

1. Rosie had 10 boxes of drawing pins.

She counted the number of drawing pins in each box.

The table gives information about her results.

Number of drawing pins	Frequency	
29	2	
30	5	
31	2	
32	1	

- (a) Write down the modal number of drawing pins in a box.

.....

(1)

- (b) Work out the range of the number of drawing pins in a box.

.....

(1)

- (c) Work out the mean number of drawing pins in a box.

.....

(3)

(Total 5 marks)

2. Rosie had 10 boxes of drawing pins.

She counted the number of drawing pins in each box.

The table gives information about her results.

Number of drawing pins	Frequency	
29	2	
30	5	
31	2	
32	1	

Work out the mean number of drawing pins in a box.

.....  
(Total 3 marks)

3. Charles found out the length of reign of each of 41 kings.  
He used the information to complete the frequency table.

Length of reign ( $L$ years)	Number of kings		
$0 < L \leq 10$	14		
$10 < L \leq 20$	13		
$20 < L \leq 30$	8		
$30 < L \leq 40$	4		
$40 < L \leq 50$	2		

- (a) Write down the class interval that contains the median.

.....  
(2)

- (b) Calculate an estimate for the mean length of reign.

..... years

(4)

(Total 6 marks)

4. 20 students scored goals for the school hockey team last month.  
The table gives information about the number of goals they scored.

Goals scored	Number of students	
1	9	
2	3	
3	5	
4	3	

- (a) Write down the modal number of goals scored.

.....

(1)

(b) Work out the range of the number of goals scored.

.....  
(1)

(c) Work out the mean number of goals scored.

.....  
(3)  
(Total 5 marks)

5. 20 students scored goals for the school hockey team last month.  
The table gives information about the number of goals they scored.

Goals scored	Number of students	
1	9	
2	3	
3	5	
4	3	

Work out the mean number of goals scored.

.....  
(Total 3 marks)

6. Anil counted the number of letters in each of 30 sentences in a newspaper.

Anil showed his results in a stem and leaf diagram.

0	8 8 9
1	1 2 3 4 4 8 9
2	0 3 5 5 7 7 8
3	2 2 3 3 6 6 8 8
4	1 2 3 3 5

Key 4 | 1 stands for 41 letters

- (a) Write down the number of sentences with 36 letters.

.....

**(1)**

- (b) Work out the range.

.....

**(1)**

- (c) Work out the median.

.....  
(1)  
(Total 3 marks)

7. Fred did a survey on the areas of pictures in a newspaper.  
The table gives information about the areas.

Area ( $A \text{ cm}^2$ )	Frequency
$0 < A \leq 10$	38
$10 < A \leq 25$	36
$25 < A \leq 40$	30
$40 < A \leq 60$	46

Work out an estimate for the mean area of a picture.

.....cm<sup>2</sup>  
(Total 4 marks)

8. Emma repairs bicycles.  
She keeps records of the cost of the repairs.

The table gives information about the costs of all repairs which she carried out in one week.

Cost (£C)	Frequency
$0 < C \leq 10$	3
$10 < C \leq 20$	7
$20 < C \leq 30$	6
$30 < C \leq 40$	8
$40 < C \leq 50$	9

Find the class interval in which the median lies.

.....  
(Total 2 marks)

9. Fred did a survey of the time, in seconds, people spent in a queue at a supermarket. Information about the times is shown in the table.

Time ( $t$ seconds)	Frequency
$0 < t \leq 40$	8
$40 < t \leq 80$	12
$80 < t \leq 120$	14
$120 < t \leq 160$	16
$160 < t \leq 200$	10

- (a) Write down the modal class interval.

.....seconds

(1)

A person is selected at random from the people in Fred's survey.

- (b) Work out an estimate for the probability that the person selected spent more than 120 seconds in the queue.

.....

(2)

(Total 3 marks)



10. Fred did a survey of the time, in seconds, people spent in a queue at a supermarket. Information about the times is shown in the table.

Time( $t$ seconds)	Frequency
$0 < t \leq 40$	8
$40 < t \leq 80$	12
$80 < t \leq 120$	14
$120 < t \leq 160$	16
$160 < t \leq 200$	10

A person is selected at random from the people in Fred's survey.

Work out an estimate for the probability that the person selected spent more than 120 seconds in the queue.

.....  
(Total 2 marks)

11. Bill recorded the times, in minutes, taken to complete his last 40 homeworks.

This table shows information about the times.

Time ( $t$ minutes)	Frequency	
$20 \leq t < 25$	8	
$25 \leq t < 30$	3	
$30 \leq t < 35$	7	
$35 \leq t < 40$	7	
$40 \leq t < 45$	15	

- (a) Find the class interval in which the median lies.

.....  
(1)

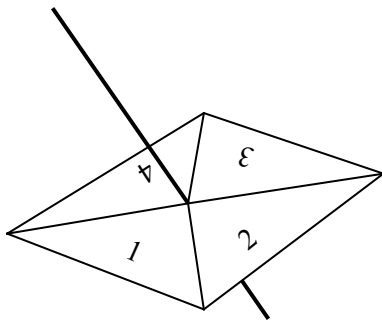
- (b) Calculate an estimate of the mean time it took Bill to complete each homework.

.....minutes

(4)

(Total 5 marks)

12. Here is a 4-sided spinner.



The sides of the spinner are labelled 1, 2, 3 and 4.  
Hanif spins the spinner 100 times.

His results are shown in the table.

Score	Frequency
1	26
2	26
3	23
4	25

- (a) Is the spinner fair?  
Give a reason for your answer.

.....  
.....

(1)

- (b) Work out the mean score.

.....

(3)  
(Total 4 marks)

13. Janine recorded the times, in seconds, for each of 15 people to do a puzzle. Here are her results.

90 81 78 83 68  
 75 79 81 69 87  
 76 91 67 73 81

- (a) Complete the ordered stem and leaf diagram and key to show these results.

