

AQA

A Level

A Level Mathematics

Single Variable Data and
Histograms (Answers)

Name:

M M E

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Total Marks:

L1- Single Variable Data and Histograms- Questions

AQA

1) The data you have received is in the form *name (frequency)*. The data is as follows:
dog (8); cat (7); guinea-pig (3); hamster (2); fish (5); snake (1); bird (1).

i) Give a title to these variables that encompasses them all

[1 mark]

Animals/pets/ number of pets per family- anything that recognises the link between them.

ii) What type of data is this, such that you cannot find a mean for it?

[1 mark]

Qualitative.

2) Name a type of graph used to represent:

i) quantitative data

[1 mark]

Bar-chart or pie-chart.

ii) qualitative data: discrete

[1 mark]

Histogram or pie-chart or bar-chart.

iii) qualitative data: continuous

[1 mark]

Histogram or pie-chart or bar-chart

3) You have a frequency table but the class widths are not consistent, what would be the way of displaying this graphically and why?

[1 mark]

Histogram.

[1 mark].

For bar-chart class width must be consistent. Relative frequency/frequency density should be mentioned.

4) The heights of miniature figures are given in *mm*.

1, 5, 7, 14, 19, 21, 23, 25, 27, 31, 32, 35, 36, 37, 38, 40, 42, 47, 48, 50

Draw a histogram, made of 5 groups, representing the distribution of heights.

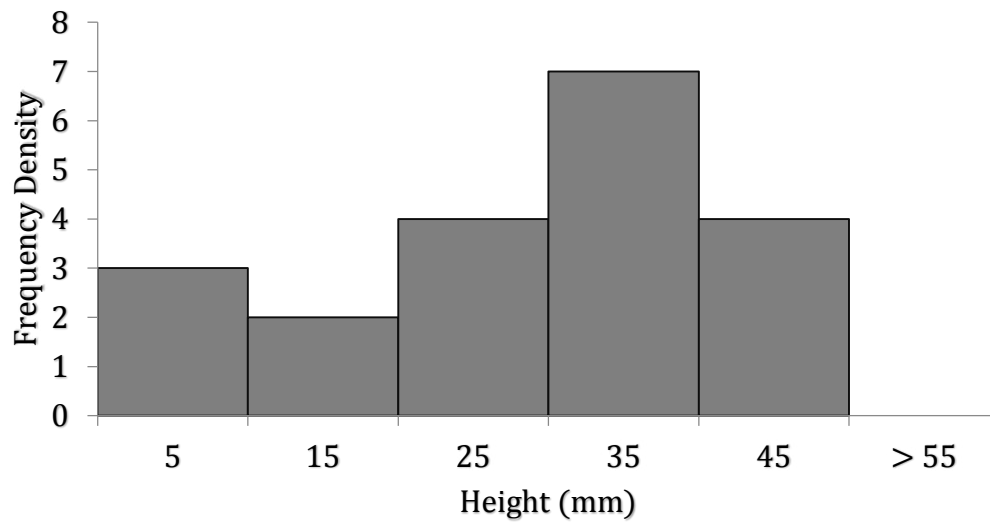
[1 mark for frequency table]

<i>Height (mm)</i>	<i>Frequency</i>
$0 < h \leq 10$	3
$11 < h \leq 20$	2
$21 < h \leq 30$	4
$31 < h \leq 40$	7
$41 < h \leq 50$	4
$h > 50$	0

[1 mark for frequency density]

[1 mark for no gaps]

[1 mark for correct drawing of all bars]



- 5) The following table, used to make a histogram, has been partially filled completed with the data for amount of money, in pence, 94 children spend on sweets every day. Complete the table by calculating the values where the letter x is.

$$\text{Frequency density} = \text{frequency} \div \text{class width}$$

[1 mark for each correct missing value - 6 max]

<i>Amount (p)</i>	<i>Frequency</i>	<i>Frequency Density</i>
$0 < p \leq 50$	10	0.2
$50 < p < 75$	22	0.88
$75 < p \leq 105$	15	0.5
$105 < p \leq 200$	22	0.34
$200 < p \leq 250$	25	0.5

[4]

There is no requirement to draw the histogram.

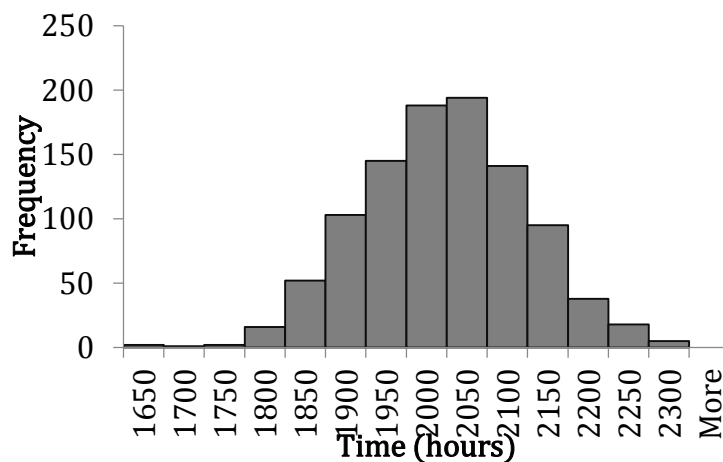
- 6) The time 1000 lightbulbs last has been recorded in the table shown and used to produce a histogram. The standard deviation of the data is 100 hours. Using your knowledge of histograms and probability distributions estimate the probability of a bulb lasting less than 2100 hours.

The graph serves no purpose other than to remind you that histograms of continuous random variables become closer to probability distributions as the sample size increases. In this instance, a normal distribution is formed.

[1 mark]

This means we can obtain a probability using the Standard Normal Variable defined as:

$$z = \frac{x - \mu}{\sigma} \quad (1)$$



[1 mark for midpoint]

[1 mark for frequency \times midpoint]

<i>Time</i>	<i>Midpoint (M)</i>	<i>Frequency(F)</i>	<i>FM</i>
1600 < t \leq 1650	1625	2	3250
1650 < t \leq 1700	1675	1	1675
1700 < t \leq 1750	1725	2	3450
1750 < t \leq 1800	1775	16	28400
1800 < t \leq 1850	1825	52	94900
1850 < t \leq 1900	1875	103	193125
1900 < t \leq 1950	1925	145	279125
1950 < t \leq 2000	1975	188	371300
2000 < t \leq 2050	2025	194	392850
2050 < t \leq 2100	2075	141	292575
2100 < t \leq 2150	2125	95	201875
2150 < t \leq 2200	2175	38	82650
2200 < t \leq 2250	2225	18	40050
2250 < t \leq 2300	2275	5	11375

[1 mark for correct mean]

$$\mu = \frac{\Sigma FM}{\Sigma F} = \frac{1996600}{1000} = 1996.6$$

For this population, we can denote the time the bulb lasts as X .

$$\therefore X \sim N(1996.6, 100^2)$$

Recalling that the standard deviation is given to us.

$$P(t < 2100) = p(x < 2100)$$

[1 mark]

Using (1) we can write, when $x = 2100$

$$z = \frac{2100 - 1996.6}{100} = 1.034$$

[1 mark]

Looking up the values of the Standard Normal distribution we can say

$$\text{So } P(x < 2100) = P(z < 1.034) = 0.849431918$$