OCR
Oxford Cambridge and RSA

Higher

GCSE

Mathematics - Paper 5

J560/05: Paper 5 (Higher tier)

General Certificate of Secondary Education

Mark Scheme for June 2023

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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			$\frac{3}{5}$ **cao**	3	**B1** for $\frac{11}{7}$ or $\frac{7}{11}$ **oe** **M1** for $\frac{33}{35} \times \frac{7}{11}$ or $\frac{33}{35} \div \frac{55}{35}$ **or better** or $\frac{33}{35} \times \frac{7}{k}$ **oe** where $\frac{7}{k}$ is *their* improper fraction $k > 7$	0.6 or equivalent unsimplified fraction e.g. $\frac{231}{385}$, $\frac{33}{55}$ gets B1M1
2	(a)		125 Corresponding [angles]	2	**B1** for each	Do not accept F [angles] Ignore irrelevant further comments
2	(b)		50	3	**M1** for 180 – 125 **soi** **M1** for 75 marked in correct place[s] inside triangle or used in correct calculation to find angle	For M1, accept 55 marked on diagram in correct place[s] M1 for e.g. 180 – (180 – 125) –75 oe Do not award if incorrect angle e.g. 55 is also marked in a place where 75 should be
3			190	2	**M1** for $\frac{380}{2}$ or $\frac{3800}{20}$ or 3.8 × 50 or 38 × 5	M1 not awarded if spoiled e.g. goes on to divide by 10 or 100
4			Correct explanation $\frac{1}{2}$ omitted from the area of the cross section **oe** 8	1 2	**M1** for $\frac{1}{2} \times b \times h = 24$ **seen**, either as a formula or with values	See appendix 1 Do not ignore incorrect statements M1 implied by $b \times h = 48$ or a correct factor pair of 48 or e.g. $h(h + 2) = 48$ oe M1 may be seen in their explanation of the error

Question			Answer	Marks	Part marks and guidance	
5	(a)		Four correctly plotted points	2	**B1** for 2 or 3 correct plots	Use overlay as a guide, ± half small square radially
5	(b)		Positive	1		Do not accept description of relationship Condone embellishments e.g. strong moderate, medium etc
5	(c)		Point at (6, 1.4) indicated only	1		FT *their* plots from (a), If they have 2 outliers they must indicate both or just (6, 1.4)
5	(d)	(i)	Ruled line of best fit **and** answer **FT** ± 0.01 *their* straight ruled line at 8 years	2	**B1** for ruled line of best fit or answer **FT** ± 0.01 *their* straight ruled line with positive gradient	Use overlay for LOBF, ruled line needs to reach both gates set at: (2, 0.8) and (2, 0.94) (13, 1.54) and (13, 1.66)
5	d	ii	This child will fit the average pattern and will not be too tall or too short for their age **oe**	1		See appendix 2 Ignore incorrect statements
5	(e)		Only have data on students up to 14 years old **oe**	1		**Accept e.g**. The trend may not continue The line of best fit should not extend beyond the data provided Outside range of data provided oe Small sample **Do not accept e.g.** 17 is not on the graph The graph does not go to 17 (alone) See appendix 3 Ignore incorrect statements

Question			Answer	Marks	Part marks and guidance	
6			300	4	**M3** for 180 ÷ (20 – 8) × 20 **oe** or **M2** for 180 ÷ (20 – 8) or 180 = $\frac{20-8}{20}$ **oe** or **M1** for $\frac{20-8}{20}$ **oe** or $\frac{8}{20}$ **oe** or (20 – 8) : 20 **oe** or 8 : 20 **oe** If **0** scored **SC1** for answer 450	M3 for a complete method that would lead to 300 M2 implied by 1 [dose] = 15 **oe** e.g. 4 [doses] = 60, 2 [doses] = 30 etc Accept reciprocals of fractions for M1 or ratios reversed
7	(a)		Correct method that would lead to 495, 60 or 8.25 **oe** e.g. (55 ÷ 5) × 45 or 55 × (45 ÷ 5) or 11 × 0.75 **oe** or 540 ÷ (45 ÷ 5)	M2	**M1** for 55 ÷ 5 or 11 or 45 ÷ 5 or 0.75 or 60 × 9 **oe** or for repeated addition attempt at method with no more than one error	M2 may be repeated addition, done in stages etc For M2 accept e.g. 11 × 45, 45 × 10 + 45, 9 × 55, 540 ÷ 9, 540 ÷ 45 × 5 M2 implied by 495 or 60 or 8.25 or 8 mins 15 seconds For M2, do not accept incorrect time conversion e.g. 0.45 × 11
			60 [boxes] or 8.25 **oe** or 495 **and** 540	A2	**A1** for 495	Accept 8 mins 15 seconds for A2

