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 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.

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. 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.

   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.

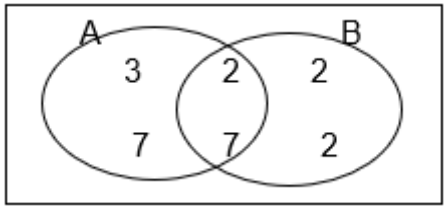
24. For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work. If in doubt, consult your Team Leader.

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

Question			Answer	Marks	Part marks and guidance	
1			2 5 1	3	**B1** for each	
2 (19)			Two from: • Horizontal scale uneven • No vertical scale • Vertical scale does not start at 0	2	**B1** for each	See Appendix Mark the best part of a statement if no contradiction If more than two reasons (often two in one statement), mark the worst two
3 (20)			18 nfww	3	**B2** for answer $\frac{18}{99}$ or **M2** for $\frac{2 \times 99}{11}$ oe or **B1** for $\frac{\mathbf{2}}{\mathbf{11}}$ or **M1** for [k ×] $\frac{\mathbf{99}}{\mathbf{11}}$ or **M1** for $\frac{a}{b} \times 99$	e.g. $\frac{99}{11}$ = 9 and then 2 × 9 For **B1** accept $\frac{\mathbf{2}}{\mathbf{11}}$, 0.181 to 0.182 or 18.1% to 18.2% Condone k as 0.5 or 1 or an integer $3 \leq k \leq 10$ Do not imply **M1** from just 9 seen $0 < \frac{a}{b} < 1$ and either $a = 2$ or $b = 11$

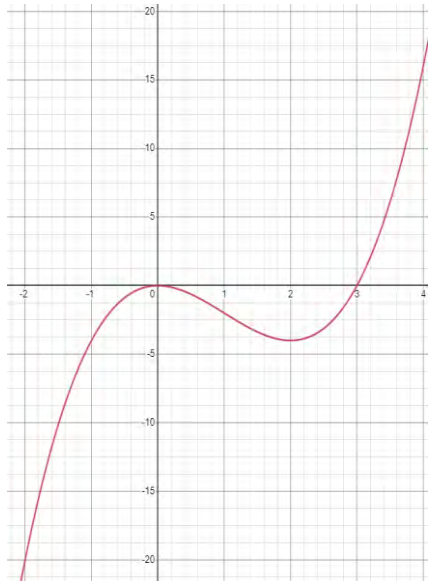
Question			Answer	Marks	Part marks and guidance	
4 (21)	(a)	(i)	30 nfww	4	**M1** for 5 × 150 implied by 750 [km] **M2** for *their* 750 ÷ (2.5 × 10) oe or **M1** for 2.5 × 10 implied by 25 OR **M1** for 5 × 150 implied by 750 [km] **M2** for *their* 750 ÷ 2.5 ÷ 10 oe or **M1** for *their* 750 ÷ 2.5 implied by 300	Not from 150 ÷ 5 A correct answer in working, subsequently spoilt, scores max **M1M1** *Their* 750 from attempt at 5 × 150; condone 150 for *their* 750 *Their* 750 from attempt at 5 × 150; condone 150 for *their* 750
		(ii)	Correct reason indicating roads/paths unlikely to be straight oe	1		See Appendix
	(b)		The units are not the same oe 1 : 15 000 000	1 1		See Appendix eg should have multiplied by 100 000 or one is cm and the other is km Condone: • poorly placed zero separators e.g. 150, 000, 00 • correct other forms • inclusion of units

Question			Answer	Marks	Part marks and guidance	
5 (22)	(a)				Allocate marks similarly for other methods such as five triangles using an angle of 72. If in doubt, consult TL. There must be evidence of angle or trig work to score any marks e.g. working back from 247.75 to *h* = 8.258…is likely to score 0 or B1	
			[angle =] 36 or 54	**B1**	in correct place if only shown on diagram	Do not award 36 or 54 if calculated as an area
			$[h =]\frac{6}{\tan 36}$ or 6 × tan54 or $\frac{6sin54}{sin36}$ may be implied by 8.258 to 8.259 or 8.26 following **M1** but **not** from area	**M2**	**M1** for $\tan 36 = \frac{6}{h}$ or $\tan 54 = \frac{h}{6}$ or $\frac{6}{\sin 36} = \frac{h}{\sin 54}$ or $\frac{\sin 36}{6} = \frac{\sin 54}{h}$	Accept other notation used for '*h*'
			10 × $\frac{1}{2}$ × 6 × *their h* oe	**M2dep**	**M1** for $\frac{1}{2} \times 6 \times$ *their h* oe may be implied by 24.774 to 24.775	*Their h* **dep** on previous **M2** or **M1** Accept correct use of $\frac{1}{2}ab\sin C$
			247.748 to 247.749	**A1**		
	(b)		5.45 or 5.449 to 5.450 nfww	**3**	**M2** for $h = \frac{450 \times 3}{247.75}$ oe or **M1** for $\frac{1}{3}h \times 247.75 = 450$ oe	247.75 may be *their* more accurate 247.748 to 247.749 or 247.7, 247.8 or 247.74 from **(a)** Use of incorrect formula is not **MR**

