OCR
Oxford Cambridge and RSA

Higher

GCSE

Mathematics - Paper 6

J560/06: Paper 6 (Higher tier)

General Certificate of Secondary Education

Mark Scheme for June 2022

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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

4. Mark strictly to the mark scheme.

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

6. 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.

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

8. 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.

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

10. 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.

11. 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).

12. 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.

13. 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.

14. 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

15. **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.

16. 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.

17. 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.

18. 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.

19. 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).

20. 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'.

21. 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.

22. 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.

23. 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.

24. 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.

25. 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.

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

27. 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.

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

Question			Answer	Marks	Part marks and guidance	
1		(a)	<table><tr><td></td><td>3</td><td>4</td><td>5</td></tr><tr><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>5</td><td>6</td><td>7</td><td></td></tr></table>	2	**B1** for at least 7 correct values in the table	
		(b)	$\frac{8}{16}$ oe	1FT		lsw if final answer comes from simplifying $\frac{8}{16}$ Accept decimal, percentage with % but not ratio or "in".
		(c)	$\frac{4}{16}$ oe	1FT		lsw if final answer comes from simplifying $\frac{4}{16}$ Do not penalise ratio or "in" if already penalised in (b)

Question			Answer	Marks	Part marks and guidance	
2			42.09[…] with correct working	4	**M3** for $\pi \times \left(\frac{23}{2\pi}\right)^2$ OR **M1** for 23 ÷ 2π or 23 = 2π*r* or 23 = π*d* **A1** for 3.66[…] **M1** for $\pi \times$(*their* 3.66)² If 0 or 1 scored, instead award **SC2** for 42.09[…] with no or insufficient working If 0 scored, instead award **SC1** for 3.66[…], 42.08[…], 42.10[…], 42.11[. …] or 168[. …] with no or insufficient working	Correct working requires evidence of at least **M1** Do not accept starting with 42.1 and working backwards Candidates should use the π button or 3.142. Accept 3.14 and 22/7 for max of **M3** **M1** may be in two steps or seen as diameter here and diameter/2 in the area calculation *their* 3.66 must come from a calculation involving π

Question			Answer	Marks	Part marks and guidance	
3			8 min 15 sec	4	**B3** for 8.25 or $8\frac{1}{4}$ or $8\frac{15}{60}$ or for answer 8m 25s OR **M1** for $3.3 \times 10^{-6} \times 1.5 \times 10^{8}$ oe soi by figs 495 and **M1FT** for (*their* 495 ÷ 60)	eg $\frac{1.5 \times 10^{8}}{303030\{.3\ldots\}}$ *their* 495 from attempt at a correct M1 expression

Question			Answer	Marks	Part marks and guidance	
4			4 and 25 nfww	4	**B3** $\frac{10a^4 \times a^8}{25a^5} = \frac{2a^7}{5}$ OR **B2** for $k = 4$ or **M1** any correct simplification of $\frac{a^k \times a^8}{a^5} = a^7$ eg $[a^k \times] a^3 [= a^7]$ or $[a^k \times a^8 =] a^{12}$ $a^k = a^4$ $\frac{a^{k+8}}{[a^5]} [= a^7]$ $k + 8 - 5 = 7$ oe and **B2** for $m = 25$ or **M1** for $\frac{10}{m} = \frac{2}{5}$ oe	Otherwise, condone embedded answers for M marks only **M1** applying correctly a law of indices May be seen within an attempt to simplify with other coefficients. Allow $[m] = 10 \times 5 \div 2$
5			Yes SSS Yes ASA No	3	**B2** for two correct rows or **B1** for one correct row	Accept ticks and crosses For "No" ignore reason
6	(a)		425	2	**M1** for 680 ÷ 1.6[0] oe	e.g. [0].68[0] ÷ [0].0016
	(b)		1600 or 1.6×10^3	1		

