Mark Scheme (Results)

November 2014

Pearson Edexcel GCSE
Linked Pair Pilot in Mathematics
Application of Mathematics
Higher: (Calculator) Unit 1

PEARSON

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

Question		Working	Answer	Mark	Notes
1		$\dfrac{65^2}{4\times\pi}$	336	2	M1 for $\dfrac{65^2}{4\times\pi}$ or 4225 written as a numerator or 12.56(637…) written as a denominator A1 for answer in range 336 to 337
2	(a)	400×1.20	480	2	M1 for 400×1.2 oe A1 cao
	(b)	$150\div1.2=125$ 125×1.56 Or $1.56\div1.2=1.3$ 150×1.3	195	3	M1 for $150\div1.2$ or 125 M1 for "125" $\times1.56$ A1 cao Or M1 for $1.56\div1.2$ (=1.3) M1 for $150\times$ "1.3" A1 cao
3	(a)		Plot	1	B1 cao for plotted point
	(b)		3200	2	M1 for drawing a suitable line of best fit A1 for answer in range 3000 – 3400
4	*(a)		Explanation	1	C1 for all angles of the triangles are equal or two angles are equal (so all three are equal)
	(b)		7.5	2	M1 for $15\div2$ oe A1 cao Or M1 for $\dfrac{3}{4}\times10$ oe A1 cao

Question	Working	Answer	Mark	Notes
5	$2(x + x + 10) = 40$ $4x + 20 = 40$ $4x = 20$ $x = 5$ Or $2(x + x - 10) = 40$ $2x - 10 = 20$ $2x = 30$ $x = 15$ Or <table><tr><td></td><td>Amy</td><td>Beth</td><td>Chris</td></tr><tr><td>$x = 2$</td><td>2</td><td>12</td><td>28</td></tr><tr><td>$x = 4$</td><td>4</td><td>14</td><td>36</td></tr><tr><td>$x = 6$</td><td>6</td><td>16</td><td>44</td></tr><tr><td>$x = 5$</td><td>5</td><td>15</td><td>40</td></tr></table>	5	4	M1 for algebraic method to set up Amy and Beth's ages as x and $x + 10$ M1 for setting up the equation $2(x + x + 10) = 40$ oe M1 for $4x + 20 = 40$ A1 cao Or M1 for algebraic method to set up Beth and Amy's ages as x and $x - 10$ M1 for setting up the equation $2(x + x - 10) = 40$ oe M1 for $4x - 20 = 40$ A1 cao Or M1 for establishing Amy is x and Beth is $x + 10$ (can be implied by one correct trial) M1 for strategy to involve 3 trials with correct ages (Totals not needed) or 2 trials with correct ages and totals M1 for a trial where Chris' age < 40 and trial where Chris' age > 40 or 5, 15 and 40 identified as the answer A1 cao

Question		Working	Answer	Mark	Notes
6	(a)		£17.50	1	B1 for 17.5(0)
	(b)		£1.25	1	B1 cao
	(c)		Comparison made	3	M1 for drawing line for Saws to You through the origin or for line with gradient 3 C2 for correct figures for 5 days and 6 days for both companies and making a statement of which is cheaper up to 5 days and which is cheaper for 6 days or more (C1(dep M1) for making any correct comparison from their graphs) Or M1 for any 3 correct costs for Saws to You C2 for correct figures for 5 days and 6 days for both companies and making a statement of which is cheaper up to 5 days and which is cheaper for 6 days or more (C1 (dep M1) for making any correct comparison from their calculations for the two companies)
7		$\frac{1}{2}$ (21 + 28) × 15 $\frac{1}{2}$ (21 + 28) × 15 ÷ 25	2	4	M1 for $\frac{1}{2}$ (21 + 28) × 15 (= 367.5) oe M1 for "367.5" ÷ 25 A1 for 14.7 B1 cao accept one 10 kg and one 5 kg

Table within Question 6(c) Working:

Days	SAV	STY
3	13.75	9
4	15.00	12
5	**16.25**	**15**
6	**17.50**	**18**
7	18.75	21

Question	Working	Answer	Mark	Notes
8		268.82	5	M1 for $128.50 + 172.70 = 301.20$ M1 for $\dfrac{15}{100} \times "301.20" = 45.18$ M1 for $\dfrac{5}{100} \times ("301.20 - 5.18")(=12.801)$ M1 for "301.20" – "45.18" +"12.801" A1 accept 268.821 Or M1 for $128.50 + 172.70 = 301.20$ M2 for $(128.50+172.70) \times 0.85$ (M1 for $(128.50 + 172.70) \times 0.15$) M1 for $(128.50+172.70) \times 0.85 \times 1.05$ A1 accept 268.821 Or M1 for $\dfrac{15}{10} \times 128.5(=19.275)$ or $\dfrac{15}{10} \times 172.70(= 25.905)$ M1 for $128.50 - "19.275"$ (= 109.225) or $172.70 - "25.905"$ (= 146.795) M1 for $\dfrac{5}{10} \times 109.225 = 5.46125$ or $\dfrac{5}{100} \times 146.795 = 7.33975$ M1 for "114.68625" + "154.13475" A1 accept 268.821 SC B2 for 271.08

Question		Working			Answer	Mark	Notes
9	(a)	f	m	m×f	148	4	M1 f × m where m is a value in each interval (consistent and allow end points) with no more than one error M1 for Σf × m where the ms are the midpoints of the intervals M1(dep on 1st M) for dividing by their total frequency A1 for 148
		2	125	250			
		5	135	675			
		10	145	1450			
		8	155	1240			
		5	165	825			
		30		4440			
			4440 ÷ 30				
	(b)				Points plotted at (135, 1), (145, 7), (155, 8), (165, 10), (175,4) and joined with line segments	2	B2 for correct plotting of 5 points and joining with line segments (B1 for points plotted correctly at midpoints of intervals OR joining points with line segments at the correct heights and consistent within the class interval (including end values) OR correct frequency polygon with one point incorrect OR correct frequency polygon with first and last point joined) NB Ignore any histogram drawn and any part of frequency polygon outside range of first and last points plotted

Question		Working	Answer	Mark	Notes
10		See end	Correct flow chart	4	B1 for including decision box for A < 20 oe B1 for including box for calculating total pay when A< 20 e.g. P = H ×5.03 or when A ≥ 20 e.g. P = H × 6.31 B1 for output box with Output £P oe C1 for fully correct flowchart with all boxes the correct shape
11	(a)		Question	2	B1 for question with a time frame B1 for at least 3 non-overlapping response boxes with units (this may be in the question) - do not condone inequality signs
	(b)		Stratified sample	1	B1 cao
12	(a)	$\dfrac{30}{100} \times 320 =$ $320 + 96 = 416$	416	3	M1 for $\dfrac{30}{100} \times 320$ oe M1 for 320 + "96"oe A1 cao
	(b)	30% = 90 1% = 90 ÷ 30 = 3 100% = 3 × 100	300	3	M1 for 30% = (£)90 or 1 – 0.7 = 0.3 M1 for 100% = 90 ÷ 30 × 100 or 90 ÷ 0.3 A1 cao
13	(a)		7.75	2	M1 for (2 + 8 + 12 + 9) ÷ 4 A1 cao
	(b)		Trend given	1	C1 for there is an upward trend or cruises are getting more popular oe