Question			Answer	Marks	Part marks and guidance	
6 (23)	(a)		1176	2	**M1** for $2^3 \times 3 \times 7^2$ oe or for  or for listing at least three correct terms in each list 294, 588, 882, ... AND 56, 112, 168, ...	e.g. $2\times2\times2\times3\times7\times7$ Accept no box but need to see A and B
	(b)		13 nfww	2	**M1** for [26 =] 2 [×] 13 oe	For **M1** accept 2, 13 or similar possibly seen in a factor tree, diagram etc

Question			Answer	Marks	Part marks and guidance	
7	(a)		Both bags may have 5 apples and 7 bananas or both bags may have 5 apples and 12 fruit	1	Accept 5 : 7 and $\frac{5}{12}$ are equivalent or 5 + 7 = 12 with $\frac{5}{12}$ or $\frac{5}{12}$, $\frac{7}{12}$ with 5 : 7	See Appendix Check for working at the top of the page
			A numerical example with some explanation (n fruit where n is a multiple of 12, $n \neq 12$)	1		More than just numbers
			"Finley might be correct or might not be correct"	1dep	Dep on at least one other mark If **0** scored **SC1** for explanation along lines of: don't know how many fruit in the bag and middle box ticked	Accept single tick, cross or other highlight

Question			Answer	Marks	Part marks and guidance	
	(b)		56 as answer nfww	3	By ratios: **B2** for both 40 : 56 and 44 : 56 identified or for 10 : 14, 11 : 14 and 44 : 56 or **B1** for 2 ratios equivalent to 5 : 7 and 11 : 14 with a common number of bananas By equation: **B2** for a correct equation that would lead directly to the number of bananas or **B1** for a correct equation that would lead directly to the number of apples or total fruit, either before or after the addition of 4 apples By fractions: **B2** for $\frac{40[+4]}{96[+4]}$ and $\frac{44}{100}$ identified or **B1** for 2 fractions of the form $\frac{5k+4}{12k+4}$, where *k* is a positive integer All methods: If **0** scored **SC1** for answer 44 or 100	eg. 10 : 14 and 11 : 14 or 20 : 28 and 22 : 28 eg: *b* = bananas, *a* = apples, *t* = original total **B2** for $\frac{5b}{7} + 4 = \frac{11b}{14}$ oe or better or **B1** for $\frac{5t}{12} + 4 = \frac{11(t+4)}{25}$ oe or better or for $\frac{5a+4}{7a} = \frac{11}{14}$ oe or better eg $\frac{9}{16}$, $\frac{14}{28}$ oe, $\frac{19}{40}$, $\frac{24}{52}$ oe, $\frac{29}{64}$, $\frac{34}{76}$ oe $\frac{39}{88}$, $\frac{44}{100}$ oe
8	**(a)**		-4 and 0	**2**	**B1** for one correct value	

Question			Answer	Marks	Part marks and guidance	
	(b)		Correct curve 	**3**	**B2FT** for 6 or 7 points accurately plotted or **B1FT** for 4 or 5 accurately plotted	Mark curve first. Curve must pass within ½ small square of the correct seven points **FT** *their* values from the table in **(a)** but accept only the correct curve Accuracy ± ½ small square radially If no points plotted mark the curve at the *x*-values Condone curve not having max at (0, 0) and min at (2, -4) as long as it passes through correct points Condone wobbly curve and slight feathering Do not condone straight line segments
	(c)		3.4	**1FT**	Strict **FT** from graph to 1 d.p.	Do not accept answers to more than 1 d.p. or answers without a graph If curve is between two grid lines accept either value eg if crossing between 3.4 and 3.5 accept 3.4 or 3.5 If curve has more than one *x* value where *y* = 5 then they must give all

