Mark Scheme (Results)

Summer 2022
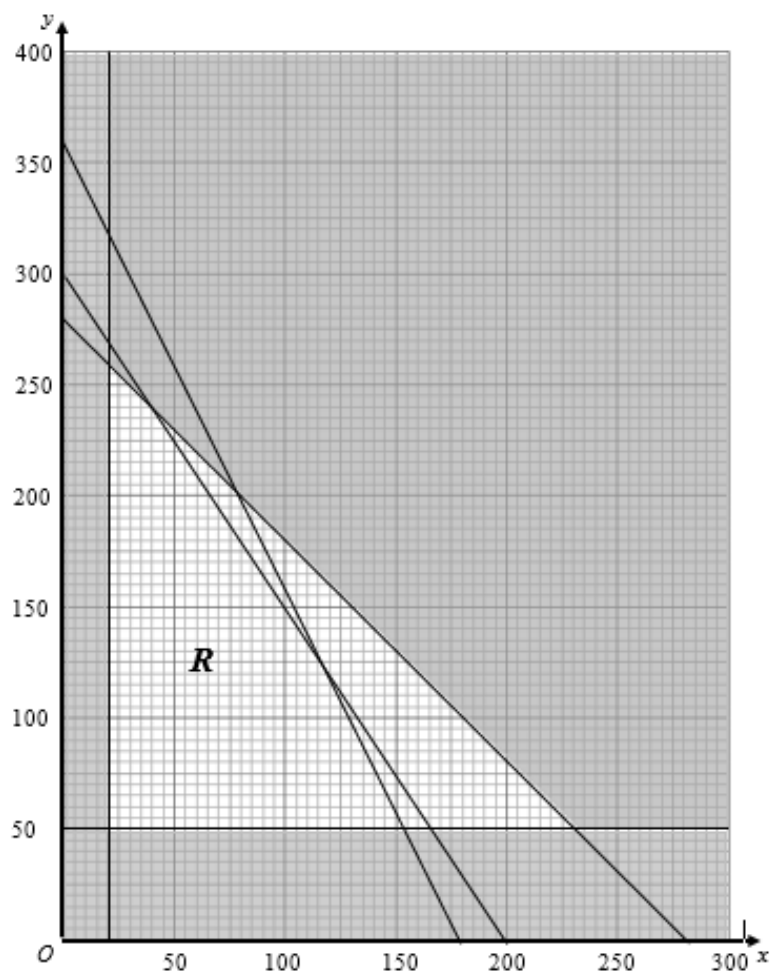
General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question	Working	Answer	Mark	Notes
1(a)		2012	1	B1 cao
1(b)	$1.10 \div 103.9 \times 100 \ (=1.0587..)$	£1.06	3	B1 for use of 3.9 or 103.9 oe M1 for complete method to calculate original value A1 awrt £1.06 accept £1.05 supported
2(a)(i)		Negative	1	C1 cao
2(a)(ii)		Explanation	1	C1 for correct interpretation eg Not necessarily as although we may buy more when items are cheaper, some items are necessity or people may switch to cheaper brands or if people don't buy, retailers will have to drop the price **OR** 'Yes' with an appropriate reason, eg if food is cheaper then people can afford to buy more
2(b)		Quantity purchased with reason	1	C1 for Quantity purchased and valid reason, eg the price of a product may influence how much we buy **or** price can be controlled **or** price may not be the only factor or influence that affects quantity purchased
2(c)(i)	$\dfrac{-1631.21}{\sqrt{15903.86 \times 25732.1}}$ oe	−0.0806	2	M1 for a complete method to find PMCC A1 for awrt −0.08
2(c)(ii)		Reject theory with reason	1	C1 ft from c(i) Decision with valid reason relating to strength, eg Reject the theory because the PMCC value indicates very weak negative correlation so the relationship is not very strong **or**