Question			Answer	Marks	Part marks and guidance	
7	(a)		x^2 + [1]x – 20 final answer	2	**M1** for at least three of x^2 , [+]5x , − 4x , – 20	**M1** may be seen in a table e.g. <table><tr><td></td><td>x</td><td>-– 4</td></tr><tr><td>x</td><td>x^2</td><td>–4x</td></tr><tr><td>[+] 5</td><td>[+]5x</td><td>–20</td></tr></table> [1]x counts as two terms **M1** for for x^2 + [1]x + – 20 Do not accept poor algebra e.g. x5 for 5x or x × x for x^2
	(b)		(x – 5)(x + 5) final answer	1		Condone missing final bracket
8	(a)		1852 1945	3	**B2** for 1852 or 1945 or for 1852.2 with either 1944.[6] or 1944.8[1] or **M1** for $1764 \times \frac{5}{100} + 1764$ oe soi 1852.2	e.g. 1764 × 1.05 e.g. 1600 × 1.05^3 NC% methods **M0** for just labels eg 10% = then 5% = **M1** for 1764 ÷ 10 = [x]. [x] ÷ 2 = [y], [y] + 1764

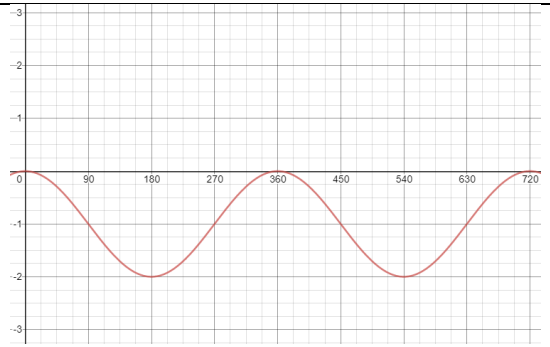
Question			Answer	Marks	Part marks and guidance	
	(b)		Correct curved graph	**3**	**B2** for 5 of *their* points plotted correctly or **B1** for 4 of *their* points plotted correctly or 5 of *their* points plotted at correct height but incorrect time	½ square accuracy <u>Stick graph</u> mark heights as points max **B2** If stick graph and curve regard as choice and mark points/heights only <u>Bar chart</u> If points clearly marked, mark the points If points not clear **B0** Ruled line or line segments max **B2**
	(c)		Increases [to 2000] Flattens/levels off/plateaus/horizontal [at 2000]	**1** **1**		See Appendix 2000/the maximum must be seen once for 2 marks Accept approx./about 2000 Condone embellishments such as “slight fall” after correct statement or reference to line of best fit

Question			Answer	Marks	Part marks and guidance	
9			25[%] with correct working	5	**B2** for 12 600 or **M1** for 18 000 × $\frac{70}{100}$ oe or for 18 000 × $\frac{30}{100}$ AND **M2** for $\frac{their\ 12600-9450}{their\ 12600}$ [× 100] oe or **M1** for $\frac{9450}{their\ 12\ 600}$ [× 100] oe If 0 or **M1** scored, instead award **SC2** for answer 25[%] with no or insufficient working If 0 scored, instead award **SC1** for 0.25 or 0.75 or 75[%] with no or insufficient working	"correct working" requires at least **M2** or **M1M1** with the first **M1** implied by **B2** **M0** for e,g. 70% of 18 000 **M0** for e.g. 70% × 18 000 Accept 3150 for numerator **M2** may be seen as $\left(1-their\frac{9450}{their\ 12600}\right)$ [× 100] **M1** may be seen as $\frac{9450}{18000}$= 0.525 and then followed by $\frac{0.525}{0.7}$ Trials for second M marks **M2** for 12600 × 0.25 = 3150 or **M1** for 12600 × 0.75 = 9450 Equation method **B2M2** or **B2M2** for *p*/100 × 12600 = 3150 leading to *p* = 25 (scores 5 marks) **B2M1** for *p*/100 × 12600 = 9450 leading to *p* = 75 **B2M1** for 18000 x 0.7 x *m* = 9450 leading to *m* = 0.75, as 12600 implied within this