Question			Answer	Marks	Part marks and guidance	
9	(a)		$\frac{30}{360} \times \pi \times 12^2$ oe 37.69 to 37.704	M2 A1	M1 for $\pi \times 12^2$ implied by 144π or 452.3 to 452.45 A0 for just 37.7	M2 oe e.g. $\frac{360}{30} = 12$ and $\frac{\pi \times 12^2}{12}$ Condone 3.14 or $\frac{22}{7}$ for π in M marks M0 for 12π without working
	(b)		68.5 to 68.6 nfww	4	<u>With area of parallelogram as 120 or from an attempt at 20 × 6:</u> M3 for $\frac{their(20 \times 6) - 37.7}{their(20 \times 6)}$ [× 100] oe or M2 for *their* (20 × 6) – 37.7 implied by 82.3 or for $\frac{37.7}{their(20 \times 6)}$ [× 100] implied by 31.4 to 31.5 or M1 for 20 × 6 implied by 120 <u>If correct method for area of parallelogram is not shown or an incorrect value is used:</u> If *A* > 37.7 SC2 for $\frac{A - 37.7}{A}$ [× 100] oe or SC1 for $\frac{37.7}{A}$ [× 100]	If 120 not used, *their* (20 × 6) must come from attempt at 20 × 6 Note there are other methods for finding area of a parallelogram 37.7 may be *their* more accurate 37.69 to 37.704 from **(a)** M3 oe e.g. 100 – $\frac{37.7 \times 100}{their(20 \times 6)}$ e.g SC2 for $\frac{240 - 37.7}{240}$ [× 100] oe For SC marks method must be shown; do not imply from an answer only

Question			Answer	Marks	Part marks and guidance	
10	(a)		(9 + 10 + 11 + 12) – (5 + 6 + 7 + 8) = 16	1		May be shown in stages Accept 42 – 26 = 16 May be explained via sum of differences of paired cells eg 4 × 4 from (9 – 5), (10 – 6) etc

	(b)		Eg. Top half: $n + (n + 1) + (n + 2) + (n + 3) = 4n + 6$ Bottom half: $(n + 4) + (n + 5) + (n + 6) + (n + 7) = 4n + 22$ $(4n + 22) – (4n + 6) = 16$	**5**	**B2** consistent algebraic terms for consecutive numbers for the whole grid or **B1** consistent algebraic terms for at least 3 consecutive numbers AND **M2** for algebraic sums for top half and bottom half of grid or **M1** for algebraic sum for top half or bottom half of grid AND **A1dep** for sum of bottom half – sum of top half = 16 shown algebraically or explained from correct working. <u>Alternative method for pairs of numbers</u> **B2** as above AND **M2** for the difference of four pairs of algebraic terms from top and bottom calculated or **M1** for the one pair of algebraic terms from top and bottom calculated AND **A1dep** for all four differences summed to 16 shown numerically or explained from correct working If **0** scored, allow **SC1** for a correct numerical or described example showing an overall difference of 16	eg. n, $n + 1$, $n + 2$, $n + 3$, $n + 4$, $n + 5$, $n + 6$, $n + 7$ For **M2** and **M1** FT expressions of form $an + b$, $b \neq 0$ eg. Top half: $2n + (2n + 1) + (2n + 2) + (2n + 3) = 8n + 6$ Bottom half: $(2n + 4) + (2n + 5) + (2n + 6) + (2n + 7) = 8n + 22$ Accept unsimplified or simplified for **M** marks **A1** is **dep** on **B2M2** scored Condone $\begin{array}{r} 4n + 22 \\ [-]\ 4n + 6 \\ \hline 16 \end{array}$ **A0** for $4n + 22 – 4n + 6$ or for just $22 – 6$ or for use of $2n$, $2n + 1$, $2n + 2$ etc as their algebraic terms eg. “difference between n+4 and n is 4” Must not be the numbers 5 to 12

