

Mark Scheme (Results)

Summer 2016

Pearson Edexcel GCSE
In Mathematics A (1MA0)
Higher (Calculator) Paper 2H

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NOTES ON MARKING PRINCIPLES

- 1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- 2 Mark schemes should be applied positively.
- 3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Note that in some cases a correct answer alone will not score marks unless supported by working; these situations are made clear in the mark scheme. Examiners should be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- 4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- 5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- 6 Mark schemes will award marks for the quality of written communication (QWC).
The strands are as follows:
 - i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labelling conventions.
 - ii) *select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.
 - iii) *organise information clearly and coherently, using specialist vocabulary when appropriate.*
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Partial answers shown (usually indicated in the ms by brackets) can be awarded the method mark associated with it (implied).

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks; transcription errors may also gain some credit. Send any such responses to review for the Team Leader to consider.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

10 Probability

Probability answers must be given as fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

14 The detailed notes in the mark scheme, and in practice/training material for examiners, should be taken as precedents over the above notes.

Guidance on the use of codes within this mark scheme

M1 – method mark for appropriate method in the context of the question

A1 – accuracy mark

B1 – Working mark

C1 – communication mark

QWC – quality of written communication

oe – or equivalent

cao – correct answer only

ft – follow through

sc – special case

dep – dependent (on a previous mark or conclusion)

indep – independent

isw – ignore subsequent working

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Question		Working	Answer	Mark	Notes
1	(a)		1 4 6 8 9 2 1 2 3 5 7 9 3 0 4 6 8 8 4 1 3 6 6 8	3	B2 for correct ordered stem and leaf (B1 for fully correct unordered, or ordered with one error or omission) B1 (indep) for key (units not required but must be correct if stated) eg. 1 4 = 14 (marks)
	(b)		$\frac{9}{20}$ oe	2	B2 for $\frac{9}{20}$ oe or ft from stem and leaf diagram (B1 for $\frac{x}{20}$ where $x < 20, x \neq 9$ or $\frac{9}{y}$ where $y > 9$ or ft from stem and leaf diagram)
2	(a)		$30abc$	1	B1
	(b)		$3(y + 2)$	1	B1
	(c)		$x^2 - 3x$	1	B1
3			9.25	3	M2 for $x + x + 4 + x + x + 4 = 45$ oe or $x + x + 4 = 22.5$ oe (M1 for $x + x + 4 + x + x + 4$ oe) A1 for 9.25 or $\frac{37}{4}$ oe OR M1 for $45 - 8 (= 37)$ or $22.5 - 4 (= 18.5)$ M1 for $(45 - 8) \div 4$ or $(22.5 - 4) \div 2$ A1 for 9.25 or $\frac{37}{4}$ oe

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Question	Working	Answer	Mark	Notes
4	$400 \div 18 = 22(.2)$ $499 \div 20 = 24(.95)$ or 25 $600 \div 26 = 23(.07\dots)$ (or equivalent in £) $18 \div 4 = 4.5$ $20 \div 4.99 = 4(.008\dots)$ $26 \div 6 = 4.3(333\dots)$	18 pack with supporting working	4	M1 for a method that would result in at least two values that could be used to compare two packs M1 for a complete method that would result in values that could be used to compare all three packs A1 for all fully correct figures suitable for comparison C1 ft (dep on M2) for comparison of their values with a correct conclusion from their figures
5		0.09, 0.36	3	M1 for $1 - 0.4 - 0.15$ oe ($= 0.45$) or $100 - 100 \times 0.4 - 100 \times 0.15$ ($= 45$) M1 for $(1 - 0.4 - 0.15) \div 5$ ($= 0.09$) or $(100 - 100 \times 0.4 - 100 \times 0.15) \div 5$ ($= 9$) A1 for 0.09 and 0.36 oe OR M1 for $0.4 + 0.15 + x + 4x = 1$ M1 for $x = (1 - 0.4 - 0.15) \div 5$ A1 for 0.09 and 0.36 oe [SC: B1 for 0.162 and 0.648 if M0 scored]

