OCR
Oxford Cambridge and RSA

Higher

GCSE

Mathematics - Paper 3

J560/03: Paper 3 (Foundation tier)

General Certificate of Secondary Education

Mark Scheme for June 2023

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

MARKING INSTRUCTIONS
PREPARATION FOR MARKING
RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: RM Assessor Online Training; OCR Essential Guide to Marking.

2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are available in RM Assessor.

3. Log-in to RM Assessor then mark and annotate the **required number** of practice responses ("scripts") and the **required number** of standardisation responses.

MARKING

1. Mark strictly to the mark scheme.

2. Marks awarded must relate directly to the marking criteria.

3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.

4. If you are in any doubt about applying the mark scheme, consult your Team Leader via the RM Assessor messaging system.

5. Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners should give candidates the benefit of the doubt and mark the crossed out response where legible.

6. When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

7. On each blank page the annotation **BP** must be inserted to confirm that the page has been checked. For additional objects (if present), a tick must be inserted on each page to confirm that it has been checked.

8. There is a NR (No Response) option. Award NR (No Response)
   - if there is nothing written at all in the answer space
   - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
   - OR if there is a mark (e.g. a dash, a question mark) which is not an attempt at the question.

   The hash key (#) on your keyboard will enter NR.

   Note: Award 0 marks for an attempt that earns no credit (including copying out the question).

9. The RM Assessor **comments box** is used by the Principal Examiner or your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**

   If you have any questions or comments for your Team Leader, use the RM Assessor messaging system.

10. Assistant Examiners should send a brief report on the performance of candidates to their Team Leader (Supervisor) by the end of the marking period. Please follow the direction of your Team Leader about which questions you should report on and how to submit your report. Your report should contain notes on particular strengths displayed as well as common errors or weaknesses.

11. Annotations available in RM Assessor. These **must** be used whenever appropriate during your marking.

Annotation	Meaning
	Correct
	Incorrect
BOD	Benefit of doubt
FT	Follow through
ISW	Ignore subsequent working (after correct answer obtained), provided method has been completed
M0	Method mark awarded 0
M1	Method mark awarded 1
M2	Method mark awarded 2
A1	Accuracy mark awarded 1
B1	Independent mark awarded 1
B2	Independent mark awarded 2
MR	Misread
SC	Special case
^	Omission sign
BP	Blank page
SEEN	Seen

For a response awarded zero (or full) marks a single appropriate annotation (cross, tick, M0 or ^) is sufficient, but not required.

For responses that are not awarded either 0 or full marks, you must make it clear how you have arrived at the mark you have awarded and all responses must have enough annotation for a reviewer to decide if the mark awarded is correct without having to mark it independently.

It is vital that you annotate standardisation scripts fully to show how the marks have been awarded.

Subject-Specific Marking Instructions

12. **M** marks are for using a correct method and are not lost for purely numerical errors.
A marks are for an accurate answer and depend on preceding **M** (method) marks. Therefore **M0 A1** cannot be awarded.
B marks are independent of **M** (method) marks and are for a correct final answer, a partially correct answer, or a correct intermediate stage.
SC marks are for special cases that are worthy of some credit.

13. The following abbreviations are commonly found in GCSE Mathematics mark schemes.

- **figs 237**, for example, means any answer with only these digits. You should ignore leading or trailing zeros and any decimal point e.g. 237000, 2.37, 2.370, 0.00237 would be acceptable but 23070 or 2374 would not.
- **isw** means **ignore subsequent working** after correct answer obtained and applies as a default.
- **nfww** means **not from wrong working**.
- **oe** means **or equivalent**.
- **rot** means **rounded or truncated**.
- **soi** means **seen or implied**.
- **dep** means that the marks are **dependent** on the marks indicated. You must check that the candidate has met all the criteria specified for the mark to be awarded.
- **with correct working** means that full marks **must not** be awarded without some working. The required minimum amount of working will be defined in the guidance column and **SC** marks given for unsupported answers.

14. Anything in the mark scheme which is in square brackets […] is not required for the mark to be earned, but if present it must be correct.