Question		Working	Answer	Mark	Notes
14	(a)		55 000 000	1	B1 accept 55 million
	(b)		1.43×10^5	1	B1 cao
	(c)		6.32×10^4	2	M1 for $(9.461 \times 10^{12}) \div (1.496 \times 10^8)$ A1 for 6.32×10^4 to 6.33×10^4
15		e.g. $4x + 24 = \dfrac{3}{5}(10x + 20)$	12	5	M1 for writing a correct expression for the perimeter of the square or the rectangle e.g. $4(x + 6)$ or $10x + 20$ or for the semiperimeter M1 for equating the two (semi) perimeters correctly M1 for resolving the fraction e.g. $20x + 120 = 30x + 60$ or for rearranging the equation to the form. $a = bx + c$ M1 for $10x + 60 = 120$ or $24 = 2x + 12$ or $x = 6$ A1 cao
16	(a)			2	B2 for a fully correct cf graph [B1 for 4 or 5 consistent, correctly plotted points OR for a cf graph drawn through points other than the end points of each interval]
	(b)(i)		23	3	B1 ft from their cumulative frequency graph
	(ii)	37 – 13	23 - 24		M1 for identifying upper and lower quartiles A1 ft from their cumulative frequency graph
	(c)	80 – 72	7 - 9	2	M1 for reading 72 singers identified at 45 minutes A1 ft from their cumulative frequency graph

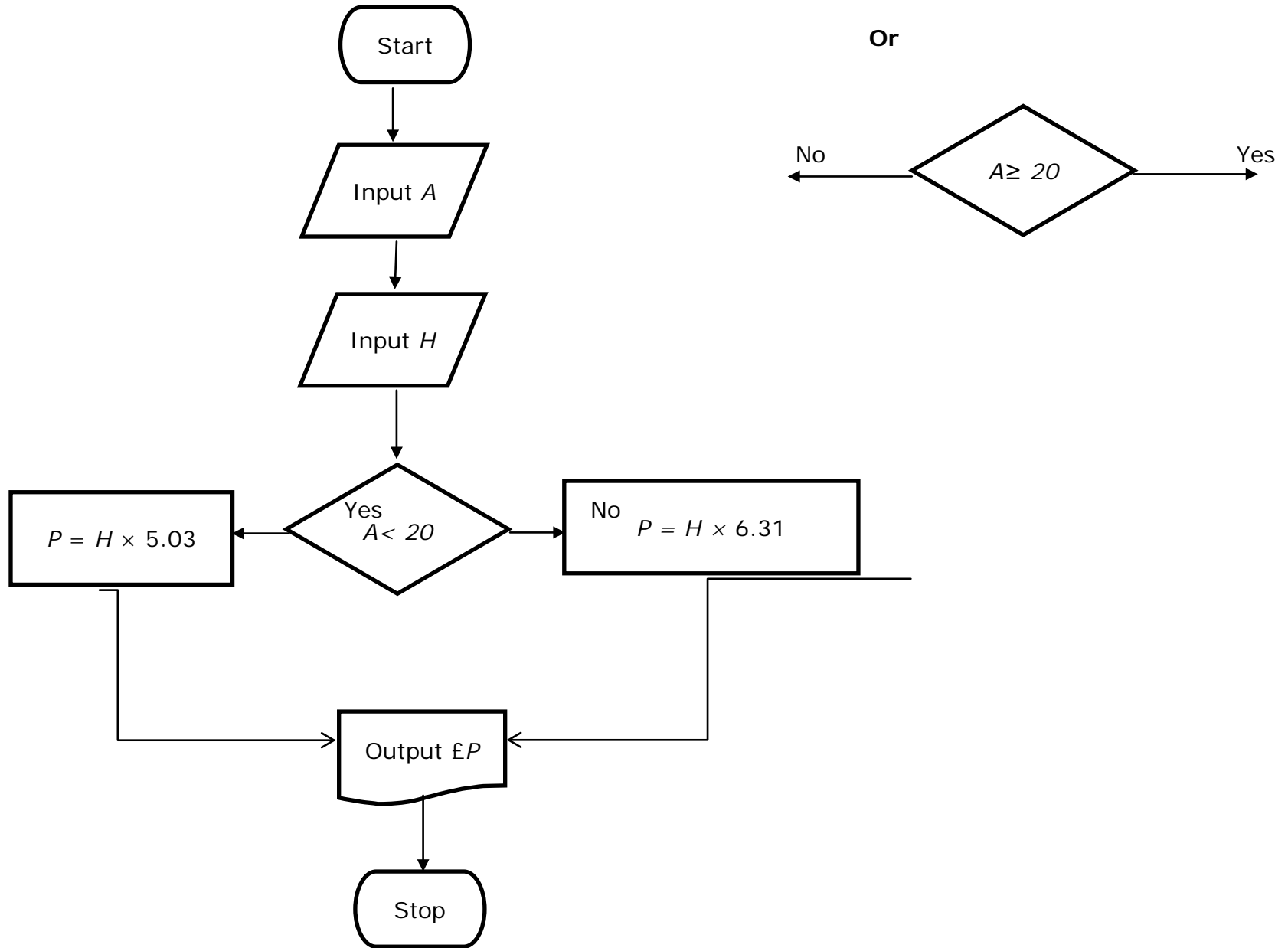| Question	Working	Answer	Mark	Notes
17	$3p + 6r = 780$ $2p + 5r = 590$ (×2) $\quad 6p + 12r = 1560$ (×3) $\quad 6p + 15r = 1770$ Subtract $\quad 3r = 210$ so $r = 70$ Substitute $3p + 420 = 780$ $3p = 360$	$p = £1.20$ $r = £0.70$	5	M1 for writing down both equations correctly M1 for correct process to eliminate either p or r (condone one arithmetic error) A1 for either 70p or 120p oe M1 (dep on previous M1) for substituting found value into an appropriate equation, or further elimination A1 for either 120p or 70p oe T & I:- B5 if fully correct, B0 otherwise
18	Linear sf $\qquad$ 10 : 15 or 2 : 3 Area sf $\qquad$ 4 : 9 $72 \div 9 \times 4$	32	3	M1 for area scale factor is $2^2 : 3^2$ or 4 : 9 oe M1 for $72 \div 9 \times 4$ oe A1 cao
*19	<table><tr><td></td><td>With</td><td>Without</td></tr><tr><td>Median</td><td>1.8 kg</td><td>1.4 kg</td></tr><tr><td>Range</td><td>1.1 kg</td><td>1.1 kg</td></tr><tr><td>IQR</td><td>0.4 kg</td><td>0.4 kg</td></tr></table>	Comparison of data	2	C1 for comparison of medians or stating the range or interquartile range are the same. Values stated must be correct. C1 for comparison relating the results in a context i.e. including the median and a measure of spread

