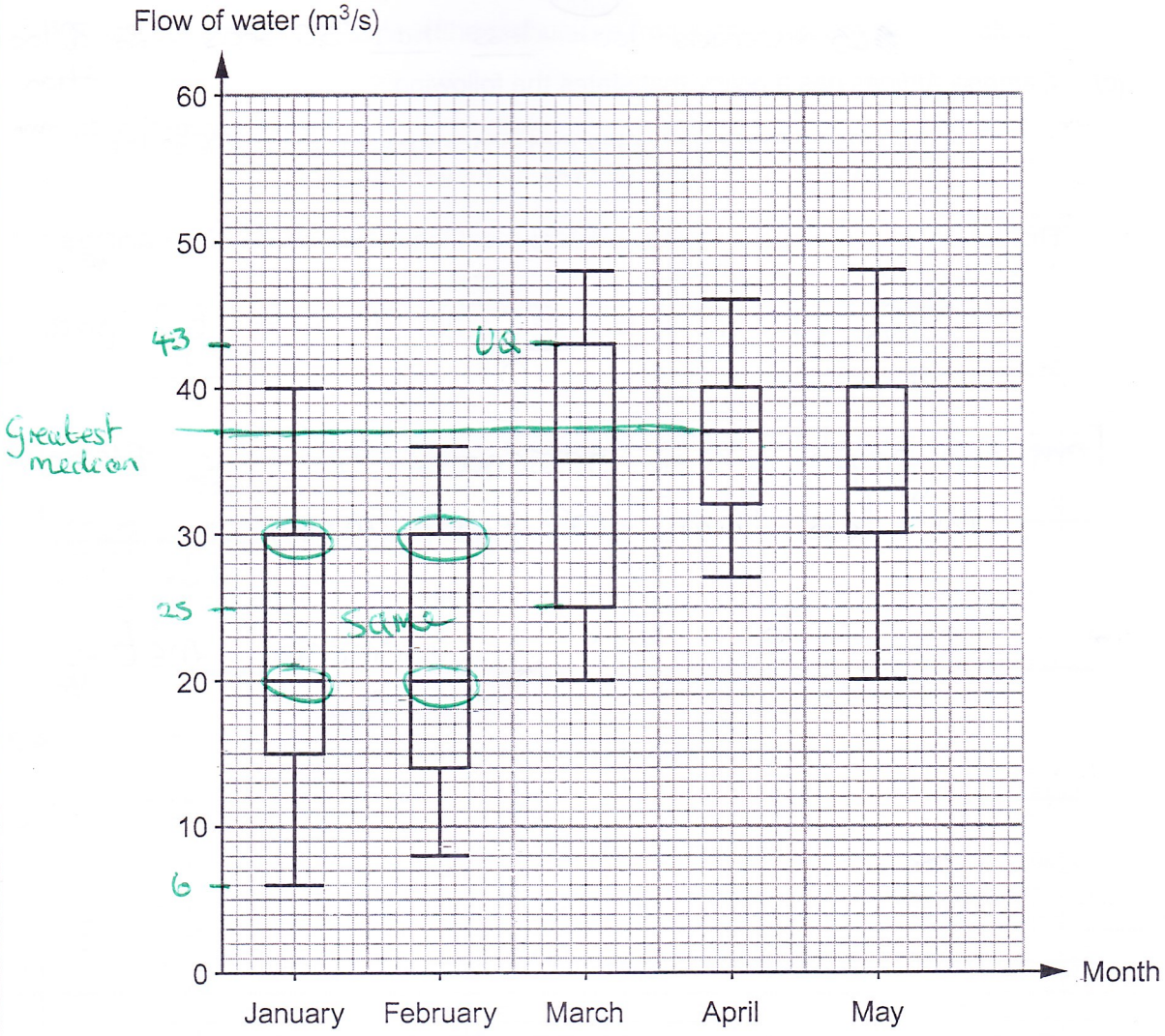
From the graph 65 passengers left the plane in less than 60 secs (1 min).

∴ YES requirements met.

3310U501

Examin only

6. The following box and whisker plots show the flow of water through a drain, measured in m^3/s. The flow of water was measured at 11 a.m. each day for the first 5 months of the year.



(a) In which of the five months was the median flow of water the greatest? [1]

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Examiner only

(b) In which of the five months was the range of the flow of water the greatest? [1]

January (40 - 6 = 34)

(c) Iona is writing some statements for a report on the flow of water through the drain. Complete each of the statements given below.

