1. 4024/11/M/J/16 Q18

18	(a)	Vertical axis label should be 'Frequency density' or heights should be 3, 8, 10, 2.	1	
	(b)	Rectangles with same bases as in (a), with heights 3, 8, 10, 2. Vertical label 'Frequency density' and a suitable scale.	3 *	**C2** for 4 bars correct, with no label or incorrect scale on vertical axis or for 3 bars correct with 'Frequency density' label and numbered linear scale. **C1** for numbers 3, 8, 10, 2; or 'Frequency density' label or for 3 bars correct

2. 4024/12/M/J/16 Q23

23	(a)	Two correct bars drawn	2	**C1** for rectangle base 0 to 10 height 2.8 or for rectangle base 30 to 60 height 0.6
	(b)	12	1	
	(c)	$\dfrac{30}{150}$ oe or $\dfrac{18+m}{138+m}$ oe evaluated	2ft*	**B1 FT** for fraction with numerator or denominator correct or for answer 20% or 0.2

3. 4024/21/M/J/16 Q10

10	(a)		(2) (4) 14 54 84 98 (100)	1	
	(b)		Correct curve	2	P1 for at least 5 correct plots
	(c)	(i)	195 ft 190 ⩽ and < 200	1	
		(ii)	50 –75	2	B1 for one quartile correct in ranges 225 to 235 or 160 to 175
	(d)		Correct curve	4	P3 for at least 4 correct plots or B1 + B1 for any two correct points soi.
	(e)		92 ft	1	
	(f)		B 15 ft A	1ft	Their 90 – 75

4. 4024/22/M/J/16 Q3

3	(a)	(i)	1.64 or $1\frac{16}{25}$	2	**M1** for $\dfrac{0\times7+1\times5+2\times6+3\times4+4\times3}{7+5+6+4+3}$
		(ii)	2	1	
		(iii)	0	1	
	(b)		appropriate reason	1	
	(c)		$\dfrac{1}{30}$ cao	2	**M1** for $\dfrac{5}{25}\times\dfrac{4}{24}$ oe
	(d)		Correct bar chart with axes labelled	2	**B1** if only one error (eg incorrect height, scales missing / incorrect, inconsistent bar widths, or 4 correct bars)

5. 4024/11/O/N/16 Q9

9	(a)	0.155 cao	1	
	(b)	20 WWW	1 *	

6. 4024/12/O/N/16 Q9

9	(a)	20 25	1 1	
	(b)	Rectangle with base 35 to 50 and height 2	1	

7. 4024/21/O/N/16 Q10

10	(a)	(i)	Correct histogram with linear scale on frequency density axis	3	**B2** for all 5 heights correct with axis scaled OR **B1** for at least 3 correct frequency densities soi and **B1** for all 5 bars correct widths
		(ii)	39.4[4…]	3	**B1** for use of correct midpoints **M1** for $\dfrac{\Sigma fx}{135}$

8. 4024/22/O/N/16 Q11

11	(a)	(i)	(a)	40 to 41	1	
			(b)	23 to 27	2	B1 for 52 ±1 or 27 ±1
			(c)	225 to 245	1	
		(ii)		79 to 80	1	
		(iii)		Paper1 e.g. Paper 2 has median 54 oe Using (i)(a), (i)(c) or (ii) with numerical justification – accept reasonable attempts to read the graphs correctly.	1	

9. 4024/11/M/J/17 Q12

12(a)(i)	5	1	
12(a)(ii)	16	1	
12(b)	Histogram completed correctly	1	Column 20-30, height 1.4

10. 4024/21/M/J/17 Q11

11(a)	75 nfww	3	M2 for $\dfrac{\sum \text{frequency} \times \text{midvalue}}{80}$ oe or M1 for $\sum fc$
11(b)	25, 46, 64, 73, 78	1	
11(c)	8 points correctly plotted and joined	2	FT increasing curve B1 for at least 6 points correctly plotted
11(d)(i)	74 to 76	1	
11(d)(ii)	36 to 44	2	B1 for 52 to 56 <u>and</u> 92 to 96 seen
11(e)	54 to 62	3	B1 for 27 to 29 M1 for attempt to read at $(80 - 2 \times \textit{their } 28)$

11. 4024/22/M/J/17 Q11

11(a)(i)	$55 \leqslant t < 60$	1	
11(a)(ii)	60.8 nfww	3	**M2** for $\dfrac{\sum \text{frequency} \times \text{midvalue}}{50}$ oe or **M1** for $\sum ft$
11(a)(iii)	$\dfrac{23}{50}$ or 0.46 or 46%	2	**B1** for 23 seen or $16 + 7$ seen
11(b)(i)	34	1	
11(b)(ii)	4.5	2	**B1** for 31.5 to 32.5 <u>and</u> 36 to 37 seen
11(b)(iii)	(28, 0) (32, 15) (36, 45) (40, 60) plotted and points joined	3	**B2** for at least 3 correct points plotted or **B1** for 2 correct points plotted or (28, 0) (32, 15) (36, 45) and (40, 60) seen

