Higher

GCSE

Mathematics - Paper 5

J560/05: Paper 5 (Higher tier)

General Certificate of Secondary Education

Mark Scheme for June 2024

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.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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.

7. Award No Response (NR) if:
   - there is nothing written in the answer space

   Award Zero '0' if:
   - anything is written in the answer space and is not worthy of credit (this includes text and symbols).

   Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

8. 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.

9. 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.

10. 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

11. **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.

12. 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.

13. 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.

14. 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.

15. 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).

16. 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'.

17. 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.

18. 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.

19. 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.

20. 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.

21. 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.

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

23. 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.

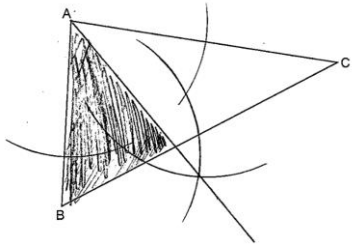
24. If in any case the mark scheme operates with considerable unfairness consult your Team Leader.

Question			Answer	Mark	Part marks and guidance	
1			40	2	**M1** for 120 ÷ 3	Accept 1200 ÷ 30, $\frac{600}{15}$, $\frac{120}{100} \div \frac{3}{100}$ Do not allow M1 if extra step after 120 ÷ 3 e.g. 120 ÷ 3 then divide by 100
2	(a)		First card Second card Difference | 0 | 2 | 5 | 9 0 | | 2 | 5 | 9 2 | 2 | | 3 | 7 5 | 5 | 3 | | 4 9 | 9 | 7 | 4 |	2	**B1** for 3 or 4 correct entries	For 2 marks, ignore entries in shaded squares if they are 0's For B1 ignore shaded squares
2	(b)		$\frac{6}{12}$ oe nfww	2	If shaded squares are blank or <u>all</u> have zeros FT *their* 12 entries for 2 marks **M1** for all *their* even numbers and all factors of 10 identified only <u>IF Shaded SQUARES are counted</u>: FT *their* 16 entries **B2FT** *their* table Or **M1** for all *their* even numbers and all factors of 10 identified only If 0 scored **SC1** for answer $\frac{6}{16}$	isw conversion/cancelling after *their* correct probability Do not accept ratio or words If table correct and shaded squares have zeros allow answer $\frac{10}{16}$ oe for 2 marks M1 may be seen on table by e.g. ringing values or listing We only accept the 16 squares in the Grid, not the card values Count zero as an even number If table correct apart from <u>all</u> zeros in shaded squares allow all even numbers and factors of 10 [0's in shaded squares] identified For SC1 allow answer $\frac{3}{8}$ if $\frac{6}{16}$ seen first

Question			Answer	Mark	Part marks and guidance	
3	(a)		12 26 with correct working	6	**B5** for 3 hours 36 mins with correct working or 12 26 am with correct working OR <u>Method to find time in 1st stage</u> **M2** for $\frac{1}{10} \times 200 \div 40$ [× 60] oe or **M1** for $\frac{1}{10}$ × 200 oe AND <u>Method to find time in 2nd stage</u> **M2** for $0.4 \times 200 \div 50$ oe or **M1** for 0.4 × 200 oe AND **M1dep on M2M2** for *their* 30[mins] + *their* 96[mins] + 1hr30[mins] If 0 or 1 or 2 scored, instead award **SC3** for answer 12 26 or 12 26 pm If 0 or 1 scored, instead award **SC2** for 3 h 36 [mins] or 12 26 am	Correct working requires evidence of at least M2M2 Accept 12 26 pm for 6 marks M2 implied by 0.5[h], $\frac{1}{2}$ [h] or 30 [mins] nfww M1 implied by 20 [miles] nfww M2 implied by $\frac{8}{5}$ [h], $1\frac{3}{5}$ [h], 1.6 [h] isw, 96[mins] or 1[h] 36[min] nfww M1 implied by 80 [miles] nfww M1 implied by addition onto 0850

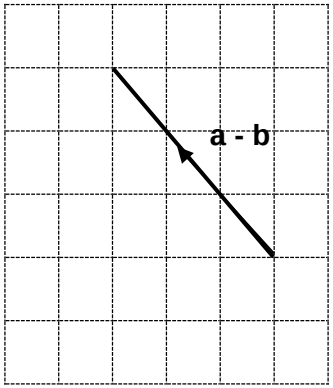
Question			Answer	Mark	Part marks and guidance	
3	(b)		Correct response e.g. Ryan drives at the speed limit and does not drive slower or is delayed	1		Accept any valid reason why Ryan may not be able to travel at Maximum Speed at all times e.g. Ryan does not get stuck in traffic There are no roadworks etc He does not stop on the journey Car does not breakdown Do not accept incorrect statements e.g he travels at a constant speed Mark best response as long as not contradictory or incorrect See Appendix 1
4	(a)		Positive	1		Ignore embellishments
4	(b)		Indicates the point (39, 10)	1		Ignore circles around the points ≤ 30 for both Science and Maths as this is working for part (e)

