

Mark Scheme (Results)

March 2012

GCSE Mathematics (1380) Higher
Paper 4H (Calculator)

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NOTES ON MARKING PRINCIPLES

1 **Types of mark**

M marks: method marks

A marks: accuracy marks

B marks: unconditional accuracy marks (independent of M marks)

2 **Abbreviations**

cao – correct answer only

ft – follow through

isw – ignore subsequent working

SC: special case

oe – or equivalent (and appropriate)

dep – dependent

indep – independent

3 **No working**

If no working is shown then correct answers normally score full marks

If no working is shown then incorrect (even though nearly correct) answers score no marks.

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

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.

5 **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.

6 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 canceling 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.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

7 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.

8 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.

9 Parts of questions

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

10 Money notation

Accepted with and without the “p” at the end.

11 Range of answers

Unless otherwise stated, when any 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).

1380_4H				
Question	Working	Answer	Mark	Notes
1		41	2	M1 for $4n + 1$ seen or $4 \times 10 + 1$ or attempt to count on from 21 in 4's at least 3 times A1 cao
2	$16 \times 7 = 112$ $112 - 87$	25	2	M1 for $6 \times 14.5 (= 87)$ or $7 \times 16 (=112)$ or $6 \times 1.5 (= 9)$ or $7 \times 1.5 (= 10.5)$ A1 for 25
3	(a) 350×1.34 (b) $67 \div 1.34 = 50$ $50 - 47.50$ $47.50 \times 1.34 = 63.65$ $67 - 63.65 = 3.35$ $3.35 \div 1.34 =$	469 2.50	2 3	M1 for 350×1.34 or digits 469 A1 for 469 M1 for $67 \div 1.34$ or 50 seen M1 (dep) for "50" – 47.5(0) A1 for £2.5(0) OR M1 for $47.5(0) \times 1.34$ or 63.65 or 3.35 seen M1 (dep) for $67 - "63.65"(= 3.35)$ and " $3.35" \div 1.34$ A1 for £2.5(0)

1380_4H				
Question	Working	Answer	Mark	Notes
4	$3 \times 65 = 195$ $195 \times \frac{20}{100} = 39$ $195 + 39 =$	234	4	<p>M1 for $3 \times 65 (= 195)$ M1 for “195” $\times \frac{20}{100}$ oe or 39 M1 (dep M2) for adding”195” and “39” A1 cao</p> <p>OR</p> <p>M1 for $65 \times \frac{20}{100}$ oe or 13 M1 (dep M1) for adding 65 and “13” M1 (indep) for $(65 + “13”) \times 3$ A1 cao</p> <p>OR</p> <p>M2 for 78 seen M1 for 78×3 A1 cao</p> <p>(SC B3 for 208 as answer from $195 + 13$ SC B2 for 312 as answer or $195 + 13$ SC B1 for 52 from 20% of 260)</p>

1380_4H					
Question	Working	Answer	Mark	Notes	
5	(a)	$\frac{\sqrt{6.25 + 3.75}}{2.2}$ $\frac{\sqrt{10}}{2.2}$	1.4373(98936...)	3	B3 for 1.4373(98936...) or 1.4374 (B2 for answer of $\frac{5\sqrt{10}}{11}$ or sight of $\sqrt{10}$ or 3.162...or 1.43 or 1.44 or 1.437) (B1 for sight of 2.2 or 10)
	(b)		1.44	1	B1 for 1.44 or ft from part(a) provided (a) is given to at least 3 decimal places.
6			3.2	4	B2 for a trial $3.1 \leq x \leq 3.2$ (B1 for trial $3 \leq x \leq 4$) B1 for a different trial $3.15 \leq x < 3.2$ B1 (dep on at least one previous B1) for 3.2 Accept trials correct to the nearest whole number (rounded or truncated) if the value of x is to 1 dp but 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.