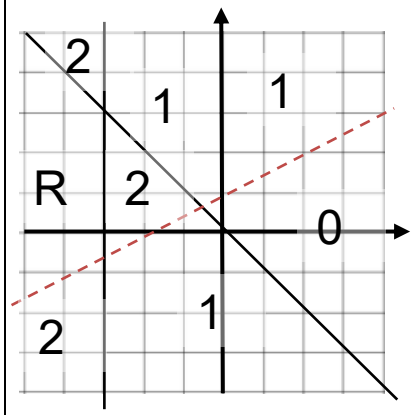
Question			Answer	Marks	Part marks and guidance	
7	(b)		They continue to pack boxes at the same rate (or faster) **oe**	1		Accept any comment that implies the rate does not go slower e.g. They took no breaks They pack for 9 mins without stopping Each box took the same time to pack They don't get tired That they were not interrupted The boxes remain the same size and consistency That they won't make any mistakes. I assumed every box took 9 seconds **Do not accept** e.g. I assumed one box took 9 seconds

Question			Answer	Marks	Part marks and guidance	
8			[Vol of block ≈ 3 × 5 × 2 =] 30 or [3 × 4.9 × 2 =] 29[.4] or [3 × 4.9 × 2 =] 31 or [3 × 5 × 2.2 =] 33	**M2**	**M1** for 3.1 × 4.9 × 2.2 or with one rounded value[s]	Throughout question if the candidate attempts to convert to different units this must be done correctly for method marks
			their 30 × *their* 8 or 2400 ÷ *their* 30 or 2400 ÷ *their* 8	**M1**	**Dep** on at least **M1 or** for 2400 and *their* 8 used If **M0M0, SC1** for two of 3, 5, 2 and 8 used	*their* 8 is 7.87, 7.9 or 8 Accept 2.4 ÷ *their* 30 *their* 8 is 7.87, 7.9 or 8 If these calculations are not shown they may be implied by correct figures for the answers
			240 or 80 or 300	**A1**		Accept e.g. 0.24 kg Accept e.g. 0.08 kg/cm^3
			Not reasonable **oe** and 2400 g or 0.24[0] kg shown **oe** or Not reasonable **oe** and 80 or 0.08 kg/cm^3 shown or Not reasonable **oe** and 300 and 30 shown	**A1**	**Dep on M2M1A1**	Allow e.g. wrong/not correct for not reasonable Accept implicit comparison with 2.4 kg if 2400 g or 0.24 kg not shown e.g. it should be 10 times heavier

Question			Answer	Marks	Part marks and guidance	
9	(a)		150	2	**M1** for $\frac{3}{2}[\times 100]$ **oe**	M1 for answer 1.5
9	(b)		18	4	**M3** for $\frac{15}{14-9} \times 6$ **oe** or for answer 27 : 18 : 42 or **B2** for 9 : 6 **and** 14 : 6 or 9 : 6 **and** 6 : 14 **oe seen** or ratio of *A* :[Z] : *M* = 9*k*: [6*k*]: 14*k* **seen** or $\frac{7}{3}[k] - \frac{3}{2}[k] = 15$ **oe** or **M1** for $\frac{7}{3}[k]$ and $\frac{3}{2}[k]$ **oe** or for attempt to adjust ratios using a common multiple of 2 and 3 with one correctly adjusted value If 0 scored, **SC1** for 21: 14 : 6 **oe** seen	If working to this question is seen in part (a) then it has to be used in part (b) to score any marks For B2 e.g. [A : Z : M =] 9 :[6]:14 oe **seen** (allow in any order) M1 for [A : Z =] 9 : 6 seen or [M : Z =] 14 : 6 seen or [Z : M =] 6 : 14 seen