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Question		Working	Answer	Mark	Notes
5			0.09, 0.36	3	<p>M1 for $1 - 0.4 - 0.15$ oe ($= 0.45$) or $100 - 100 \times 0.4 - 100 \times 0.15$ ($= 45$) M1 for $(1 - 0.4 - 0.15) \div 5$ ($= 0.09$) or $(100 - 100 \times 0.4 - 100 \times 0.15) \div 5$ ($= 9$) A1 for 0.09 and 0.36 oe</p> <p>OR</p> <p>M1 for $0.4 + 0.15 + x + 4x = 1$ M1 for $x = (1 - 0.4 - 0.15) \div 5$ A1 for 0.09 and 0.36 oe</p> <p>[SC: B1 for 0.162 and 0.648 if M0 scored]</p>
6	(a)		20.3	2	<p>M1 for $\frac{50}{1.57^2}$ oe A1 for answer in range 20.2 to 20.3</p>
	(b)		68.04	2	<p>M1 for (m =) $1.8^2 \times 21$ oe A1 for 68.04</p>
	(c)		2.61	3	<p>M2 for a complete method to find 145% of 1.8, eg. $\frac{145}{100} \times 1.80$ oe (M1 for a method to find 45% of 1.8, eg. $\frac{45}{100} \times 1.80$ ($= 0.81$) or for a multiplication factor of 1.45) A1 cao</p>

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Question		Working	Answer	Mark	Notes
7		x $x^3 - 5x$ 3 12 4 44 3.1 14.(291) 3.2 16.(768) 3.3 19.(437) 3.4 22.(304) 3.5 25.(375) 3.6 28.(656) 3.7 32.(153) 3.8 35.(872) 3.9 39.(819) 3.75 33.9(84..) 3.76 34.3(57..) 3.77 34.7(32..) 3.78 35.1(10..) 3.79 35.4(89..)	3.8	4	B2 for a trial $3.7 \leq x \leq 3.8$ evaluated (B1 for a trial $3 \leq x \leq 4$ evaluated) B1 for a different trial $3.75 \leq x < 3.8$ evaluated B1 (dep on at least one previous B1) for 3.8 Accept trials correct to the nearest whole number (rounded or truncated) if the value of x is to 1 dp but correct to 1dp (rounded or truncated) if the value of x is to 2 dp. NB: no working scores no marks even if the answer is correct.
8	(a)		4 : 3	2	M1 for $720 : 540$ oe or for $3 : 4$ or $1 : \frac{4}{3}$ oe or $\frac{3}{4} : 1$ oe A1 for $4 : 3$ or $\frac{4}{3}$ (or 1 .33....) : 1 or $1 : \frac{3}{4}$ (or 0.75)
	(b)		480	2	M1 for $720 \div 3 (= 240)$ or scale factor of $\frac{3}{2}$ or $\frac{2}{3}$ oe or $720 : 480$ A1 cao

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Question	Working	Answer	Mark	Notes
9		124° with reasons	4	<p>M1 for a method to find any angle, eg. angle $DEF = 180 - 70 - 54 (= 56)$ or angle $AEB = 70$ or angle $EAB = 54$ or angle $GEB = 180 - 70 (= 110)$ A1 for $x = 124$ NB: angles may be just shown on the diagram</p> <p>C2 for full reasons, appropriate to their given method, with no additional reasons (C1 for one appropriate reason relating to parallel lines)</p> <p>Possible reasons: <u>corresponding angles</u> are equal; <u>alternate angles</u> are equal; <u>co-interior angles (allied)</u> add up to <u>180</u> <u>angles on a straight line</u> add up to <u>180</u> ; <u>angles in a triangle</u> add up to <u>180</u>; <u>vertically opposite angles</u> are equal ; the <u>exterior angle of a triangle</u> is equal to the sum of the <u>interior opposite angles</u>; <u>angles at a point</u> add up to <u>360</u>;</p>
10	$2 \times 8 = 16$ $6 \times 21 = 126$ $10 \times 12 = 120$ $14 \times 7 = 98$ $18 \times 2 = 36$	7.92	4	<p>M1 for fx with x consistently within interval including ends (allow 1 error) M1 for consistently using appropriate midpoints in fx M1 (dep on first M1) for "Σfx" $\div 50$ (or divided by "Σf" if clearly calculated), eg $396 \div 50$ A1 for 7.92 cao</p>