15. Unless the command word requires that working is shown and the working required is stated in the mark scheme, then if the correct answer is clearly given and is not from wrong working **full marks** should be awarded.

Do not award the marks if the answer was obtained from an incorrect method, i.e. incorrect working is seen and the correct answer clearly follows from it.

16. Where follow through (**FT**) is indicated in the mark scheme, marks can be awarded where the candidate's work follows correctly from a previous answer whether or not it was correct. For questions with FT available you must ensure that you refer back to the relevant previous answer. You may find it easier to mark these questions candidate by candidate rather than question by question.

    Figures or expressions that are being followed through are sometimes encompassed by single quotation marks after the word their for clarity, e.g. FT 180 × (their '37' + 16), or FT 300 – √(their '52 + 72'). Answers to part questions which are being followed through are indicated by e.g. FT 3 × their (a).

17. In questions **with no final answer line**, make no deductions for wrong work after an acceptable answer (i.e. **isw**) unless the mark scheme says otherwise, indicated by the instruction 'mark final answer'.

18. In questions **with a final answer line and incorrect answer given**:

    (i) If the correct answer is seen in the body of working and the answer given on the answer line is a clear transcription error allow full marks unless the mark scheme says 'mark final answer'. Place the annotation ✓ next to the correct answer.

    (ii) If the correct answer is seen in the body of working but the answer line is blank, allow full marks. Place the annotation ✓ next to the correct answer.

    (iii) If the correct answer is seen in the body of working but a completely different answer is seen on the answer line, then accuracy marks for the answer are lost. Method marks could still be awarded if there is no other method leading to the incorrect answer. Use the **M0**, **M1**, **M2** annotations as appropriate and place the annotation **×** next to the wrong answer.

19. In questions **with a final answer line**:

    (i) If one answer is provided on the answer line, mark the method that leads to that answer. A correct step, value or statement that is not part of the method that leads to the given answer should be awarded **M0** and/or **B0**.

    (ii) If more than one answer is provided on the answer line and there is a single method provided, award method marks only.

    (iii) If more than one answer is provided on the answer line and there is more than one method provided, award marks for the poorer response unless the candidate has clearly indicated which method is to be marked.

20. In questions with **no final answer line**:

    (i) If a single response is provided, mark as usual.

(ii) If more than one response is provided, award marks for the poorer response unless the candidate has clearly indicated which response is to be marked.

21. When the data of a question is consistently misread in such a way as not to alter the nature or difficulty of the question, please follow the candidate's work and allow follow through for **A** and **B** marks. Deduct 1 mark from any **A** or **B** marks earned and record this by using the **MR** annotation. **M** marks are not deducted for misreads. If a candidate corrects the misread in a later part, do not continue to follow through, but award **A** and **B** marks for the correct answer only.

22. Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures even if this is rounded or truncated on the answer line. For example, an answer in the mark scheme is 15.75, which is seen in the working. The candidate then rounds or truncates this to 15.8, 15 or 16 on the answer line. Allow full marks for the 15.75.

23. Ranges of answers given in the mark scheme are always inclusive.

24. For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work. If in doubt, consult your Team Leader.

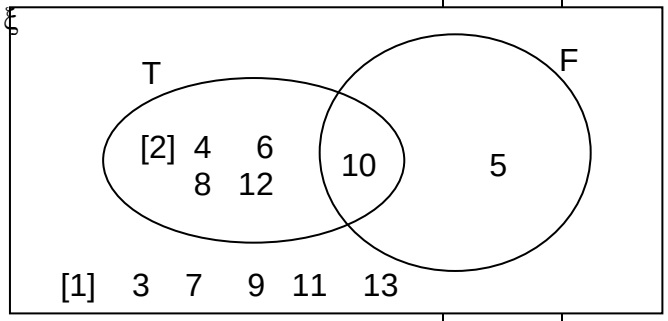
25. If in any case the mark scheme operates with considerable unfairness consult your Team Leader.