1380_4H				
Question	Working	Answer	Mark	Notes
7	$16^2 - 8^2 = 192$ $\sqrt{192} = 13.85640646$	13.86	3	M1 for showing the intention to square and subtract or sight of $16^2 - 8^2$ or 192 M1 for $\sqrt{(256 - 64)}$ or $\sqrt{192}$ or $8\sqrt{3}$ A1 for answer in the range 13.85 to 13.86 OR M2 for $16\cos 30$ or $16\sin 60$ (M1 for $\cos 30 = \frac{QR}{16}$ or $\sin 60 = \frac{QR}{16}$) A1 for answer in the range 13.85 to 13.86

1380_4H					
Question	Working	Answer	Mark	Notes	
8	(a)	x^{5+4}	x^9	1	B1 for x^9 or x^{5+4}
	(b)	y^{7-2}	y^5	1	B1 for y^5 or y^{7-2}
	(c)	$6a + 15 + 5a - 10$	$11a + 5$	2	M1 for correct expansion of one bracket, eg $3 \times 2a + 3 \times 5$ or sight of $6a + 15$ or $5a - 10$ or $11a$ or $+5$ seen as part of their answer A1 for $11a + 5$ oe
	(d)	$y^2 + 5y + 7y + 35$	$y^2 + 12y + 35$	2	M1 for 3 out of 4 terms with correct signs or all 4 terms correct ignoring signs A1 for $y^2 + 12y + 35$ oe
	(e)	$p^2 - 6p + 8$	$(p - 4)(p - 2)$	2	M1 for $(p \pm 4)(p \pm 2)$ or $(p + a)(p + b)$ with $a, b \neq 0$, $a + b = -6$ or $ab = 8$ or $p(p - 2) - 4(p - 2)$ or $p(p - 4) - 2(p - 4)$ A1 for $(p - 4)(p - 2)$ (accept others letters)
9	(a)	$1 - (0.15 + 0.25 + 0.20 + 0.16)$	0.24	2	M1 for $1 - (0.15 + 0.25 + 0.20 + 0.16)$ or $1 - "0.76"$ A1 for 0.24 oe
	(b)	300×0.25	75	2	M1 for 300×0.25 A1 cao

1380_4H				
Question	Working	Answer	Mark	Notes
12	$45 \div (2 + 3 + 4)$	Ann £10 Bob £15 Cath £20	3	<p>M1 for dividing 45 by the sum of the ratios $2 + 3 + 4$ M1 for multiplying "5" by 2 or 3 or 4 A1 for Ann £10, Bob £15, Cath £20, condone missing £ signs</p> <p>OR</p> <p>M1 for realising of $\frac{2}{"9"}$ or $\frac{3}{"9"}$ or $\frac{4}{"9"}$ M1 for multiplying 45 by $\frac{2}{"9"}$ or $\frac{3}{"9"}$ or $\frac{4}{"9"}$ A1 for Ann £10, Bob £15, Cath £20, condone missing £ signs</p> <p>NB: Award M1M1A0 for 2 out of 3 answers on answer line or 10 : 15 : 20 seen as final ratio</p>
13	$\frac{1}{2} (6 + 12) \times 8$	72	2	<p>M1 for $\frac{1}{2} \times (6 + 12) \times 8$ or complete method to find the area eg $8 \times 6 + \frac{1}{2} \times 8 \times "12 - 6"$ or $12 \times 8 - \frac{1}{2} \times 8 \times "12 - 6"$ or $48 + 24$ or $96 - 24$ A1 cao</p>

1380_4H				
Question	Working	Answer	Mark	Notes
14	(a)			
	$\tan x = \frac{8}{12} = 0.666\dots$ $x = \tan^{-1} 0.6666\dots =$	33.7	3	<p>M1 for $\tan x = \frac{8}{12}$ or $\tan x = 0.66(6\dots)$ or $\tan x = 0.67$</p> <p>M1 for $\tan^{-1}\left(\frac{8}{12}\right)$ or $\tan^{-1} 0.66(6\dots)$ or $\tan^{-1} 0.67$</p> <p>A1 for answer in range 33.6 to 33.7</p> <p>OR</p> <p>If using Pythagoras and trigonometry, then no marks until</p> <p>M1 for $\sin x = \frac{8}{14.4\dots}$ or $\cos x = \frac{12}{14.4\dots}$</p> <p>or $\sin x = \frac{8}{14.4\dots} \times \sin 90$</p> <p>M1 for $\sin^{-1} \frac{8}{14.4\dots}$ or $\cos^{-1} \frac{12}{14.4\dots}$</p> <p>or $\sin^{-1}\left(\frac{8}{14.4\dots} \times \sin 90\right)$</p> <p>A1 for answer in range 33.6 to 33.7</p> <p>(SC B2 for 0.588...(using rad) or 37.4...(using grad))</p>