(i) 'Both the upper quartiles and medians in the months of January and February were the same.' [1]

(ii) '25% of the results in March show the flow of water was greater than 43 m^3/s.' [1]

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

25% of the results in January show the flow of water was less than 6 m^3/s.	TRUE	(FALSE)
The units, m^3/s, measure the volume of water passing through the drain each second.	(TRUE)	FALSE
The mean flow of water in April was **certainly** greater than 36 m^3/s.	TRUE	(FALSE)
The month with the greatest difference between the lower quartile and the median was May.	TRUE	(FALSE)

7. *(a)* A standard piece of A4 paper is usually 0·08 mm thick.
What is 0.08 mm written in **metres** in standard form?
Circle your answer. [1]

8×10^{4} 8×10^{-4} 8×10^{-3} 8×10^{3} (circled) 8×10^{-5}

$0{\cdot}08\,\text{mm} = \frac{0{\cdot}08}{1000} = 0{\cdot}00008\ \text{m}$

(b) A piece of card is 1 mm thick.
A stack of these pieces of card is 3×10^{-2} metres high.

(i) Calculate how many pieces of card there are in the stack. [2]

$\frac{3 \times 10^{-2}}{1 \times 10^{-3}}$ $1\,\text{mm} = 0{\cdot}001\,\text{m} = 1 \times 10^{-3}\,\text{m}$

$= 3 \times 10^{-2-(-3)} = 3 \times 10^{-2+3}$

$= 3 \times 10^{1}$

$= 30$ cards

(ii) What assumption have you made in answering *(b)*(i)? [1]

There are no errors in any measurements taken.

Examiner only

(c) In 2012 it was recorded that

- the total mass of the paper used for printing newspapers, in the world, was $2{\cdot}88 \times 10^7$ **tonnes**,
- the world population was approximately $7{\cdot}2 \times 10^9$ people.

Use this information to calculate the mass of paper per person used to print newspapers in 2012.
Give your answer in **kg per person**. [4]

Mass per person $= \dfrac{2{\cdot}88 \times 10^7 \text{ tonnes}}{7{\cdot}2 \times 10^9 \text{ people}}$

But $2{\cdot}88 \times 10^7$ tonnes $= 2{\cdot}88 \times 10^7 \times 1000$

$= 2{\cdot}88 \times 10^{10}$ kg

$\therefore$ Mass per person $= \dfrac{2{\cdot}88 \times 10^{10} \text{ kg}}{7{\cdot}2 \times 10^9 \text{ people}}$

$= \dfrac{2{\cdot}88 \times 10^{1}}{7{\cdot}2}$

$= \dfrac{28{\cdot}8}{7{\cdot}2}$

$= 4$ kg per person

Mass of paper: 4 kg per person

8. On a new housing estate, teams of painters paint the walls and ceilings of houses once they are built.

(a) It takes a team of 5 painters 10 hours to paint a house that has a total wall and ceiling area of 500 m^2.

A new house on the estate has a total wall and ceiling area of 600 m^2.
This house has to be painted in 8 hours.

Calculate the least number of painters needed.
You must show all your working. [4]

5 painters 10 hrs ÷5 to paint 500 m^2 ÷5
5 painters 2 hrs ×6 to paint 100 m^2 ×6
×3 15 painters ÷3 4 hrs ÷3 to paint 600 m^2
÷2 15 painters ×2 8 hrs ×2 to paint 600 m^2
7.5 7.5
Now 15 = 15 painters