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Question	Working	Answer	Mark	Notes
11		42.28	5	<p>M1 for method to find weekly mileage, eg. $18 \times 2 \times 5$ (= 180) or weekly car park charge, eg. 3.50×5 (= 17.50)</p> <p>M1 for method to find fuel used in a relevant journey, eg. "180" \div 45.2 (= 3.9823 gallons) or $18 \div 45.2$ (= 0.39823 gallons)</p> <p>M1 for a correct use of the conversion factor to convert between gallons and litres, eg. "3.9823" \times 4.546 (= 18.1 litres) or "0.39823" \times 4.546 (= 1.81 litres) or 1.369×4.546 (= 6.22... £/gallon) or $45.2 \div 4.546$ (= 9.94... miles/litre)</p> <p>M1 for a method to find the cost of a relevant journey, eg. "18.1..." \times 1.369 (= 24.78 ...) or "1.81..." \times 1.369 (= 2.478 ...) or "3.9823" \times "6.22..." (= 24.78...)</p> <p>A1 for answer in the range 42.26 to 42.3(0)</p> <p>NB candidates could work in litres or in gallons and/or could work in £ or p</p>

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Question	Working	Answer	Mark	Notes
12		144	4	<p>M1 for method to find the interior angle of a regular pentagon, eg. $180 \times (5 - 2) \div 5 (= 108)$ oe M1 (indep) for using a line of symmetry to find an angle, eg. "interior angle" $\div 2$ (half an interior angle) or 90 between line and side M1 (dep on M2) for complete method to find angle x, eg. $90 + "54"$ or "108"$\times 5 - "108"$$\times 2 - 90 \times 2$ A1 for 144 supported by working</p> <p>OR</p> <p>M1 for considering all 5 lines of symmetry or angle vertically opposite x with angle bisector drawn M1 for $360 \div 10 (= 36)$ or $360 \div 5 (= 72)$ M1 for $(360 \div 10) \times 4$ or $(360 \div 5) \times 2$ A1 for 144 supported by working</p> <p>OR</p> <p>M1 for method to find the exterior angle of a regular pentagon (72°), eg. $360 \div 5 (= 72)$ oe M1 (indep) for using a line of symmetry to find an angle, eg. "interior angle" $\div 2$ (half an interior angle) or 90 between line and side M1 (dep on M2) for complete method to find angle x, eg. $180 - 2(180 - 90 - 72)$ A1 for 144 supported by working</p>

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Question		Working	Answer	Mark	Notes
13	(a)		-1, 1, -1	2	B2 for all correct (B1 for 1 or 2 correct)
	(b)		Correct graph	2	M1 ft for 4 or 5 points from their table plotted correctly, provided at least B1 awarded in part (a) A1 for a fully correct graph (no line segments)
14			3	5	M1 for a complete method to find the area of the cross section, eg. $15 \times 2 + "(12 - 4)" \times 2 + 15 \times 2$ (= 76) or for finding the volume of a relevant prism, eg. $15 \times 2 \times 120$ (= 3600) "(12 - 4)" maybe just seen on the diagram M1 for a method to find the volume of the bar, eg. "76" \times 120 (= 9120) or ft "area of cross section" \times 120 provided "area of cross section" includes a method to find the area of at least two relevant rectangles M1 for "volume" \times 8, eg. "9120" \times 8 (= 72960) or $250 \times 1000 \div 8$ (= 31250) NB "volume" must be dimensionally correct M1 (dep on previous M1) for $250 \div ("volume" \times 8) \div 1000$, eg. $250 \div "72960 \div 1000"$ (= 3.4265....) or "31250" \div "9120" A1 for an answer of 3 with correct working