PAPER: 5AM1H_01

Question		Working	Answer	Mark	Notes
20		Area Trapezium $\frac{1}{2}(7.5+2.5)\times 2.5 = 12.5$ $4.25 \times 1.75 = 7.4375$ Area Octagon $2 \times 12.5 + 7.5 \times 2.5 = 43.75$ No. of octagons is $12 \times 8 = 96$ Waste $= 90 \times 60 - 96 \times 43.75 = 1200$ % waste $= \dfrac{1200}{5400}\times 100 =$ Or Area of square $= 2.5 \times 2.5 = 6.25$ Area of triangle $= \dfrac{1}{2}\times 2.5 \times 2.5 = 3.125$ Area of octagon $= 5 \times 6.25 + 4 \times 3.125 = 43.75$ Waste $= 90 \times 60 - 96 \times 43.75 = 1200$ % waste $= \dfrac{1200}{5400}\times 100 =$ Or Area of triangle $= \dfrac{1}{2}\times 2.5 + 2.5 = 3.125$ Waste for 1 badge $= 4 \times 3.125 = 12.5$ Total Waste $= 96 \times 12.5 = 1200$ % waste $= \dfrac{1200}{5400}\times 100 =$	22.2	5	M1 for correct method to find area of a trapezium or a square and a triangle M1 for correct and complete method to find the area of the octagon M1 for correct calculation to find waste M1 for correct calculation for % waste $\dfrac{"1200"}{5400}\times 100$ A1 for answer in range 22.1 to 22.3 Or working with area of 4 triangles for waste M1 for correct method to find area of a square and a triangle M1 for correct and complete method to find the waste for one badge M1 for correct calculation to find total waste M1 for correct calculation for % waste $\dfrac{1200}{5400}\times 100$ A1 for answer in range 22.1 to 22.3 Or for working with triangles M1 for identifying the octagon is made up from 14 small triangles M1 for identifying waste is 4 small triangles M1 for establishing waste is $\dfrac{4}{18}$ area of one badge or $\dfrac{96 \times 4}{96 \times 18}$ area of the plastic sheet M1 for correct calculation for % waste $\dfrac{2}{9}\times 100$ oe A1 for answer in range 22.1 to 22.3