Question			Answer	Mark	Part marks and guidance	
4	(c)		Ruled line of best fit **and** answer **FT** ± 0.5 *their* straight ruled line at 28 Science marks	2	**B1** for ruled line of best fit or answer **FT** ± 0.5 *their* straight ruled line with positive gradient	Use overlay for LOBF, ruled line needs to reach both gates set at: (8,11) and (8,22) (49,35) and (49,46) Gates include circles on overlay Ignore LOBF beyond gates
4	(d)		Correct explanation e.g. It is beyond the range of the data provided on the scatter diagram. The pupil may not follow the trend/pattern of the data	1		<u>Accept</u> The line of best fit should not extend beyond the data provided Outside range of data provided oe Small sample Data only goes up to 49 No one scores 60 Do not Accept You cannot extend past the LOBF otherwise it is inaccurate Ignore incorrect statements See Appendix 2
4	(e)		35[%]	3	**M2** for $\frac{7}{20}$ × 100 oe **or** **B1** for 7 [pupils] If 0 scored, **SC1** for $\frac{their7}{20}$ correctly converted to a percentage.	B1 implied by $\frac{7}{20}$ oe or $\frac{7}{k}$ (k > 7)

Question			Answer	Mark	Part marks and guidance	
5			acceptable bisector of angle A with two pairs of supporting arcs	M2	**M1** for acceptable bisector of angle A with no or incorrect arcs	Tolerance ± 2° Use overlay Accept dashed or solid line for bisector If additional incorrect bisectors are drawn then this is choice and M0 unless the shading indicates they have chosen the correct bisector
			Region to the left of their bisector shaded  	B1	**Dep** on ruled line from angle A reaching BC	Accept any clear indication for shading
6			1800 final answer and 200 and 9 shown	3	**M2** for 200 × 9 or **M1** for *their* 200 × *their* 9 or **B1** for 200 and 9 seen	For M1 e.g. uses 198 and 8.9 or uses incorrectly rounded values

Question			Answer	Mark	Part marks and guidance	
7			84 with correct working	6		Correct working requires evidence of at least B1M3 (could be done in stages) or other alternate correct approach leading to 84 accept use of equivalent decimals throughout
					B1 for $\frac{1}{8}$ or 8 soi	
					M4 for $\frac{7}{4}\times\frac{6}{1}\times\frac{8}{1}$ oe or better	e.g. M4 for 1750 ÷ 1000 × 6 × 8
					or **M3** for $\frac{7}{4}\times\frac{6}{1}$ oe isw or better $\frac{7}{4}\times\frac{8}{1}$ oe isw or better	M3 implied by $\frac{42}{4}$ oe or 10.5 nfww or $\frac{56}{4}$ oe or 14 nfww oe e.g. M3 for 1750 ÷ 1000 × 6 [or × 8] oe
					or 1750 × 6 × 8 oe or better	If $\frac{1}{7}$ or 7 used as ratio then max mark is M3 for $\frac{7}{4}\times\frac{6}{1}$ oe isw (leads to answer 73.5)
					or **M2** for $\frac{7}{4}\div\frac{1}{6}$ oe or $\frac{7}{4}\div\frac{1}{8}$ oe	or for equivalent improper fraction to $\frac{7}{4}$ M2 oe for both decimal values correct e.g. 1.75 ÷ 0.167 or 1.75 ÷ 0.125, For M2, allow error in decimal e.g. 0.160 for 0.167 if 1 ÷ 6 method shown
					or for $\frac{1}{6}\times\frac{1}{8}$ oe or better or 1750 × 6 oe or 1750 × 8 oe or better	Accept 8 × 6
					or **M1** for $1\frac{3}{4}\div\frac{1}{6}$ oe or $1\frac{3}{4}\div\frac{1}{8}$ oe	Allow M1 for 1.75 ÷ $\frac{1}{6}$ or 1.75 ÷ $\frac{1}{8}$
					If 0 or 1 scored, instead award **SC2** for answer 84 If 0 scored **SC1** for $\frac{7}{4}\times 7$ oe seen	Implied by $\frac{49}{4}$ oe seen , 12.25 seen See AG

Question			Answer	Mark	Part marks and guidance	
8	(a)		100	1		Not e.g. 100x, 100k
8	(b)		50	1		Not e.g. –50, 50x, 50k
9			24 nfww	4	**M1** for [v =] [0+] 3 × 4 **M2** for *their* $(3 \times 4)^2 \div (2 \times 3)$ or better or **M1** for *their* $(3 \times 4)^2 = 2 \times 3 \times s$	nfww – not from 2 × 3 × 4 M1 implied by [v =] 12 but not if obtained from $0 = u + 3 \times 4$, this gets M0 If eqn not used and $d = st$ answer 12 then M0 Condone other variable used for s but not v, u, a or t See AG if other kinematics formulas used
10			8	4	**M2** for $a + a + a + 5 + a + 5 = 42$ oe or **M1** for 3 × 14 oe or $a + a + a + 5 + a + 5$ oe AND **M1** for $a = \frac{42-10}{4}$ oe or FT *their* equation of the form $ka + c = d$ oe to $a = \frac{d-c}{k}$ oe	Allow M2 if correct expression <u>seen first</u> and then incorrectly simplified before in eqn = 42 M1 implied by 42 or $4a + 10$ oe FT only from written equation Where k, c and d are positive integers and $k > 1$ Allow **M1** for one trial into $2(a + 5) + 2a$ evaluated correctly
11	(a)		$\begin{pmatrix} -3 \\ 1 \end{pmatrix}$	2	**B1** for answer $\begin{pmatrix} -3 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 1 \end{pmatrix}$	No fraction line in vector – but penalise 1 mark only in (a) and (b)
11	(b)		Correct response e.g. a vector $\begin{pmatrix} p \\ q \end{pmatrix}$ where $p^2 + q^2 = 10$ or FT *their (*a)	1FT	Allow correct or FT *their* (a) Must be numeric and column vector	e.g. $\begin{pmatrix} \pm 3 \\ \pm 1 \end{pmatrix}$ or $\begin{pmatrix} \pm 1 \\ \pm 3 \end{pmatrix}$ or $\begin{pmatrix} \sqrt{10} \\ 0 \end{pmatrix}$ etc but not *their* $\begin{pmatrix} -3 \\ 1 \end{pmatrix}$ from (a)