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Question		Working	Answer	Mark	Notes
15			No (supported)	4	M1 for a correct method to calculate 77% of 15000 or 0.77 seen eg. 15000×0.77 oe (= 11550) or $15000 - \frac{23}{100} \times 15000$ oe (= $15000 - 3450 = 11550$) M1 for demonstrating a correct compound interest method over 3 years, eg “11550” $\times 0.82$ (=9471) and “9471” $\times 0.82$ (=7766.22) or “11550” $\times 0.82^2$ or 0.77×0.82^2 (=0.517748) A1 for 7766(.22) or 0.51(7748) or 0.48(2252) C1 ft (dep on M2) for a statement giving the correct decision for their calculated values
16	(a)		128	1	B1 for answer in the range 128 to 128.5
	(b)		10.5 to 11.5	2	M1 for a LQ in the range 122 to 122.5 or an UQ in the range 133 to 133.5 A1 for answer in the range 10.5 to 11.5

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Question	Working	Answer	Mark	Notes
17		30.1	4	<p>M1 for a correct trigonometric statement to find an unknown angle, eg. $\sin(30+x)$ or $\cos A = \frac{10.4 + 5.2}{18}$ or $\frac{\sin ADC}{18} = \frac{\sin 30}{10.4}$</p> <p>M1 for a complete method to find the angle, eg. $\sin^{-1}\left(\frac{10.4+5.2}{18}\right)$ (= 60.07...) or $\cos^{-1}\left(\frac{10.4+5.2}{18}\right)$ (= 29.92.. or $\sin^{-1}\left(\frac{18 \times \sin 30}{10.4}\right)$ (= 59.92.. or $180 - 59.92.. = 120.07..$)</p> <p>M1 (dep on M2) for a fully complete method to find angle x, eg. "60.07." - 30 or $60 - "29.92.."$ or $90 - "59.92.."$</p> <p>A1 for answer in the range 30.07 to 30.1</p> <p>OR</p> <p>M1 for $(BC^2 =) 18^2 - (10.4 + 5.2)^2$ or $BC^2 + (10.4 + 5.2)^2 = 18^2$</p> <p>M1 for $(BC =) \sqrt{18^2 - (10.4 + 5.2)^2}$ (= 8.97...)</p> <p>M1 (dep on M2) for a fully complete method to find angle x, eg. $\tan^{-1}\left(\frac{5.2}{"8.97..."}\right)$</p> <p>A1 for answer in the range 30.07 to 30.1</p>

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Question		Working	Answer	Mark	Notes
18	(a)		$10a^5b^4$	2	B2 cao (B1 for any two of 10, a^5 , b^4 in a product)
	(b)		$y = 5p^2 - x$	3	M1 for a correct first step to either remove the square root, eg. $p^2 = \frac{x+y}{5}$ or clear the fraction, eg. $\sqrt{5}p = \sqrt{x+y}$ M1 (dep) for a method to remove the square root and a method to clear the fraction , eg. $5p^2 = x+y$ A1 for $y = 5p^2 - x$
19			11	2	M1 for $\frac{51}{234} \times 50$ oe (= 10.89...) A1 for 11 (accept 10)
20		$\frac{-6 \pm \sqrt{6^2 - 4 \times 3 \times -2}}{2 \times 3}$ $(x+1)^2 - 1 - \frac{2}{3} = 0$	0.29 and - 2.29	3	M1 for substitution of $a = 3$, $b = 6$, $c = -2$ into the formula or for completing the square (condone one sign error) M1 for $\frac{-6 \pm \sqrt{60}}{6}$ or $-1 \pm \sqrt{\frac{5}{3}}$ or in simplified form A1 for answers in the range 0.29 to 0.292 and - 2.292 to - 2.29
21			29.25	3	B1 for one of 14.5, 13.5, 8.75, 8.65 M1 for " v_{UB} " - " u_{LB} " where $14 < "v_{UB}" \leq 14.5$ and $8.65 \leq "u_{LB}" < 8.7$ A1 for 29.25 from correct working