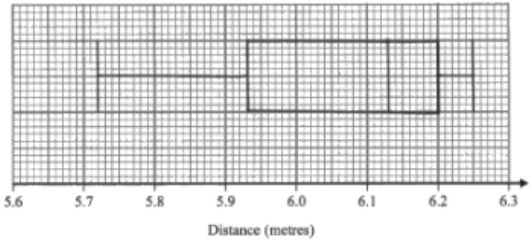|				Value is close to zero so no correlation
Question	**Working**	**Answer**	**Mark**	**Notes**
3(a)		Explanations	1	C1 Explanation eg $x \geq 20$ means he wants to make at least 20 deluxe sandwiches
3(b)		$x + y \leq 280$	1	B1 oe Accept $x + y \leq 278$
3(c)		$3x + 2y \leq 600$	2	M1 $3x + 2y$ or 24×25 (=600) A1 for $3x + 2y \leq 600$ oe
3(d)		Diagram drawn and feasible region identified	3	M1 for $2x + y = 360$ drawn M1ft for $3x + 2y = 600$ drawn A1 for a fully correct diagram with R labelled
3(e)	(20, 260) £513 (20, 50) £135 (40, 240) £522 (120, 120) £486 (155, 50) £438.75	£522 and 40 deluxe and 240 standard	3	M1 ft for testing one of their vertices in the FR or $2.25x + 1.80y$ A1 ft accurate sales for their vertex A1 (40, 240) (£)522

Question	Working	Answer	Mark	Notes
4(a)		Graph drawn	3	B1 for 18, 54, 129, 238, 286, 300 M1 ft for cumulative points correctly plotted at the end of the intervals or consistently plotted within the interval A1 fully correct diagram
4(b)	Median dog owners 8.2 – 8.6hrs oe Median non-dog owners 3 – 3.2hrs 8.3 × 52 = 431.6hrs total/yr 3.1 × 52 = 161.2hrs total/yr 431.6 – 161.2 = 270.4	Valid comment supported	4	M1 ft for method to find the median for dog owners **or** non-dog owners from cumulative frequency graph M1 ft for one median multiplied by 52 weeks May be seen as part of a difference calculation A1 ft for comparative total hours per year, eg 426 – 448hrs oe **and** 156 – 166.4hrs oe **OR** 270 difference C1 (dep M2) ft for a valid comment, eg claim is correct as dog owners walk for approx. 270 hours per year more than non-dog owners. **OR** The dog walkers walk approximately 270 hours more per year (which is greater than 250)

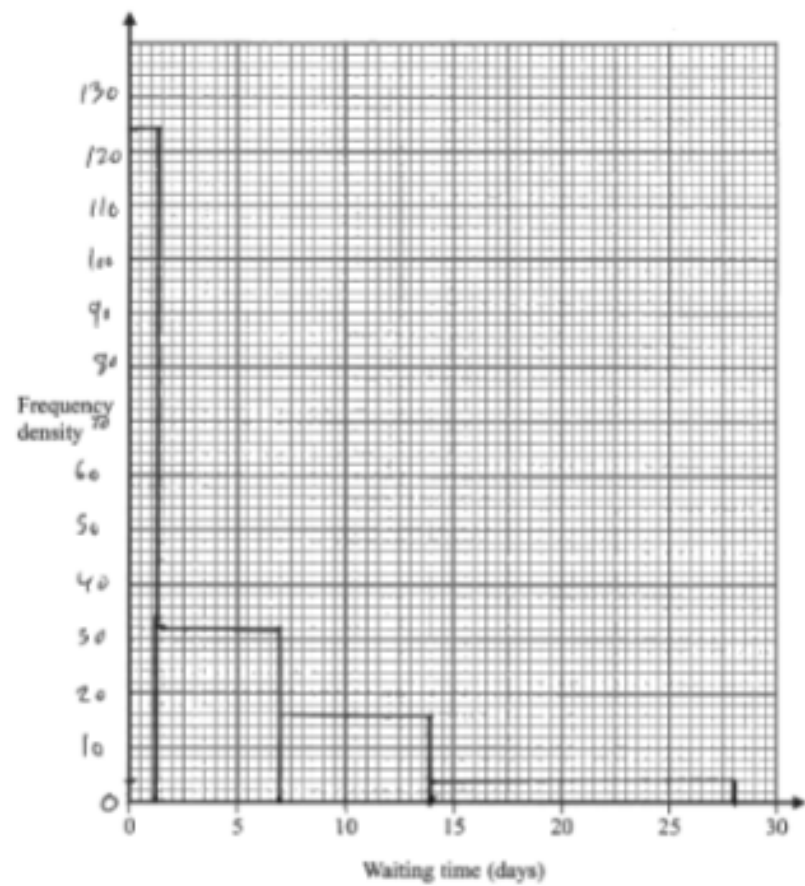| Question	Working	Answer	Mark	Notes
5(a)		$25x + 8y = 299.5$ $15x + 3y = 141$	2	C2 for correct equations with variables clearly defined, eg $25b + 8s = 299.5$ **and** $15b + 3s = 141$ (C1 for one correct equation)
5(b)	$\dfrac{8.99 - 5.1}{5.1} \times 100$ (=76.274..) **or** $\dfrac{37.99 - 21.5}{21.5} \times 100$ (=76.697..)	15kg sack and 76.3(%) and 76.7(%)	3	M1 for complete method to find percentage change for bag **or** sack M1 for complete method to find percentage change for bag **and** sack A1 for 15kg sack **and** 76.2(74…) **and** 76.6(97…)
5(c)	$20x + 35y = 214$ $\underline{84x - 35y = 25.2}$ $+$ $104x \qquad = 229.2$	Collar £2.30 Lead £4.80	3	M1 for correct method to eliminate one variable (condone one arithmetic error) M1 for a complete method to find the other variable, eg by substitution **or** by elimination A1 for $x = 2.3$ **and** $y = 4.8$

