



## Representations of Data: Histograms - Edexcel Past Exam Questions MARK SCHEME

### Question 1 : Jan 07 Q5

Question number	Scheme	Marks
5. (a)	Time is a <u>continuous</u> variable <u>or</u> data is in a <u>grouped</u> frequency table	B1 (1)
(b)	Area is proportional to frequency <u>or</u> $A \propto f$ <u>or</u> $A = kf$	B1 (1)
(c)	$3.6 \times 2 = 0.8 \times 9$  1 child represented by 0.8	M1 dM1 A1 cso (3)
(d)	(Total) = $\frac{24}{0.8} = \underline{30}$	M1, A1 (2)
<b>7 marks</b>		
(b)	1 <sup>st</sup> B1 for one of these correct statements. "Area proportional to frequency density" or "Area = frequency" is B0	
(c)	1 <sup>st</sup> M1 for a correct combination of any 2 of the 4 numbers: 3.6, 2, 0.8 and 9 e.g. $3.6 \times 2$ or $\frac{3.6}{0.8}$ or $\frac{0.8}{2}$ etc BUT e.g. $\frac{3.6}{2}$ is M0  2 <sup>nd</sup> M1 dependent on 1 <sup>st</sup> M1 and for a correct combination of 3 numbers leading to 4 <sup>th</sup> . May be in separate stages but must see all 4 numbers A1cso for fully correct solution. Both Ms scored, no false working seen and <u>comment required</u> .	
(d)	M1 for $\frac{24}{0.8}$ seen or implied.	



Question 2 : June 07 Q5

Question Number	Scheme	Marks
(a)	18-25 group, area=7x5=35 25-40 group, area=15x1=15	B1 B1 (2)
(b)	$(25-20) \times 5 + (40-25) \times 1 = 40$	M1A1 (2)
(c)	Mid points are 7.5, 12, 16, 21.5, 32.5 $\sum f = 100$ $\frac{\sum ft}{\sum f} = \frac{1891}{100} = 18.91$	M1 B1 M1A1 (4)
(d)	$\sigma_t = \sqrt{\frac{41033}{100} - \bar{t}^2}$ $\sqrt{\frac{n}{n-1} \left( \frac{41033}{100} - \bar{t}^2 \right)}$ alternative OK  $\sigma_t = \sqrt{52.74...} = 7.26$	M1  M1 A1 (3)
(e)	$Q_2 = 18$ or 18.1 if (n+1) used $Q_1 = 10 + \frac{15}{16} \times 4 = 13.75$ or 15.25 numerator gives 13.8125 $Q_3 = 18 + \frac{25}{35} \times 7 = 23$ or 25.75 numerator gives 23.15	B1 M1A1  A1 (4)

Notes:		
(b)	5x5 is enough evidence of method for M1. Condone 19.5, 20.5 instead of 20 etc. Award 2 if 40 seen.	
(c)	Look for working for this question in part (d) too. Use of some mid-points, at least 3 correct for M1. These may be tabulated in (d). Their $\frac{\sum ft}{\sum f}$ for M1 and anything that rounds to 18.9 for A1.	
(d)	Clear attempt at $\frac{41033}{100} - \bar{t}^2$ or $\frac{n}{n-1} \left( \frac{41033}{100} - \bar{t}^2 \right)$ alternative for first M1. They may use their $\bar{t}$ and gain the method mark. Square root of above for second M1 Anything that rounds to 7.3 for A1.	
(e)	Clear attempt at either quartile for M1 These will take the form 'their lower limit'+ correct fraction x 'their class width'. Anything that rounds to 13.8 for lower quartile. 23 or anything that rounds to 23.2 dependent upon method used.	
(f)	Anything that rounds to 0.38 for B1 or 0.33 for B1 if (n+1) used.	



