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Mark Scheme (Results)

November 2012

GCSE Mathematics (Linear) 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. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

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. Examiners should also 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 indicate within the table where, and which strands of QWC, are being assessed. 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 labeling 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.

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If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.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

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 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.

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.

11 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.

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)

Guidance on the use of codes within this mark scheme
M1 – method mark 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

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
1		$\frac{\sqrt{20.4}}{6.2\times0.48}=\frac{4.5166359}{2.976}$	1.5176(868)	2	B2 for 1.5176… (B1 for sight of 4.51(66359..) **or** 4.52 **or** 2.97(6) **or** 2.98 **or** 1.51 **or** 1.52 **or** 1.518 **or** 1.517 **or** 1.5177**or** $\frac{\sqrt{510}}{5}$)
2	(a)		Triangle with vertices (1, 5) (4, 5) (4,7)	2	B2 correct reflection (B1 a translation of the correct answer with the final shape above $y = x$ **or** any two correct vertices) SC : B1 for a triangle with vertices at (2, 5) (4, 5) (4, 8)
	(b)		Translation by $\begin{pmatrix}-2\\-4\end{pmatrix}$	2	B1 Translation B1 $\begin{pmatrix}-2\\-4\end{pmatrix}$ NB. Award no marks for a combination of transformations

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
*3		$3 \times £193.86 = £581.58$ £581.58 ×0.85=£494.343	£494.34	5	M1 3 × 193.86 (= 581.58) B1 ft correct discount % identified or used in working (may be identified in table) M1 '581.58'× '0.15' (=87.23(7)) M1 (dep on the previous M1) '581.58' − '87.23(7)' (= 494.34(3) **or** 494.35) C1 (dep on all method marks) for £494.34 **or** £494.35 identified as final answer with correct money notation **OR** M1 3 × 193.86 (= 581.58) B1 ft correct discount % identified or used in working (may be identified in table) M2 '581.58'× '0.85' **(=** 494.34(3)) (M1 '581.58' × '1.15' (=668.81(7)) C1 (dep on all method marks) for £494.34 **or** £494.35 identified as final answer with correct money notation **NB. Throughout, values may be rounded or truncated to 2 decimal places**

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
4		<table><tr><th>Bird</th><th>Frequency</th><th>Angles</th></tr><tr><td>Magpie</td><td>15</td><td>75</td></tr><tr><td>Thrush</td><td>10</td><td>50</td></tr><tr><td>Starling</td><td>20</td><td>100</td></tr><tr><td>Sparrow</td><td>27</td><td>135</td></tr></table> Angles $\frac{15}{72}\times 360$, $\frac{10}{72}\times 360$, $\frac{20}{72}\times 360$, $\frac{27}{72}\times 360$ OR 360 ÷ 72 = 5 5 ×15 = 75 etc	Correct pie chart	3	M1 for any one of $\frac{15}{'72'}\times 360$, $\frac{10}{'72'}\times 360$, $\frac{20}{'72'}\times 360$, $\frac{27}{'72'}\times 360$ oe ('72' must clearly come from adding frequencies) A1 for 75 seen from correct working **or** 50 seen **or** 100 seen **or** 135 seen **or** one sector of angle 50^o or 100^o or 135^o labelled correctly with bird's name **or** all sectors correctly drawn A1 for correct pie chart fully labelled with birds' names **OR** M1 for $\frac{'75'}{15}\times 10$ **or** $\frac{'75'}{15}\times 20$ **or** $\frac{'75'}{15}\times 27$ ('75' should be in the range 73 - 77) A1 for 50 seen **or** 100 seen **or** 135 seen **or** one sector of angle 50^o or 100^o or 135^o labelled correctly with bird's name **or** all sectors correctly drawn A1 for correct pie chart fully labelled with birds' names **NB. Allow a tolerance of ±2^o on all drawn angles**

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
5		25 ÷ 50 = 0.5 h = 30 min 25 ÷ 60 = 0.416 h = 25 min	5	3	M1 for 25 ÷ 50 **or** $\frac{60}{50}\times 25$ **or** 30 (min) **or** 0.5(h) **or** 25 ÷ 60 **or** $\frac{60}{60}\times 25$ **or** 25 (min) **or** 0.41(6)(h) **or** 0.42 (h) M1(dep) '0.5' –' 0.416 '**or** '30' – '25' A1 cao **OR** M1 for 60 ÷ 25 (= 2.4) **and** 60 ÷ "2.4" **or** 50 ÷ 25 (= 2) **and** 60 ÷ "2" M1(dep) '30' – '25' A1 cao