Question			Answer	Mark	Part Marks	Guidance
1	(a)		B	1		Accept any clear indication e.g. the cone or the second one May be on diagram
	(b)		G	1		Accept any clear indication e.g the third one May be on diagram
	(c)		Kite or isosceles trapezium with only the given line of symmetry and no right angles	2	**B1** for correct shape but inaccurate or • kite with right angle • arrowhead without right angle • rhombus **B0** for • square • rectangle • non-isosceles trapezium • arrowhead with right angle • parallelogram • triangle or shape with 5 or more sides	Mark intention: accept vertices ± 2mm and freehand for 2 marks If in doubt, use overlay as guide. Place so the correct point would be in the centre of the square and their point must be in, or on, square formed by red lines within overlay Condone slight extensions, gaps and wobbles If more than 1 drawing and no clear choice mark the worst Mark boldest lines as intended diagram
2	(a)	(i)	>	1		
	(a)	(ii)	=	1		
	(b)		3	1		
3	(a)		... 5×5 or 5^2	1		As last line on working lines
	(b)		125	1		
	(c)		29	1		

Question			Answer	Mark	Part Marks	Guidance
4	(a)		20	2	**M1** for 125 ÷ 6.25 oe	May be 20 repeated subtraction or addition in a list Accept 6.25 × 20 for M1
	(b)		1080	3	**B2** for figs 108 OR **M2** for 12 000 × (77 – 68) oe or **M1** for 12 000 × 77 or 12 000 × 68 or 77 – 68	May be in working or on answer line May be implied by figs 924 – figs 816 oe may be e.g. 12 000 × (0.77 – 0.68) or 12 000 × 0.09 Subtraction should be seen but may be implied by layout Condone subtraction written the wrong way around May be implied by figs 924... or figs 816 ... or 9
5	(a)		(–3, 3) plotted correctly	1		Use overlay if in doubt Take centre of mark as position If A used as plot, scores 1 if centre of A in correct position
	(b)		5	1		
	(c)		Ruled vertical line x = 2	1		Accept good freehand and dashed line If more than one vertical line and no clear choice mark the worst, ignore line at x = –3 If y = 2 also drawn and not rejected, treat as choice Use overlay to check if in doubt At least 2 cm long. If line more than 2 cm then must be in overlay throughout length.
	(d)		(–3, –2)	2	**B1** for answer (2, –2) or (–3, –2) seen or plotted on grid If 0 scored, **SC1** for answer (–3, ...) or (…, –2)	Ignore other points

Question			Answer	Mark	Part Marks	Guidance
6	(a)	(i)	12a final answer	1		Accept 12 × a or a12 or a × 12
		(ii)	b^4 final answer	1		Do not accept b4 but BOD if 4 appears raised above the base of b
		(iii)	c^6 final answer	1		Do not accept c6 but BOD if 6 appears raised above the base of c
	(b)		3(3 – 2y) final answer	1		May be 3×(3 – 2y) or –3(–3 + 2y)
7			39	3	**M2** for 0.7 × (60 + 60) – 45 oe or **M1** for 0.7 × (60 + 60) oe implied by 84 OR **M2** for $70 \times 2 - \frac{45}{60} \times 100$ implied by 65 or **M1** for $\frac{45}{60} \times 100$ implied by 75 OR **M2** for $\frac{45 + [\ ]}{2} = 0.7 \times 60$ oe or **M1** for 0.7×60 oe implied by 42 If 0 scored, **SC 2** for answer $\frac{39}{60}$	Accept 39 out of 60 for 3 marks e.g. 84 – 45 e.g. 140 – 75 e.g.45 + [ ] = 84 An implied M mark stands so long as there is no evidence to suggest that it is not used to reach the answer

Question			Answer	Mark	Part Marks	Guidance
8	(a)		30	2	**M1** for $\frac{4\times(9+6)}{2}$ oe or $4\times 6+\frac{4\times 3}{2}$ oe or $4\times 9-\frac{4\times 3}{2}$	 Implied by 24 + 6 Implied or by 36 – 6
	(b)		50	2	**B1** for d = 100 seen or **M1** for $2\pi r = 100\pi$ or for $\pi d = 100\pi$ or $\frac{100}{2}$	 Accept e.g. $[r =]\frac{100\pi}{2\pi}$