∴ Least number of painters needed
= 8

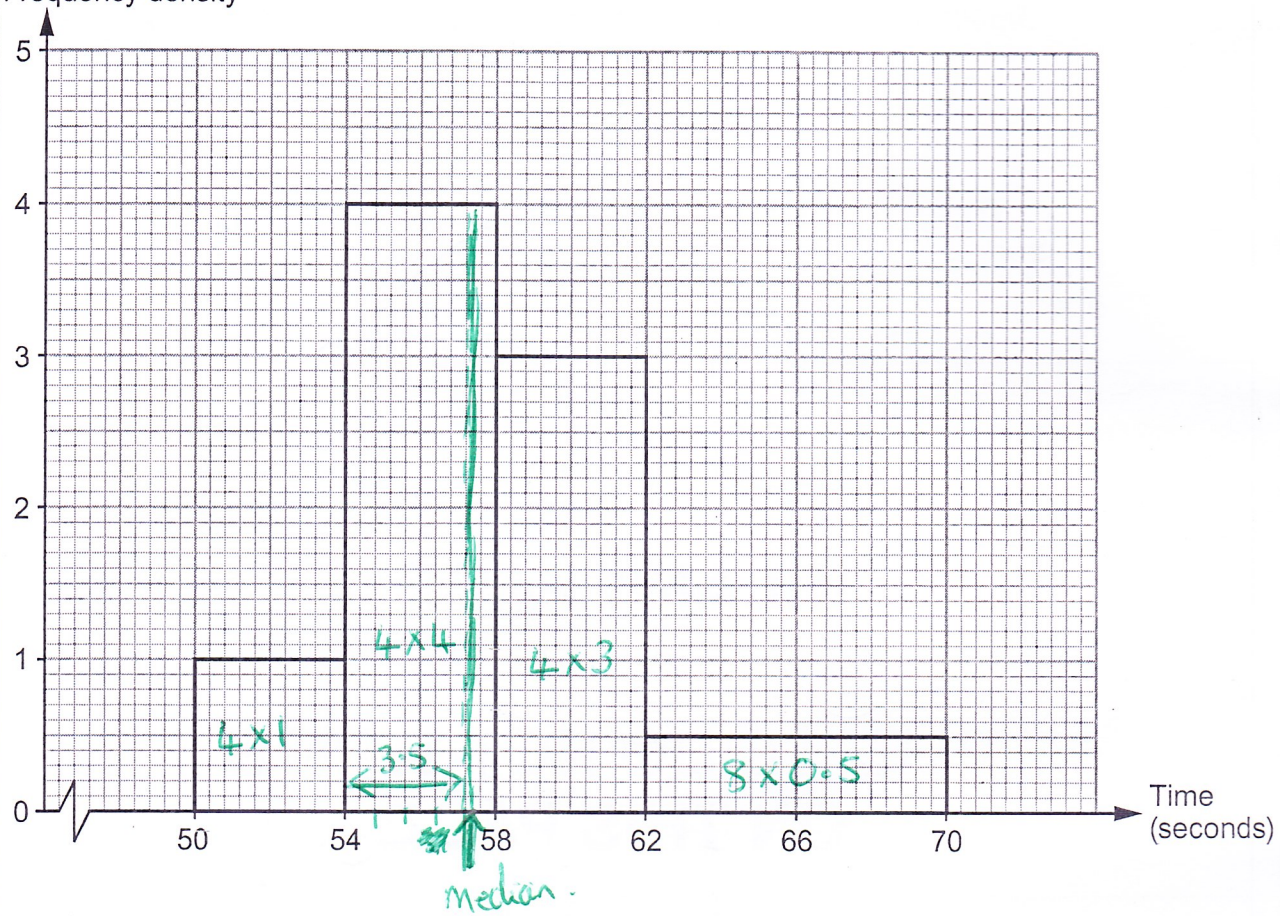
(b) What assumption have you made in answering part *(a)*? [1]

All painters work at the same rate

Exam onl

9. The time taken to run 400 m was recorded for each member of a running club.

(a) A histogram of the results for the members who are under 30 years of age is shown below.



(i) Calculate how many members of the running club are under 30 years of age. [2]

Calculate total area of all bars

$(4\times1) + (4\times4) + (4\times3) + (8\times0.5)$

$= 4 + 16 + 12 + 4 = 36$

(ii) Calculate an estimate of the median time taken by the under-30s to run 400 m. [4]

median = 18th time.

4 from 1st bar, You need 14 from second bar. Area = l × w

$14 = 4 \times w$

$\frac{14}{4} = w$

$3.5 = w$

∴ Median = 57.5 secs

Examiner only

(b) The frequency table below shows the results for the members who are 30 years of age or over.

width 4 width 4 width 2 width 2 width 8

Time, t (seconds)	$50 < t \leqslant 54$	$54 < t \leqslant 58$	$58 < t \leqslant 60$	$60 < t \leqslant 62$	$62 < t \leqslant 70$
Number of people	4	10	16	18	12
Frequency density	$\frac{4}{4} = 1$	$\frac{10}{4} = 2.5$	$\frac{16}{2} = 8$	$\frac{18}{2} = 9$	$\frac{12}{8} = 1.5$

Complete the table, and draw a histogram to illustrate this data on the graph paper below. [4]

