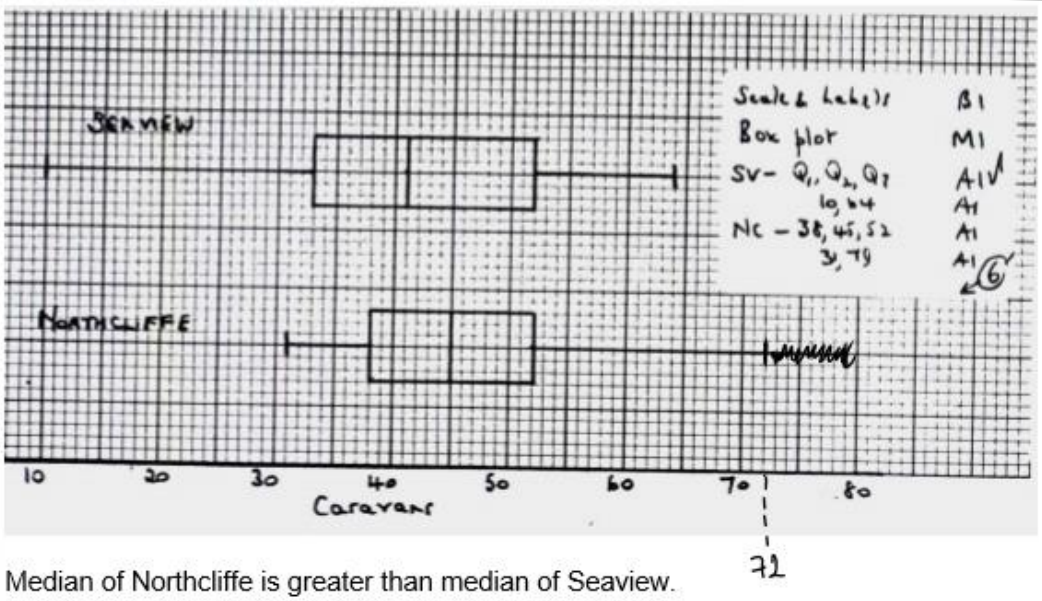
Representation of Data - Edexcel Past Exam Questions MARK SCHEME

Question 1 : Jan 05 Q2

(a)



(6)

(b) Median of Northcliffe is greater than median of Seaview.
Upper quartiles are the same
IQR of Northcliffe is less than IQR of Seaview
Northcliffe positive skew, Seaview negative skew any 3 acceptable comments **B1B1B1**

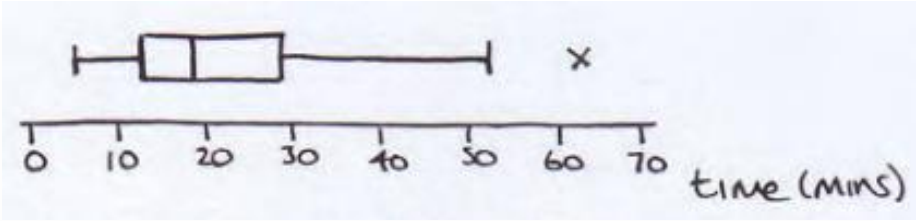
(3)

(c) On 75% of the nights that month **B1**
both had no more than 52 caravans on site. **B1**

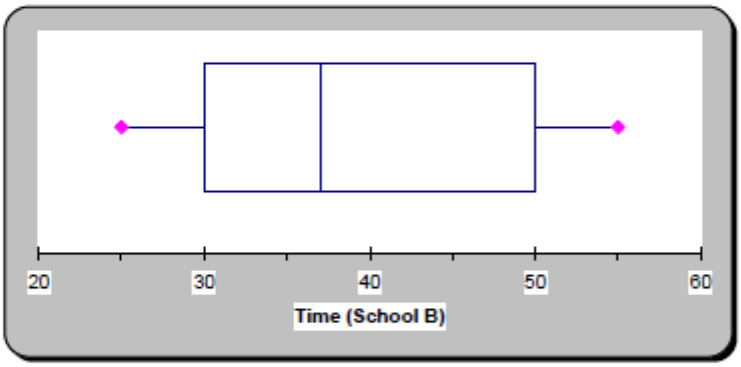
(2)