Question			Answer	Mark	Part Marks	Guidance
9	(a)			2	**B1** for one correct region	Condone number 1 and/or number 2 repeated
	(b)		$\frac{1}{13}$ or 0.076 to 0.077	1	**FT** their diagram for numerator	Accept 7.6% to 7.7% isw after correct, or FT, fraction seen
	(c)		10 has been counted twice oe	1		See appendix
			$\frac{7}{13}$ or 0.53[8..] to 0.54	1		Accept 53[8..]% to 54%

Question			Answer	Mark	Part Marks	Guidance
10	(a)		3 : 7	2	**B1** for 9 : 21 or 6 : 14 or seen or for answer 1 : 2.3[3...] or 0.42 to 0.43 : 1	Ignore incorrect cancelling once a correct, partially simplified ratio seen
	(b)		4	2	**M1** for $\frac{1}{5}\times 5$ or $1\div\frac{1}{5}$ or $\frac{4}{5}$ oe seen or **B1** for equivalent ratio to 1 : 4 oe seen	0.8 or 80% e.g. 2 : 8, $\frac{1}{4}:1$, 0.25 : 1
	(c)		5 nfww	3	**M2** for (3 × 25) ÷ 15 or **M1** for (3 × 25) implied by 75 or $\frac{25}{15}$ implied by 1.6 to 1.7 OR **M2** for 3 × 5 ÷ 3	NB The following are wrong methods and score **M0** 25 ÷ 3 = 8.33... and then 15 ÷ 8.33... = 1.8 rounded to 2 So 3 + 2 = 5 Also 15 ÷ 3 = 5 and also 25 ÷ 5 = 5 From using the inverse of 25 days ÷ 5 × 3 to get 15 days
11			Yes Yes No Yes	2	**B1** for 3 correct	Accept any unambiguous indication e,g ✓ for yes or ✖ for no

Question			Answer	Mark	Part Marks	Guidance
12	(a)		108	3	**M2** for $\frac{72}{360} \times 540$ oe or **M1** for $\frac{72}{360}$ oe or $\frac{540}{360}$ oe	May be e.g. $72 \div \frac{360}{540}$ or $72 \div 0.66$ to 0.67 or $540 \div 5$ Implied by e.g. $\frac{1}{5}$ or 5 or 0.2 or 20% or e.g. 1.5 or 0.66 to 0.67 accept Inverse $\frac{360}{72}$ or $\frac{360}{540}$ accept $360 \times x = 72 \times 540$ for M1 where x is any variable or 216 [students] NOT from 360 – 72 – 72
	(b)		162	3	**M2** for $\frac{3}{4} \times (360 - 2 \times 72)$ oe OR **M1** for $\frac{3}{4} \times [\quad]$ oe or **B1** for 216	or $\frac{3}{4} \times (540 - 2 \times$ their 108$) \times \frac{360}{540}$ oe e.g. 540 – 216 (= 324) → 324 ÷ 4 (= 81) → 324 – 81 (= 243) → $243 \times \frac{360}{540}$ or $243 \div \frac{540}{360}$ or $243 \div 1.5$ NB $\frac{360}{540} = \frac{2}{3}$ and the inverse is often 1.5 [ ] < 540
13	(a)		$\sqrt{16} = 4$ or $4^2 = 16$	M1		Ignore other correct roots e.g. $\sqrt{9} = 3$ unless these used to reach answer.
			2	A1	If 0 scored, **SC1** for answer 2 with no or confused or insufficient working	Must just be 2
	(b)		It would not change oe	1		The square root symbol only gives the positive root, so no change oe