1380_4H				
Question	Working	Answer	Mark	Notes
14	(b)	9.44	3	<p>M1 for $\sin 32 = \frac{5}{YZ}$ or $\cos 58 = \frac{5}{YZ}$</p> <p>M1 for $(YZ =) \frac{5}{\sin 32}$ or $(YZ =) \frac{5}{\cos 58}$</p> <p>A1 for answer in range 9.43 to 9.44</p> <p>OR</p> <p>M1 for $\frac{5}{\sin 32} = \frac{YZ}{\sin 90}$ or $\frac{\sin 32}{5} = \frac{\sin 90}{YZ}$</p> <p>M1 for $(YZ =) \frac{5}{\sin 32} \times \sin 90$</p> <p>A1 for answer in range 9.43 to 9.44</p> <p>OR</p> <p>M1 for $(YZ^2 =) 5^2 + \left(\frac{5}{\tan 32}\right)^2$ or $5^2 + 8(.00\dots)^2$ seen or $89(.0\dots)$ seen</p> <p>M1 for $(YZ =) \sqrt{5^2 + \left(\frac{5}{\tan 32}\right)^2}$ or $\sqrt{5^2 + 8(.00\dots)^2}$ seen or $\sqrt{89(.0\dots)}$ seen</p> <p>A1 for answer in range 9.43 to 9.44</p> <p>(SC B2 for 9.06...(using rad) or 10.3...(using grad))</p> <p>NB: Equivalent methods using 58° should be credited accordingly</p>

1380_4H					
Question		Working	Answer	Mark	Notes
15	(a)		Enlargement, scale factor 2, centre (5, 6)	3	B1 for Enlargement B1 for scale factor 2 B1 for (5, 6) (NB: a combination of transformations scores no marks)
	(b)		Correct reflection	2	M1 for a reflection in a line parallel to the y axis (see overlay) A1 cao
16	(a)		12, 27, 45, 57, 60	1	B1 cao
	(b)		Correct cumulative frequency diagram	2	B1 ft for all five points plotted correctly (± 1 sq) at top end of intervals dep on sensible table (condone 1 addition error) B1 ft (dep on previous B1) for points joined by curve/line segments (SC B1 for all five points plotted not at ends but consistent within each interval and joined)
	(c)		42	2	M1 for attempt to draw line across at 30 or 30.5 on cf graph A1 for answer in the range 41 to 43 or ft from cf graph
	(d)	60 – 52	8	2	M1 for 51 or 52 or 53 seen or line drawn up to cf graph at 55 or correct reading at 55 ($\pm \frac{1}{2}$ sq) A1 for 7 or 8 or 9 or ft from graph

1380_4H				
Question	Working	Answer	Mark	Notes
17		Rotation, 180°, centre (-1, 1)	3	B1 for rotation B1 for 180° (accept half turn) B1 for (-1, 1) (SC B1 for triangle with vertices (-3, 0) (-5, 0) (-3, -4) drawn) OR B1 for enlargement B1 for scale factor - 1 B1 for (-1, 1) (NB: a combination of transformations scores no marks)

1380_4H				
Question	Working	Answer	Mark	Notes
18	$3x + 5y = 19$ $4x - 2y = -18$ $12x + 20y = 76$ $12x - 6y = -54$ Subtract $26y = 130$ $y = 5$ Substitute $3x + 25 = 19$ $3x = -6$	$x = -2$ $y = 5$	4	<p>M1 for coefficients of x or y the same followed by correct operation, condone one arithmetical error A1 for first solution M1 (dep on M1) for correct substitution of found value into one of the equations or appropriate method after starting again. A1 for second solution</p> <p>OR</p> <p>M1 for full method to rearrange and substitute to eliminate x or y, allow one arithmetical error A1 for first solution M1 (dep on M1) for correct substitution of found value into one of the equations or appropriate method after starting again. A1 for second solution</p> <p>Trial and improvement 0 marks unless both x and y correct values found</p>