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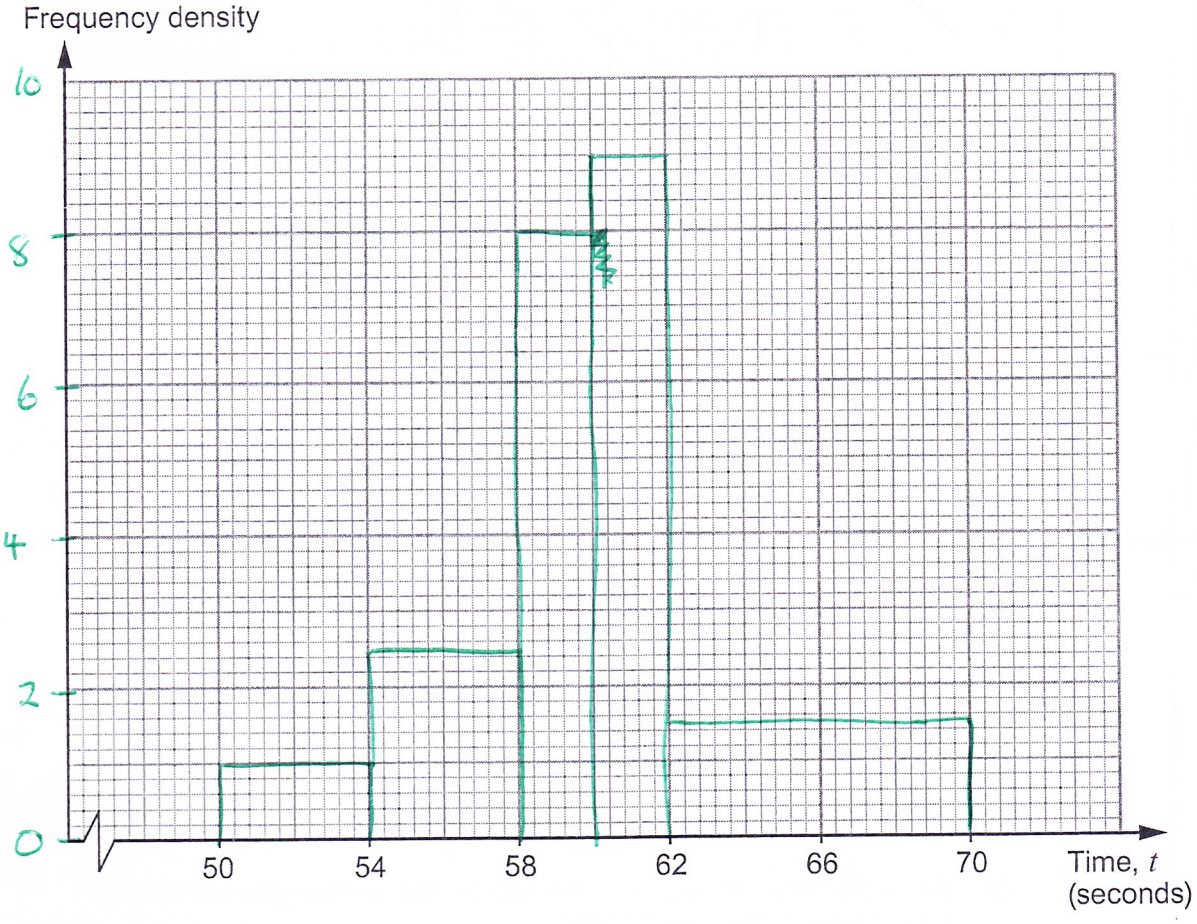