Question			Answer	Mark	Part Marks	Guidance
14	(a)		No and $\frac{73}{70}$ or 1.04[...] or 104% AND is greater than 1 oe or is not equal to 1 oe or He won't have enough money oe	2	Not "It's improper fraction" or "Top heavy" **M1** for $\frac{1}{2}+\frac{2}{5}+\frac{1}{7}$ soi $\frac{73}{70}$ or 0.5 + 0.4 + 0.14[…] soi 1.04[...] or 50[%] + 40[%] +14[...%] soi 104[...%]	Accept equivalent fractions, decimals or percentages Allow using an amount of money. Check their total or difference for 2 marks If comparing fractions, must have common denominator or numerator. Accept e.g. $\frac{10.4[...]}{10}$ for $\frac{73}{70}$ May be **M1** for $1-\left(\frac{1}{2}+\frac{2}{5}\right)$ soi $\frac{1}{10}$ and for **2 marks** No $\frac{1}{7}>\frac{1}{10}$ or $\frac{10}{70}>\frac{7}{70}$ or **M1** for 1 – (0.5 + 0.4) soi 0.1 and for **2 marks** No $\frac{1}{7}=0.14[...]>0.1$ or **M1** for $1-\left(\frac{1}{2}+\frac{1}{7}\right)$ soi $\frac{5}{14}$ and for **2 marks** No $\frac{5}{14}=\frac{25}{70}$ $\frac{2}{5}=\frac{28}{70}>\frac{25}{70}$ oe
	(b)		256	2	**M1** for 320 × $\frac{2}{5}$ [× 2] oe soi 128	e.g. $\frac{4}{5}\times 320$ or $640\times\frac{2}{5}$ or 640 × 0.4 or 320 × 2 [= 640] and [their 640] ÷ 5 = [their 128]

Question			Answer	Mark	Part Marks	Guidance
15			The [age] groups overlap oe	**1**		See appendix Mark the best part of a single statement provided no contradiction or incorrect statements If more than one criticism, mark the worst Allow describing one or more common values or giving correct scales
16	**(a)**		4.9×10^{-1}, 9.5×10^{1}, 2.4×10^{2}, 1.3×10^{3},	**1**		Mark the answer line and look for order of indices -1, 1, 2, 3 Condone TE if unambiguous If answer given as ordinary numbers must be correct 0.49, 95, 240, 1300
	(b)		4.5×10^{3}	**2**	**B1** for 4500 or for 500 and 4000	For B1 accept poor form e.g. 45×10^{2}
17	**(a)**		29 500	**1**		
	(b)		Accept any correctly matched pair of values in which rugby < football from these ranges rugby: 30 450 to 30 498 and football: 30 451 to 30 499	**2**	**B1** for one value for rugby or football in these ranges rugby from 30 450 to 30 498 or football from 30 451 to 30 499	Error interval alone scores 0 Only mark candidate's chosen value(s) Rugby < football does not need to be stated If a pair of values and rugby or football not stated assume the value on the left or below another is rugby For B1 if one or multiple values seen and no clear choice/designation all must be in range 30 451 to 30 498
18			$k = \frac{t+h}{2}$ oe final answer	**2**	**B1** for answer $\frac{t+h}{2}$ oe or **M1** for $t + h = 2k$ or $\frac{t}{2} = k - \frac{h}{2}$	For **2** oe allow $k = \frac{t}{2} + \frac{h}{2}$ or $k = 0.5t + 0.5h$ For **B1** oe allow $\frac{t}{2} + \frac{h}{2}$ or $0.5t + 0.5h$ $t - 2k + h = 0$ does not count as the first correct step

Question			Answer	Mark	Part Marks	Guidance
19	(a)		83 or 84	3	**M2** for $150 \times \frac{5}{9}$ oe implied by answer 83.3… or **M1** for $\frac{5}{9}$ or for $\frac{150}{9}$	Non calculator methods must be fully correct, see appendix, and would lead to 83.3 May be implied by 0.55 to 0.56 or 55% to 56% May be implied by 16.6 to 16.7
	(b)		$\frac{3}{5}$	2	**B1** for $\frac{12}{20}$ oe	For **B1** accept 0.6 or 60% or $\frac{12}{20} \times 150$
	(c)		[Ling has] more results [than Riley] oe	1		See appendix Accept he/they/she as reference to Ling May be inverse: [Riley has] fewer results [than Ling] oe Do not accept comments about more/less in the bag