Question			Answer	Marks	Part marks and guidance	
10			5 and 9 with correct working	6	**M3** for 72 and 40 OR **M2** for 72 or 40 OR **B1** for $p + q = 112$ **oe** **B1** for $p - q = 32$ or $q - p = 32$ **oe** AND **M1** for 360 ÷ *their p* or 360 ÷ *their q* **oe** or $\frac{180(n-2)}{n} = 180 -$ *their p* or $\frac{180(n-2)}{n} = 180 -$ *their q* **oe** **A1** for one correct answer If **0** or **1** scored, instead award **SC2** for both answers correct with no or insufficient working If 0 scored award **SC1** for one correct answer with no or insufficient working	"Correct working" requires evidence of M3 and M1 $2p = 112 + 32$ oe implies B1B1 $2q = 112 - 32$ oe implies B1B1 M1 could be repeated addition oe For M1, accept e.g. 360 ÷ 5 = 72 or other convincing justification A1dep on at least M2 and M1 leading to that answer
11			51	4	**M3** for $(1 - (1 - 0.3)^2)$ **oe soi** or **M2** for $(1 - 0.3)^2$ **oe soi** or 0.49 or 49 or **M1** for $(1 - 0.3)$ **oe soi** or for $y = kx^2$ **oe** or $yk = x^2$ **oe**	$\frac{51}{100}$ oe and –51 implies M3 For method soi if a value of *x* introduced e.g. if 100 used M2 for $100 \times (1 - 0.3)^2$ oe M1 for $100 \times (1 - 0.3)$ oe or 70 seen Not e.g. $y \propto kx^2$

Question			Answer	Marks	Part marks and guidance	
12	(a)		$\frac{14}{37}$ final answer	1		Ignore attempts to convert correct final answer to a decimal
12	(b)		$\frac{3n-1}{(n+1)^2+1}$ **oe** final answer	3	**M2** for $3n - 1$ or $(n + 1)^2 + 1$ **oe** or **M1** for $3n$ [+ k] or for a quadratic expression in n **oe**	For 3 marks oe e.g. $\frac{3n-1}{[1]n^2+2n+2}$, Condone consistent use of different variable for all marks e.g. M2 for $3x - 1$ Where k is a value, or 'k' For M2 and M1 expressions do not need to be in a fraction
13	(a)		6	3	**M1** for $\sin 30 = \frac{BD}{12}$ **oe** **B1** for $\sin 30 = 0.5$ **oe soi**	Accept e.g. $\sin 30 = \frac{\sqrt{1}}{2}$ Do not allow B1 if contradicted
13	(b)		$6\sqrt{2}$ or $\frac{12}{\sqrt{2}}$ **cao**	3	**B2** for $\sqrt{72}$ **or better** **OR** **M1** for $\frac{their(a)}{sin45}$ [= *AB*] **oe** or 2(*their* (*a*))^2 **oe** or $\frac{12\times sin30}{sin45}$[= *AB*] **B1** for $\sin 45 = \frac{\sqrt{2}}{2}$ or $\frac{1}{\sqrt{2}}$ **oe soi**	For M1, accept $\frac{their(a)}{cos45}$ [= *AB*] **oe** For M1 , accept e.g. $\frac{their(a)\times sin90}{sin45}$ [= *AB*] M1 implied by e.g. 72 For B1 accept $\cos 45 = \frac{\sqrt{2}}{2}$ or $\frac{1}{\sqrt{2}}$ **oe** Do not allow B1 if contradicted

Question			Answer	Marks	Part marks and guidance	
14			Correct region indicated  	5	**B2** for $y - 1 = \frac{1}{2}x$ broken line or **B1** for $y - 1 = \frac{1}{2}x$ solid line AND **B1FT** for *R* correct side of $y - 1 = \frac{1}{2}x$ **B1** for *R* correct side of $x = -3$ **B1** for *R* correct side of $y = -x$	Use overlay as a guide for accuracy must pass through or touch small circles (when extended if necessary) position is 2 small dots each way from correct position of ends of line Allow shorter accurate line provided it defines their region See marks on diagram for next 3 marks Grid assumes $y - 1 = \frac{1}{2}x$ is correct Mark position of R first. If R not labelled then accept other clear indication. If $y - 1 = \frac{1}{2}x$ <u>not attempted</u> then allow B1B1 max for region FT dep on **sloping** line drawn that is long enough to define the region chosen on grid
15	(a)		$(3x + 2)(3x - 2)$ final answer	2	**M1** for answer a pair of factors of the type $(ax + b)(ax - b)$, where $a = 3$ or $b = 2$ or for correct answer seen	For 2 marks or M1, condone omission of final bracket
15	(b)		$(3x + 4)(x - 2)$	M2	**M1** for $3x(x - 2) + 4(x - 2)$ or $x(3x + 4) - 2(3x + 4)$ or for $(3x + a)(x + b)$ where $ab = -8$ or $3b + a = -2$	For M2 and M1 condone omission of final bracket For M2, condone $\frac{(3x-6)(3x+4)}{3}$ followed by $x - 2$ [= 0] and $3x + 4$ [= 0] If no product of factors shown, $x - 2 = 0$ and $3x + 4 = 0$ gets M1 only After $3x(x - 2) + 4(x - 2)$ or $x(3x + 4) - 2(3x + 4)$ and then correct answers allow M2B1
			$-\frac{4}{3}$ **oe** and 2	B1	Correct or **FT** *their* two factors dep on factors of the form $(3x \pm a)(x \pm b)$	Accept –1.33…