(Total 14 marks)

Question 2 : June 05 Q4

(a)	$1.5\,(Q_3 - Q_1) = 1.5\,(28 - 12) = 24$	may be implied	B1
	$Q_3 + 24 = 52 \Rightarrow$ 63 is an outlier	att Q3 +… or Q1 - …, 52 and -12or <0 or evidence of no lower outliers	M1, A1
	$Q_1 - 24 < 0 \Rightarrow$ no outliers	63 is an outlier	A1
			M1 A1 A1 (7)
(b)	Many delays are small so passengers should find these acceptable or sensible comment in the context of the question.		B1 (1)

Question 3 : June 06 Q1

(a)	Indicates max / median / min / upper quartile/ lower quartile (2 or more) Indicates outliers (or equivalent description) Illustrates skewness (or equivalent description e.g. shape) Any 3 rows Allows comparisons Indicates range / IQR / spread	B1 B1 B1 (3)
(b)(i)	37 (minutes)	B1
(ii)	Upper quartile or Q_3 or third quartile or 75^{th} percentile or P_{75}	B1 (2)
(c)	Outlier s How to calculate correctly 'Observations that are very different from the other observations and need to be treated with caution' These two children probably walked / took a lot longer Any 2	 B1 B1 (2)
(d)	 Box & median & whiskers Sensible scale 30,37,50 25,55	 M1 B1 B1 B1 (4)
(e)	Children from school A generally took less time Any correct 4 lines 50% of B ≤ 37 mins, 75% of A < 37 mins (similarly for 30) Median/Q1/Q3 of A < median/Q1/Q3 of B (1 or more) A has outliers, (B does not) Both positive skew IQR of A<IQR of B, range of A>range of B	 B1 B1 B1 B1 (4)

Question 4 : Jan 07 Q5

Question number	Scheme	Marks
(a)	Time is a <u>continuous</u> variable or data is in a <u>grouped</u> frequency table	B1 (1)
(b)	Area is proportional to frequency or $A \propto f$ or $A = kf$	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)
		7 marks

(b) 1st B1 for one of these correct statements.

"Area proportional to frequency density" or "Area = frequency" is B0

(c) 1st M1 for a correct combination of any 2 of the 4 numbers: 3.6, 2, 0.8 and 9

e.g. 3.6×2 or $\frac{3.6}{0.8}$ or $\frac{0.8}{2}$ etc BUT e.g. $\frac{3.6}{2}$ is M0

2nd M1 dependent on 1st M1 and for a correct combination of 3 numbers leading to 4th.

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 5 : June 07 Q2

Question Number	Scheme	Marks
(a)	$\frac{1}{2}$	**B1** (1)
(b)	54	**B1** (1)
(c)	+ is an 'outlier' or 'extreme value' Any heavy musical instrument or a statement that the instrument is heavy	**B1** **B1** (2)

Notes		
(a)	Accept 50% or half or 0.5. Units not required.	
(b)	Correct answer only. Units not required.	
(c)	'Anomaly' only award B0 Accept '85kg was heaviest instrument on the trip' or equivalent for second B1. Examples of common acceptable instruments; double bass, cello, harp, piano, drums, tuba Examples of common unacceptable instruments: violin, viola, trombone, trumpet, french horn, guitar	
(d)	'Quartiles equidistant from median' or equivalent award B1 then symmetrical or no skew for B1 Alternative: 'Positive tail is longer than negative tail' or 'median closer to lowest value' or equivalent so slight positive skew. B0 for 'evenly' etc. instead of 'symmetrical' B0 for 'normal' only	
(e)	**Please note that B mark appears first on ePEN** First line might be missing so first M1 can be implied by second. Second M1 for standardising with sigma and equating to z value NB Using 0.7734 should not be awarded second M1 Anything which rounds to 0.67 for B1. Accept 0.675 if to 3sf obtained by interpolation Anything that rounds to 13.3 - 13.4 for A1.	