6	
7	
8	
9	

Key

(3)

Janine says “To find the median time, you add all the results and divide by 15”

Janine is **wrong**.

- (b) (i) Explain how to find the median.

.....  
 .....

- (ii) Find the median.

..... s

(2)  
 (Total 5 marks)

14. The table gives some information about the time taken by a group of 100 students to complete an IQ test.

Time ( $t$ seconds)	Frequency	
$60 < t < 70$	12	
$70 < t < 80$	22	
$80 < t < 90$	23	
$90 < t < 100$	24	
$100 < t < 110$	19	

- (a) Write down the modal class interval.

.....

(1)

- (b) Calculate an estimate for the mean time taken by the students.

..... seconds

(4)

(Total 5 marks)

15. The table gives some information about the time taken by a group of 100 students to complete an IQ test.

Time ( $t$ seconds)	Frequency	
$60 < t \leq 70$	12	
$70 < t \leq 80$	22	
$80 < t \leq 90$	23	
$90 < t \leq 100$	24	
$100 < t \leq 110$	19	

Calculate an estimate for the mean time taken by the students.

..... seconds  
(Total 4 marks)

16. Ali found out the number of rooms in each of 40 houses in a town. He used the information to complete the frequency table.

Number of Rooms	Frequency	
4	4	
5	7	
6	10	
7	12	
8	5	
9	2	

Ali said that the mode is 9  
Ali is wrong.

- (a) Explain why.

.....  
.....

(1)

- (b) Calculate the mean number of rooms.

.....

(3)  
(Total 4 marks)

17. The table gives information about the times, in minutes, that 106 shoppers spent in a supermarket.

Time ( $t$ minutes)	Frequency	
$0 < t \leq 10$	20	
$10 < t \leq 20$	17	
$20 < t \leq 30$	12	
$30 < t \leq 40$	32	
$40 < t \leq 50$	25	

- (a) Find the class interval that contains the median.

.....

(1)

- (b) Calculate an estimate for the mean time that the shoppers spent in the supermarket. Give your answer correct to 3 significant figures.

..... minutes

(4)

(Total 5 marks)

18. A shop sells mobile phones. The table shows the number of mobile phones sold each month from January to May.

Jan	Feb	Mar	Apr	May
70	64	73	85	91



- (a) Work out the percentage increase in the number of mobile phones sold from April to May.  
Give your answer correct to 3 significant figures.

..... %

(3)

- (b) Work out the 3-month moving averages for the information in the table.  
The first one has been worked out for you.

.....69.....

(2)

(Total 5 marks)

19. Majid carried out a survey of the number of school dinners 32 students had in one week.

The table shows this information.

Number of school dinners	Frequency	
0	0	
1	8	
2	12	
3	6	
4	4	
5	2	

Calculate the mean.

.....  
(Total 3 marks)

20. Sethina recorded the times, in minutes, taken to repair 80 car tyres. Information about these times is shown in the table.

Time ( $t$ minutes)	Frequency		
$0 < t \leq 6$	15		
$6 < t \leq 12$	25		
$12 < t \leq 18$	20		
$18 < t \leq 24$	12		
$24 < t \leq 30$	8		

Calculate an estimate for the mean time taken to repair each car tyre.

..... minutes  
(Total 4 marks)

21. Marcus collected some pebbles.  
He weighed each pebble.

The grouped frequency table gives some information about weights.

Weight ( $w$ grams)	Frequency		
$50 \leq w < 60$	5		
$60 \leq w < 70$	9		
$70 \leq w < 80$	22		
$80 \leq w < 90$	27		
$90 \leq w < 100$	17		

Work out an estimate for the mean weight of the pebbles.

..... grams  
(Total 4 marks)

22. Shirin recorded the number of students late for school each day for 21 days. The stem and leaf diagram shows this information.

Number of students late

1	4 5 7 8 8 9
2	2 2 5 6 6 7 7 9 9 9
3	0 1 3 4 6

Key:  
1|4 means  
14 students late

- (a) Find the median number of students late for school.

.....

**(1)**

- (b) Work out the range of the number of students late for school.

.....

**(1)**

**(Total 2 marks)**

23. A teacher asked 50 children how much pocket money they got each week. The table shows some information about their replies.

Pocket money (£ $x$ )	Frequency
$0 < x \leq 2$	1
$2 < x \leq 4$	10
$4 < x \leq 6$	23
$6 < x \leq 8$	14
$8 < x \leq 10$	2

Work out the estimate for the mean amount of pocket money the children got.

£ .....

(Total 4 marks)

24. There are 10 children in a playgroup.  
The table shows information about the ages, in years, of these children.

Age in years	Frequency
2	3
3	5
4	2

Work out the mean age of the children.

..... years  
(Total 3 marks)

25. Mark recorded the number of e-mails he received each day for 21 days.  
The stem and leaf diagram shows this information.

Number of e-mails

0		4 5 5 6 7 7 8 9
1		0 1 2 3 3 4 6 7 8
2		0 1 3 6

Key
2 6 means 26 e-mails

- (a) Find the median number of e-mails that Mark received in the 21 days.

..... (1)

- (b) Work out the range of the number of e-mails Mark received in the 21 days.

.....

(1)  
(Total 2 marks)

26. The table gives information about the time taken by 20 students to travel to school.

Time ( $t$ minutes)	Frequency	
$0 < t \leq 5$	2	
$5 < t \leq 10$	8	
$10 < t \leq 15$	4	
$15 < t \leq 20$		
$20 < t \leq 25$	3	

Work out an estimate for the mean time.

.....minutes

(Total 4 marks)

27. 80 people work in Joe's factory.  
The table shows some information about the annual pay of these 80 workers.

Annual pay (£ $x$ )	Number of workers
$10\,000 < x \leq 14\,000$	32
$14\,000 < x \leq 16\,000$	24
$16\,000 < x \leq 18\,000$	16
$18\,000 < x \leq 20\,000$	6
$20\,000 < x \leq 40\,000$	2



- (a) Write down the modal class interval.

.....