Question			Answer	Marks	Part marks and guidance	
11	(a)		$\frac{10}{28}$ oe	2	**M1** for $\frac{10}{k}$ with $k > 10$ or $\frac{m}{28}$ with $0 < m < 28$ or for $\frac{4+6}{13+6+5+4}$ If **0** scored, **SC1** for answer 10 : 28 or 5 : 14	Accept 0.357 to 0.36
	(b)		Eg. P(seats given late) = $\frac{5}{9}$ P(seats given on time) = $\frac{13}{19}$ 0.55[5…] to 0.56 and 0.68 to 0.68[4…] or 0.6 and 0.7 or $\frac{95}{171}$ and $\frac{117}{171}$ AND Yes/correct [because] oe	3	**M1** for P(seats given late) = $\frac{5}{9}$ oe **M1** for P(seats given on time) = $\frac{13}{19}$ oe	Condone lack of labelling; mark to candidate's benefit. Condone wrong labelling for **M** marks only Include working on the diagram Allocate similar marks if working with probabilities for "no seats": $\frac{4}{9}$ $\frac{6}{19}$ 0.4[4…] and 0.3[1] to 0.32 $\frac{76}{171}$ and $\frac{54}{171}$ For full marks must convert both to a comparable form and give a correct conclusion Comparable form may be decimal, percentage or fractions with common denominator or numerator
12			≤ $x < 2$	1 2	**B1** for $x \leq 2$ or $x > 2$	

Question			Answer	Marks	Part marks and guidance	
13	(a)		40 nfww	4	**B1** for freq density 3.2 for 0-5 bar soi **M2 for** 1.4 × 10 and 2 × 5 may be implied by 14 and 10 or **M1** for 1.4 × 10 may be implied by 14 OR For $k \neq 1$ **M3** for *their* $(16k + 10k + 14k) \div k$ or **M2** for $16k + 10k + 14k$ or **M1** for two from $16k$, $10k$, $14k$	Figures may be seen on bars Could be implied by correct fd used for bars 2 and 3 or from scale on diagram e.g **M3** for (40 + 25 + 35) ÷ 2.5 or **M2** for 40 + 25 + 35 or **M1** two from 40, 25, 35 **M3** for (80 + 50 + 70) ÷ 5 or **M2** for 80 + 50 + 70 or **M1** two from 80, 50, 70
	(b)		Bar for 30-45 drawn with height 3 small squares	2	**M1** for 9 ÷ 15 soi by 0.6	Condone good freehand

Question			Answer	Marks	Part marks and guidance	
14			13.5 and 6.5 with correct working	5		'Correct working' requires evidence of Pythagoras or quadratic Accept $\frac{27}{2}$ and $\frac{13}{2}$
					M2 for [h^2 =] $12.5^2 - 12^2$ or better or **M1** for $12^2 + h^2 = 12.5^2$ or better	Allow other letters or $t - 10$ for h and allocate marks as per main method
					B1 for $h = 3.5$ AND	Accept -3.5 or ±3.5
					M1 for 10 + *their* 3.5 soi by 13.5 or 10 – *their* 3.5 soi by 6.5	*Their* 3.5 from use of Pythagoras
					If **0**, **1** or **2** scored, instead award **SC3** for both 13.5 and 6.5 as answers with no or insufficient working If **0** or **1** scored, instead award **SC2** for either 13.5 or 6.5 as answer with no working or insufficient working	<u>Alternative method 1:</u> **M3** for $t^2 - 20t + 87.75 = 0$ or **M2** for $144 + t^2 - 20t + 100 = 156.25$ or **M1** for $12^2 + (t - 10)^2 = 12.5^2$ AND **M1** for correct method to solve *their* 3-term quadratic

Question			Answer	Marks	Part marks and guidance	
15			$y = \frac{6912}{x^3}$ oe	3	**M1** for $y = \frac{k}{x^3}$ oe soi by $4 = \frac{k}{12^3}$ oe **B1** for [k =] 6912	
16			$6x^{3.5}$ nfww final answer	4	Mark coefficient and indices separately: **B1** for 6 from $\frac{9 \times 2}{3}$ AND **B3** for $x^{3.5}$ nfww or **B2** for $x^{7.5}$ from $x^7 \times \sqrt{x}$ or for $x^{-3.5}$ or $\frac{\square}{x^{3.5}}$ from $\frac{\sqrt{x}}{x^4}$ or **B1** for $\sqrt{x} = x^{\frac{1}{2}}$ or $x^{0.5}$ **B1** for x^3 from $\frac{x^7}{x^4}$	Accept equivalent fractions in place of decimal powers If attempting both $\frac{x^7}{x^4}$ and $\frac{\sqrt{x}}{x^4}$ mark to candidate's benefit rather than choice