12. 4024/11/O/N/17 Q10

10(a)	−2	1	
10(b)	−1	1	
10(c)	0	1	

13. 4024/12/O/N/17 Q2

2(a)	7, 8, 5 all three	1	
2(b)	18 × their (min. frequency) FT provided min. frequency < 20	1	

14. 4024/21/O/N/17 Q2

2(a)	14.35 or 14.4	3	**B1** for use of correct midpoints soi **M1** for (2.5 × 35 + 7.5×42 + 15×30 + 25×28 + 40 × 15) ÷ 150
2(b)	Correct histogram with linear scale on frequency density axis	3	**B2** for all 5 bar heights correct with frequency density axis scaled OR **B1** for at least 3 correct heights drawn or 3 correct frequency densities calculated **B1** for 5 bars correct width and position

15. 4024/22/O/N/17 Q2

2(a)(i)	12 40 85 107	1	
2(a)(ii)	Correct cumulative frequency curve	2	**B1FT** for at least 5 correct plots
2(b)(i)	47 to 49	1FT	
2(b)(ii)	28 to 32	2FT	**B1** for 63 to 65 or 32 to 35
2(c)	49.3	3	**M1** for $(12{\times}10 + 28{\times}30 + 45{\times}50 + 22{\times}70 + 13{\times}90)$ **and** **B1 dep** for *their* $\Sigma fx \div 120$

16. 4024/11/M/J/18 Q7

7(a)	5 (items)	1	
7(b)	4 (items)	1	
7(c)	3.85 or $3\frac{17}{20}$	2	**M1** for $\dfrac{\sum fx}{20}$ or $\dfrac{77}{20}$
7(d)	90	1	

17. 4024/12/M/J/18 Q12

12(a)	$\dfrac{80}{400}$ oe	1	
12(b)	200	1	**FT** (*their*(a)) $\times$ 1000 where $0 <$ *their* **(a)** < 1

18. 4024/22/M/J/18 Q2

2(a)	Correct frequency polygon (ruled lines)	2	**B1** for 4 or 5 heights correct soi
2(b)	$q = 9$	**B2**	**M1** for $[0{\times}p] + 1{\times}14 + 2{\times}15 + 3{\times}7 + 4{\times}q + 5{\times}5 + 6{\times}2$ oe
	$p = 17 -$ *their q*	**B1**	**Strict FT** provided q integer with $0 \leqslant q \leqslant 17$
2(c)(i)	Correct labelled pie chart: C[omedy] , D[rama] , H[orror]	3	**B2** for correct sectors without labels or incorrect labels or **B1** for one correct sector or 90, 54 and 72 seen
2(c)(ii)	$\dfrac{21}{60}, \dfrac{7}{20}, \dfrac{126}{360}$, 0.35 or 35%	1	
2(c)(iii)	$\dfrac{210}{3540}$ oe	2	**M1** for $\dfrac{15}{60} \times \dfrac{14}{59}$ [×2] or **SC1** for $\left(\dfrac{15}{60}\right)^2$ or answer $\dfrac{1}{16}$ oe

19. 4024/11/O/N/18 Q13

13	Correct histogram with Freq. densities 1, 1.5, 2, 2.4, 0.8	3	**B1** for 4 or more rectangles on correct bases. **B1** for 4 or more correct Freq. densities, soi.

20. 4024/12/O/N/18 Q15

15(a)	5 correct plots	2	**B1** for 3 or 4 correct plots
15(b)	Negative	1	
15(c)	Line of best fit	1	Acceptable **ruled** straight line.
15(d)	Reading their value for $x = 7.6$	1	Strict **FT**.

21. 4024/21/O/N/18 Q1

1(a)(i)	6 points plotted correctly	2	**B1** for 4 or 5 points plotted correctly
1(a)(ii)	Positive	1	
1(a)(iii)	$\dfrac{3}{5}$ **cao**	2	**B1** for $\dfrac{6}{10}$ **oe** seen
1(a)(iv)	Ruled line of best fit	**B1**	
1(a)(v)	54 to 58	**B1**	**FT** reading from *their* straight line of best fit at 48 km
1(b)(i)	$20 < t \leqslant 40$	1	
1(b)(ii)	39.5	3	**B1** for correct use of midpoints **soi** **M1** for $(10 \times 29 + 30 \times 38 + 50 \times 26 + 70 \times 21 + 90 \times 6) \div 120$ **oe**
1(b)(iii)	22.5	2	**B1** for $21 + 6$ or 27 seen