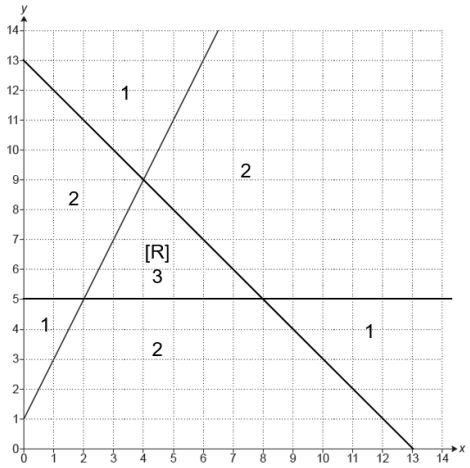
Question			Answer	Marks	Part marks and guidance	
10			864 with correct working	6		”correct working” requires at least **M1M1**
					M1 for $\frac{12\times16}{2}\times18$ **A1** for 1728 or **M1** for $\frac{12\times16}{2}$ AND **M1** for $\sqrt[3]{\textit{their } 1728}$ **A1** for 12 AND **M1** for 6 × (*their* 12)^2 If 0, 1 or 2 scored, instead award **SC3** for 864 as final answer with no working or insufficient working If 0 or **M1** scored, instead award **SC2** for 12 seen as dimension of cube or $\left(\sqrt[3]{3456}\right)^2\times6$ soi 1371 to 1372 with no working or insufficient working If 0 scored, award **SC1** for 1728 or $\sqrt[3]{3456}$ soi 15.1[...] with no working or insufficient working	Accept e.g. 12 × 8 × 18 or 96 × 18 Allow $12^3 = 1728$ for **M1A1** *Their* 1728 must be from correct method for volume of triangular prism *Their* 12 must come from use of volume of triangular prism and cube root

Question			Answer	Marks	Part marks and guidance	
11			107.95 with correct working	6	**B1** for 2*a* or *a* + 5 or 4*a* + 5 or 25.4[0] + 5*x* seen **M1** for *a* + 2*a* + *a* + 5 = 85 or better or for a trial correctly evaluated **A1** for [*a* =] 20 [hours] AND **M2** for $\frac{25.4[0]}{their\ 20} \times 85$ or 1.27 × 85 oe or 25.4[0] + 50.8[0] + $\frac{25.4[0]}{their\ 20} \times their25$ oe or 25.4[0] + 1.27 × 40 + 1.27×25 oe or **M1** for $\frac{25.4[0]}{their\ 20}$ implied by 1.27 or $\frac{25.4[0]}{4}$ implied by 6.35 If 0 or 1 scored, instead award **SC2** for 107.95 with no or insufficient working If 0 scored, instead award **SC1** for 20 [hours] with no or insufficient working	"correct working" requires at least **M1**AND**M1** or **M2** If working in pence: • Allow up to 5 part marks for consistent working • Allow full marks if answer is clearly stated as 10795 p[ence] **M1** implied by sub into *a* + 2*a* + *a* [+ 5] with evaluation **B1 max** possible for using 5*a* instead of *a* + 5 e.g. **M2** for $\frac{25.4[0]}{4} \times 17$ Method marks may be earned in stages May see equivalent algebraic methods. See Appendix. Non-algebraic methods may earn up to full marks.

Question			Answer	Marks	Part marks and guidance	
12			0.3 oe nfww	4	**M3** for $0.4^2 + 0.3^2 + 0.2^2 + 0.1^2$ oe or **M2** for 0.4^2 oe and 0.3^2 oe and 0.2^2 oe and 0.1^2 oe or **M1** for 0.4^2 oe or 0.3^2 oe or 0.2^2 oe or 0.1^2 oe	**M2** for correct method spoilt e.g. $\frac{(0.4^2 + 0.3^2 + 0.2^2 + 0.1^2)}{4}$ Likely equivalents: $0.4^2 = 0.16$ or $\frac{4}{25}$ or 16% $0.3^2 = 0.09$ or $\frac{9}{100}$ or 9% $0.2^2 = 0.04$ or $\frac{1}{25}$ or 4% $0.1^2 = 0.01$ or $\frac{1}{100}$ or 1%
13			716 636 160 with correct working	4	**B1** for 90 or 9 × 10 AND **M2** for 24 × 24 × *their* 90 × 24 × 24 × 24 oe or **M1** for 24 × 24 [×….] or 24 × *their* 90 [×….] or for 24,24,9,10,24,24,24 in any order If 0 or 1 scored, instead award **SC2** for 716 636 160 with no working If 0 scored, instead award **SC1** for 26 × 26 × *their* 90 × 26 × 26 × 26	"correct working" requires at least **M1** Allow 9 × 10 or 89 for *their* 90 eg **M1** for 24 × 5 × *their* 90 or for 24 × 23 × *their* 90 × 22 × 21 × 20 Accept list, summed, or on diagram