Question			Answer	Marks	Part marks and guidance	
17	(a)		$x = 0.1818\ldots$ $100x = 18.1818\ldots$ $99x = 18$ $x = \frac{18}{99} = \frac{2}{11}$	3	**M1** for $100x = 18.1818\ldots$ and **M1** for $100x - x = 18.1818\ldots - 0.1818\ldots$ or better	For full marks, clear step by step process must be evident x and $100x$ to same number of dp (min of 2dp) or both to min of 4dp or accept $x = 0.\dot{1}\dot{8}$ and $100x = 18.\dot{1}\dot{8}$ Apply marks in a similar way to other methods eg **M1** and **M1** for $10000x - 100x$ etc <u>If attempting non-calculator 2÷11:</u> For full marks, need to see all "carry-overs" of 9 and 2 and answer to division of 0.181… **M2** for "carry-over" of 9 and 2 and answer to division of 0.18 or **M1** for "carry-over" of 9 and answer 0.1…
	(b)		$0.\dot{1}\dot{8} \times 5$ or $\frac{2}{11} \times 5$ or 'multiply by 5' oe $= 0.\dot{9}\dot{0}$ nfww	1 1dep	 **dep** on first mark	Accept equivalent calculations or words e.g. $0.\dot{1}\dot{8} \div 2 = 0.\dot{0}\dot{9}$ and $0.\dot{0}\dot{9} \times 10$ 'divide by 2 and then multiply by 10' Working may be to min of 4dp but answer must use recurring notation Answer only scores **0**

Question			Answer	Marks	Part marks and guidance	
18			17.5 to 17.6 with correct working	6		'Correct working' requires evidence of at least **M1M1**
					M2 for $AC = \frac{8 \sin 60}{\sin 20}$ or **M1** for $\frac{AC}{\sin 60} = \frac{8}{\sin 20}$ oe	
					A1 for 20.2 to 20.3	**A1** implies **M2** after **M1** seen
					AND	
					M2 for $\sqrt{their20.3^2 + 6^2 - 2 \times their20.3 \times 6 \times \cos 55}$ or **M1** for $their20.3^2 + 6^2 - 2 \times their20.3 \times 6 \times \cos 55$	*Their* 20.3 or 20 from use of trig May be performed in stages
					If **0**, **1** or **2** scored, instead award **SC3** for 17.5 to 17.6 with no working or insufficient working	
					If **0** or **1** scored, instead award **SC2** for 306.6 to 308.4 with no working or insufficient working	
					If **0** scored, instead award **SC1** for 20.2 to 20.3 with no working or insufficient working	

19			$\frac{169}{12}$ or $14\frac{1}{12}$ or $14.08\dot{3}$ with correct working	**5**		'Correct working' requires evidence of at least **M2M1** or **M1M1M1** **SC3** applies to all methods
					<u>Gradients and equation of straight line</u> **M2** for gradient of tangent = $\frac{12}{5}$ oe soi or for gradient of tangent = $\frac{5}{p-12}$ or **M1** for gradient of radius = $-\frac{5}{12}$ soi or gradient of tangent = $\frac{-1}{their \text{ gradient of radius}}$	Mark to candidate's advantage if gradients not labelled Do not mix marks across two methods (ie do not give gradient marks and another M1 for 13 from Pythagoras)
					AND	
					M2 for $0 = \frac{12}{5}p - \frac{169}{5}$ or better or for $5 = \frac{12}{5}(p - 12)$ or better or for $\frac{5}{p-12} = \frac{12}{5}$ or better	**M2** must be a correct equation solely in terms of *p* or solely in terms of *x* e.g. $0 = \frac{12}{5}x - \frac{169}{5}$ or better
					or	
					M1 for $y =$ *their* $\frac{12}{5}x + c$ or better or for $y = \frac{5}{p-12}x + c$ or better or for $y - {}^{-}5 =$ *their* $\frac{12}{5}(x - 12)$ or better or $\frac{-1}{their \text{ gradient of radius}} = \frac{5}{p-12}$ or better	For **M1** allow FT *their* $\frac{12}{5}$ if from $m_1 = \frac{-1}{m_2}$
					If **0**, **1** or **2** scored, instead award **SC3** for answer $\frac{169}{12}$ or $14\frac{1}{12}$ or $14.08\dot{3}$ with no or insufficient working	PTO for alternative methods