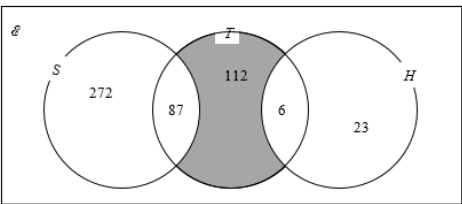| Question	Working	Answer	Mark	Notes
6	without insurance: $0.93 \times 250 = 232.5$ $0.42 \times 590 = 247.8$ $0.07 \times 1800 = 126$ $232.5 + 247.8 + 126 = 606.3$ standard ins: $246 + 0.93 \times 75 + 0.42 \times 75 + 0.07 \times 75 = 352.5$	Premium insurance identified with correct figures	5	M1 for one correct calculation shown in method for calculating expected value of one option eg 0.93×250 M1 for complete method to find expected value without insurance **or** standard insurance M1 for complete method to find expected value without insurance **and** standard insurance A1 for (£)606.3(0) **and** (£)352.5(0) C1 (dep on M3) ft for identifying Premium insurance
7(a)	$15.98 (53.15 - 3.8)^{1.04} = 921.712...$	921 or 922	2	M1 for $15.98 (53.15 - 3.8)^{1.04}$ A1 for answer in range 921 – 922

Question	Working	Answer	Mark	Notes
7(b)(i)		correct inequality	2	M1 for a correct equation or partially correct inequality, eg $0.11(254 - T)^{1.88} + 5963$ **or** $0.11 (254 - T)^{1.88} = 1018$ A1 for a correct inequality, eg $0.11 (254 - T)^{1.88} + 5963 > 6981$ **or** $0.11 (254 - T)^{1.88} > 1018$
7(b)(ii)	$T = 125, P = 1021.648..$ $T = 125.2, P = 1018.672..$ $T = 126, P = 1006.809..$ $(254 - T)^{1.88} > 9254.545…$ $(254 - T) > \sqrt[1.88]{9254.545..} = 125.24..$	125.2 seconds	4	M1 for evaluated trial with T M1 for a second trial M1 for trials of $T = 125$ and $T = 126$ A1 for answers in the range 125 – 126 seconds **OR** M1 for beginning to solve eg $0.11 \times (254 - T)^{1.88} > 1018$ M1 for eliminating power of 1.88 M1 for complete method to isolate in terms of T A1 for answers in the range 125 – 126 seconds

