A/A* - Histograms

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Question	Maximum Mark	Mark Awarded
1	9	
2	8	
3	3	
Total Mark		

EAS
Education Achievement Service
for South East Wales
Gwasanaeth Cyflawni Addysg
i Dde Ddwyrain Cymru

1.

The lengths of the worms collected in a one square metre area of woodland were measured. The results are summarised in the grouped frequency distribution below.

Length, l (mm)	Frequency
$0 < l \leqslant 10$	4
$10 < l \leqslant 20$	2
$20 < l \leqslant 30$	10
$30 < l \leqslant 40$	20
$40 < l \leqslant 50$	24
$50 < l \leqslant 60$	24
$60 < l \leqslant 70$	0
$70 < l \leqslant 80$	2

It is decided by the team recording the lengths of the worms that:

- groups $0 < l \leqslant 10$ and $10 < l \leqslant 20$ should be combined
- groups $60 < l \leqslant 70$ and $70 < l \leqslant 80$ should be combined.

(a) Explain why you think this decision was made and whether you think it is a sensible idea. [1]

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(b) Complete the table below and draw a histogram to display the results for the lengths of the worms, keeping to the decision made for combining the results. [4]

Length, l (mm)	Frequency	Frequency density
$0 < l \leqslant 20$		
$20 < l \leqslant 30$		
$30 < l \leqslant 40$		
$40 < l \leqslant 50$		
$50 < l \leqslant 60$		
$60 < l \leqslant 80$		

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(c) Write down an estimate for the median length of the worms.
You **must** show your working. [4]

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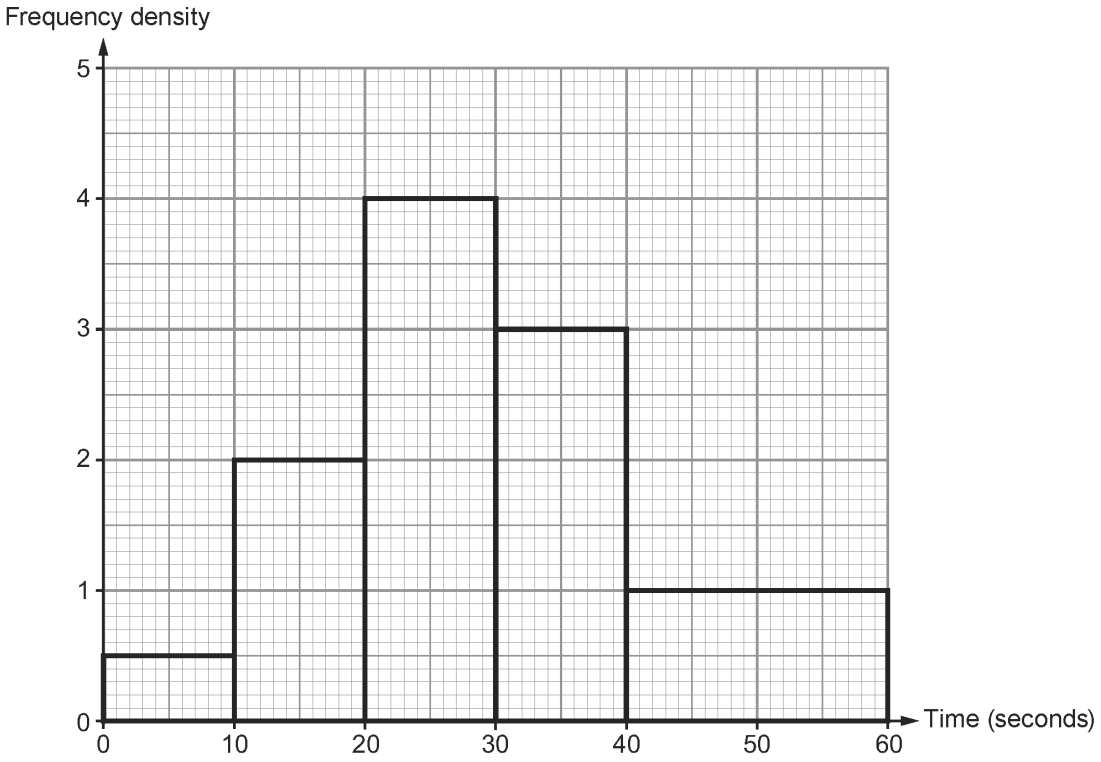
2. A cinema investigates the time taken for people to be served at the pay desk.
They carried out a survey between 2 p.m. and 2:30 p.m. on a Thursday.
The histogram shows the results of the survey.



(a) How many people were served at the pay desk? [3]

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..... people

(b) Calculate an estimate for the number of people who were served in less than 12·5 seconds. [2]

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..... people

(c) The cinema target is to serve 80% of people in less than 40 seconds per person. How many more people than the target were served in less than 40 seconds? [3]