Question			Answer	Mark	Part marks and guidance	
11	(c)		Vector **a** – **b** correctly drawn with correct direction arrow on the resultant  	3	**B2** for **a** – **b** correctly drawn but with an incorrect or no direction arrow or or **B1** for *their* $\begin{pmatrix}-3\\1\end{pmatrix} - \begin{pmatrix}0\\-2\end{pmatrix}$ or $\begin{pmatrix}-3\\3\end{pmatrix}$ or for drawing $\begin{pmatrix}-3\\1\end{pmatrix} - \begin{pmatrix}0\\-2\end{pmatrix}$ oe on grid as two sides of a potential triangle (condone missing/wrong arrows) If 0 scored, **SC1** for vector $\begin{pmatrix}-3\\5\end{pmatrix}$ drawn on grid with correct direction arrow	Full marks may be within a triangle with correct direction arrow B2 may be within a triangle with no direction arrow[s]
12	(a)		No oe AND correct valid reason or correct supporting values e.g. • The value of the interest changes each year as the amount grows • It is exponential growth • Compound interest means the interest grows each year	1		e.g. Accept e.g. • There will 5% interest on the £50 as well as an extra £50 oe • It will increase by 5% of 1050 • Finds £1102.5[0] or 102.5[0] or 52.50 for 2nd year If they show a calculation in their reason it must be correct See appendix 3

Question			Answer	Mark	Part marks and guidance	
12	(b)		[a =] 8000 [b =] 0.8	4	**B1** for [a =] 8000 AND **B3** for [b =] 0.8 oe or **M2** for $\frac{6400}{8000}$ oe or 80% oe or $\frac{8000-6400}{8000}$ oe 0.2 oe or **M1** for 6400 = $a \times b$[1] soi or better	Allow M2 for e.g. a = 0.8 M2 for e.g. 20% e.g. For M1 6400 = *their* $a \times b$[1] seen or 6400 = 8000× b [1] For M1 accept 8000 – 6400 = 8000b [1] seen
13			Both inequalities $x \geq 10$, $x \leq -10$ as final answer	3	**B2** for answer one of $x \geq 10$ or $x \leq -10$ or **M1** for $x^2 \geq 100$ or for $(x+10)(x-10)$	Allow 3 marks for $-10 \geq x \geq 10$ final answer B2 implied by answer e.g. $-10 \leq x \geq 10$ or $x \geq \pm 10$ as one element of inequality correct M1 implied by 10 **or** –10 seen in answer

Question			Answer	Mark	Part marks and guidance	
14			$\frac{2n}{4n+1}$ oe final answer	**3**	**B2** for denominator $4n + 1$ oe or for $2n$ **and** $4n + 1$ seen or **B1** for $2n$ oe or for $4n + c$ oe	Condone consistent use of different variable for all marks e.g. B2 for denominator $4x + 1$ For B marks isw attempts to cancel after seen in fraction B2 for denominator e.g. $5 + 4(n – 1)$ oe May not be in a fraction For B1 expressions do not need to be in a fraction where c is any number including zero, or 'c' B1 for e.g. $4n$, $4n + c$, $4n – 1$, $3 + 4(n – 1)$ Do not allow as part of an incorrect expression e.g. $2n^2 + 4n$
15			$4x^3 + 5x^2 – 23x – 6$ final answer	**3**	**B2** for correct but unsimplified answer or for 3 correct terms in final answer with no more than 4 terms or **B1** for expansion of any two of the given brackets with three correct terms	e.g. $4x^3 + 13x^2 – 8x^2 – 26x + 3x – 6$ $4x^3 + 4x^2 + x^2 – 24x + x – 6$ $4x^3 + 12x^2 – 7x^2 – 21x – 2x – 6$ For B2 accept correct terms on grid the simplified x term counts as two correct terms $4x^2 + 12x + x + 3$ [+] $13x$ counts as two terms $x^2 + 3x – 2x – 6$ [+1] x counts as two terms $4x^2 – 8x + x – 2$ $– 7x$ counts as two terms For B1 accept e.g. x^2, [+] $3x – 2x$, $– 6$ on grid If in a longer train of 'random' terms only award B1 if four correct consecutive terms are given