Question			Answer	Mark	Part Marks	Guidance
20			$17\,000 \times 0.85 \times 0.9$ oe	M3	**M2** for $17\,000 \times \frac{100-15}{100}$ oe soi 14 450 or **M1** for $17\,000 \times \frac{15}{100}$ oe soi 2550 and **M1** for their $14\,450 \times \frac{100-10}{100}$ oe	Allow subtractions the wrong way round if intention clear For non-calculator methods, see appendix N/C methods allow layout to imply addition Labels (correct values) (incorrect values) e.g. **M1** 10% = 1700 **M0** 10% = 1750 ✖ 5% = 850 5% = 875 15% = 2550 15% = 2625 **M1** 10% = 1700 5 % = 850 15% = 1550 ✖ Condone slip in addition Accept any value except 17 000 for their 14 450 After **M0** accept 17 000 for their 14 450
			[final value =] 13 005	B1		Accept 13 000 for **B1** after **M3**

Question			Answer	Mark	Part Marks	Guidance
21			37 with correct working	5	**M1** for 2x + 5 + 3x − 1 + x = 100 may be implied by a subsequent correct equation **M1** for simplifying their equation to ax + b = c or 6x + 4 = 100 **M1** for the first correct step in solving their ax + b = c and **M1** for substituting their 16 into 2x + 5 OR **M3** for one complete correct evaluation of 2x + 5 + 3x − 1 + x = 100 or **M2** for one complete correct evaluation of 2x + 5 + 3x − 1 + x = a total or **M1** for one correct evaluation of each expression 2x + 5 [+] 3x − 1 [+] x If **0, 1** or **2** scored, instead award **SC3** for answer 37 with no or insufficient working If **0** or **1** scored, instead award **SC2** for x = 16 with no or insufficient working	"Correct working" requires evidence of first method and at least **M1** and x = 16 or **M3** if using trials or **M2M1** for non-algebraic method Three separate expressions are not enough Ignore inclusion of % in working 6x + 4 = 100 scores **M1M1** e.g. 6x = 100 – 4 6x = 96 scores M1M1M1 For **M** marks with trials: allow each term or each expression from the question evaluated separately e.g. (Use 10) 20 + 5 + 30 – 1 + 10 = 64 or 25 (+) 29 (+) 10 = 64 <u>Alternative method (Non algebraic)</u> **M2** for 100 – 5 + 1 oe or **M1** for – 5 + 1 or – 4 AND **M1** for their (100 – 5 + 1) ÷ 6 AND **M1** for substituting their 16 into 2x + 5

Question			Answer	Mark	Part Marks	Guidance
22			Accurate ruled perpendicular bisector of AB with two correct pairs of supporting arcs	2	**B1** for accurate ruled perpendicular bisector of AB with no or incorrect arcs	Use overlay as a guide Put ruler on screen to check 2 cm if needed Tolerance ±2 mm and ±2°. Line length at least 2 cm Bisector crosses between circles of overlay but does not cut them and perpendicular by eye
			Accurate ruled bisector of angle ABC with two correct pairs of supporting arcs	2	**B1** for accurate ruled bisector of angle ABC with no or incorrect arcs	Tolerance ±2°. Line length at least 2 cm Bisector between or on red lines of overlay arcs.
			Correct position of boat clearly identified at point of intersection of two straight lines	1 dep	Dep on at least **B1** and **B1**	
23	(a)		[They should have] divided by 1.25 or multiplied by 0.8 oe or 2625 increased by 25% is 3281.25/not 3500	1		See appendix Mark the best part of the statement unless there is contradiction or an incorrect statement
	(b)		3304	4	**M3** for 3500 ÷ 1.25 × 1.18 oe or **M2** for [k ×] 1.18 ÷ 1.25 soi by 0.944 or for 3500 ÷ 1.25 soi 2800 or for m × 1.18 where m is their value for 2020 or **M1** for 1.25 or 1.18 seen	For non-calculator methods see appendix May be 1.25 ÷ 1.18 soi 1.059... m can be 2625 (which gives 3097.5) May be implied by 1.475 NC 1.25 may be e.g. k ÷ 4 + k, k = a number