(1)

- (b) Find the class interval that contains the median.

.....

(1)

(Total 2 marks)

28. Vanessa made 80 phone calls last month.

The table gives information about the length of the calls.

Length of call ( $t$ minutes)	Frequency		
$0 < t \leq 10$	20		
$10 < t \leq 20$	32		
$20 < t \leq 30$	14		
$30 < t \leq 40$	9		
$40 < t \leq 50$	5		

Work out an estimate for the mean length of the calls.

..... minutes  
(Total 4 marks)

29. Josh asked 30 adults how many cups of coffee they each drank yesterday.

The table shows his results.

Number of cups	Frequency	
0	5	
1	9	
2	7	
3	4	
4	3	
5	2	

Work out the mean.

.....  
(Total 3 marks)

30. Josh asked 30 students how many minutes they each took to get to school.

The table shows some information about his results.

Time taken ( $t$ minutes)	Frequency		
$0 < t \leq 10$	6		
$10 < t \leq 20$	11		
$20 < t \leq 30$	8		
$30 < t \leq 40$	5		

Work out an estimate for the mean number of minutes taken by the 30 students.

..... minutes  
(Total 4 marks)

31. Zach has 10 CDs.  
The table gives some information about the number of tracks on each CD.

Number of tracks	Frequency	
11	1	
12	3	
13	0	
14	2	
15	4	

- (a) Write down the mode.

.....

(1)

- (b) Work out the mean.

.....

(3)  
(Total 4 marks)

32. Zach has 10 CDs.  
The table gives some information about the number of tracks on each CD.

Number of tracks	Frequency	
11	1	
12	3	
13	0	
14	2	
15	4	

Work out the mean.

.....

(Total 3 marks)

01. (a) 30 1  
*B1 cao*

(b) 3 1  
*B1 cao*

(c) 30.2 3

$$2 \times 29 = 58$$

$$5 \times 30 = 150$$

$$2 \times 31 = 62$$

$$1 \times 32 = 32$$

$$\frac{302}{10} = 30.2$$

*M1 for freq  $\times$  no pins*

*M1 (dep on 1st M1) for totalling and  $\div 10$*

*A1 for 30.2 cao*

**[5]**

02. 30.2 3

$$2 \times 29 = 58$$

$$5 \times 30 = 150$$

$$2 \times 31 = 62$$

$$1 \times 32 = 32$$

$$\frac{302}{10} = 30.2$$

*M1 for freq  $\times$  no. pins (at least 3)*

*M1 for totalling and for  $\div 10$*

*(dep on 1<sup>st</sup> M1)*

*A1 cao*

**[3]**

03. (a)  $10 < L \leq 20$  2

*M1 for use of cumulative frequency to find the 20.5<sup>th</sup> or 21<sup>st</sup> value*

*A1 cao for the correct range – any form*

(b) 16.95 4

$$(5 \times 14) + (15 \times 13) + (25 \times 8) + (35 \times 4) + (45 \times 2) = 70 + 195 + 200 + 140 + 90 = 695$$

$$695 \div 41 =$$

*MI  $\Sigma fx$  using values within intervals (including ends), at least 4 consistently*

*MI (dep)  $\Sigma fx$  using midpoints*

*MI (dep on 1<sup>st</sup> MI) "695"  $\div$  41*

*AI for 16.95 – 17 years or 17.45 – 17.5 years*

[6]

04. (a) 1 1

*BI for 1*

(b) 3 1

*BI for 3*

(c) 2.1 3

$$9 \times 1 + 3 \times 2 + 5 \times 3 + 3 \times 4 (= 42)$$

$$"42" \div 20$$

*MI for  $9 \times 1, 3 \times 2, 5 \times 3, 3 \times 4$  or for 42 seen*

*MI (dep) for "42"  $\div$  20*

*AI for 2.1 or  $2 \frac{1}{10}$  or  $2 \frac{2}{20}$*

[5]

05. 2.1 3

$$9 \times 1 + 3 \times 2 + 5 \times 3 + 3 \times 4 (= 42)$$

$$"42" \div 20$$

*MI for  $9 \times 1, 3 \times 2, 5 \times 3, 3 \times 4$  or for 42 seen*

*MI (dep) "42"  $\div$  20*

*AI for 2.1 or  $2 \frac{1}{10}$  or  $2 \frac{2}{20}$*

[3]

06. (a) 2 1  
*Bl cao*
- (b) 37 1  
 45 – 8  
*Bl cao*
- (c) 27 1  
*Bl cao*
- [3]**
07.  $38 \times 5; 36 \times 17.5; 30 \times 32.5; 46 \times 50;$   
 (= 190; 630; 975; 2300)  
 $\Sigma fx = 190 + 630 + 975 + 2300 = 4095$   
 Mean  $\Sigma fx / \Sigma f = 4095 / 150$   
 27.3 4  
*MI for fx within intervals (including ends) at least two consistently*  
*MI (dep) fx consistently using midpoints*  
*MI (dep on 1<sup>st</sup> M) for use of  $\Sigma fx / \Sigma f$*   
*AI for 27.3*
- [4]**
08.  $30 < C \leq 40$  2  
*MI evidence of attempt to find the position in which the median lies (eg counting or  $\Sigma \frac{f}{2}$  or  $\Sigma \frac{f+1}{2}$ )*  
*AI cao*  
*NB:  $\frac{33}{2}$  leading to correct answer MIA1 but leading to 20 – 30 award MIA0; also  $(33 + 1) \div 2$*
- [2]**
09. (a)  $120 < t \leq 160$  1  
*Bl correct interval eg 120–160*



(b)  $\frac{26}{60}$

2

$$MI (16 + 10) \div '60' \text{ or } 26 \text{ seen or } \frac{16}{60}$$

*Al oe***[3]**

10.  $\frac{26}{60}$

2

$$MI (16 + 10) \div '60' \text{ or } 26 \text{ seen or } \frac{16}{60}$$

*Al oe***[2]**

11. (a)  $35 \leq t < 40$

1

*BI for correct interval*

(b)  $8 \times 22.5$   
 $3 \times 27.5$   
 $7 \times 32.5$   
 $7 \times 37.5$   
 $15 \times 42.5$   
 $1390 \div 40$   
34.75