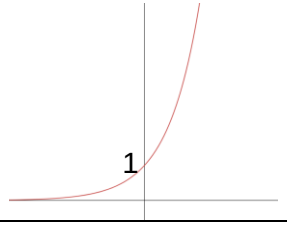
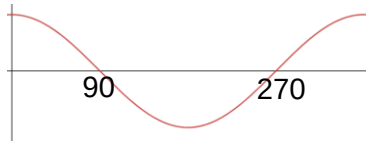
Question			Answer	Mark	Part marks and guidance	
16			9 nfww	**3**	**M2** for $\frac{6}{\sqrt[3]{8}} \times \sqrt[3]{27}$ oe or **M1** for $\sqrt[3]{8} : \sqrt[3]{27}$ soi or for $\frac{8}{27} = \frac{6^3}{x^3}$ oe or better	M2 implied by ratio 6 : 9 or 9 : 6 M1 accept in any order, e.g. 3 : 2 oe accept as fraction e.g. $\frac{2}{3}$ oe or $\frac{3}{2}$ oe

Question			Answer	Mark	Part marks and guidance	
17			$2\frac{1}{9}$ final answer with correct working	5	**M2** for $0.\dot{4}$ or 0.44[4…] oe or **M1** for $1.\dot{6}$ - $1.\dot{2}$ oe seen **M2** for $2.\dot{1}$ oe or **M1** for $1.\dot{6}+ 0.\dot{4}$ oe If 0 or 1 scored, instead award **SC2** for answer $2\frac{1}{9}$ <u>Alt method</u> **M2** for $\frac{11}{9}$ oe fraction or **M1** for $1.\dot{2}$ and $12.\dot{2}$ oe seen **M2** for $\frac{15}{9}+\left(\frac{15}{9}-\textit{their}\frac{11}{9}\right)$ oe or **M1** for $\left(\frac{15}{9}-\textit{their}\frac{11}{9}\right)$ oe If 0 or 1 scored, instead award **SC2** for answer $2\frac{1}{9}$	Correct working requires evidence of at least M2 M1 or other alternate correct approach leading to $2\frac{1}{9}$, correct working may be shown on a diagram For M1 accept 1.66[6…] – 1.22[2…] or better For M2, accept any clear indication that the decimal figure 1 recurs e.g. 2.1r, 2.111… For M1 accept 1.66[6…] + 0.44[4…] or better Accept oe e.g. $1.\dot{2}+ 2(0.\dot{4}$**)** Allow oe for any pair allowing 'recurrence' to be removed, accept e.g. 1.22… and 12.22… For M2 and M1 must be using a common denominator for FT and could work with mixed numbers . The method must be shown for FT e.g. M2 for *their* $\frac{11}{9}+ 2\left(\frac{15}{9}-\textit{their}\frac{11}{9}\right)$ oe The method must be shown for FT

Question			Answer	Mark	Part marks and guidance	
18			$R = \sqrt[3]{2}\,x$ or $R = \sqrt[3]{2x^3}$ final answer	**4**	**M3** for $12[\pi]x^3 = 6[\pi]R^3$ or better Or **M2** for $\frac{4}{3}[\pi]x^3 = \frac{1}{3}[\pi] \times R^2 \times 2R$ oe or **M1** for $\frac{1}{3}\pi \times R^2 \times 2R$	Condone *r* for *R* throughout Answer $\sqrt[3]{2}\,x$ or $\sqrt[3]{2x^3}$ allow M3 For method marks condone 3.14, 3.142 or $\frac{22}{7}$ for π For method marks ignore any units For M3 removes fractions and simplifies terms in *R* M3 accept e.g. $2x^3 = R^3$ Must see correct expression in *R* for M1
19	**(a)**		Rotation about the origin and 50˚ clockwise oe	**2**	**B1** for each	Accept 0, 0 or O for origin More than one transformation scores zero marks Extra properties treat as choice Accept 310˚ anticlockwise
19	**(b)**		(1, 4) and (5, 4)	**1**		Condone omission of bracket[s] if otherwise correct If additional coordinates listed then scores zero

Question			Answer	Mark	Part marks and guidance	
20			$12\sqrt{3} + 16\pi$ final answer with correct working	7	**M1** for angle of major sector = 240° or $\frac{240}{360}$ oe soi **M1** for $\frac{their\ 240}{360} \times 2 \times \pi \times 12$ **A1** for 16π AND **M2** for [2 ×] 12 cos30° oe or **M1** for $\frac{x}{12} = \cos 30$ oe **B1** for cos 30 = $\frac{\sqrt{3}}{2}$ soi **A1** for $12\sqrt{3}$ If 0, 1 or 2, scored instead award **SC3** for answer $12\sqrt{3} + 16\pi$ If 0 or 1 scored, instead award **SC2** for $12\sqrt{3}$ or 16π in answer	Correct working requires evidence of at least M1M1M2 For M1 accept e.g. $\frac{2}{3}$ soi 240 may be on diagram For M1 120 ≤ *their* 240 ≤ 300 but not 180 $24\pi \div 3 \times 2$ oe eg done in stages implies M1M1 M2 oe accept e.g. [AB^2 =] $12^2 + 12^2 - 2.12.12.\cos 120$ or $\frac{12\sin 120}{\sin 30}$, [2×] $\sqrt{12^2 - (12\sin 30)^2}$ oe where *x* is ½ AB M1 for any correct implicit method for finding AB or ½ AB In this method and other methods used, B1 is awarded for the correct trig value[s] <u>associated</u> with their method for find [½]AB, even if their method is incorrect, not just seen in a table of trig values unless selected Award maximum of 6 marks if answer incorrect SEE AG