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Question	Working	Answer	Mark	Notes
22		28.9	3	<p>M2 for $\frac{75}{360} \times 2 \times \pi \times 6$ oe + $\frac{75}{360} \times 2 \times \pi \times 10$ oe (= 7.85... + 13.08... = 20.94..)</p> <p>(M1 for $\frac{75}{360} \times 2 \times \pi \times 6$ oe or $\frac{75}{360} \times 2 \times \pi \times 10$ oe)</p> <p>A1 for 28.9 to 28.95</p>
23	$0 < t \leq 5$ fd = $8 \div 5 = 1.6$ $5 < t \leq 15$ fd = $32 \div 10 = 3.2$ $15 < t \leq 30$ fd = $36 \div 15 = 2.4$ $30 < t \leq 40$ fd = $18 \div 10 = 1.8$ $40 < t \leq 60$ fd = $6 \div 20 = 0.3$	Correct histogram	3	<p>B3 for a fully correct histogram with vertical axis correctly scaled or with a key, eg. $2 \text{ cm}^2 = 1$</p> <p>(B2 for at least 4 correct blocks with or without a scale or a key OR for all five fd correct)</p> <p>(B1 for 2 correct blocks of different widths or for at least three correct fd values)</p>

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Question		Working	Answer	Mark	Notes
24	(a)		$\frac{-1}{3x+4}$	2	M1 for $(3x \pm 4)(x \pm 3)$ or $(-3x \pm 4)(-x \pm 3)$ A1 for $\frac{-1}{3x+4}$, accept $\frac{1}{-3x-4}$
	(b)		$\frac{2x}{x^2-1}$	3	M1 for common denominator $(x-1)(x+1)$ or x^2-1 M1 for $\frac{x(x+1)}{(x-1)(x+1)} - \frac{x(x-1)}{(x-1)(x+1)}$ oe or $\frac{x(x+1)-x(x-1)}{(x-1)(x+1)}$ oe (NB: The denominator must be $(x-1)(x+1)$ or x^2-1 or another suitable common denominator) A1 for $\frac{2x}{(x-1)(x+1)}$ or $\frac{2x}{x^2-1}$

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Question	Working	Answer	Mark	Notes
25		80.4	6	<p>M1 for $0.5 \times 7 \times 8 \times \sin x = 18$</p> <p>M1 (dep) for $(x =) \sin^{-1}\left(\frac{18}{0.5 \times 7 \times 8}\right)$ oe (= 40)</p> <p>M1 (dep on at least M1) for $(AC^2 =) 7^2 + 8^2 - 2 \times 7 \times 8 \times \cos "40"$</p> <p>M1 (dep on previous M1) for correct order of evaluation or 27.2(03...) or 5.2(15...)</p> <p>M1 (dep) for $\sin A = \frac{8 \times \sin "40"}{"5.2(15.)"}$ or $\sin A = \frac{18}{0.5 \times 7 \times "5.2(15.)"}$</p> <p>or $\cos A = \frac{"5.2(15.)"^2 + 7^2 - 8^2}{2 \times "5.2(15.)" \times 7}$</p> <p>A1 for answer in the range 80.3 to 80.4 from correct working</p> <p>OR</p> <p>(with perpendicular from A meeting BC at a point X)</p> <p>M1 for $0.5 \times 8 \times h = 18$</p> <p>M1 (dep) for $(h =) \frac{18}{0.5 \times 8}$ (= 4.5)</p> <p>M1 (dep on at least M1) for $BAX = \cos^{-1} \frac{"4.5"}{7}$ (= 49.99 ...)</p> <p>M1 (dep) for $(BX =) \sqrt{7^2 - "4.5"^2}$ (= 5.3619...)</p> <p>M1 (dep) for $CAX = \tan^{-1} \frac{8 - "5.3619"}{"4.5"}$ (= 30.38 ...)</p> <p>A1 for answer in the range 80.3 to 80.4 from correct working</p> <p>NB Similar method applies for use of perpendicular from C to AB</p>

Table for use in Question 11

Journeys in miles	Fuel used in gallons; miles \div 45.2	Fuel used in litres, gallons \times 4.546	Cost of journey in £, litres \times 1.369 or gallons \times 6.22...
18	0.398...	1.81...	2.478...
36	0.796...	3.62...	4.956...
90	1.991...	9.05...	12.39...
180	3.98...	18.1...	24.78...
252	5.57...	25.3...	34.69...