4

*MI for fx consistently within interval including ends (allow 1 error)**MI (dep) consistently using midpoints.**MI (dep on 1<sup>st</sup> M) for  $\sum fx \div \sum f$* *Al for 34.75 or 34.7 or 34.8***[5]**

12. (a) Reason 1  
*BI for 'The frequencies are nearly equal' oe*

(b)  $1 \times 26 + 2 \times 26 + 3 \times 23 + 4 \times 25 = 247$   
 $247/100$   
 $= 2.47$  3  
*MI for  $fx$  (attempting at least 2 relevant products)*  
*MI for  $\sum fx \div 100$*   
*AI 2.47 cao*

[4]

13. (a)

6	8	9	7		
7	8	5	9	6	3
8	1	3	1	7	1
9	0	1			

6	7	8	9		
7	3	5	6	8	9
8	1	1	1	3	7
9	0	1			

*MI for unordered diagram (condone one error)*  
*AI cao*  
*BI for key (eg 6 | 7 = 67)*

3

(b) (i) Explanation 2  
*BI for '(order numbers and) select middle value' oe*

(ii) 79 2  
*BI cao*  
*BI cao*

[5]

14. (a)  $90 < t \leq 100$  1  
*B1 for  $90 < t \leq 100$ ; accept  $90 - 100$ .*

(b)  $65 \times 12 = 780$   
 $75 \times 22 = 1650$   
 $85 \times 23 = 1955$   
 $95 \times 24 = 2280$   
 $105 \times 19 = 1995$   
 $8660/100 =$   
 $= 86.6$  4

*M1 for use of  $fx$  with  $x$  consistent within intervals (including end points). Allow one slip.*

*M1 (dep) for use of midpoints*

*M1 (dep on 1<sup>st</sup> M1) for use of  $\sum fx/100$  or  $\sum fx/\sum f$*

*A1 86.6*

[5]

15.  $65 \times 12 = 780$   
 $75 \times 22 = 1650$   
 $85 \times 23 = 1955$   
 $95 \times 24 = 2280$   
 $105 \times 19 = 1995$   
 $8660/100 = 86.6$  4

*M1 for use of  $fx$  with  $x$  consistent within intervals (including end points). Allow one slip even if outside interval*

*M1 (dep) for use of midpoints*

*M1 (dep on 1<sup>st</sup> M1) for use of  $\sum fx/100$  or  $\sum fx/\sum f$*

*A1 86.6*

[4]

16. (a) Reason 1  
*B1 eg "mode is 7"*

*"the mode is the one which is there the most"*

*"because its got the lowest frequency"*

$$\begin{aligned}
 \text{(b)} \quad & 4 \times 4 = 16 \\
 & 5 \times 7 = 35 \\
 & 6 \times 10 = 60 \\
 & 7 \times 12 = 84 \\
 & 8 \times 5 = 40 \\
 & 9 \times 2 = 18
 \end{aligned}$$

$$\text{Mean} = \frac{\sum fx}{\sum f} = \frac{253}{40}$$

$$= 6.325$$

3

*MI  $\sum fx$  (at least 3, implied by answers) or 253 seen*

$$\text{MI (dep)} \frac{\sum fx}{\sum f} =$$

*AI 6.325, 6.33, 6.3, 6.32*

[4]

$$17. \quad \text{(a)} \quad (106 + 1) \div 2 \text{ th value}$$

1

$$= 30 < T \leq 40$$

*BI cao*

$$\begin{aligned}
 \text{(b)} \quad & 5 \times 20 + 15 \times 17 + 25 \times 12 + 35 \times 32 + 45 \times 25 = \\
 & = (100 + 255 + 300 + 1120 + 1125) \div 106 \\
 & = 2900 \div 106
 \end{aligned}$$

4

$$= 27.4$$

*MI fx consistent within each interval, allow 1 error.*

*MI use of midpoints in fx*

$$\text{MI (dep on 1<sup>st</sup> MI)} \frac{\sum fx}{\sum f}$$

*AI 27.3 – 27.4*

[5]

18. (a)  $\frac{91-85}{85} \times 100 = \frac{6}{85} \times 100 = 7.05882..$   
7.06%

3

M2  $\frac{91-85}{85} \times 100$

(M1  $\frac{91-85}{85}$  or sight of  $\frac{6}{85}$  or 0.0705 – 0.071 or  $\frac{91}{85}$  or

1.0705 – 1.071)

A1 7.05 – 7.06

Or

M1  $\frac{91}{85} \times 100 (= 107.05)$

M1 (dep) “107.05” – 100

A1 7.05-7.06

T&I methods must lead to an answer 7.05 – 7.06 for full marks, otherwise 0 marks

(b)  $(64 + 73 + 85)/3 = 222/3 = 74$   
 $(73 + 85 + 91)/3 = 249/3 = 83$   
74, 83

2

M1 for  $(64 + 73 + 85)/3$  or  $(73 + 85 + 91)/3$  or  $222/3$  or  $249/3$  or 74 or 83 (condone missing brackets)

A1 both answers in the correct order cao

[5]

19.  $(0 \times 0) + 1 \times 8 + 2 \times 12 + 3 \times 6 + 4 \times 4 + 5 \times 2 = 76$   
 $76 \div ((0) + 8 + 12 + 6 + 4 + 2)$

2.375

3

M1 for  $1 \times 8$  and  $2 \times 12$  and  $3 \times 6$  and  $4 \times 4$  and  $5 \times 2$  condone one error or sight of 76.