Question	Working	Answer	Mark	Notes
8a	UQ 6.2 LQ 5.93	Shown	4	B1 for correctly identifying either the UQ 6.2 **or** LQ 5.93 NB may be seen in part (b) M1 ft for LQ – 1.5 × [UQ – LQ] **or** UQ + 1.5 × [UQ – LQ] A1 for 6.605 **and** 5.525 accept rounded values to 1 or more dp C1 ft (dep M1) for comparison of maximum and minimum values to show no outliers
8b	Min 5.72 Median 6.13 Max 6.25 	Box plot drawn	2	B2 ft for a fully correct box plot drawn and labelled (B1 for a partially correct box plot, allow up to 2 plotting errors **or** for median identified as 6.13)

Question	Working	Answer	Mark	Notes
9(a)		Arithmetic	1	C1 Arithmetic or Linear or any other valid sequence type
9(b)(i)		$p = 125$, $q = 175$	2	M1 for method to start to deduce nth term eg $125n + q$ **or** $300 = p + q$ **and** $425 = 2p + q$ **OR** for one value correct A1 cao
9(b)(ii)	"125"n + "175" = 35 × 60 or "125"n + "175" = 2100 **OR** 1050, 1175, 1300, 1425, 1550, 1675, 1800, 1925, 2050, 2175, …	16 weeks	3	M1 for $5 \times 7 \times 60$ M1 ft for method to begin to solve or for setting up an equation, eg "125"n + "175" = 35 × 60 **OR** for continuing sequence to at least "2100" A1 for awrt 16 weeks
10(a)	124 ÷ 500 (=0.248) oe 80 × "0.248" (=19.84)	20	3	M1 for finding probability for the class interval $0 \le t < 1$ M1 for full method using relative frequency A1 for 19 or 20
10(b)		Explanation	1	C1 for valid explanation, eg because there is no endpoint so no boundary

Question	Working	Answer	Mark	Notes
10(c)	$124 \div 1 = 124$ $192 \div 6 = 32$ $112 \div 7 = 16$ $56 \div 14 = 4$	correct histogram	3	B3 for fully correct histogram with vertical axis correctly scaled (B2 for 3 correct blocks **or** for all 4 frequency ÷ class interval (B1 for for at least 2 correct blocks of different widths **or** for frequency ÷ class interval for at least 2 frequencies))
10(d)	$0.4 \times 12.4 + 2.8 \times 3.2 + 2.4 \times 1.6 + 5.6 \times 0.4 = 20$ $20 \div 2 = 10 cm^2$ $0\text{-}1 = 4.96 cm^2$ $1 + \dfrac{250 - 124}{192} \times (7 - 1) = 4.9375$	5(.2) days and comparison	3	M1 ft for finding the area of at least 2 bars M1 ft for completed method using area C1 for 4.9 – 5.2 days and comparison, eg the surgery average waiting time is much smaller than the UK average **OR** M1 for correct class interval identified ($1 < t \le 7$) and 500 used as total M1 ft appropriate proportional method used C1 for 4.9 – 5.2 days and comparison, eg the surgery average waiting time is much smaller than the UK average
10(e)	$124 + 192 + \dfrac{3}{7} \times 112$	364	2	M1 for a complete method to find number of patients waiting for less than 10 days A1 for 364 accept $\dfrac{364}{500}$ oe

Frequency density

Waiting time (days)

Question	Working	Answer	Mark	Notes
11(a)(i)		28/500	1	B1 for 28/500 oe
11(a)(ii)		407/500	1	B1 for 407/500 oe
11(b)(i)		S and H with reason	2	B1 for S **and** H or people who required an appointment at the surgery **and** people who required a home visit C1 for reason eg there is no overlap or patients are not going to have an appointment at the surgery and a home visit
11(b)(ii)		Description	1	C1 for description eg patients who had a telephone appointment and also needed to visit the surgery for an additional appointment
11(b)(iii)		Correct region shaded	1	B1 for correct region shaded
11(b)(iv)	$P(H \mid T) = P(H \cap T)/ P(T)$ $=6/(87 + 112 + 6)$	$\dfrac{6}{205}$	2	M1 for (6/500)/(205/500) **or** 6/(87+112+6) **OR** $x/(87 + 112 + 6)$, $x < 205$ **or** $6/y$, $y \neq 500$ and $0 < P(H \mid T) < 1$ A1 for $\dfrac{6}{205}$ oe