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:

Angles: $\pm 5^\circ$

Measurements of length: ± 5 mm

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Question		Modification	Notes
1	(a)	Stem and leaf diagram enlarged and 4th horizontal line has been inserted.	B2 for correct ordered stem and leaf (B1 for fully correct unordered or ordered with one error or omission) B1 (indep) for key (units not required but must be correct if stated) eg 1 4 = 14 (marks)
2	(a)	Braille only - 3a x 5b x 2c changed to 3p x 5q x 2r. MLP only - a changed to e, b changed to f and c changed to g.	B1

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Question	Modification	Notes
3	Diagram enlarged. MLP only - x changed to y.	<p>M1 for forming an appropriate equation e.g. $x + x + 4 + x + x + 4 = 45$</p> <p>M1 for correct operation(s) to isolate x and non-x terms in an equation eg $4x + 8 = 45$ or $4x = 37$</p> <p>A1 for 9.25 or $\frac{37}{4}$ oe</p> <p>OR</p> <p>M1 for $45 - 8$</p> <p>M1 for $(45 - 8) \div 4$</p> <p>A1 for 9.25 or $\frac{37}{4}$ oe</p>
4	Diagram removed.	<p>M1 for a method that results in at least two values that can be used to compare two multipacks</p> <p>M1 for a complete method to find all three equivalent figures</p> <p>A1 for all 3 correct figures suitable for comparison</p> <p>C1 ft (dep on M2) for comparison of their values with a correct conclusion</p>
8	Diagram removed.	<p>M1 for $720 : 540$ oe or $3 : 4$</p> <p>A1 cao</p> <p>M1 for $720 \div 3$ or scale factor of $\frac{3}{2}$ or $\frac{2}{3}$ oe</p> <p>A1 cao</p>

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Question	Modification	Notes
9	Diagram enlarged. Wording added 'Angle FBC is marked x° '.	<p>M1 for angle $DEF = 180 - 70 - 54 (= 56)$ or for angle $AEB = 70$ M1 for $180 - "56" (= 124)$ or for $70 + 54 (= 124)$ C2 (dep on M2) for 124 with full reasons, appropriate to their given method (C1 (dep on at least M1) for one appropriate reason relating to parallel lines) Possible reasons: <u>corresponding angles</u> are equal; <u>alternate angles</u> are equal <u>angles on a straight line</u> add up to 180° ; <u>angles in a triangle</u> add up to 180° <u>vertically opposite angles</u> are equal the <u>exterior angle</u> of a triangle is <u>equal</u> to the sum of the <u>interior opposite angles</u></p>

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Question	Modification	Notes
12	Diagram enlarged.	<p>M1 for method to find the exterior angle of a pentagon (72°) M1 for method to find the interior angle of a pentagon (108°) M1 for $360 - "108" - "108"/2 - "108"/2$ or for $180 - (180 - 90 - "108"/2)$ or for $"108" \times 5 - "108" \times 2 - 90 \times 2$ A1 for 144 supported by working OR M1 for considering all 5 lines of symmetry M1 for $360 \div 10 (= 36)$ M1 for $"36" \times 4$ A1 for 144 supported by working</p>
13	(b) Grid enlarged.	<p>M1 ft for 5 points from their table plotted correctly, provided at least B1 awarded in part (a) A1 for a fully correct graph</p>
14	Diagrams enlarged. Model provided for all candidates of the first diagram.	<p>M1 for a complete method to find the area of the cross section ($= 76$) or for finding the volume of one small prism after splitting the bar into prisms M1 (dep) for a complete method to find the volume of the bar eg $"76" \times 120 (= 9120)$ oe M1 for $"volume" \times 8$ eg $"9120" \times 8 (= 72960)$ M1 for $250 \div "72.96" (= 3.4265\dots)$ A1 cao</p>