Question			Answer	Marks	Part marks and guidance	
14				3	**B1** for general shape of cosine curve **B1** for max at $y = 0$, minimum at $y = -2$ **B1** for max at $x = 360, 720$	Starting at its max and completing at least one full cycle; condone incorrect period For full marks, it must be a curve and have correct curvature Only these two max between $0 < x \leq 720$
15	(a)		20, 44, 69, 76, 80	2	**M1** for cf calculated with one arithmetic error	Allow 80 or *their* 80 FT
	(b)		Plots at right-hand end of intervals Plots at correct heights Join with smooth curve or straight line segments	1 1 1	 Tol ½ square; FT if M1 in (a) Tol ½ square; FT their ascending plots only Condone curve or absence of curve below $t = 25$	Plots of frequencies scores 0 across the whole of (b) 0 for bars at correct heights since must miss off one end; if cf graph as well as bars, ignore bars
	(c)	(i)	For 2 marks must say right/correct/true not yes Sight of 20 or 60 20/80 = ¼ or ¼ of 80 = 20 60/80 = ¾ or ¾ of 80 = 60	 1 1	 Must be separate from the fraction comment. Do not accept more than/less than 60/20. 	See Appendix Accept equivalent in words
		(ii)	wrong/incorrect/false and correct reason	1	e.g. cannot be sure as exact data not given; it could be anywhere between 45 and 50 etc	

Question			Answer	Marks	Part marks and guidance	
16	(a)		E.g. [*y*=]$-(x+3)(x-5)$ AND either $[y=-x^2-3x+5x]+15$ or [Constant/*y*-intercept =] -3 × -5 = 15 <u>Alternative method using simultaneous equations</u> $y = -x^2 + bx + c$ 0 = –(-3)^2 -3*b* + *c* and 0 = -5^2 + 5*b* + *c* [b = 2] *c* = 15	3	**M2** for [*y*=]$-(x+3)(x-5)$ or **M1** for $k(x+3)(x-5)$ **M2** for 0 = –(-3)^2 – 3*b* + *c* and 0 = -5^2 + 5*b* + *c* or **M1** for $y = -x^2 + bx + c$ or for 0 = (-3)^2 – 3*b* + *c* and 0 = 5^2 + 5*b* + *c*	See Appendix For full marks, all shown parts of their expansion must be correct Accept *k* implied as 1
	(b)		The equation could be a multiple E.g. [*y*=]$-k(x+3)(x-5)$ So the intercept could be a multiple of 15	2	**B1** for Giving an example in the form $-k(x+3)(x-5)$ (where *k*>0, *k*≠1, *k* need not be an integer) or stating that the intercept could be a multiple of 15	Allow full or part marks for a fully correct algebraic example E.g. [*y*=]$-2(x+3)(x-5)$ would have a *y*-intercept of 30
17	(a)		6 is not a prime number oe	1		
	(b)		$2^{12} \times 3^5 \times 5^6$	2	**M1** for [6^5 =] $2^5 \times 3^5$ seen, expanded or used or for answer including 2^{12} or 3^5	Correct answer in expanded form implies $2^5 \times 3^5$ used for **M1**
	(c)		20 000	2	**B1** for $2^5 \times 5^4$	