M1 (dep on 1st M1) for  $\Sigma fx \div \Sigma f$

A1 for 2.375 or 2.37 or 2.38 or 2.4

[3]

20.  $15 \times 3 = 45$        $15 \times 3.5$   
 $25 \times 9 = 225$        $25 \times 9.5$   
 $20 \times 15 = 300$        $20 \times 15.5$   
 $12 \times 21 = 252$        $12 \times 21.5$   
 $8 \times 27 = 216$        $8 \times 27.5$   
 $1038 \div 80 =$        $1078 \div 80 =$   
 $12.97 - 13.48$  4
- MI for fx consistently within interval including ends (allow 1 error)*  
*MI (dep) consistently using appropriate midpoints*  
*MI (dep on first M) for  $\Sigma fx \div \Sigma f$*   
*AI for 12.97 – 13.48* [4]
21. (a) 80.25 4
- $55 \times 5 + 65 \times 9 + 75 \times 22 + 85 \times 27 + 95 \times 17 = 6420$   
Mean =  $\frac{6420}{80}$   
*MI for fx values within intervals (const.)*  
*MI for using correct midpoints*  
*MI (dep on at least one MI) for summing fx and dividing by 80*  
*AI cao* [4]
22. (a) 26 1  
*BI cao*
- (b) 22 1  
*BI cao* [2]
23. 5.24 4
- $(1 \times 1) + (3 \times 10) + (5 \times 23) + (7 \times 14) + (9 \times 2) = 262$   
Mean =  $\frac{262}{50}$   
*MI for fx values within intervals (consistent)*  
*MI for using correct midpoints*  
*MI (dep on at least MI) for summing fx and dividing by 50*  
*AI cao* [4]

24. 2.9 3
- $2 \times 3 + 3 \times 5 + 4 \times 2 = 6 + 15 + 8 = 29$   
 $29 \div 10$
- M1 for  $2 \times 3$  or  $3 \times 5$  or  $4 \times 2$   
 or listing all 10 ages  
 or 29 seen  
 M1 (dep) for adding and dividing by “3 + 5 + 2”  
 A1 cao*
- [3]
25. 12 2  
 22
- B1 for 12, accept  $\frac{1}{2}$   
 B1 cao*
- [2]
26.  $2.5 \times 2 + 7.5 \times 8$   
 $+ 12.5 \times 4 + 17.5 \times 3 + 22.5 \times 3$   
 (= 235)  
 “235”/20  
 11.75 4
- M1 for use of  $fx$  with  $x$  consistent within intervals (including end points)  
 M1 (dep) for use of mid-intervals  
 M1 (dep on 1<sup>st</sup> M1) for summing and dividing by 20  
 A1 cao*
- [4]
27. (a)  $10000 < x \leq 14000$  1  
*B1*
- (b)  $14000 < x \leq 16000$  1  
*B1*
- [2]

28.  $(20 \times 5) + (32 \times 15) + (14 \times 25) + (9 \times 35) + (5 \times 45)$   
 $= 100 + 480 + 350 + 315 + 225$   
 $1470 \div 80 = 18.375$   
 18.4 4
- M1 for  $f \times$  consistent part of interval condone 2 errors*  
*M1 for  $f \times$  mid interval (allow 2 arithmetic errors)*  
*M1 (dep on first M1) for “1470”  $\div$  80*  
*A1 for 18.4 or better*
- [4]**
- 
29.  $(0 \times 5) + (1 \times 9) + (2 \times 7) + (3 \times 4) + (4 \times 3) + (5 \times 2)$   
 $0 + 9 + 14 + 12 + 12 + 10$   
 $57 \div 30$   
 1.9 3
- M1 for  $0 \times 5, 1 \times 9$ , etc (min 3 attempts shown) may be implied by 0, 9 etc*  
*M1 (dep) for attempt to add and divide by 30*  
*A1 cao*  
*(B2 sc for 2.06 – 2.1)*
- [3]**
- 
30.  $(6 \times 5) + (11 \times 15) + (8 \times 25) + (5 \times 35) = 570$   
 $“570” \div “(6 + 11 + 8 + 5)”$   
 19 4
- M1 for use of  $fx$  with  $x$  consistent within intervals (including end points) accept one error*  
*M1 (dep) for use of midpoints*  
*M1 (dep on 1st M1) for use of  $\Sigma fx / \Sigma f$*   
*A1 cao*
- [4]**
- 
31. (a) 15 1
- B1 cao*



$$\begin{aligned}
 \text{(b)} \quad & (1 \times 11 + 3 \times 12 + 0 \times 13 + 2 \times 14 + 4 \times 15) \div 10 \\
 & = 135 \div 10 \\
 & = 11 + 36 + 0 + 28 + 60 \\
 & 13.5
 \end{aligned}$$

3

*M1 for  $1 \times 11$  or  $3 \times 12$  or  $0 \times 13$  or  $2 \times 14$  or  $4 \times 15$  or sight of any two or more of the correct answers 11, 36, 0, 28, 60 (must be from a product however)*

*M1 (dep) for adding 4 or 5 of these products and dividing by 10*  
*AI cao*

*[SC: B2 available for using ' $13 \times 0 = 13$ ' without further mistakes] giving an answer of 14.8*

[4]

$$\begin{aligned}
 32. \quad & (1 \times 11 + 3 \times 12 + 0 \times 13 + 2 \times 14 + 4 \times 15) \div 10 \\
 & = 135 \div 10 \\
 & = 11 + 36 + 0 + 28 + 60 \\
 & 13.5
 \end{aligned}$$

3

*M1 for  $1 \times 11$  or  $3 \times 12$  or  $0 \times 13$  or  $2 \times 14$  or  $4 \times 15$  or sight of any two or more of the correct answers 11, 36, 0, 28, 60 (must be from a product however)*

*M1 (dep) for adding 4 or 5 of these products and dividing by 10*  
*AI cao*

*[SC: B2 available for using ' $13 \times 0 = 13$ ' without further mistakes] giving an answer of 14.8*

[3]

### 01. Mathematics A Paper 1

A minority of candidates achieved some success with the first two parts but very few made any headway with the last part. In the second part, some of the candidates who had some knowledge of range, albeit imperfect, gave answers such as  $29 - 32$  and  $5 - 1 = 4$  while, in part (c), the majority of candidates either gave 30 with no working or found the sum of 29, 30, 31 and 32 and then divided their result, usually by 4 and sometimes by 10. Apart from the usual confusion of mean, mode and median, interpreting the table was an additional stumbling block. In recognition of this, one mark was awarded for listing the ten numbers, even if the candidate subsequently attempted to find the median.