Question			Answer	Mark	Part Marks	Guidance
24	(a)		Correct substitution of (x, y) from integer point on curve into equation leading to k = 3 e.g. (2, 4) $4 = 2k – 2^2 + 2$ or $4 = 2k – 4 + 2$ leading to k = 3 with at least one correct intermediate step	2	**M1** for correct substitution of (x, y) from integer point on curve into $y = kx – x^2 + 2$ or $y = 3x – x^2 + 2$ OR **M1** for e.g. x = 2 correctly substituted in $y = 3x – x^2 + 2$ and finding y = 4 Max M1 if k = 3 substituted	(-1, -2) : $-2 = -[1]k – (-1)^2 + 2$ (1, 4) : $4 = [1]k – 1^2 + 2$ (2, 4) : $4 = 2k – 2^2 + 2$ (3, 2): $2 = 3k – 3^2 + 2$ (4, -2): $-2 = 4k – 4^2 + 2$ Use of (0, 2) scores 0 but may be replaced with another point (ie do not treat as a choice) <u>Examples of intermediate steps</u> $4 = 2k – 2^2 + 2$ then $4 = 2k – 4 + 2$ is a sufficient int step or $4 = 2k – 2$ is a sufficient int step or $6 = 2k$ is a sufficient int step $3 = k$
	(b)		0.4 and 2.6	2	**B1** for 0.4 or 2.6 or **M1** for line y = 3 drawn or for (0.4, 3) and (2.6, 3) indicated	Line to cut curve twice Treat x = 3 drawn or multiple horizontal lines as choice unless y = 3 clearly chosen Condone good freehand line eg circled or lines drawn down to x-axis

Question			Answer	Mark	Part Marks	Guidance
25			2.1[0…] nfww	**4**	**M1** for $\frac{360}{60}$ oe soi by 6 AND **Method 1 using tan:** **M2** for [h =] 20 tan(their 6) oe or **M1** for correct use of tan(their 6) oe or **Method 2 using sine rule:** **M2** for [h =] $\frac{20\sin(their\ 6)}{\sin(90-their\ 6)}$ or **M1** for $\frac{\sin(their\ 6)}{h} = \frac{\sin(90-their\ 6)}{20}$ oe or **Method 3 using cos and Pythagoras:** **M2** for $\sqrt{(\frac{20}{\cos(their\ 6)})^2 - 20^2}$ or **M1** for $(\frac{20}{\cos(their\ 6)})^2 - 20^2$	May be on diagram In all methods, if their angle is not 6 then method must be seen, not implied by interim answers unless stated otherwise Accept any acute angle used for their 6 eg [h =] $\frac{20}{\tan(90-their\ 6)}$ eg tan(their 6) = $\frac{h}{20}$ NBs $\frac{\text{approx. circumference}}{60} = \frac{40\pi}{60}$ = 2.1 scores **0** 20sin6 = 2.1 scores **M1** for 6 Solution from scale drawing scores a maximum of **M1** if 6 seen
			Total	**100**		

Non Calculator methods for percentages.

Labels only

This is when labels such as 10% = are used.

If only labels are used the final answer scores full marks if it is correct.
Condone a numerical slip if the answer is correct.
If there is an error in the values and so the **final answer is incorrect** this cannot score method marks

e.g. Find 65% of 60

Method scoring M1A1

10% = 6
5% = 3
50% = 30
65% = 39 ✓ M1A1

10% = 6
5% = 4 ✖ condone this slip as answer correct
50% = 30
65% = 39 ✓ M1A1

Method scoring M0A0

10% = 6
5% = 4 ✖ M0 Do not condone this slip as answer incorrect
50% = 30
65% = 40 ✖

Build up method

This is where the candidate finds the percentages to build up to the required value but shows the operations used.

e.g. Find 65% of 60
10% = 60 ÷ 10 = x
5% = x ÷ 2 = y
50% = x × 5 = z
65% = x + z + y
Because the operations have been shown and they are correct, if there is an error in one of x, y or z, method marks can still be earned