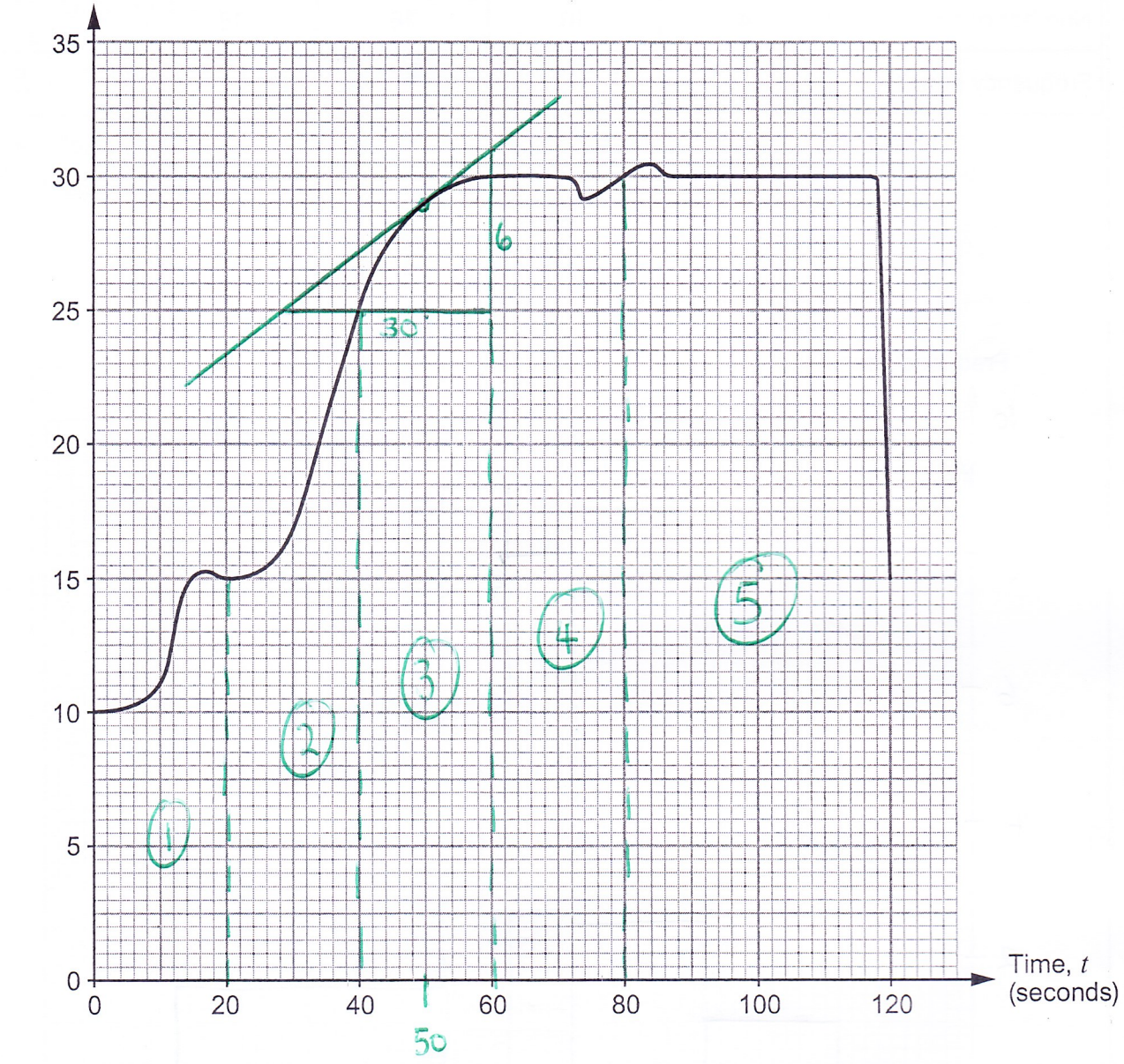
(c) On average, which of the two groups was faster at running 400 m?
Give a reason for your answer.
Your reason must be based on your interpretation of the histograms. [1]

under 30 years

because a greater % of the histogram area is for lower times.

Examin only

10. The graph below shows a 120-second section of Iestyn's car journey to work this morning.



(a) (i) At t = 50 seconds, estimate the acceleration of Iestyn's car in m/s^2. Leave your answer as a fraction. [3]

Draw tangent acc = gradient = $\frac{\text{height}}{\text{base}} = \frac{6}{30}$

$= \frac{1}{5}$ m/s^2

Examiner only

(ii) At another time, Iestyn calculated the acceleration of the car to be $0\dot{2}4$ m/s^2. Write this recurring decimal as a fraction. [2]

Let $x = 0.2\dot{4}$

$10x = 2.\dot{4}$

$100x = 24.\dot{4}$

Sub $90x = 22$ $\therefore$ $22/90$

$x = 22/90$

(b) (i) Calculate an estimate of the distance travelled by Iestyn's car in the first 80 seconds of his journey.
You must consider the speed of the car when t = 0, 20, 40, 60 and 80 seconds. [4]

Distance = area under graph

$= (1) + (2) + (3) + (4)$

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

$= \frac{(10+15)20}{2} + \frac{(15+25)20}{2} + \frac{(25+30)20}{2} + (30\times20$