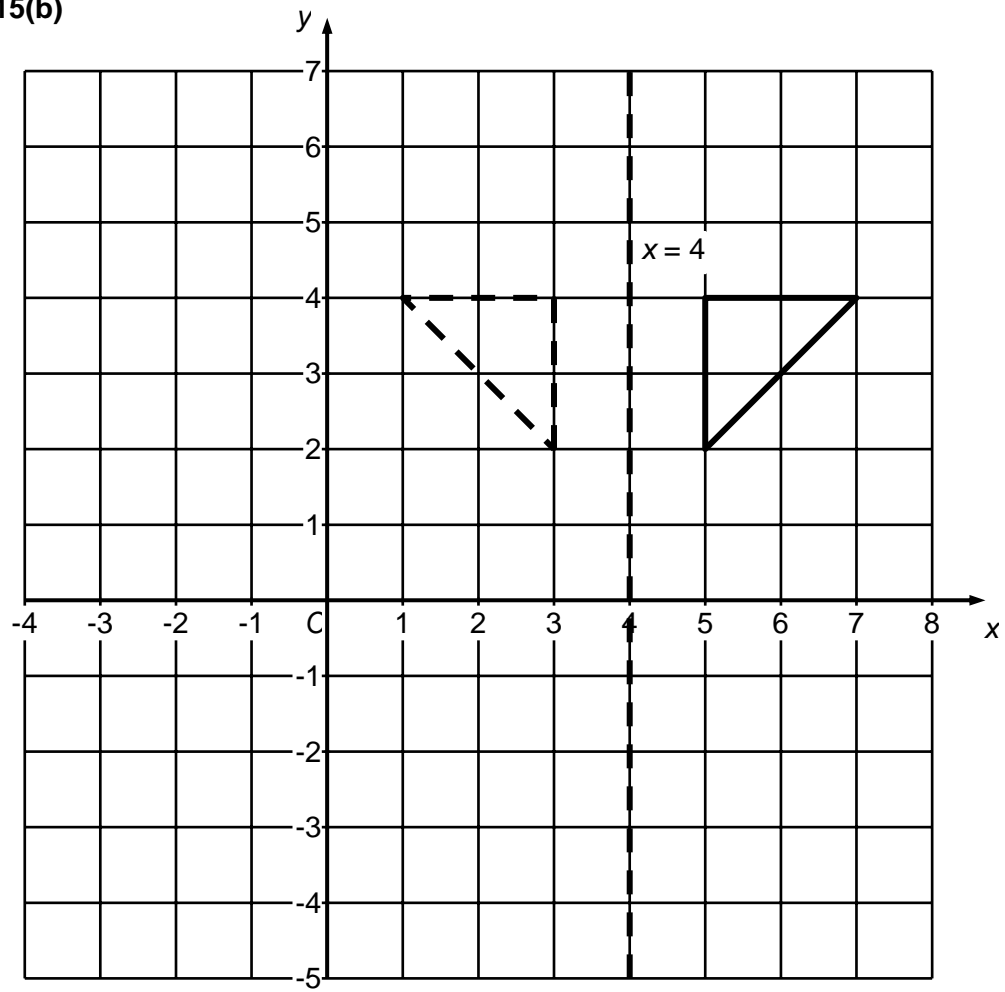
1380_4H				
Question	Working	Answer	Mark	Notes
19	$a = 5, b = 8, c = -6$ $x = \frac{-8 \pm \sqrt{8^2 - 4 \times 5 \times -6}}{2 \times 5}$ $\frac{-8 \pm \sqrt{64 + 120}}{10} = \frac{-8 \pm \sqrt{184}}{10}$ $= 0.5564659966$ or $= -2.156465997$ OR $x^2 + \frac{8}{5}x - \frac{6}{5} = 0$ $\left(x - \frac{4}{5}\right)^2 - \left(\frac{4}{5}\right)^2 - \frac{6}{5} = 0$ $x + \frac{4}{5} = \pm \sqrt{\left(\frac{4}{5}\right)^2 + \frac{6}{5}}$ $x = -\left(\frac{4}{5}\right) \pm \sqrt{\frac{46}{25}}$	0.56, -2.16	3	M1 for substitution, $\frac{-8 \pm \sqrt{8^2 - 4 \times 5 \times -6}}{2 \times 5}$ condone one sign error in substitution M1 for $\frac{-8 + \sqrt{184}}{10}$ oe or $\frac{-8 - \sqrt{184}}{10}$ oe A1 for one answer in the range 0.556 to 0.56 and one answer in the range -2.156 to -2.16 OR M1 for $(x + 0.8)^2$ oe M1 for method leading to $-0.8 \pm \sqrt{1.84}$ oe A1 for one answer in the range 0.556 to 0.56 and one answer in the range -2.156 to -2.16