### Mathematics B Paper 14

Some stronger candidates scored a mark on part (a) or part (b). Very few scored any marks on (c), where  $124 \div 4$  was the most common attempt yielding an answer of  $30r^2$  or 30.5.

02. This question proved to be a good discriminator. Some candidates wrote out all the values in an attempt to find the median, whilst others stated the mode. A significant number found 302, but then failed to undertake a division. The most common error was the calculation  $122 \div 4$  or  $122 \div 10$ . It was disappointing when candidates exhibited correct method, flawed by poor summation of  $fx$  values.

03. **Paper 4**

Candidates rarely showed a correct understanding of how to work towards the median. Common misconceptions included 20.5 as *the* median, or 8 being the median as it is the middle number of the frequencies. Only a minority of candidates arrived at the correct answer. Part (b) is usually well answered, but in this paper there were few correct answers; indeed, most candidates appeared to know little about even using midpoints in their calculations. Of those who did use  $f \times x$ , a common error was to divide their sum by 5. It was discouraging to see tables completed correctly, but this work then being abandoned and replaced by simple, but incorrect statements such as  $41 \div 5 = 8.2$

**Paper 6**

Another standard question, this time on data handling. A few candidates calculated the wrong median by finding  $42 \div 2 = 21$  and then writing down the interval  $20 - 30$

The mean was generally found correctly, although there were a few who found the sum of the frequencies and divided by 5. Candidates could assume the midpoints were, for example, at 5 or 5.5 for full marks as age can be treated as a discrete variable.

04. This question was not well understood and very poorly answered. Many of the answers given by candidates (particularly in the first two parts) were larger than four: the greatest number of goals scored.
- (a) Only 14% of the answers seen were correct. Many candidates recorded the answer '9' whilst others confused the mode with the median or the range.
- (b) A slightly higher proportion of candidates (18%) answered this part correctly. Giving the range '1 - 4' was a popular response, but this is not enough to gain the mark for 'range' in a mathematics paper.
- (c) Of those candidates who attempted this part of the question, most worked out '10  $\div$  4', '20  $\div$  4', or '20  $\div$  10' rather than the correct '42  $\div$  20'. The correct answer was given by less than 0.3% of candidates though 7% of candidates worked out the total correctly.
05. Many candidates worked out the  $fx$  values and summed these to 42 but this total was often divided by 4 or 10. Those who did attempt the calculation  $42 \div 20$  often gave an answer of 2.2. The weaker candidates thought that the mean could be obtained by dividing 20 (the number of students) by either 4 or 10.

06. This question assessed the ability of candidates to interpret stem & leaf diagrams. Most candidates gained the mark in (a) for reading off a value correctly. In parts (b) and (c) fewer than half the candidates gained the mark, mainly due to their not understanding the terms “range” and “median”.
07. It was disappointing that although this is a standard question, there were relatively few correct answers. Many candidates simply divided 150 by 4 and gave an answer of 37.5. Even those who knew how to find an estimate of the mean had problems finding the correct midpoints for the 10 – 25 and 25 – 40 intervals. Unfortunately, some candidates divided  $\sum fx$  by 4 instead of by the total frequency and failed to recognize that their answer was considerably larger than the areas in the table.

#### 08. Intermediate Tier

The most common answer was  $10 < C \leq 10$  obtained by rearranging the frequencies in order 3, 6, 7, 8, 9 and finding 7 in the middle, then proceeding to give the cost corresponding to the frequency of 7. Others gave  $20 < C \leq 30$  since this was the middle band of the costs given. There were also some attempts to find the mean (as evidenced by use of midpoints). Overall the question was not well answered.

#### Higher Tier

Responses to this question were generally sound. Most candidates knew that they had to find the mid value of the frequencies in some way. The responses were equally split between  $33 \div 2$  or  $(33 + 1) \div 2$  and virtually all candidates were sensible and related this to a class interval in the table - either the correct one or the previous interval. Very few candidates selected the middle of the given frequency intervals.

#### 09. Specification A

Surprisingly only about 1/3 of candidates answered part (a) correctly. Many demonstrated their confusion with the median (or mean) by choosing the interval from 80. Some chose the correct interval but then spoiled their answer by giving the midpoint or the frequency as their answer. Part (b) was well answered. Most used fractions and there were few cases of incorrect notation. The most common errors included incorrect totalling of the frequencies, picking out the 16 only (to give  $\frac{16}{60}$ ) or stating the 26, but not as a probability.

**Specification B**

Part (a) was not answered well, many candidates showing a clear misunderstanding of the requirements of the question, often giving values 120, 140 or 160 only as their answer. In part

(b) most candidates gained at least 1 mark and usually 2. Common wrong answers were  $\frac{16}{60}$  or  $\frac{26}{50}$ ; these gained one mark only.

10. This question was done well by many candidates. Most appreciated the need to add the frequencies for both intervals to gain at least one mark for 26. The most common incorrect answers were  $\frac{16}{60}$  and  $\frac{26}{50}$ ; and, less commonly,  $\frac{1}{26}$ ,  $\frac{34}{60}$ , and  $\frac{16}{60} \times \frac{26}{50}$ .

**11. Intermediate Tier**

Part (a) was not answered well. There was little evidence of correct methods to find the median and many gave the middle interval or the value 7. Although estimating the mean of a set of grouped data is a standard question, part (b) proved to be too difficult for many candidates. The most common incorrect method was  $40 \div 5 = 8$ . Others added the midpoints and divided by 5. Even those with some idea often used the beginnings or ends of the intervals instead of the midpoints. Arithmetic errors were common.