Question 6 : 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)x5+(40-25)x1=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 7 : Jan 08 Q3

Question Number	Scheme	Marks

Width	1	1	4	2	3	5	3	12
Freq. Density	6	7	2	6	5.5	2	1.5	0.5

0.5×12 or 6 **A1**

M1

Total area is $(1\times6)+(1\times7)+(4\times2)+....,=70$

$(90.5-78.5)\times\frac{1}{2}\times\frac{140}{\text{their } 70}$ **M1**

"70 seen anywhere" **B1**

Number of runners is 12 **A1**

(5)

Total 5 marks

1st M1 for attempt at width of the correct bar (90.5 - 78.5) [Maybe on histogram or in table]

1st A1 for 0.5×12 or 6 (may be seen on the histogram. Must be related to the area of the bar above 78.5 - 90.5.

2nd M1 for attempting area of correct bar $\times\frac{140}{\text{their } 70}$

B1 for 70 seen anywhere in their working

2nd A1 for correct answer of 12.

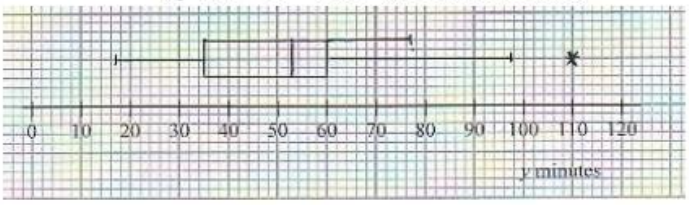
Minimum working required is $2\times0.5\times12$ where the 2 should come from $\frac{140}{70}$

Beware 90.5 - 78.5 = 12 (this scores M1A0M0B0A0)

Common answer is $0.5\times12=6$ (this scores M1A1M0B0A0)

If unsure send to review e.g. $2\times0.5\times12=12$ without 70 being seen

Question 8 : Jan 09 Q4

Question Number	Scheme	Marks
(a)	$Q_2 = 53, \quad Q_1 = 35, \quad Q_3 = 60$	B1, B1,B1 (3)
(b)	$Q_3 - Q_1 = 25 \Rightarrow Q_1 - 1.5\times 25 = -2.5$ (no outlier) $Q_3 + 1.5\times 25 = 97.5$ (so 110 is an outlier)	M1 A1 (2)
(c)		M1 A1ft A1ft (3)

(a)	1st B1 for median 2nd B1 for lower quartile 3rd B1 for upper quartile
(b)	M1 for attempt to find one limit A1 for both limits found and correct. No explicit comment about outliers needed.
(c)	M1 for a box and two whiskers 1st A1ft for correct position of box, median and quartiles. Follow through their values. 2nd A1ft for 17 and 77 or "their" 97.5 and *. If 110 is not an outlier then score A0 here. Penalise no gap between end of whisker and outlier. Must label outlier, needn't be with *. **Accuracy** should be within the correct square so 97 or 98 will do for 97.5