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16	Grid enlarged. Small squares removed. Right axis has been labelled. Graph line marked to go through (125,15)(130,30)(135,45).	<p>B1 130 cao</p> <p>M1 for reading from graph at cf = 15 (= 122) and cf = 45 (= 133) with at least one of LQ or UQ correct</p> <p>A1 cao</p>
17	Diagram enlarged.	<p>M1 for $\sin(C) = \frac{10.4 + 5.2}{18}$ oe or for $(BC^2) = 18^2 - (10.4 + 5.2)^2$</p> <p>M1 for $\sin^{-1}\left(\frac{"15.6"}{18}\right)$ or for $\sqrt{324 - 243.36}$ or $\sqrt{80.64}$ (= 8.979...)</p> <p>M1 for $\sin^{-1}\left(\frac{"15.6"}{18}\right) - 30$ or for $\tan^{-1}\left(\frac{5.2}{"8.979..."}\right)$</p> <p>A1 for 30.07 to 30.1</p> <p>OR</p> <p>M1 for $\sin(ADC) = \left(\frac{18 \times \sin 30}{10.4}\right)$</p> <p>M1 for $\sin^{-1}\left(\frac{18 \times \sin 30}{10.4}\right)$ (= 59.926...)</p> <p>M1 for $(180 - "59.926") - 90$ oe</p> <p>A1 for 30.07 to 30.1</p>

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18	(a) MLP only - a changed to j and b changed to k. Braille only – a changed to p b changed to q. (b) MLP only - x changed to e and y changed to f.	B2 cao (B1 for any two of 10, a^5 , b^4 in a product) M1 for a method to remove square root or clear fraction M1 for a method to remove square root and clear fraction A1 for $y = 5p^2 - x$
22	Diagram enlarged. Shading changed to dotted shading. Wording added ‘A B C D’ after ‘Calculate the perimeter of the shaded region.’	M1 for $\frac{75}{360} \times 2 \times \pi \times 6$ oe (= 7.85...) or $\frac{75}{360} \times 2 \times \pi \times 10$ oe (= 13.08...) M1 for “7.85...” + “13.08...” A1 for 28.9 to 28.95
23	Table frequencies changed to 8, 32, 36, 24 and 16. Diagram enlarged.	B3 for a fully correct histogram with vertical axis correctly scaled or with a key, eg. $2 \text{ cm}^2 = 1$ (B2 for at least 4 correct blocks with or without a scale or a key OR for all five fd correct) (B1 for 2 correct blocks of different widths or for at least three correct fd values)
24(b)	MLP only - x changed to y.	M1 for common denominator $(x - 1)(x + 1)$ M1 for $\frac{x(x+1) - x(x-1)}{(x-1)(x+1)}$ A1 for $\frac{2x}{(x-1)(x+1)}$ or $\frac{2x}{x^2 - 1}$

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25	Diagram enlarged.	<p>M1 for $0.5 \times 7 \times 8 \times \sin B = 18$</p> <p>M1 for $(B =) \sin^{-1}\left(\frac{18}{0.5 \times 7 \times 8}\right)$ oe (= 40.0)</p> <p>M1 for $(AC^2 =) 7^2 + 8^2 - 2 \times 7 \times 8 \times \cos "40.0"$</p> <p>M1 (dep) for correct order of evaluation or 27.209...</p> <p>M1 for $\frac{\sin A}{8} = \frac{\sin "40.0"}{"5.216"}$ or $0.5 \times 7 \times "5.216" \times \sin A = 18$</p> <p>A1 for answer in the range 80.3 to 80.4 from correct working</p> <p>OR</p> <p>(with perpendicular from A meeting BC at a point X)</p> <p>M1 for $0.5 \times 8 \times AX = 18$</p> <p>M1 for $(AX =) \frac{18}{0.5 \times 8} (= 4.5)$</p> <p>M1 for $BAX = \cos^{-1} \frac{"4.5"}{7} (= 49.99 \dots)$</p> <p>M1 for $(BX =) \sqrt{7^2 - "4.5"^2} (= 5.3619\dots)$</p> <p>M1 for $CAX = \tan^{-1} \frac{8 - "5.3619"}{"4.5"} (= 30.38 \dots)$</p> <p>A1 for answer in the range 80.3 to 80.4 from correct working</p>