Question			Answer	Mark	Part marks and guidance	
21			$\left(-\frac{5}{3}, \frac{25}{3}\right)$ oe and (1, 3) with correct working	6		Accept (–1.67 or –1.666 to –1.667 , 8.33[3]…) Correct working requires evidence of at least M2M2
					M2 for $3x^2 + 2x – 5$ [= 0] or **M1** for $3x^2 = 5 – 2x$	For M2 accept e.g. $5 – 2x – 3x^2$ [= 0]
					M2 for $(3x + 5)(x – 1)$ [= 0] or **M1** for $(3x + a)(x + b)$ where $ab = –5$ or $3b + a = 2$ or for correct partial factors $3x(x – 1) + 5(x – 1)$ or $x(3x + 5) – [1] (3x + 5)$	Strict FT *their* 3-term quadratic equation or expression e.g.If M2 awarded for $5 – 2x – 3x^2$ [= 0] then factors should be correct for this equation for M2 or M1 Accept correct use of quad formula or completing the square, M2 if completely correct, M1 if one error in substitution in formula or $(x + a)^2$ correct if completing the square
					A1dep on M2M2 for either pair of coordinates correct or for both *x* values correct or both *y* values correct If 0, 1 or 2 scored, instead award **SC3** for answers $\left(-\frac{5}{3}, \frac{25}{3}\right)$ oe and (1, 3) If 0 or 1 scored, instead award **SC2** for answer $\left(-\frac{5}{3}, \frac{25}{3}\right)$ oe or for both *x* values correct or both *y* values correct If 0 scored, **SC1** for one answer (1, 3)	If A1 for correct *x*–values or y – values after correct partial factorisation award M2 for factors See AG for work with equations in terms of *y*

Question			Answer	Mark	Part marks and guidance	
22	(a)		Correct sketch with y – intercept 1 indicated  	2	**B1** for increasing exponential curve with no ruled sections or for any sketch with a single y – intercept at 1	For 2 marks, condone curve touching but not crossing x- axis For 2 marks or B1 mark intention For 2 marks no ruled sections See AG
22	(b)		Correct sketch of $y = \cos x$ with 90 and 270 indicated and starting at 1 on y-axis  	2	**B1** for cos shape graph with period 360 starting at (0, k), $k > 0$ and amplitude k Or for cos shape graph starting at (0, 1) with amplitude 1 and with a period a factor of 360 Or for cos shape graph with period 360 with 90 and 270 indicated where graph crosses x - axis	For 2 marks mark intention e.g. $y = 2\cos x$ For B1 allow poor curvature, mark intention e.g. $y = \cos 2x$, May be errors with amplitude See AG
23	(a)		$\frac{9}{16}$ oe	2	**B1** for answer $\frac{k}{16}$ or $\frac{9}{k}$ and must be a proper fraction	Do not accept ratio or words isw conversion/cancelling
23	(b)		$\frac{10}{50}\times\frac{7}{49}+\frac{7}{50}\times\frac{10}{49}$ oe leading to $\frac{2}{35}$ with no errors in processing seen	3	**M2** for $[2]\left(\frac{10}{50}\times\frac{7}{49}\right)$oe or **M1** for $\frac{10}{50}$ oe and $\frac{7}{49}$ oe **or** $\frac{7}{50}$ oe and $\frac{10}{49}$ oe seen	Award 3 marks for e.g. $\frac{10}{50}\times\frac{7}{49}=\frac{1}{35}$ and $\frac{1}{35}\times 2 = \frac{2}{35}$ 0.2 and 0.142 to 0.143 **or** 0.35 and 0.204…

APPENDIX 1 Question 3b

	Response	Mark
1	That Ryan does not stop along the way	**1**
2	He stayed the exact speed limit and was not below the limit	**1**
3	That he didn't speed and met the speed limit (travels at speed limit)	**1**
4	He travels at the speed limit	**1**
5	Does not have to stop [for fuel, lunch etc]	**1**
6	Ryan stays at 40 mph and 50mph when on these roads (BOD referencing the roads with the speed limits)	**1BOD**
7	There was no traffic so Ryan kept on moving (BOD implies that he isn't stopped/slowed down by traffic)	**1BOD**
8	That Ryan stayed at a constant speed in each section of the journey	**0**
9	That he didn't stop for a break and drove the same speed (drove same speed is incorrect)	**0**
10	He makes stops on his journey (He must be travelling at max speed at all times)	**0**
11	Could not be true due to traffic	**0**
12	There will not be much traffic	**0**
13	They are at 50mph and 40mph the whole time (for the third part he doesn't travel at 50mph or 40mph so this is incorrect)	**0**
14	He travelled at a constant speed (this is not true)	**0**
15	The speed limit does not change (this is not true)	**0**
16	He drove at constant speed and did not stop for lunch (part of statement is incorrect-constant speed)	**0**
17	There is no traffic (not quite enough – need to say e.g. traffic is not holding them up)	**0**