22. 4024/22/O/N/18 Q2

2(a)	Correct cumulative frequency curve	2	B1 for at least 5 correct plots
2(b)(i)	118 to 120	1	
2(b)(ii)	14 to 18 nfww	2	M1 for reading at CF 150 or 50
2(c)	On average Lim's tomatoes had lower masses oe	B1	Strict FT their median
	Masses of Ravi's tomatoes were more consistent oe	B1	Strict FT their IQR
2(d)(i)	46, 26	1	
2(d)(ii)	$110 < m \leqslant 120$	1	FT their frequency table
2(d)(iii)	118.8	3	B1 for correct use of midpoints soi M1 for $(20{\times}90 + 28{\times}105 + 64{\times}115 + their\ 46{\times}125 + their\ 26{\times}135 + 16{\times}150) \div 200$ oe

23. 4024/11/M/J/19 Q9

9(a)(i)	Apple Banana Orange 10 8 12	1	
9(a)(ii)	Correct bar chart	2	FT *their* frequency table B1 for bars labelled correctly and of equal width or bars drawn to correct height.
9(b)(i)	$\dfrac{7}{30}$ oe	1	
9(b)(ii)	48	1	

24. 4024/12/M/J/19 Q3

3(a)	85	1	
3(b)	−5	2	B1 for −50 seen M1 for $(-45 - 30 - 35 + 0 + 5 - 10 - 20 + 40 + 20 + 25) \div 10$ oe If 0 scored, SC1 for answer 5

25. 4024/21/M/J/19 Q2

2(a)	(14.7, 32.5) (13.7, 28.4) (12.9, 26.1) (15.2, 33.5) (16.1, 36.0) plotted	2	**B1** for 3 or 4 correct
2(b)	positive	1	
2(c)	Ruled line of best fit	1	
2(d)	Strict FT *their* ruled line of best fit	1	

26. 4024/22/M/J/19 Q2

2(a)	(16, 23) (18,18) (20, 12) (21, 8) plotted	2	**B1** for 2 or 3 correct plots
2(b)	negative	1	
2(c)	Ruled line of best fit	1	
2(d)	Strict FT *their* ruled line of best fit read at Sydney = 15°C	1	

27. 4024/11/O/N/19 Q2

2	There is no correlation between the two sets of marks oe	1	

28. 4024/12/O/N/19 Q14

14(a)	36.6 cao	2	**M1** for 20th percentile = 24 soi
14(b)	36 or 37 or 38	2	**M1** for 100 people < 37.0 soi or 62 or 63 or 64 people < 36.8 soi

29. 4024/12/O/N/19 Q15

15(a)	16	1	
15(b)	Rectangle: base 1 to 2, height 6 **and** Rectangle: base 6 to 8, height 2	2	**B1** for one correct rectangle

30. 4024/21/O/N/19 Q2

2(a)(i)	Correct histogram with frequency density axis scaled	3	**B1** for 4 or more rectangles on correct bases **B1** for 4 or more correct frequency densities soi
2(a)(ii)	49	2	**M1** for 56 + 24 + 18 soi
2(b)(i)	2	1	
2(b)(ii)	2.63	2	**M1** for $([0 \times 17] + 1 \times 47 + 2 \times 42 + 3 \times 28 + 4 \times 32 + 5 \times 21 + 6 \times 13) \div 200$ oe
2(b)(iii)	$\dfrac{34}{200}$ oe	1	
2(b)(iv)	0.1222 final answer	3	**M2** for $2 \times \dfrac{13}{200} \times \dfrac{187}{199}$ oe or **M1** for $\dfrac{k}{200} \times \dfrac{200-k}{199}[\times 2]$ oe where $0 < k < 200$ If 0 scored, **SC1** for $2 \times \dfrac{13 \times 187}{200^2}$ oe

31. 4024/22/O/N/19 Q3

3(a)(i)	6 points plotted correctly	2	**B1** for 3, 4 or 5 points plotted correctly
3(a)(ii)	4	1	
3(a)(iii)	Positive	1	
3(a)(iv)	Ruled line of best fit	1	
3(a)(v)	*Their* time for 800 m at 65 s for 400 m	1	Strict **FT** their straight line of best fit
3(b)(i)	$p+10+15+13+q = 50$ oe	1	
3(b)(ii)	$142.5p+147.5\times10+152.5\times15+157.5\times13+162.5q=153.6\times50$ oe simplified to $142.5p+162.5q = 1870$	2	**B1** for $142.5p$, 147.5×10, 152.5×15, 157.5×13 and $162.5q$ seen or for 153.6×50 seen
3(b)(iii)	Correct method to eliminate one variable	**M1**	
	$[p =]4$ $[q =]8$	**A2**	**A1** for one correct or **B1** only for correct answers without algebraic method