Question 9c
Appendix

Statement	Reason	Mark
He has included the 10 as being in set F and set T separately	BOD counting 10 twice for “included the 10 and separately”	1
The 10 is included in both fractions	Implies has been counted twice	1
She has counted the 10 for both	BOD “for both” implies “twice”	1
10 appears in both F and T	Does not say “counted twice”	0
The element may be in both T and F	Wrong as the element IS in both and this doesn’t imply double counting	0
One number is in both sets	Does not say “counted twice”	0
Not all go into both	Does not say counting an element twice	0
He has included the shared number	Does not say “twice”	0
You do not count numbers that are in both sets	False, you do but once for each	0
He has not accounted for the ones between them	Does not say “counted twice”	0

It has overlapping numbers.		1
Some numbers appear twice.		1
Should be 0-5, 6-10 etc.	or 0 – 4 then 5 – 9 etc	1
Should be 0≤ h< 5, 5 ≤ h< 10 etc	Condone 0< h≤ 5, 5<h≤ 10 etc	1
The labels for the bars overlap		1bod
10 is in both sets	Repeated value	1
the age is confusing because there's 2 bars that 10 can go into	Repeated value	1
The age section of the graph use the previous number in each bar.	Repeated value	1
he uses the same age twice	Accept BOD to mean value repeated in two groups	1
he doesn't need to put the same number that was at the end in the beginning	BOD repeated value	1
Some people could claim to be in two different bar charts (5, 10, 15)	BOD inclusion of charts and intention 5 – 10 and 10 - 15	1
Should be 0≤ h≤ 5, 5 ≤ h≤10 etc	This does not resolve the issue of overlapping values	0
it didn't have to go up in two's as the number of people attending were all odd	False	0
you should not go if your 0 – 5 as it is very young to go to a youth club	Irrelevant	0
the bars aren't all the same width	They are	0
The age gaps are too big	No criticism of the end points of the scale	0
There are gaps between the bars		0
Age doesn't start at 0.		0
The categories could be more specific/are not accurate.		0
Some young people are older than 20.		0
Age is not a linear scale		0

Question 19c

Ling chose more counters		1
There is more counters	BOD as does not say “in the bag” and could mean “in the sample”	1 bod
Lin picked more times		1
Ling took more samples		1
Ling took a larger sample	Could mention numbers such as “more than 9”	1
She has more in the tally	BOD	1
Ling did it 20 times and Riley did it 9 times	BOD a comparison (would be better if “only” included)	1
There are more counters in the bag	This is untrue	0
Ling did it multiple times	Not a comparison (we have to do the comparing)	0
Ling did it 20 times	Not a comparison (we have to do the comparing)	0

Question 23a

He needs the multiplier by 0.8	As this is described as a multiplier it is assumed that $\times$ 0.8 is the correct operation and equivalent to $\div$ 1.25	1
3500 $\div$ 1.25 oe = 2800	Award the mark for [ ] $\div$ 1.25 oe	1
He should have reduced 3500 by 20%	Equivalent to $\times$ 0.8	1
It should be 2800	Does not show the calculation	0
Because it is 25% more of 2020 not 25% less of 2022	“It” is vague. They appear to be saying that the distance in 2022 is 25% more than that in 2020 (repeats line 3 of question) but then does not comment on Kai’s error	0
3500 is equal to 125% not 100%	Does not explain the error	0
Because in 2022 the distance drove is 125% of the distance in 2020, so 0.75 would be inaccurate	First line does not comment on Kai’s error Second line is incorrect (Comments on accuracy are insufficient)	0
Because they do 2022 is 125% of 2020 so they would have to get rid of 25% by the actual number	And to get rid of 25% they would multiply by 0.75 as Kai has done	0
You would need to divide it by 1.25 to get a 25% decrease	Contradiction; first is correct, second is wrong	0
x 0.75 is a 25% reduction	True but does not explain the error	0
Does not reverse the percentage	It is unclear what is meant	0
He needs the multiplier to be 1.25	Does not say how this is to be used	0
Because that would be 25% of 3500 which is 125% so that wouldn’t be the same as 25% of 100%	Does not say divide by 1.25	0
He took 25% of the wrong amount	Does not say divide by 1.25	0

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