Question			Answer	Marks	Part marks and guidance	
18			E.g. Correct inequalities shown on diagram, correct region R identified and correct area calculation ½ × 6 × 4 [= 12]  	6	**B1** for line $y = 5$ **B1** for line $x + y = 13$ AND **B1** for correct side of $y = 2x + 1$ **B1** for correct side of $y = 5$ **B1** for correct side of $x + y = 13$ AND **M1dep** for ½ × 6 × 4 [= 12] oe	Condone good freehand lines, which can be dashed or solid. Lines need only be one square long for line mark but they must be fit for purpose to define their region Mark the region which is labelled, but if no labelling mark the single region which is shaded (or unshaded) or implied by area calculation of correct region R Use diagram for these three marks If extra lines, mark those bounding R. If no R, mark poorest two Dep on region R being correct Accept counting squares but check areas bounding $y = 2x + 1$ Accept split into two triangles 4 and 8 oe

Question			Answer	Marks	Part marks and guidance	
19	(a)		$(x – 4)^2 – 7$ final answer	3	**B1** for $(x – 4)^2$ AND **B2FT** for – 7 or **M1** for $9 – (\textit{their}\ {}^{-}4)^2$ oe shown If 0 or 1 scored, allow **SC2** for final answer $(x – 4) – 7$	 No FT from $(x – 3)^2$ FT can be implied, check $9 – (\textit{their}\ {}^{-}4)^2$
	(b)		$4 + \sqrt{7}$ $4 – \sqrt{7}$ final answer with working from **(a)**	2FT	 **M1** for *their* $(x – 4)^2$ = *their* 7 FT from *their* (a) for solutions in exact form if working shown	Answers only score 0 Do not FT where $b = 0$ e.g. $(x – 4)^2$ If their b is a perfect square, allow FT for $a + \sqrt{b}$ and $a – \sqrt{b}$ or simplified as two integers If $b < 0$, a max of M1

Question			Answer	Marks	Part marks and guidance	
20			125 with correct working	**4**	**M3** for [8 ×] $\left(\sqrt{\frac{75}{12}}\right)^3$ or 2.5^3 oe or **M2** for $\sqrt{\frac{75}{12}}$ or $\sqrt{6.25}$ oe implied by 2.5 or 5/2 or **M1** for $\frac{75}{12}$ oe implied by 6.25 <u>Alternative method:</u> **M3** for [8 ÷] $\left(\sqrt{\frac{12}{75}}\right)^3$ or 0.4^3 oe or **M2** for $\sqrt{\frac{12}{75}}$ or $\sqrt{0.16}$ oe implied by 0.4 or 2/5 or **M1** for $\frac{12}{75}$ oe implied by 0.16 If 0 scored, instead award **SC1** for answer 125 with no or insufficient working	"correct working" requires evidence of at least **M2** Accept ratios **M3** for 8 : 125 oe or **M2** for 2 : 5 oe or **M1** for 4 : 25 oe

21			2.8 to 2.81 with correct working	**6**		All methods: "correct working" requires at least **M1**AND**M1**AND**M1**
					First M1 may be on diagram or within other M marks	First M1 may be on diagram or within other M marks
					M1 for BAC = 180 – (32 + 43) or 58 + 47 or 105	**M1** for BAC = 180 – (32 + 43) or 58 + 47 or 105
					AND	AND
					M2 for AC = $\frac{7.5 \times sin32}{\sin(their\ 105)}$	**M2** for AB = $\frac{7.5 \times sin43}{\sin(their\ 105)}$
					or **M1** for $\frac{AC}{sin32} = \frac{7.5}{\sin(their\ 105)}$ oe	or **M1** $\frac{AB}{sin43} = \frac{7.5}{\sin(their\ 105)}$ oe
					AND	AND
					A1 for AC = 4.11[4…] or 4.115 (M1A1 implies M2A1)	**A1** for AB = 5.29[5…] or 5.3[0] (M1A1 implies M2A1)
					AND	AND
					M1 for $\frac{AX}{their\ 4.11}$ = sin43 or *their* 4.11 × sin 43 oe	**M1** for $\frac{AX}{their 5.3[0]}$ = sin32 or *their* 5.3[0] × sin 32 oe
					If 0, 1 or 2 scored, instead award **SC3** for 2.8 to 2.81 with no or insufficient working.	If 0, 1 or 2 scored, instead award **SC3** for 2.8 to 2.81 with no or insufficient working.
					If 0 or 1 scored, instead award **SC2** for 4.11[4…], 4.115 with no or insufficient working.	If 0 or 1 scored, instead award **SC2** for 5.29[5…] or 5.3[0] with no or insufficient working.