Question			Answer	Marks	Part marks and guidance	
					Alternative method (Pythagoras and trig): **M1** for [O to (12, -5)] $\sqrt{12^2+5^2}$ may be implied by 13 in working or on diagram **M1** for [angle *at O*] sin $\theta = \frac{5}{13}$ or cos $\theta = \frac{12}{13}$ or tan $\theta = \frac{5}{12}$ or better (do not imply from just an angle) AND **M2** for [p =] $\frac{13}{\frac{12}{13}}$ or **M1** for cos *their*$\theta = \frac{13}{p}$ or $p = \frac{13}{\cos their\theta}$ (*Their* θ from earlier trig work)	Alternative method (Pythagoras and equations) **M2** for $13^2 + (p-12)^2 + 5^2 = p^2$ oe or **M1** for $(p-12)^2 + 5^2$ oe or for $\sqrt{12^2+5^2}$ may be implied by 13 in working or on diagram AND **M2** for $338 - 24p = 0$ oe or **M1** for $169+p^2-24p+144+25 = p^2$ or better

Question			Answer	Marks	Part marks and guidance	
20			$\frac{5x-19}{x-3}$ final answer nfww	5	**M2** for $\frac{x-7}{x-3}$ nfww or **M1** for $(x + 7)(x – 7)$ AND **M2** for $4x – 12 + x – 7$ or **M1** for $4(x – 3) + x – 7$ <u>Alternative method:</u> **M2** for $4(x^2 + 4x – 21)$ or better or **M1** for $4(x + 7)(x – 3)$ AND **M2** for $(5x – 19)(x + 7)$ or **M1** for $5x^2 + 16x – 133$	For **M2** and **M1** accept written as separate fractions e.g. **M2** for $\frac{4x-12}{x-3} + \frac{x-7}{x-3}$

Appendix

Question 2

Reason	Mark	Reason
It doesn't have months for each year. Only a few for 2023	**1**	
There are no numbers on the y axis	**1**	
As it doesn't have all the numbers going up the side of electricity	**1**	
The dates keep skipping from years to months and back again	**1**	
It has months instead of years for 2023	**1**	
Some years have months labelled	**1**	Implies others do not
The x axis dates are uneven distances apart	**1**	Condone x-axis
x-axis goes up by different amounts	**1**	BOD recognising uneven scale
The y-axis doesn't have any data	**1**	BOD means not having any numbers
2023 has four sections but the other years only have one	**1**	Recognises inconsistent scale
The y axis doesn't start from 0	**1**	Condone reference to y axis
8 kwh is very far away from 10 kwh making it look like a big difference where in reality it isn't	**1**	BOD implies "because vertical scale does not start at 0"
The scale of kwh has a large space between 8 and 10	**1**	BOD implies "because vertical scale does not start at 0"
More results for 2023	**1**	Correct because it shows the monthly figures
It misses out a couple of months	**0**	Could be referring to [Jan] Feb, Mar, [April]
The graphs is in months	**0**	Wrong as the graph also has years. Statement doesn't recognise the uneven scale
The axis doesn't start from 0	**0**	y axis not referenced
On the x axis, there's a fluctuation/jagged line on the line	**0**	
Doesn't show the numbers	**0**	Vertical axis not referenced
The y-axis isn't labelled	**0**	It is labelled but does not have a scale

The graph is on a small scale/ It's not drawn to scale	**0**	Do not accept reference to "drawn to scale"

Question 4a(ii)

Reason	Mark	Reason
In real life Heidi will not be able to walk in a straight line	**1**	Implies distance increases
Roads aren't straight	**1**	Implies distance increases
She doesn't consider buildings in the way of the straight line distance	**1**	Implies "not a straight line"
The km are estimated as 750 where it is not in real life	**0**	Correct but does not reference using a direct distance
She may have to go a different route	**0**	Doesn't say that the overall distance may be greater (than calculated)
Do not accept		
Average speed is just an estimate	**0**	Do not address error in method of using straight-line distance
Because it's a decimal so doesn't give an exact number of days	**0**	
Because it seems unrealistic	**0**	
She will get tired/slow down/toilet stops	**0**	
There is not enough information	**0**	
Rounded down	**0**	