1380_4H				
Question	Working	Answer	Mark	Notes
20	$c^2 = 60^2 + 90^2 -$ $2 \times 60 \times 90 \times \cos 130^\circ$ $c^2 = 3600 + 8100 - 10\,800 \times -$ 0.6427876 $c^2 = 11\,700 + 6942.106$ $c^2 = 18642.106$ $c = \sqrt{18642.106} = 136.536$ Perimeter = $60 + 90 + 136.536$	286.5	4	M1 for substituting values correctly into cosine rule formula e.g. $60^2 + 90^2 - 2 \times 60 \times 90 \times \cos 130^\circ$ M1 for correct order of evaluation A1 for finding value of missing side in range 136 to 137 A1 for answer in range 286 to 287
21	$4 \div 10 = 0.4$ $8 \div 5 = 1.6$ $24 \div 5 = 4.8$ $16 \div 10 = 1.6$ $5 \div 20 = 0.25$	Bars at, for example, 0.8cm, 3.2cm, 9.6cm, 3.2 cm and 0.5 cm in height	3	B3 for fully correct histogram (B2 for 4 correct blocks B1 for 3 correct blocks) (see overlay) (If B0, SC B1 for correct key, eg $1\text{cm}^2 = 2.5(\text{students})$ or frequency \div class interval for at least 3 frequencies NB apply the same mark-scheme if a different frequency density is used

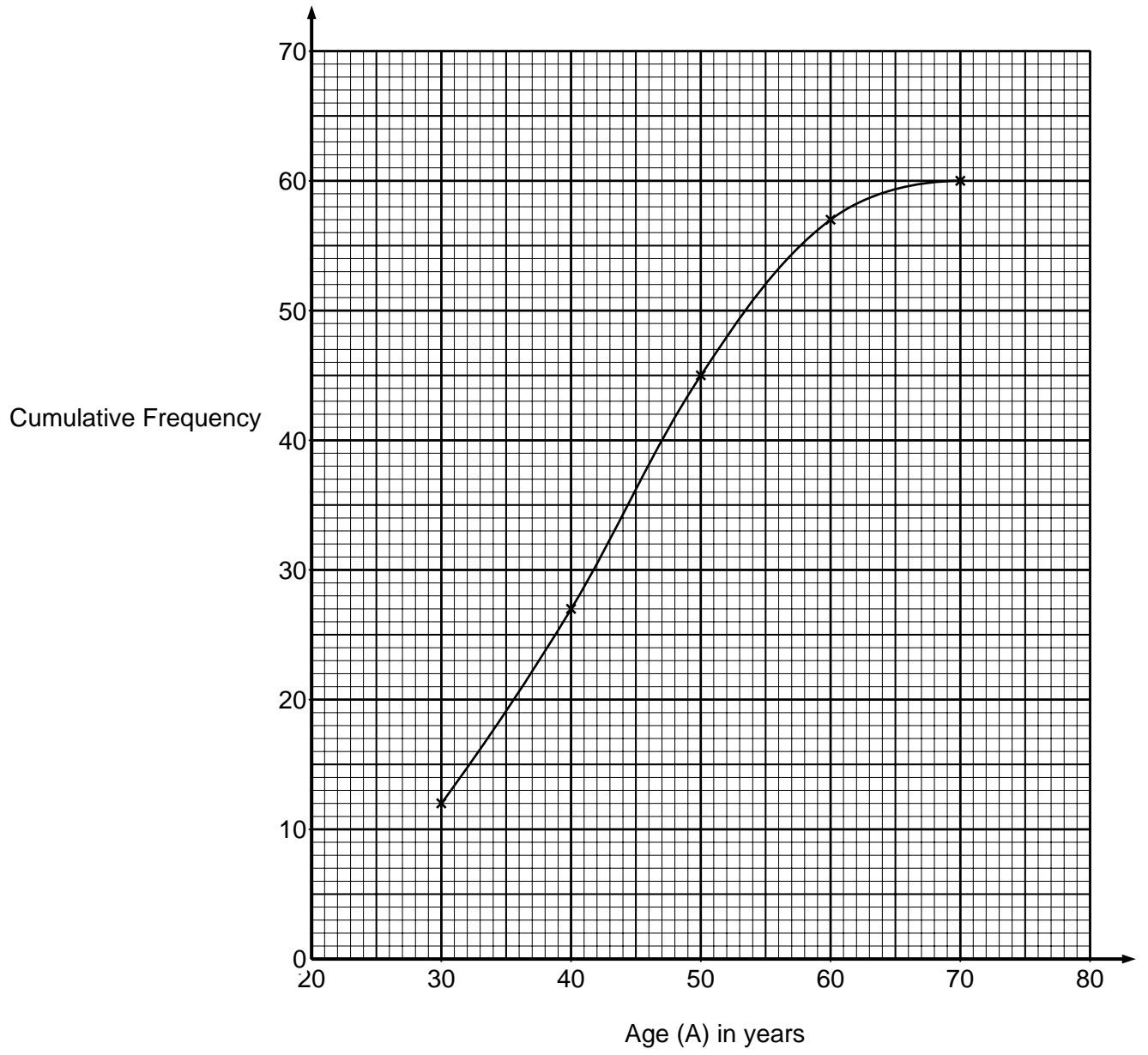
1380_4H				
Question	Working	Answer	Mark	Notes
22	Upper bound $\frac{163.5}{45.25} = 3.613259669$ Lower bound $\frac{162.5}{45.35} = 3.583241455$	3.6 because the LB and UB agree to that number of figures	5	B1 for either 162.5 or 163.5 or 163.4999... B1 for either 45.25 or 45.35 or 45.34999... M1 for “163.5” ÷ ”45.25” where $163 < '163.5' \leq 164$ and $45.2 \leq '45.25' < 45.3$ or for “162.5” ÷ ”45.35” where $162 \leq '162.5' < 163$ and $45.3 < '45.35' \leq 45.4$ A1 for 3.613(...) and 3.583(...) (Note: accept 3.61 and 3.58 from $\frac{163.5}{45.25}$ and $\frac{162.5}{45.35}$) A1 for 3.6 and ‘both LB and UB round to 3.6’ oe NB 3.6 without working scores no marks