					Alternative Method splitting BC: First M1 may be on diagram or within other M marks. Accept other terms for *d*. Do not accept numerical partition of BC. **M1** for BX = *d* and XC = 7.5 – *d* AND **M2** for *d* = $\frac{7.5tan43}{tan32+tan43}$ oe or **M1** for *d*tan32 = (7.5 – *d*)tan 43 oe AND **A1** for *d* =4.49 to 4.5 (M1A1 implies M2A1) AND **M1** for $\frac{AX}{their\ 4.49}$ = tan32 or *their* 4.49 × tan32 or for $\frac{AX}{(7.5-their\ 4.49)}$ = tan43 or (7.5 – *their* 4.49) × tan43 If 0, 1 or 2 scored, instead award **SC3** for 2.8 to 2.81 with no or insufficient working. If 0 or 1 scored, instead award **SC2** for 4.49[…] or 4.5[0] with no or insufficient working. Alternative Method using Areas The main scheme still applies. The first four marks will be identical and the area	First M1 may be on diagram or within other M marks. Accept other terms for *d*. Do not accept numerical partition of BC. **M1** BX = 7.5 – *d* and XC = *d* AND **M2** for *d* = $\frac{7.5tan32}{tan43+tan32}$ oe or **M1** for *d*tan43 = (7.5 – *d*)tan 32 oe AND **A1** for *d* = 3 to 3.01 (M1A1 implies M2A1) AND **M1** for$\frac{AX}{their\ 3.01}$ = tan43 or *their* 3.01× tan43 or $\frac{AX}{(7.5-their\ 3.01)}$ = tan32 or (7.5 – *their* 3.01) × tan32 If 0, 1 or 2 scored, instead award **SC3** for 2.8 to 2.81 with no or insufficient working. If 0 or 1 scored, instead award **SC2** for 4.49[…] or 4.5[0] with no or insufficient working.

Question			Answer	Marks	Part marks and guidance	
					method eventually simplifies to the final M1 expression. This is just a much more complex method.	

APPENDIX

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 80

Method scoring M1A1

10% = 8	10% = 8
5% = 4	5% = 5 condone this slip as answer correct
50% = 40	50% = 40
65% = 52 ✓ M1A1	65% = 52 ✓ M1A1

Method scoring M0A0

10% = 8
5% = 6 ✖ Do not condone this slip as answer incorrect
50% = 40
65% = 54 ✖ **M0**

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 80
10% = 80 ÷ 10 = x
5% = $x \div 2 = y$
50% = $x \times 5 = z$
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

8c

Reason	Judgement	Mark
It would increase to 2000 then stay at 2000	Correct Correct	1 1
Once it reaches 2000 it will plateau	Reaches 2000 implies increasing It will plateau is fine	1 1
It would increase to approx. 2000 and then remain more or less constant around this value.	approx. is okay. 2000 referenced at least once.	1 1
Keep increasing as 2000 is a little way up the scale.	Increase is fine	1 0
It will increase and continue past the maximum Then it will fall as fish will die	Award for "It will increase" Doesn't say the line will level off	1 0
After the 5th year the graph would be capped at 2000, only allowing 55 more fish in the lake.	Implies increase in graph BOD The description is for what is happening in the lake and not the shape of the graph	1 0
The line continues up and then falls	Continues **up** is enough but without the up, would not get the mark Falls is incorrect	1 0
It would cause it to slow down in the rate of increase and would then cause it to plateau.	Describes increase True. No mention of 2000. Max 1 mark	1 0
The line of best fit would hit a peak.	Not awarded as the peak could be at the end of the line so "up" not implied.	0
 It would eventually plateau and level out with no increase.	No mention of increase (to 2000)	0 1
The line will continue to 2000 Then it will go along the x-axis	Correct as "the line continues" and max/2000 imply going up Incorrect as it is parallel to the x-axis, not along it	1 0
It starts to decrease...then not go past 2000 Once at 2000 it will stay around the same place	Incorrect should be increase Staying around the same place BOD for value	0 1
After 4 years the shape would no longer increase. It'll stay at 2000 with a horizontal line on 2000.	Incorrect. Correct	0 1
 It would plateau/level off at 2000 fish	No mention of graph increasing 2000 then staying there.	0 1
 It would become a horizontal straight line		0 1