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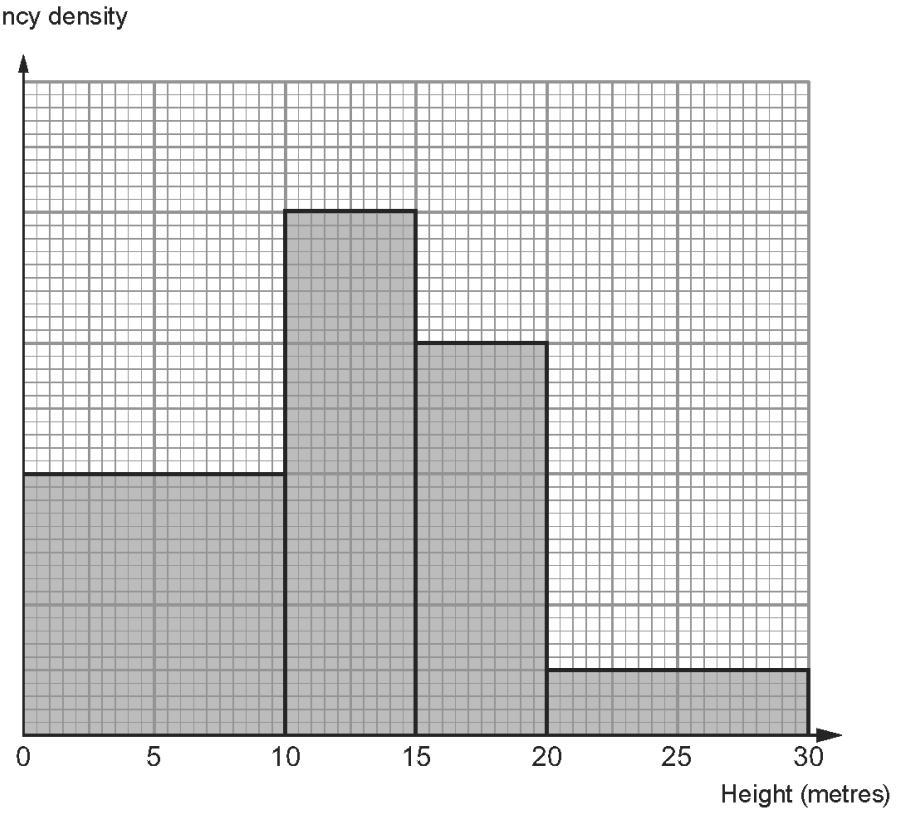
..... extra people above the target

3.

This histogram shows the distribution of heights, in metres, of 240 trees in a wood.



How many trees were between 10 and 15 metres in height? [3]

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Marking Scheme

1.

Applications Unit 1 Summer 2015	Mark	Comment
9(a) "No, data is destroyed" OR "Yes, not many very short or very long worms" OR "frequency is quite low in these groups"	E1	Accept implied 'yes' or 'no' Needs to give a decision with logic/reasoning explained, may be stated or implied Do not accept 'fewer groups' without a reason Do not accept 'smooths out data'
(b) Frequency density, any 3 correct **0.3,** 1, 2, 2.4, 2.4, **0.1**	M1 A1	
Axes correct to represent 0.1 to 2.4 and labelled frequency density and length, with no gaps between bars	B1	Values horizontally must give actual values not indication of groups Histogram needs to be attempted
Correct histogram bars	B1	May not have labelled axes and values may be given in groups on the horizontal axis. Clearly must show the highest vertical reading 2.4
(c) 43rd or 43.5th worm considered Answer in the range $40<l\leq44$ (mm) $10\times 7/24 + 40$ or $50 - 10\times 17/24$ 42.9(1666 …mm) or 43(mm)	B1 B1 M1 A1	Or $10 \times 7.5/24 + 40$ if considering the 43.5th worm Or if considering the 43.5th worm, 43(.125 mm) Unsupported answers: 43 is awarded B1, B0, M0, A0 43 mm is awarded B1, B1, M0, A0
	9	

2.

(a) Strategy, finding area $0.5\times10 + 2\times10 + 4\times10 + 3\times10 + 1\times20$ or equivalent 115 (people)	M1 M1 A1	Any single area is sufficient Must show intention to add. Allow for 4 of the 5 terms correct (Note for markers: 5+20+40+30+20 or the final 20 as 10+10) CAO
(b) $0.5\times10 + ¼\times2\times10$ or equivalent 10 (people)	M1 A1	FT 'their 5' + ¼ of 'their 20' provided area is being considered, with M1 awarded in (a)
(c) (80% of 115 people is) 92 (people) 95 (people in up to 40 seconds) (Exceeded by serving) 3 (extra people)	B1 B1 B1	FT 'their 115' provided area has been considered, with M1 awarded in (a) FT 'their 115' – 'their 20', with M1 awarded in (a) CAO Allow B3 for an unsupported answer of 3 *Alternative:* *95 (people in up to 40 seconds)* *B1* *(100 ×) 95 ÷ 115 (0.826… or 82.6%) AND* *(Difference) 2.6…% of 115* *B1* *(exceeded by serving) 3 (extra people)* *B1* *With equivalent FT, provided M1 awarded in (a), 'their 115' and 'their 115 their 20',*

3.

Unitised Unit 3 – June 2015 Higher Tier	✓		Comments
18. To be viewed with graph. Idea that each large block is equivalent to frequency of 20 OR each block on the y-axis is a frequency density of 4 OR 4/12 of 240 80 (trees)		M2 A1	M1 for $12 \times (x \times 5) = 240$

Examiner's Comments

1. Part (a) was well answered, with the majority of candidates noticing the low frequencies in the extreme groups.

   Unfortunately there are two distinct groups of candidates, those with knowledge of histograms and those without any knowledge of histograms. So, parts (b) and (c) were often well attempted, or totally incorrect.

   Finding the median did cause some problems for candidates.

   *This comment originally referred to question **9** on paper **4361/02 (04/06/2015)***

2. Candidates working with area generally answered this question well, understanding at least the requirements for two of the three parts. Other candidates showed no understanding, by not working with area.

   *This comment originally referred to question **20** on paper **4370/06 (09/06/2016)***

3. This problem solving question was answered quite well, with a substantial number of candidates realising that each block of graph paper was equivalent to a frequency of 20.

   *This comment originally referred to question **18** on paper **4353/02 (08/06/2015)***