PAPER: 5AM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
21	(a)(i)		Explanation	2	B1 for 20 or more of each bike made
	(ii)		Explanation		B1 for materials cost must be less than 4000
	(b)		$10t + 15s \geq 600$	2	M1 for $10t + 15s$ A1 for ≥ 600
	(c)		Correct shading	2	B2 for plotting all 4 graphs correctly and identifying the feasible region (B1 for plotting at least 2 graphs correctly)
	(d)		20 sports 48 town	2	M1 for calculating values of the objective function at vertices of the feasible region to maximise profit A1 for 20 sports and 48 town Alternative M1 for drawing the objective function or to write down the objective function or draw a line parallel to $3t + 4s = k$ A1 for 20 sports and 48 town
22	(a)	500×0.2 500×0.3 250×0.7 250×0.8 1000×0.24	100 150 175 200 240	2	M1 for one weight group $\times$ its frequency density e.g. 500×0.2 A1 cao
	(b)	Total frequency is 865 Halfway is at 433	1250 – 1300	2	M1 for establishing middle of the frequency A1 for answer in range 1250 – 1300

Question	Working	Answer	Mark	Notes
23	$\dfrac{52}{400} \times 30$	4	2	M1 for $\dfrac{52}{400} \times 30$ or an answer of 3.9 A1 for 4
24	Years Value at end of year 1 1.05 2 1.1025 3 1.157625 4 1.21550625 5 1.276281563 6 1.340095641 7 1.407100423 8 1.477455444 9 1.551328216 10 1.628894627 11 1.710339358 12 1.795856326 13 1.885649142 14 1.979931599 15 2.078928179	15	2	M1 for writing an equation e.g. $1.05^n = 2$ or for a correct method to find total value up to the end of at least year 5 or for at least 3 trials of n into 1.05^n or using $n \log 1.05 = \log 2$ A1 for 15 years

Question 10.

```
          Start
            │
            ▼
        Input A
            │
            ▼
        Input H
            │
            ▼
```

P = H × 5.03 ← Yes A< 20 No → P = H × 6.31

```
        Output £P
            │
            ▼
          Stop
```

Or

No ← A≥ 20 → Yes

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: ±5°
Measurements of length: ±5 mm

PAPER: 5AM1H_01			
Question		**Modification**	**Notes**
Q03		$1\frac{1}{2}$ cm grid Crosses changed to filled in circles	
Q03	(a)	2300 changed to 2500	
Q06		$1\frac{1}{2}$ cm grid	
Q09	(a)	Frequency section of table is widened to allow working	
Q09	(b)	Vertical axis $1\frac{1}{2}$ cm for 1 Horizontal axis $1\frac{1}{2}$ cm for 5	
Q15		Square hole – shaded Rest of diagram unshaded x changed to y	
Q16		Cumulative frequencies: 15 35 50 65 78 80 Leeway will be needed as answers will be very approximate Grid: $1\frac{1}{2}$ cm for 5 on both axes	

PAPER: 5AM1H_01		
Question	**Modification**	**Notes**
Q18	Pictures removed	
Q21	Grid $1\frac{1}{2}$ cm for 5 on both axes	
Q22	1500 – 2500 raise height of bar to 0.3	