Question 3 : Jan 08 Q3

Question Number	Scheme	Marks																		
	<table border="1"> <tr> <td>Width</td> <td>1</td> <td>1</td> <td>4</td> <td>2</td> <td>3</td> <td>5</td> <td>3</td> <td>12</td> </tr> <tr> <td>Freq. Density</td> <td>6</td> <td>7</td> <td>2</td> <td>6</td> <td>5.5</td> <td>2</td> <td>1.5</td> <td>0.5</td> </tr> </table> <p style="text-align: right; margin-right: 100px;"><math>0.5 \times 12</math> or 6</p> <p>Total area is <math>(1 \times 6) + (1 \times 7) + (4 \times 2) + \dots = 70</math></p> $(90.5 - 78.5) \times \frac{1}{2} \times \frac{140}{\text{their } 70}$ <p style="text-align: right; margin-right: 100px;">“70 seen anywhere”</p> <p>Number of runners is 12</p>	Width	1	1	4	2	3	5	3	12	Freq. Density	6	7	2	6	5.5	2	1.5	0.5	<p><b>MI</b></p> <p><b>A1</b></p> <p><b>MI</b></p> <p><b>B1</b></p> <p><b>A1</b></p> <p style="text-align: right;"><b>(5)</b></p> <p><b>Total 5 marks</b></p>
Width	1	1	4	2	3	5	3	12												
Freq. Density	6	7	2	6	5.5	2	1.5	0.5												
	<p>1<sup>st</sup> M1 for attempt at width of the correct bar (90.5 - 78.5) [Maybe on histogram or in table]</p> <p>1<sup>st</sup> A1 for <math>0.5 \times 12</math> or 6 (may be seen on the histogram. Must be related to the area of the bar above 78.5 - 90.5.</p> <p>2<sup>nd</sup> M1 for attempting area of correct bar <math>\times \frac{140}{\text{their } 70}</math></p> <p>B1 for 70 seen anywhere in their working</p> <p>2<sup>nd</sup> A1 for correct answer of 12.</p> <p>Minimum working required is <math>2 \times 0.5 \times 12</math> where the 2 should come from <math>\frac{140}{70}</math></p> <p>Beware <math>90.5 - 78.5 = 12</math> (this scores M1A0M0B0A0)</p> <p>Common answer is <math>0.5 \times 12 = 6</math> (this scores M1A1M0B0A0)</p> <p>If unsure send to review e.g. <math>2 \times 0.5 \times 12 = 12</math> without 70 being seen</p>																			



Question 4 : Jan 09 Q5

Question Number	Scheme	Marks
(a)	8-10 hours: width = 10.5 - 7.5 = 3 represented by 1.5cm 16-25 hours: width = 25.5 - 15.5 = 10 so represented by <u>5 cm</u> 8- 10 hours: height = fd = 18/3 = 6 represented by 3 cm 16-25 hours: height = fd = 15/10 = 1.5 represented by <u>0.75 cm</u>	B1 M1 A1 (3)
(b)	$Q_2 = 7.5 + \frac{(52-36)}{18} \times 3 = 10.2$ $Q_1 = 5.5 + \frac{(26-20)}{16} \times 2 [= 6.25 \text{ or } 6.3]$ or $5.5 + \frac{(26.25-20)}{16} \times 2 [=6.3]$ $Q_3 = 10.5 + \frac{(78-54)}{25} \times 5 [=15.3]$ or $10.5 + \frac{(78.75-54)}{25} \times 5 [=15.45 \text{ \& } 15.5]$ IQR = (15.3 - 6.3) = <u>9</u>	M1 A1  A1  A1 A1ft (5)
(c)	$\sum fx = 1333.5 \Rightarrow \bar{x} = \frac{1333.5}{104} =$ AWRT <u>12.8</u>	M1 A1
(d)	$\sum fx^2 = 27254 \Rightarrow \sigma_x = \sqrt{\frac{27254}{104} - \bar{x}^2} = \sqrt{262.05 - \bar{x}^2}$ AWRT <u>9.88</u> $Q_3 - Q_2 [=5.1] > Q_2 - Q_1 [=3.9]$ or $Q_2 < \bar{x}$	M1 A1 (4) B1ft dB1 (2)
(e)	So data is positively skew  Use median and IQR, since data is skewed <u>or</u> not affected by extreme values or outliers	B1 B1 (2) <b>[16]</b>
(a)	M1 For attempting both frequency densities $\frac{18}{3} (= 6)$ and $\frac{15}{10}$ , <u>and</u> $\frac{15}{10} \times SF$ , where $SF \neq 1$	
(b)	NB Wrong class widths( 2 and 9) gives $\frac{h}{1.66...} = \frac{3}{9} \rightarrow h = \frac{5}{9}$ or 0.55... and scores M1A0 M1 for identifying correct interval and a correct fraction e.g. $\frac{\frac{1}{2}(104)-36}{18}$ . Condone 52.5 or 53 1 <sup>st</sup> A1 for 10.2 for median. Using (n + 1) allow awrt 10.3	
(c)	2 <sup>nd</sup> A1 for a correct expression for either $Q_1$ or $Q_3$ (allow 26.25 and 78.75) 3 <sup>rd</sup> A1 for correct expressions for both $Q_1$ and $Q_3$	NB: Must see some method
(d)	4 <sup>th</sup> A1ft for IQR, ft their quartiles. Using (n + 1) gives 6.28 and 15.45 1 <sup>st</sup> M1 for attempting $\sum fx$ and $\bar{x}$ 2 <sup>nd</sup> M1 for attempting $\sum fx^2$ and $\sigma_x, \sqrt{\quad}$ is needed for M1. Allow $s =$ awrt 9.93	
(e)	1 <sup>st</sup> B1ft for suitable test, values need not be seen but statement must be compatible with values used. Follow through their values 2 <sup>nd</sup> dB1 Dependent upon their test showing positive and for stating positive skew If their test shows negative skew they can score 1 <sup>st</sup> B1 but lose the second	
	1 <sup>st</sup> B1 for choosing median and IQR. Must mention <u>both</u> . } <u>Award independently</u> 2 <sup>nd</sup> B1 for suitable reason } e.g. "use median because data is skewed" scores B0B1 since IQR is not mentioned	