$= 250 + 400 + 550 + 600$

$= 1800$ m

(ii) Hence, calculate an estimate of the average speed of Iestyn's car for this entire 120-second section of his car journey.
Give your answer in m/s. [4]

Average speed = $\frac{\text{Total Dist}}{\text{Total time}}$

Total distance

$= 1800 + (5)$

$\approx 1800 + (30\times40)$

$\approx 1800 + 1200$

≈ 3000m

$= \frac{1800 + 1200}{120}$

$= \frac{3000}{120}$

$= \frac{300}{12} = \frac{150}{6} = \frac{75}{3} = 25$m/s

Examin only

11. The diagram below shows a wooden end-piece for a curtain pole.
It is in the shape of a cone with measurements as shown in the diagram.

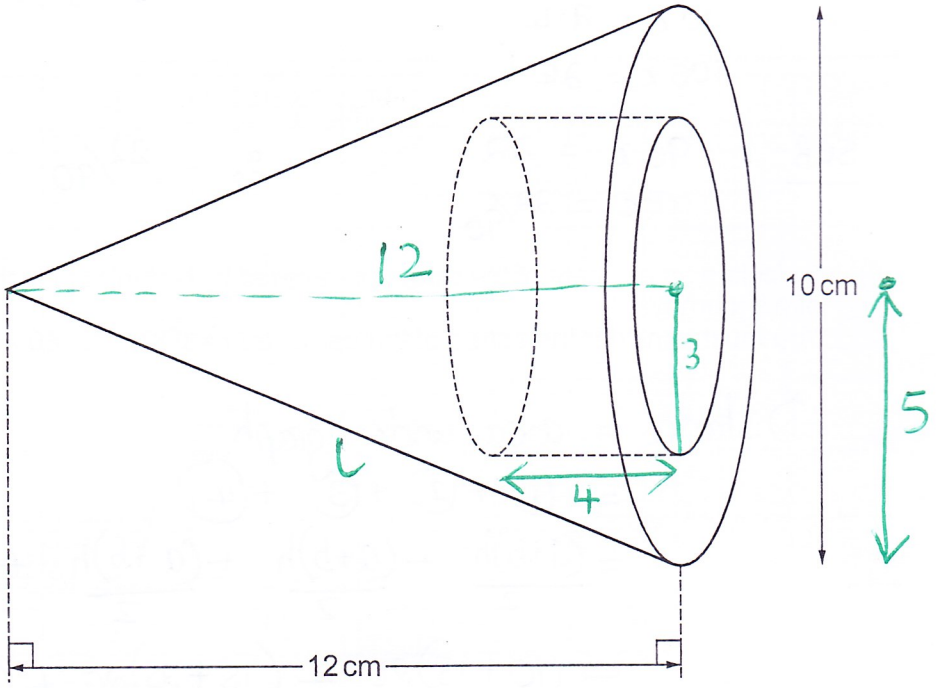


Diagram not drawn to scale

The curtain pole sits in a cylindrical hole that has been drilled into the end-piece.
The hole is of radius 3 cm and depth 4 cm.

(a) Show that the volume of wood that remains is $64\pi\,\text{cm}^3$. [4]

Vol remaining = Vol cone − vol cylinder

$V = \frac{\pi r^2 h}{3} - \pi r^2 h$

$V = \frac{\pi \times 5^2 \times 12^4}{3_1} - \pi \times 3^2 \times 4$

$V = 100\pi - 36\pi$

$V = 64\pi\ \text{cm}^3$

Examiner only

(b) The surface area of the end-piece is to be painted, except for the area inside the hole. Calculate the surface area that is to be painted. Give your answer in terms of π. [6]

Total area to be painted = curved part of cone + base

Base

$A = \pi R^2 - \pi r^2$

$= \pi \times 5^2 - \pi \times 3^2$

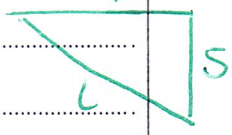
$= 25\pi - 9\pi$

$= 16\pi \text{ cm}^2$

Curved area of Cone

$A = \pi r l$

Use Pythag to find l



$h^2 = a^2 + b^2$

$l^2 = 5^2 + 12^2$

$l^2 = 25 + 144$

$l^2 = 169$

$l = 13 \text{ cm}$

$\therefore A = \pi \times 5 \times 13$

$A = 65\pi$

$\therefore$ Total area

$= 16\pi + 65\pi = 81\pi \text{ cm}^2$

END OF PAPER