APPENDIX 2 Question 4d

	Response	Mark
1	It is extrapolated and not in the data provided	**1**
2	The diagram has no data above 49 (underlined part gets the mark) (accept range 49 to 59 for this type of statement)	**1**
3	The graph does not go up to 60 as there is no data above 49 (underlined part gets the mark)	**1**
4	We do not know that the pattern will continue above 49 (implies trend may not continue)	**1**
5	The graph does not cover that data range (allow for the underlined part)	**1**
6	There are no pupils on the graph with scores above 49 (accept pupils oe for data) (accept range 49 to 59 for this type of statement)	**1**
7	There are no plots/points/results on the graph above 49 (accept plots/points/results for data) (accept range 49 to 59)	**1**
8	Most pupils scored between 20 and 50 in Science – we cannot predict accurately for 60 marks	**1**
9	They may be much better at one subject than the other and do not follow the correlation (allow for the underlined part with 'may')	**1**
10	There is no data above 50 [for Science] (accept range 49 to 59 for this type of statement)	**1**
11	It may be an outlier (Implies it may not follow the pattern)	**1**
12	It is too far away from the last piece of data	**1**
13	There is insufficient data (implies small sample)	**1**
14	The graph reaches up to 49 (not referring to data)	**0**
15	The scattergraph does not go beyond 50 (not referring to data)	**0**
16	Extrapolated (needs explanation)	**0**
17	The graph only goes up to 49 (not referring to data)	**0**
18	The graph does not show information for a score of 60	**0**
19	There is no data	**0**
20	They might be better at Maths than Science	**0**
21	It is an outlier (It is not an outlier – we do not know – needs to be phrased like example 11)	**0**
22	The highest Maths score was 49 and the highest Science score was 52 (Science is 49 and Maths 52 so incorrect)	**0**
23	Because there is no results	**0**

Appendix 3 Question 12(a)

	Response	Mark
A	No, compound interest does not increase by the same amount each year, just the same %	**1**
B	No, compound interest increases exponentially	**1**
C	No, it is 5% of the amount at the end of the first year	**1**
D	No, The 5% is calculated on the previous year	**1**
E	No, it is 5% of the 2nd year, not the first again	**1**
F	Incorrect, interest is taken on the total including added interest	**1**
G	Incorrect, she gets 5% of the new amount	**1**
H	No it is compound interest not simple interest	**0**
I	No, She has used simple interest not compound interest	**0**
J	No its not simple interest	**0**
K	No in the second year the interest is more than £50	**0**
L	No she gets £51 interest in 2nd year (incorrect value for calculation)	**0**

Additional guidance Question 7

Example A

1.75 × 8 = 14
14 × 6 = 84

Concise complete method with decimals award **6** marks

Example B

1 : 7

$7 \times 1\frac{3}{4} = 12\frac{1}{4}$, $12\frac{1}{4} + 1\frac{3}{4} = 15$,

15 ÷ 0.6 = 25

B1 earned when they add $12\frac{1}{4}$ and $1\frac{3}{4}$ as ×8 implied and $\frac{7}{4} \times 8$ oe earns M3
There is an arithmetic error but does not affect the method
Division by 0.6 is incorrect, should be $\frac{1}{6}$
Award **B1M3**

Example C

1.75 ÷ 0.125 = 10 + 6 = 16

16 × 6 = 96

0.125 implies B1
1.75 ÷ 0.125 × 6 is equivalent to M4. The only error is 16 should be 14 which is arithmetic.
Method is fine
Award **B1M4**

Example D

$7 \times 1\frac{3}{4} = 12\frac{1}{4}$

$12\frac{1}{4} \times 6 = 73.5$ 73 cups

B0 as 7 used not 8 and is not recovered
$1\frac{3}{4} \times 6$ is embedded within lines 1 and 2 and scores M3.

Award **B0M3**

Example E

1750 [ml] × 8 = 14000

14000 × 6 = 84000

84000 cups

B1 for 8 in line 1
Works in ml and earns M3 for 1750 × 8 × 6 there is no divide by 1000

Award **B1M3**

Example F

1750 ml × 8 = 14000

1000 ÷ 6 = 160

14000 ÷ 160 = 87.5 = 87 cups

B1 for 8 in line 1
Works in ml and earns M4 for a correct method 1750 ÷ 1000 × 8 × 6 oe , the only error is using 160 but this comes from 1000 ÷ 6 which is correct
Award **B1M4**

Example G

$\frac{7}{4} \div \frac{8}{1}$, $\frac{7}{4} \times \frac{1}{8} = \frac{7}{32}$

$\frac{7}{32} \times \frac{1}{6} = \frac{7}{192}$, $\frac{7}{4} \times \frac{192}{7} = \frac{192}{4}$

192 ÷ 4 = 48

B1 for 8 in line 1
There is an error in dividing $\frac{7}{4}$ by $\frac{8}{1}$
After this error the remaining steps imply $\frac{1}{6} \times \frac{1}{8}$ and earn M2
Award **B1M2**