Question			Answer	Marks	Part marks and guidance	
15	(c)		1.5 or $1\frac{1}{2}$ or $\frac{3}{2}$	4	**M1** for $2(x-5) = 2(1-3x)$ or $\frac{x-5}{1-3x} = 1$ **M1** for $2x - 10 = 2 - 6x$ or $x - 5 = 1 - 3x$ **M1** for reaching $ax = b$, FT *their* previous working provided previous working is of the form $dx + e = f + gx$	For 4 marks, condone $\frac{12}{8}$ or $\frac{6}{4}$ isw incorrect cancelling/conversion Embedded answer scores M3 maximum This final method mark may be implied from the answer
16	(a)		16	2	**M1** for $\left[\sqrt[3]{64} =\right]$ 4 or $[64^2 =]$ 4096	M1 implied by answer $\frac{1}{16}$
16	(b)		[*p* =] 14 [*q* =] 33	4	**B3** for 42 and 99 **OR** **B2** for $\frac{13}{99}$ or 0.4242…. or **M1** for [100*x* =] 13.13….. or 0.555… **M1** for $\frac{55}{99} - \frac{13}{99}$ FT *their* fraction converted to common denominator (dep on a conversion needed of *their* fraction or $\frac{5}{9}$)	B3 for $\frac{42}{99}$ or any pair that allow elimination of recurring decimal M1 may be implied from the value of *their p* and *their q*
17			[*y* =] –2*x* + 9 final answer	4	**B2** for grad = – 2 **soi** or **M1** for diagonals cross at 90° **soi** **M1** for substituting (1, 7) into *y* = (*their m*)*x* + *c* **oe soi**	Accept $\frac{-2}{1}$ for all marks B2 implied by e.g. [*y* =] -2*x* + c oe M1 could be on a diagram e.g. *y* – 7 = (*their m*)(*x* – 1) Answer [*y* =] ½ *x* + 6.5 implies M1 M1 soi by answer with their gradient e.g. *y* = 2*x* + 5 satisfies (1, 7) so gets M1

Question			Answer	Marks	Part marks and guidance	
18			Correct method to establish $x = \frac{5}{3}$ e.g. $p^{\frac{2}{5}} = m^{\frac{2}{3}}$ or better or $m^{\frac{2x}{5}} = m^{\frac{2}{3}}$ or $\frac{2x}{5} = \frac{2}{3}$ or $p = \left(\sqrt{\left(\sqrt[3]{m}\right)^2}\right)^5$ **or better**	**M2**	**M1** for $p^{\frac{2}{5}}$ or $m^{\frac{2}{3}}$ or $[\sqrt[5]{(m^x)^2} =] m^{\frac{2x}{5}}$ or for first step in making p the subject $p^2 = \left(\sqrt[3]{m^2}\right)^5$ or $\sqrt[5]{p} = \sqrt{\left(\sqrt[3]{m^2}\right)}$ **or better** If 0 scored, **SC1** for $[p =] \sqrt[3]{m^5}$ written	or better **e.g.** $\sqrt[5]{p} = \sqrt[6]{m^2}$ e.g. or better for M2 $p = \sqrt[6]{m^{10}}$ Maximum mark is SC1 for those working backwards from $x = \frac{5}{3}$ and this mark is for interpreting the index $m^{\frac{5}{3}}$ as $\sqrt[3]{m^5}$
			$p^{\frac{1}{5}} = m^{\frac{1}{3}}$ leading to $p = m^{\frac{5}{3}}$ or $\frac{2}{3} \times \frac{5}{2} = \frac{5}{3}$ or $6x = 10$ leading to $\frac{5}{3}$ or $p = \left(\sqrt[3\times2]{m}\right)^{(2\times5)}$ **or better** leading to $p = m^{\frac{5}{3}}$	**A1**	After M2 earned and with no errors seen	