**Higher Tier**

On part (a), students had to identify the median class interval. Part (b) was a standard calculation of the estimate of a mean from a grouped frequency distribution. Many candidates scored full marks for the part. There were many incorrect or incomplete solutions where the wrong midpoint was used or inconsistent midpoints were used to calculate the total time.

12. This question was poorly done by nearly all the candidates. In part (a) most of the common responses were the spinner is fair because Frequencies add up to 100. The spinner has equal sides. All the frequencies are in 20's Numbers are all even. There is one of each number in the spinner. It has 4 sides, therefore equal chance of getting any number.

Some of them said 'The spinner is not fair because the frequencies should be all 25 and they are not'. It was clear that most of the candidates didn't know the difference between the theoretical and experimental probabilities.

In part (b) there were extremely few correct solutions or even part solutions. The candidate's ability to calculate the mean from a frequency table was very disappointing. The usual errors were in evidence:

Adding the frequencies and dividing by 4  
Adding the scores and dividing by 4.

13. This type of question is being tackled more successfully than in the past and the majority of candidates were able to gain some marks in part (a). Many completely correct diagrams together with key were seen. Some candidates did not transfer all the data into the diagram and some forgot to order the leaves. A common misconception was to include the tens component of the number in the leaf section of the diagram and write 67 68 69 instead of 7 8 9. Many candidates did not understand the concept of a key. Some groups of candidates appeared to be unfamiliar with stem and leaf diagrams and did not attempt this part of the question.

Part (b) was answered quite well. In (i) most candidates knew that the median is the middle value but some then gave incorrect or ambiguous explanations of how to find this value. The most common error in (ii) was to divide 15 by 2 and give the 7.5<sup>th</sup> value (78.5) as the median. Some candidates identified the correct value in their diagram but gave the answer as 9 instead of 79. Surprisingly some candidates (even those with a correct stem and leaf diagram) proceeded to list the numbers again in a line in order to find the median.

14. In part (a) most candidates understood the modal class interval and gave the correct interval, sometimes writing it without inequality signs, but nevertheless unambiguously. Weaker candidates confused the mode with the median, and gave the class interval 80-90.

Correct answers to part (b) were in the minority. Most who used  $fx$  used the midpoint correctly rather than using another value in the interval. Mistakes included adding up the frequency incorrectly (though 100 was stated in the question), dividing by 5, or adding up a cumulative frequency and dividing by 5. A significant number performed  $fx$  in the table, but then chose to use another method to work out an incorrect answer in the part (b) answer space, which would receive no marks.

15. This was a standard task which was well carried out by many of the candidates. Even on this paper there were the usual misapprehensions, such as  $100 \div 5 = 20$  and  $8660 \div 5 = 1720$  as well as some students thinking that the midpoint of the first interval was at 65.5.
16. Some candidates could clearly explain why the mode was not nine. However, most answers were confused or unclear and could not be given any credit. Part (b) of the equation proved to be beyond nearly all candidates and most simply found the mean of the six numbers in one or other of the two columns of the table.
17. Weaker candidates tended to score a low mark on this question. There was the usual confusion when trying to find a median of ordering the frequencies or just picking the middle class interval. In part (b), many candidates had a correct method for calculating an estimate for a mean, but lost an accuracy mark through the miscalculation  $17 \times 25 = 225$  rather than 255. One or two candidates calculated an estimate of the total time (2900) but then went on to divide by the number of class intervals getting the rather high mean time of 580 minutes. There were too many candidates who found  $106 \div 5 = 21.2$

18. Part (a) was a percentage change question made a little more challenging by the relevant numbers being in a table. It was extremely rare for anything other than the 85 and 91 to be chosen. However, apart from that the remaining working was not good. Many candidates had little idea how to proceed and wrote 6% presumably from  $91 - 85$ . Others knew they had to convert a fraction to a percentage, but used a denominator of 91. Another common error was to calculate either  $\frac{91}{85}$  or  $\frac{91}{85} \times 100$  and then omit the subtraction of either unity or 100. Some candidates adopted a trial and improvement approach but rarely got to within the demanded level of accuracy.

Part (b) was a standard moving average question. There were many correct answers, but also many candidates did not know where to start and left a blank or worked out the average of all the figures.

19. Since there was only one blank column on the question paper, a very significant number of students assumed that this was a question involving cumulative frequency. Weaker candidates gave the response as  $32 \div 6$  or  $32 \div 5$ . Some candidates who did realise they had to multiply and then add, then divided their '76' by 6 or 5 instead of 32. Despite a calculator being available there were a lot of arithmetical errors seen particular in the multiplication and then addition. The correct answer was seen from only 30% of candidates.

## 20. Foundation

Very few candidates earned any marks for this question, which was designed only for the more able at the Foundation level.  $80 \div 5 = 16$  was the most common error, but few considered using midpoints. Many failed to attempt the question.

### Higher

Most candidates made full use of the extra columns in the table. A significant number of candidates correctly found  $fx$  using the appropriate midpoints but then divided the sum by "5" (the number of groups) or "75" the sum of the midpoints (this was particularly disappointing with 80 having been given in the question).

The most common response from those only gaining 1 or 2 marks was to use the end points when calculating  $fx$ . Weaker candidates divided the sum of the frequencies or the sum of the midpoints by 5. Most candidates seemed to realise that the extra columns in the table had a purpose and wrong responses included finding the frequency density and producing cumulative frequency.

21. A common error was to sum the mid-points and divide by 5. A number of candidates tried to use the cumulative frequency. Those candidates who made a good start by finding the product of the frequencies and mid-points often then divided by 5 instead of 80.

**22. Paper 11**

Many candidates ignored the stem in the Stem and Leaf diagram with 6 being the most popular answer. 26 in (a) and 22 in (b) were rarely seen.

**Paper 12**

Success at this question was centre dependant with many candidates unable to interpret a stem and leaf diagram. Many considered merely the units digits and used these to determine the median and the range; answers of 6 and 9 were common. Some of those who were familiar with stem and leaf diagrams gave  $14 - 36$  or  $36 - 14$  as their range instead of the required single figure.