The graph would plateau as no fish are being added or taken away	No mention of increase Correct for plateau	0 1
4 years almost 2000 fish(1995) so the graph would plateau as no more fish can live in the pool	No increase Plateau	0 1
It would not increase. The line of best fit would level off and perhaps sometimes slightly decrease.	Wrong (but It would not increase past 2000 implies curve increasing for 1 mark) Level off okay, condone the rest as not contradicting	0 1
It will exceed the maximum amount of fish	Describing what is going on in the lake not the shape of the graph	0 0
Would start plateauing downward becoming more and more flat as less fish were present year by year.	No mention of increase (or 2000) Spoilt for second mark as suggests going down so is contradictory	0 0
The graph curves as the max capacity is exceeded	Ruled out as a possible interpretation is that it has already reached maximum and it then curves in some direction	0

Q11

There are possibly many algebraic methods for this question. Examiners should use the main scheme as a template, matching steps or positions in the solution as best as possible. If in doubt, contact your Team Leader. For example:

(tips): Amir : Beth : Charlie are 25.4 : 50.8: 25.4 + 5x (where x is hourly rate of tips) (total tips): 25.4 + 50.8 + 25.4 + 5x = 85x (solving): x = 1.27 (substitution into either side of the equation) eg 85 × 1.27 (final answer) 107.95	This is on the scheme at B1 There is an equation on the scheme, so M1 would be a good judgement And then this would be the A1 This is on the scheme at M2 The answer is correct and the candidate has satisfied the “correct working” requirement and so is awarded full marks	B1 M1 A1 M2

Q15c(i)

Reason	Judgement	Mark
Correct, ¾ of 80 is 60 and 20 cyclists completed within 30 minutes, leaving the remaining ¾ of cyclists taking over 30 minutes		1 1
True, ¾ of 80 = 60 and 60 cyclists took more than 30 minutes		1 1
Right, 20 cyclists completed the race in under 30 minutes and 20/80 = ¼.		1 1
Right, 60 cyclists took more than 30 minutes and ¾ of 80 = 60.		1 1
Wrong, 60 cyclists took more than 30 minutes and ¾ of 80 = 60.	Despite “wrong”, mark the comments but do not award full marks	1 0
Yes, 60 cyclists took more than 30 minutes and ¾ of 80 = 60.	Do not award 2 marks with “yes”	1 0
Correct, if you add the amount of times after 30 you get 60 and there’s 80 cyclists.		1 0
Right, 60 cyclists took more than 30 minutes.		1 0
Wrong, 60 cyclists took more than 30 minutes.	Despite “wrong”, mark the comment	1 0
True, the lower quartile is at 30mins	Implies 20	1 0
¾ of 80 = 60		0 1

Q15c(ii)

Reason	Judgement	Mark
Wrong, all we know is that it is between 45 and 50	Condone 46 and 50	1
Wrong, there is a range of values for the time so not definitely 50		1
Wrong, as the time is given as a range		1
Wrong, we are not given the accurate values		1
Wrong, it might be but we need to know the exact values to find out		1
Wrong, they may have all been less than 50	all	1
Wrong, some cyclists may have taken 49.5 minutes	some	0
Wrong, we need more data	Ambiguous	0
Right, 50 is the highest value		0
Right [with any comment]		0

“x

Q16a

$(x + 3)(x – 5)$ $= x^2 – 2x – 15$ But the quadratic is upside down so it will be $-x^2 + 2x + 15$ [there then was an arrow from the +15 to the intercept]	The response doesn’t quite fit the scheme but is thought worthy of full marks This line on its own scores M1 But this line makes it equivalent to the M2 and it also a correct expansion with + 15 The linking of +15 to the intercept is an added bonus	

Q17a

Reason	Judgement	Mark
6 is not a prime number		1
6 is not a prime factor		1
6 can be written as 2 × 3		1
6 is not allowed		0

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