Question 5 : June 09 Q3

Question Number	Scheme	Marks
<p>(a) 1(cm) cao</p> <p>(b) 10 cm<sup>2</sup> represents 15 10/15 cm<sup>2</sup> represents 1</p> <p>Therefore frequency of 9 is <math>\frac{10}{15} \times 9</math> or <math>\frac{9}{1.5}</math> height = 6(cm)</p>	<p>or 1cm<sup>2</sup> represents 1.5</p> <p>Require <math>\times \frac{2}{3}</math> or +1.5</p>	<p>B1</p> <p>M1</p> <p>A1</p> <p><b>[3]</b></p>
<p>Notes</p>	<p>If 3(a) and 3(b) incorrect, but their (a) x their (b)=6 then award B0M1A0</p> <p>3(b) Alternative method: f/cw=15/6=2.5 represented by 5 so factor x2 award M1 So f/cw=9/3=3 represented by 3x2=6. Award A1.</p>	



Question 6 : June 11 Q5

Question Number	Scheme	Marks
(a)	<u>10.5</u>	B1 (1)
(b)	$(Q_2 =) (15.5 +) \frac{\frac{1}{2} \times 30 - 14}{8} \times 3$ or $\frac{\frac{1}{2} \times 31 - 14}{8} \times 3$ $= \underline{15.875 \text{ or } 16.0625}$	M1 A1 (2)
(c)	$\bar{x} = \frac{477.5}{30} = \underline{15.9}$ (15.916 $\bar{6}$ ) [Accept $\frac{191}{12}$ or $15\frac{11}{12}$ ] $\sigma = \sqrt{\frac{8603.75}{30} - \bar{x}^2} = \underline{5.78}$ (accept $s = 5.88$ )	M1, A1 M1A1ft, A1 (5)

Notes	
(a)	<b>In parts (a) to (c) a correct answer with no working scores full marks for that value.</b> B1 for 10.5 which may be in the table
(b)	M1 for a correct ratio and times 3, ignore the lower boundary for this mark A1 for awrt 15.9 (if $n = 30$ used) or awrt 16.1 (if $n+1 = 31$ is used)
(c)	1 <sup>st</sup> M1 for attempt at $\sum fx$ (this may be seen in the table as $fx: 10, 73.5, 70, 136, 82, 106$ [condone 1 slip] or awrt 500) and use of $\frac{\sum fx}{\sum f}$ or a correct expression for mean. 1 <sup>st</sup> A1 for awrt 15.9 2 <sup>nd</sup> M1 for an attempt at $\sigma$ or $\sigma^2$ , can fit their mean, condone mis-labelling $\sigma^2 = \sqrt{\dots}$ etc Allow use of their $\sum fx^2$ (awrt 9000) 2 <sup>nd</sup> A1ft for a correct expression including square root, fit their mean but not their $\sum fx^2$ . No label or correct label is OK but wrong label (e.g. $\sigma^2 = \sqrt{\dots}$ ) is A0 3 <sup>rd</sup> A1 for awrt 5.78, allow $s =$ awrt 5.88. SC Allow M1A1A0 for awrt 5.79 if $\bar{x}$ correct