- 23.** There were many good answers to this standard question. There were more candidates using the upper end point of each class interval than expected. Some candidates interpreted 'estimate' as an instruction to round off their final answer. Weaker candidates multiplied the frequencies by the class width or added up the frequencies and divided by 5. The use of cumulative frequencies was also seen.

**24. Foundation Tier**

The most common incorrect answer was '3', generally without working. However, where working was shown, the value of '3' often came from adding together the numbers in the first column of the table, i.e.  $2 + 3 + 4 = 9$  and then dividing this by '3' or adding the six numbers in the table ( $= 19$ ) and dividing this by 6. The sensible approach would have been to identify and list the ages, which was seen on some scripts, and then deal with them by adding together and dividing by '10'. It was not unusual to see all the figures from the table listed in numerical order and the median value being used for the mean. Over 90% of the candidates had no idea that there were more than 6 children in the group despite the introduction to the question stating that there were 10 children in the group.

**Intermediate Tier**

An answer of 3 was obtained in a great many ways. It was often the result of rounding 2.9 after previously stating this correct answer. This gained full marks. One mark was awarded for correctly listing the ages of the ten children even if the candidate went on to find the median or the mode, as many did. The most common attempts, other than the correct one, were  $(2 + 3 + 4)/3 = 3$  or  $(3 + 5 + 2)/3 = 3.3$  or  $(2 + 3 + 4 + 3 + 5 + 2)/6 = 3$  rounded; all gaining no marks.

- 25.** Interpretation of the stem and leaf diagram was not good. In part (a) many candidates simply ordered the numbers in the leaves and selected the median from this list giving an answer of 5. Some gave 1 (median of 0, 1 and 2) as their answer, some found the mean by mistake and some were misled by the key giving 13 ( $26 \div 2$ ) as the median. In part (b) understanding of range varied. Common responses were 2 ( $2 - 0$ ), 9 ( $9 - 0$ ) and  $26 - 4$  while less than a half of candidates gained the mark for the correct answer.

26. This question was very poorly answered with 86% of candidates failing to score at all. Few considered values within the grouped ranges and less the midpoints in order to evaluate  $fx$ . Some did and answers of 235 and 285 (using the upper limits) were seen. The most common answers seen were 4 ( $20 \div 5$ ) or 15 ( $75 \div 5$ ). Several candidates thought that the blank column was an invitation to draw a cumulative frequency table and produced a total of 63 as a result.
27. Many candidates clearly did not understand the concept of modal class interval or the interval in which the median lies. In part (a), a significant proportion of candidates gave the answer “32” and did not relate this to the class interval. Only about a third of candidates were successful here. Part (b) attracted few correct responses. Many candidates either picked out the middle frequency (16) or gave the corresponding interval  $16000 < x \leq 18000$ .
28. This question was not very well understood and there were many very poor attempts, 79% of candidates scored no marks. This type of question has been set on many Data Handling Module tests but the multistage process seemed beyond the competence of many of the candidates. The total of the frequencies, 80 was often divided by the number of the categories, 5, giving 16 as the most common response. Of those who did have some understanding of the method only about half of them used the mid-values. Working showing 1070 (the lower end of the interval  $\times$  frequency) or 1870 (the upper end of the interval  $\times$  the frequency) was not uncommon, as was 1470 (the correct response at this stage - the mid point of the interval  $\times$  the frequency). Having got this far most candidates were unsure as to how to proceed and many divided these figures by 125 (the sum of the frequencies), or 5 (the number of class intervals). Many then went on to add the frequency and their mid range value. There were a disappointing number of good candidates who rounded to 18.3 or 18 without showing intermediate steps thus losing the final accuracy mark. Only 6% of candidates scored all the marks in this question.
29. This question proved challenging to many candidates. The extra column in the table gave a clue to many candidates, most filling this in with something. The most common error here was to add together the number of cups and the frequencies to give 5, 10, 9, 7..., and then to add these up and divide by 6. Some candidates thought that they had to use a mid-interval value of some sort to calculate the mean, and consequently attempted to use values such as 2.5, 4.5, 3.5... or 0.5, 1.5, 2.5...in their calculation. For those candidates using the correct method to find the total number of cups, a common error was to work out  $0 \times 5$  as 5, thus leading to the special case B2 on the mark scheme. A large number of candidates simply found the sum of the frequencies and divided this by 6.
30. This question proved challenging for many candidates. A significant number of candidates, having correctly arrived at the result  $\Sigma fx = 570$ , then went on to divide this by 6. Other common errors included working with the end point 10, 20, 30 and 40 (rather than the mid point of the interval), and in summing the products of the cumulative frequencies and the mid interval values.



31. In this question part only 12% gained full marks for the correct answer of 15 for the mode and 13.5 for the mean. 33% of candidates gained one mark for gaining at least 2 out of the 5 products of number of tracks multiplied by the frequency but only 6% of candidates gained the mark for dividing their total by the total number of CD's (10). A very common response was 27, obtained by dividing the total number of tracks by the number of groups. This only gained any credit if their totalling of the number of tracks on a minimum of 2CD's was shown. A special case, which gained 2 marks, was allowed for candidates who thought that  $13 \times 0$  was 13 and made no further errors resulting in an incorrect average of 14.8.
32. In this question 44% of candidates gained full marks for the correct answer of 13.5. 24% of candidates gained one mark for gaining at least 2 out of the 5 products of number of tracks multiplied by the frequency, but only 6% of candidates gained the mark for dividing their total by the total number of CD's (10). A very common response was 27, obtained by dividing the total number of tracks by the number of groups. This only gained any credit if their totalling of the number of tracks on a minimum of 2CD's was shown. A special case, which gained 2 marks, was allowed for candidates who thought that  $13 \times 0$  was 13 and made no further errors resulting in an incorrect average of 14.8. Other instances of poor arithmetic often lost the accuracy mark.