1380_4H				
Question	Working	Answer	Mark	Notes
23	<p>Area of sector =</p> $\frac{35}{360} \times \pi \times 80 \times 80$ $= \frac{35}{360} \times 20106.19$ $= 1954$ <p>Area of triangle</p> $= \frac{1}{2} \times 80 \times 80 \times \sin 35$ $= 3200 \times 0.573576$ $= 1835$ <p>Area of segment = 1954 – 1835</p>	119	5	<p>M1 for $\frac{35}{360}$ oe or 0.0972(2...) seen</p> <p>or $\frac{360}{35}$ oe or 10.28(5...) seen or 10.29 seen or 10.3 seen</p> <p>M1 for $\frac{35}{360} \times \pi \times 80 \times 80$ oe or sight of value in the range 1954 to 1955</p> <p>M1 for $\frac{1}{2} \times 80 \times 80 \times \sin 35$ or $80 \times \sin 17.5 \times 80 \times \cos 17.5$ or sight of value in the range 1835 to 1836</p> <p>M1 (dep on at least one M1 scored) for the intention to find area of sector <i>OABC</i> - area of triangle <i>OAC</i></p> <p>A1 for answer in the range 118 to 120</p> <p>(B3 SC for Rads: 3324(.953305) or Grads: 282(.7733551))</p>
24	$5(2x+1)^2 = (4x+5)(5x-1)$ $5(4x^2 + 4x + 1) = 20x^2 + 21x - 5$ $20x^2 + 20x + 5 = 20x^2 + 21x - 5$ $20x + 5 = 21x - 5$ $x = 10$	$x = 10$	5	<p>M1 for intention to multiply each side by $4x + 5$</p> <p>M1 for attempt to expand $(2x + 1)^2$ or $5(2x + 1)^2$ or $(4x + 5)(5x - 1)$, at least 3 out of 4 terms correct</p> <p>A1 for $20x^2 + 20x + 5$ or $20x^2 + 21x - 5$ oe</p> <p>A1 for $20x^2 + 20x + 5 = 20x^2 + 21x - 5$ oe</p> <p>A1 for 10</p>

15(b)



16(b)



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