Example H

$\frac{1}{6} \times \frac{1}{8} = \frac{1}{48}$ [litres cordial for 1 cup]

$\frac{7}{4}$ [litres] = 48 + 36 $\frac{7}{4} = \frac{84}{48}$

84 cups

Non-standard approach using ratio after $\frac{1}{6} \times \frac{1}{8} = \frac{1}{48}$ and finding an equivalent fraction over 48 resulting in 84 cups

Award **6** marks for convincing alternate approach

Additional guidance Question 9

Candidates may choose to use Kinematics formulas other than those given

If $s = ut + ½ at^2$ used instead of given formulae, allow M3 for [s =] [0 × 4 +] $\frac{1}{2} \times 3 \times 4^2$

OR
After $\underline{v}$ = 12

Allow M2 for [s =] $\frac{0+12}{2} \times 4$ or [s =] 12 × 4 – $\frac{1}{2} \times 3 \times 4^2$

Additional guidance question 20

The length AB or $\frac{1}{2}$ AB ($12\sqrt{3}$ oe or $6\sqrt{3}$ oe may be seen unsimplified e.g. $2\sqrt{108}$ or $\sqrt{108}$) can be obtained by a number of different methods.
M2 is for the explicit method leading to AB or $\frac{1}{2}$AB and examples of this are in the guidance column of the scheme

M1 is for a correct **implicit** method

The B mark is awarded for a correct trig value[s] for their chosen method

Implicit methods may include

$AB^2 + (12\sin 30)^2 = 12^2$ oe or better

cos 120 = $\frac{12^2+12^2-AB^2}{2\times12\times12}$ oe or better

$\frac{\sin 120}{AB} = \frac{\sin 30}{12}$ oe or better

Award B1 for sin 30 = $\frac{1}{2}$ soi

Award B1 for cos 120 = $-\frac{1}{2}$ soi

Award B1 for sin 120 = $\frac{\sqrt{3}}{2}$ **and** sin 30 = $\frac{1}{2}$ soi

Additional Guidance Question 21

A few may choose to work in terms of *y*

If working in terms of *y*

M2 for $3y^2 - 34y + 75$ [= 0] accept -75 + 34*y* – 3*y*^{2} [= 0]

or **M1** for $\frac{5-y}{2} = \sqrt{\frac{y}{3}}$ oe or better

M2 for (3*y* – 25)(*y* – 3) [= 0] accept equivalent negative version factors – (3*y* – 25)(*y* – 3) [= 0] oe

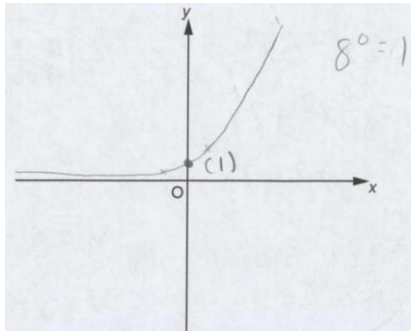
or **M1** for (3*y* + *a*)(*y* + *b*) where *ab* = 75 accept equivalent negative version factors – (3*y* + *a*)(*y* + *b*)
or 3*b* + *a* = –34 Allow M1 for factors that when expanded give one other term correct as well as '3*y*^{2}'

or for correct partial factors accept equivalent negative version partial factors
3*y* (*y* – 3) – 25 (*y* – 3) or *y* (3*y* – 25) – 3 (3*y* – 25)

If A1 for correct *y* values after correct partial factors award M2 for factors

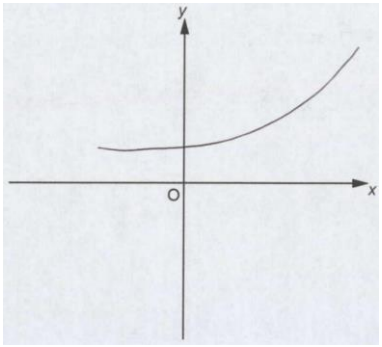
Additional guidance Question 22(a)

Example A



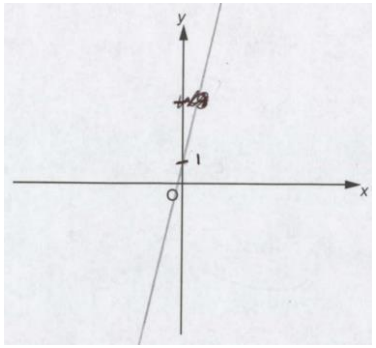
Correct shape, mark intention passes through $y = 1$
2 marks

Example B



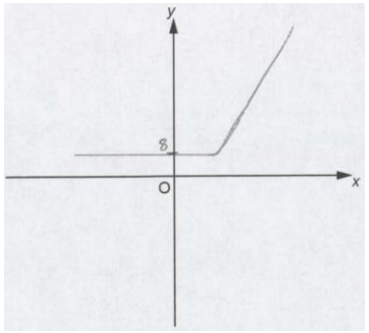
Correct shape **B1**

Example C



y – intercept at 1 **B1**

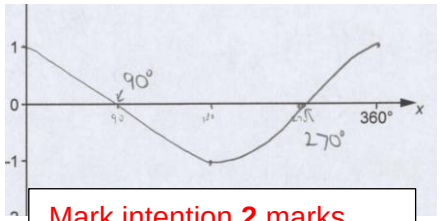
Example D



Ruled wrong shape **B0**

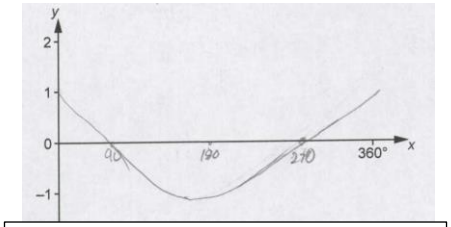
Additional guidance Question 22(b)