Question 9 : Jan 09 Q5

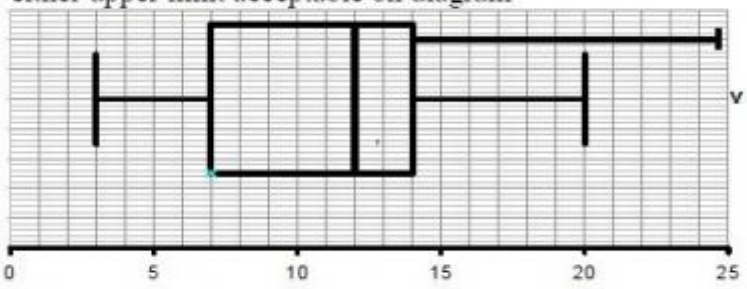
Question Number	Scheme	Marks
(a)	8-10 hours: width = 10.5 - 7.5 = 3 represented by 1.5cm 16-25 hours: width = 25.5 - 15.5 = 10 so represented by 5 cm 8- 10 hours: height = fd = 18/3 = 6 represented by 3 cm 16-25 hours: height = fd = 15/10 = 1.5 represented by 0.75 cm	B1 M1 A1 (3)
(b)	$Q_2 = 7.5 + \frac{(52-36)}{18} \times 3 = 10.2$	M1 A1
	$Q_1 = 5.5 + \frac{(26-20)}{16} \times 2 [= 6.25 \text{ or } 6.3]$ or $5.5 + \frac{(26.25-20)}{16} \times 2$ [=6.3]	A1
	$Q_3 = 10.5 + \frac{(78-54)}{25} \times 5 [= 15.3]$ or $10.5 + \frac{(78.75-54)}{25} \times 5$ [=15.45 \15.5]	A1 A1ft (5)
	IQR = (15.3 - 6.3) = 9	
(c)	$\sum fx = 1333.5 \Rightarrow \bar{x} = \frac{1333.5}{104} =$ AWRT 12.8	M1 A1
(d)	Use median and IQR, since data is skewed or not affected by extreme values or outliers	B1 B1 (2) [16]

(a)	M1 For attempting both frequency densities $\frac{18}{3}$ (= 6) and $\frac{15}{10}$, and $\frac{15}{10} \times$ SF, where SF ≠ 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
	1st A1 for 10.2 for median. Using $(n + 1)$ allow awrt 10.3
	NB:
	2nd A1 for a correct expression for either Q_1 or Q_3 (allow 26.25 and 78.75) Must see
	3rd A1 for correct expressions for both Q_1 and Q_3 some
(c)	4th A1ft for IQR, ft their quartiles. Using $(n + 1)$ gives 6.28 and 15.45 method
	1st M1 for attempting $\sum fx$ and $\bar{x}$
	2nd M1 for attempting $\sum fx^2$ and $\sigma_{n-1}, \sqrt{}$ is needed for M1. Allow s = awrt 9.93
(d)	1st B1 for choosing median and IQR. Must mention both. } Award independently 2nd B1 for suitable reason } e.g. "use median because data is skewed" scores B0B1 since IQR is not mentioned

Question 10 : June 09 Q3

Question Number	Scheme	Marks
(a)	1(cm) cao	B1
(b)	$10\ cm^2$ represents 15 $10/15\ cm^2$ represents 1 or $1cm^2$ represents 1.5 Therefore frequency of 9 is $\frac{10}{15}\times 9$ or $\frac{9}{1.5}$ Require $x\frac{2}{3}$ or $\div 1.5$ height = 6(cm)	M1 A1 [3]
Notes	If 3(a) and 3(b) incorrect, but their (a) x their (b)=6 then award B0M1A0 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.	

Question 11 : Jan 11 Q3

Question Number	Scheme	Marks
(a)	Outliers $14 + 1.5\times(14-7) = 24.5$ $7 - 1.5\times(14-7) = -3.5$ Outlier 25 either upper limit acceptable on diagram  	M1 A1 M1 A1ft B1 (5)
(b)	not true since the lower quartile is 7000 and therefore 75% above 7000 not 10000 or 10 is inside the box or any other sensible comment	B1 dB1 (2)

(a)	**A fully correct box-plot (either version) with no supporting work scores 5/5. Otherwise read on** 1st M1 for at least one correct calculation seen 1st A1 for 24.5 and −3.5 (or just negative noted) seen. May be read off the graph. If both values are seen but no calculation is given then M1A1,one value M1A0. 2nd M1 for a box with an upper and a lower whisker(s) with at least 2 correct values (condone no median marked) 2nd A1ft for 3.7, 12, 14 and 20 or 24.5 in appropriate places and readable off their scale If both upper whiskers are seen A0 Apply ft for their whiskers being compatible with their outlier limits e.g. if their lower limit is + 3.5 then a lower whisker ending at 4 or 3.5 is OK B1 for only one outlier appropriately marked at 25 **Apply ± 0.5 square accuracy for diagram**
(b)	1st B1 for rejecting the company's claim 2nd dB1 for an appropriate supporting reason. Dependent on rejecting company's claim.