Question			Answer	Marks	Part marks and guidance	
19			$\frac{1}{3}$ **oe** with correct working	5		Correct working" requires evidence of M1 and M3 or convincing alternate approach
					M1 for blue = 20 and yellow = 5	M1 implied from e.g. $\frac{20}{25}$ and $\frac{5}{25}$, [B : Y =] 20: 5 Do not award this mark if they then go on to e.g. use 4 and 1 in working on the tree diagram in both stages for the probabilities but allow the FT method marks for the products or probabilities
					M3 for $\frac{5}{25} \times \frac{20}{24} + \frac{20}{25} \times \frac{5}{24}$ **oe** or **M2** for $\frac{5}{25} \times \frac{20}{24}$ **oe**	For M3, M2 allow evaluated products e.g. for M3 allow $\frac{100}{600} + \frac{100}{600}$ oe provided tree diagram given with individual probabilities shown. M2 not awarded if part of a larger product of probabilities
					or **M1** for correct tree diagram or sample space or for $\frac{5}{25}$ **and** $\frac{20}{24}$ or $\frac{20}{25}$ **and** $\frac{5}{24}$ **oe seen**	For M3, M2, M1 FT *their* blue and yellow e.g. blue 4 and yellow 1 M3 for $\frac{4}{5} \times \frac{1}{4} + \frac{1}{5} \times \frac{4}{4}$ [answer $\frac{2}{5}$ oe] M2 for $\frac{4}{5} \times \frac{1}{4}$ **or** $\frac{1}{5} \times \frac{4}{4}$ M1 for $\frac{4}{5}$ **and** $\frac{1}{4}$
					If 0 scored, **SC1** for correct answer with no or insufficient working or for P(B) = $\frac{4}{5}$ **oe** and P(Y) = $\frac{1}{5}$ **oe**	

Question			Answer	Marks	Part marks and guidance	
20	(a)	(i)	**a** + **c**	1		Not A + C, but if use of capitals in other parts of question, penalise the first occurrence only Accept **c** + **a**
20	(a)	(ii)	**a** + $\frac{3}{8}$**c** final answer	2	**M1** for correct route or for $\overrightarrow{AN} = \frac{3}{8}$**c** or $\overrightarrow{BN} = -\frac{5}{8}$**c**	M1 for e.g. OA + AN, OC + **a** – NB Condone poor vector notation for method Could be written on diagram
20	(b)		$\overrightarrow{CN}$ = **a** – $\frac{5}{8}$**c** **oe**	M1	or **FT** (*their* **(a)(ii)**) – **c** must be vector route in terms of **a** and/or **c**	Condone omission of vector arrows etc throughout question Allow $\overrightarrow{CN}$, $\overrightarrow{CP}$ and $\overrightarrow{NP}$ both unsimplified and isw attempts to simplify
			$\overrightarrow{CP}$ = $\frac{8}{5}$**a** – **c** **oe** or $\overrightarrow{NP}$ = $\frac{3}{5}$**a** – $\frac{3}{8}$**c** **oe**	M1	or **FT** $\overrightarrow{CP} = \frac{8}{5}$ (*their* $\overrightarrow{CN}$) must be vector route in terms of **a** and/or **c** or **FT** $\overrightarrow{NP} = \frac{3}{5}$ (*their* $\overrightarrow{CN}$) must be vector route in terms of **a** and/or **c** <u>Alt method</u> (using similar triangles NCB and NPA) **M2** for $\overrightarrow{AP} = \frac{3}{5}$ **a** **oe**	NP may be embedded in working leading to OP when e.g. they do ON + NP
			$\overrightarrow{OP}$ = $\frac{8}{5}$**a** **oe** or $\overrightarrow{AP}$ = $\frac{3}{5}$**a**	B1		Award B1 for e.g. OP = **c** + $\frac{8}{5}$**a** – **c** Accept OAP = $\frac{8}{5}$**a** **oe**
			Correct conclusion $\overrightarrow{OP} = \frac{8}{5}\overrightarrow{OA}$ **oe** or $\overrightarrow{OP}$ is a multiple of $\overrightarrow{OA}$ **oe**	A1	**Dep on M2B1**	Accept correct equivalent vector conclusions involving AP and OP or OA