Example A



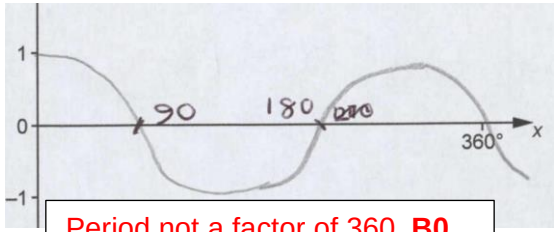
Mark intention **2** marks

Example B



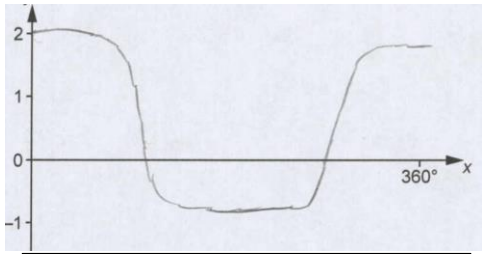
BOD mark intention **2** marks

Example C



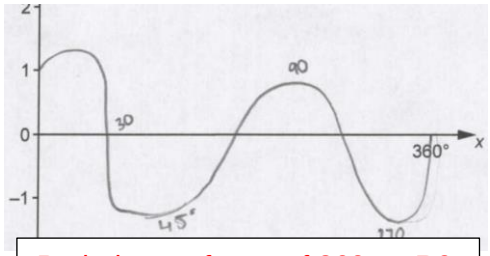
Period not a factor of 360 **B0**

Example D



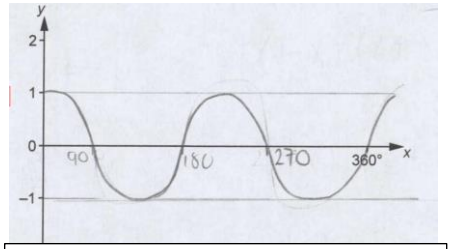
Amplitude not 2 **B0**

Example E



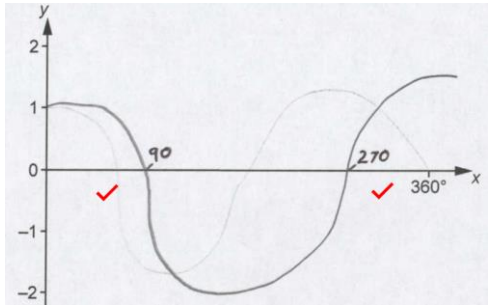
Period not a factor of 360 **B0**

Example F



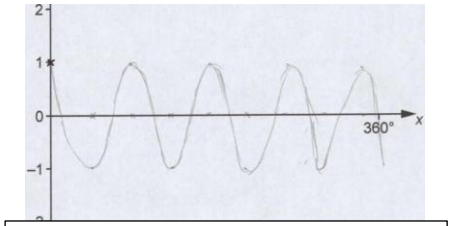
Period not a factor of 360 **B0**

Example G



Cos shape with period 360
90 and 270 indicated **B1**

Example H



Period not a factor of 360 **B0**

Need to get in touch?

If you ever have any questions about OCR qualifications or services (including administration, logistics and teaching) please feel free to get in touch with our customer support centre.

Call us on

01223 553998

Alternatively, you can email us on

support@ocr.org.uk

For more information visit

ocr.org.uk/qualifications/resource-finder

ocr.org.uk

Twitter/ocrexams

/ocrexams

/company/ocr

/ocrexams

CAMBRIDGE
UNIVERSITY PRESS & ASSESSMENT

OCR is part of Cambridge University Press & Assessment, a department of the University of Cambridge.

OCR operates academic and vocational qualifications regulated by Ofqual, Qualifications Wales and CCEA as listed in their qualifications registers including A Levels, GCSEs, Cambridge Technicals and Cambridge Nationals.

OCR provides resources to help you deliver our qualifications. These resources do not represent any particular teaching method we expect you to use. We update our resources regularly and aim to make sure content is accurate but please check the OCR website so that you have the most up-to-date version. OCR cannot be held responsible for any errors or omissions in these resources.

Though we make every effort to check our resources, there may be contradictions between published support and the specification, so it is important that you always use information in the latest specification. We indicate any specification changes within the document itself, change the version number and provide a summary of the changes. If you do notice a discrepancy between the specification and a resource, please contact us.

Whether you already offer OCR qualifications, are new to OCR or are thinking about switching, you can request more information using our Expression of Interest form.

Please get in touch if you want to discuss the accessibility of resources we offer to support you in delivering our qualifications.