Question 4b

Reason	Mark	Reason
Kilometres is not the same as cm	**1**	BOD recognises the different units
Not converting km to cm	**1**	
Not converting to the same units	**1**	"Not converting the units" is not enough

The 1 and 150 aren't both cm	**1**	BOD implies different units
They are in different measurements	**1**	BOD condone "measurements" oe for "units"
He hasn't used units making it seem 1 cm = 150 cm	**1**	BOD the missed out "the same" as explained by the example. The words before 1 cm...are not enough
If it was 1 : 150 then 1 cm would be 1.5 metres	**1**	Shows statement is incorrect
There are 1000 cm in 1 km so he didn't convert	**1**	Incorrect factor but recognises no conversion and does link cm and km implying "between them" (The incorrect factor penalised by wrong 15 000 000)
You can't have two different measurements in the same ratio	**1**	BOD condone "measurements" oe for "units"
It needs to be in cm	**1**	BOD "The ratio" needs to be "all" in cm
He did not convert the km to cm correctly	**1**	BOD references km and cm and conversion
He did not use scale correctly and so has made 150 cm and not 150 km	**1**	BOD Implies not in same units
He wrote it as 1 cm to 150 cm not km	**1**	BOD Implies not in same units
Because cm and km are / are not the same scale	**0**	Incorrect use of scale and the meaning is unclear
He did not convert the units	**0**	Needs to say "to the same units"
He undervalues the 150 km in the ratio	**0**	Doesn't explain how or why
It doesn't show the units so it would be inaccurate	**0**	Doesn't recognise different units

Question 7a

	Mark	Reason
5 apples : 7 bananas means the same as $\frac{5}{12}$ of the fruit are apples. 10 apples :14 bananas also means $\frac{5}{12}$ of the fruit are apples C&NC	**1** **1** **1**	An example with the same number of apples An example with a different number of apples with some words of explanation
5 : 7 = $\frac{5}{12}$ 10 : 14 = $\frac{5}{12}$	**1** **0**	Sufficient for first mark. Middle column of mark scheme.

C&NC	**1**	Insufficient for second mark. Some words of explanation required.
5 : 7 = $\frac{5}{12}$. 1 × 5 = 5 apples and 1 × 7 = 7 bananas. 3 × 5 = 15 apples and 3 × 7 = 21 bananas still has the same ratio but different numbers. C&NC	**1** **1** **1**	Sufficient. Middle column of mark scheme.
Bag Y must be 5*x* : 7*x* as $\frac{5x}{12x} = \frac{5}{12}$ for the number of apples. This ratio is 5 : 7. The number of apples will only be equal if *x* = 1. In other case the number of apples will not be equal. C&NC.	**1** **0** **1**	Not true
5 + 7 = 12. So, a : b = 5 : 7 and a = $\frac{5}{12}$ However, the amount of fruit in each bag is unknown, so it cannot be certain. C&NC.	**1** **0** **1**	Not numerical but would be SC if 0 scored
5 + 7 = 12. So, a = $\frac{5}{12}$. C&NC.	**1** **NR** **1**	Sufficient. Middle column of mark scheme
There may be $\frac{5}{12}$ apples in one bag but $\frac{10}{24}$ apples in the other. C&NC.	**0** **1bod** **1**	Implies different numbers of apples but same fraction
5 : 7 means that there must be 5 apples so the fraction of apples must be $\frac{5}{12}$. C.	**1** **NR** **0**	Not strictly true; condone use of “must”
25 apples and 35 bananas is 25 : 35 which is 5 : 7 and the fraction of apples is $\frac{25}{60} = \frac{5}{12}$. C.	**1** **0** **0**	25 apples and 35 bananas give 5 : 7 and $\frac{5}{12}$ **0, 1, 0** is also acceptable
If both bags have same number of fruits they will have the same proportion and the same number of apples. However, if A or B have more fruits than the other, they will have more apples than the other. C&NC.	**SC1**	No numbers. Correct statement and tick.
$\frac{5}{12}$ of the fruit are apples in both bags. Both bags could have the same number of apples but they could be different as we do not know how much fruit is in each bag. C&NC.	**SC1**	First sentence does not refer to ratio

Bag Y is $\frac{5}{12}$ apples so bag X is $\frac{5}{12}$ apples. C&NC.	**0** **NR** **0**	Insufficient compared with middle column of scheme. Ticked box mark is dependent on at least one other mark

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.