APPENDIX 1

Exemplar responses for Q4

	Response	Mark
1	Has found [the volume of] a cuboid	**1**
2	He needs to halve the volume of a cuboid (BOD referring to the calculation rather than 240)	**1**
3	They forgot to ÷2 to work out the area of the front face	**1**
4	He did not divide the [area of the] cross section by 2	**1**
5	She did not do half base [times height]	**1**
6	The area of the cross section is ½ $b \times h$	**1**
7	The area of the triangle needs to be halved	**1**
8	It has the cross section of a triangle so it needs to be divided by 2 (referring to cross section)	**1**
9	That the student has to divide $h \times b$ by 2	**1**
10	It's a triangle, they didn't half 24 after they did 4 × 6	**1**
11	So it would be 6 × 4 / 2=12	**1**
12	6 × 4 / 2 × 10 =120 (BOD describes that triangle should be divided by 2)	**1**
13	He forgot to half the 10 (incorrect – needs to refer to triangle area)	**0**
14	They didn't find the area of the triangle before ×10 (not sufficient does not describe the error)	**0**
15	The student did not work out that it is a triangle. (similar to above)	**0**
16	Calculated a cube instead of a triangle (incorrect)	**0**
17	He did not halve it (not referring to what the 'it' is)	**0**
18	They did not multiply the volume by 2 (the volume is given as 240)	**0**
19	He did not divide the volume by 2	**0**
20	Wrong formula	**0**
21	They did not halve the answer (not specific to the cross section)	**0**
22	They needed to divide by 2 (not specific to cross section)	**0**

APPENDIX 2

Exemplar responses for Question 5dii

	Response	Mark
1	Kai has average height	**1**
2	Kai fits in with everyone else (and is not like a child age 6)	**1**
3	All children are similar/same height[s] at that age	**1**
4	Kai fits the trend	**1**
5	His height fits the line of best fit	**1**
6	That he is not too small/too tall (accept assumptions that imply that the growth is performing as expected for the average)	**1**
7	He follows the pattern. He could be tall or short for his age (accept the first part ignore incorrect statement)	**1**
8	That he has not had any growth problems (accept assumptions that imply that the growth has not been different to normal for some reason, reason must be given)	**1**
9	The sample of children is representative oe	**1**
10	Kai is the same height as another 8 year old	**0**
11	Kai grows according to the line on the graph.	**0**
12	Kai is shorter than expected for their age. (incorrect – should be Kai is **not** shorter …..)	**0**
13	Assumption: the older you get, the taller you will grow	**0**
14	He will be in the middle of a 7 and 9 yr old.	**0**
15	Kai is exactly 8 years old (needs more)	**0**
16	My line of best fit is accurate	**0**
17	Between 7 and 8 there is not much growth	**0**
18	Children age as they grow	**0**

APPENDIX 3
Exemplar responses for Question 5e

Reason must refer to or imply no data above 14 and not just refer to the graph not going above 14 alone.
Accept children, plots/points as implying data.

	Response	Mark
1	It is extrapolated and not in the data provided	1
2	The diagram has no ages/data above 14 (underlined part gets the mark)	1
3	Insufficient data (small sample reference)	1
4	The graph does not go up to 17 as there is no data above 14 (underlined part gets the mark)	1
5	We do not know that the pattern of growth will continue above 14 (implies trend may not continue)	1
6	The graph does not cover that data range (allow for the underlined part)	1
7	There are no children on the graph above 14 (accept children for data)	1
8	There are no plots/points on the graph above 14 (accept plots/points for data)	1
9	Medical deficiencies (not sufficient to describe trend may not continue)	0
10	Doesn't have a growth disorder (not sufficient to describe trend may not continue)	0
11	Grows normally (not sufficient to describe trend may not continue)	0
12	The graph reaches up to 14 (not referring to data)	0
13	Extrapolated (needs explanation)	0
14	As you may stop growing by 17 (not sufficient to describe trend may not continue)	0
15	The graph only goes up to 14 (not referring to data)	0
16	The graph does not show information for 17 year olds	0
17	By 17 they won't be growing at the same rate (not referring to data)	0
18	Because it goes beyond the value on the axes	0
19	Because they could grow more or stop growing	0
20	There is no data	0

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