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
6		Angle DEC = 180 – 41 =139 Angles on a straight line sum to 180^o Angle EDC = 60 – 38 **or** Angle ABD = 180 – 120 – 38 (=22) Co-interior/allied angles of parallel lines sum to 180^o **or** Angles in a triangle sum to 180^o **and** Alternate angles x =)180 – '139' – '22' (=19) Angles in a triangle sum to 180^o **OR** Angle ADC = 180^o – 120^o = 60^o Co-interior/allied angles of parallel lines sum to 180^o Angle EDC = 22^o Angle ECD = 41^o – 22^o = 19^o Exterior angle of triangle equals sum of the two opposite interior angles **OR** Angle DBC = 38^o Alternate angles Angle BCE = 101^o Angle sum of a triangle is 180^o Angle BCD = 120^o Opposite angles of a parallelogram are equal Angle ECD = 120^o – 101^o = 19^o	x = 19^o and reasons	4	M1 for DBC = 38^o **or** ADC = 60^o(can be implied by BDC = 22^o) **or** ABC = 60^o **or** DCB = 120^o **or** (ABD =) 180 – 120 –38 (=22) M1 for (BDC =) 60 − 38 (=22) **or** BDC = '22' **or** (DEC =) 180 − 41 (=139) **or** (BCE =) 180 −41 − 38 (=101) M1 (dep on both previous M1) for complete correct method to find x **or** (x =) 19 C1 for x = 19^o **AND** Co-interior/allied angles of parallel lines sum to 180^o **or** Opposite angles of a parallelogram are equal **or** Alternate angles **AND** Angles on a straight line sum to 180^o **or** Angles in a triangle sum to 180^o **or** Exterior angle of triangle equals sum of the two opposite interior angles **or** Angles in a quadrilateral sum to 360^o

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
7		17.8 ÷ 160 × 210 = 0.11125 × 210 = 23.3625 g **OR** 210 ÷ 160 × 17.8 = 1.3125 × 17.8 = 23.3625 g **OR** 210 − 160 (=50) $\frac{17.8}{160} \times '50' (= 5.5625)$ 17.8 + 5.5625	23.3(625)	3	M1 17.8 ÷ 160 (=0.11125) **or** 17.8 × 210 (=3738) **or** 210 ÷ 160 (=1.3125) M1 (dep) '0.11125' × 210 **or** '3738'÷160 **or** '1.3125'× 17.8 A1 for answer in range 23.3 - 23.4 **OR** M1 for $\frac{17.8}{160} \times (210 - 160) (= 5.5625)$ M1 (dep) for 17.8 + '5.5625' A1 for answer in range 23.3 - 23.4 **OR** M1 for correct method to find weight of 2 cm **or** 5 cm **or** 10 cm M1 (dep) for complete method A1 for answer in range 23.3 - 23.4

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
8	(a)		–1, 0, 1, 2, 3	2	B2 for all 5 correct values; ignore repeats, any order (B1 for 4 correct (and no incorrect values) eg. 0, 1, 2, 3 **or** one additional value, eg –1, 0, 1, 2, 3, 4)
	(b)		$-4 < x \leq 3$	2	B2 for $-4 < x \leq 3$ **or** > -4 **and** ≤ 3 (B1 for $-4 < x$ **or** $x > -4$ **or** $x \leq 3$ **or** $3 \geq x$ **or** > -4 **or** ≤ 3 **or** $-4 \leq x < 3$) NB : Accept the use of any letter
	(c)	$3y - 2 > 5$ $3y > 7$	$y > \frac{7}{3}$	2	M1 for clear intention to add 2 to both sides (of inequality or equation) or clear intention to divide all three terms by 3 **or** $3y > 7$ **or** $3y < 7$ **or** $3y = 7$ A1 $y > \frac{7}{3}$ **or** $y > 2\frac{1}{3}$ **or** $y > 2.\dot{3}$ NB. final answer **must** be an inequality (SC B1 for $\frac{7}{3}$ oe seen if M0 scored)
9	(a)		32	1	B1 cao
	(b)	LQ = 21 UQ = 45	24	2	M1 for 45 **or** 21 **or** 43.5 **or** 19.5 **or** 7.75^{th} **or** 8^{th} **or** 23.25^{th} **or** 24^{th} (all of above may be seen in working space or indicated on S&L) **or** clear attempt to find UQ and LQ from a list of values or in stem and leaf diagram A1 cao

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
10		**For example** <table><tr><th></th><th>UK</th><th>USA</th></tr><tr><td>**$ per US gal**</td><td>($)6.90(8412)</td><td>[$3.15]</td></tr><tr><td>**£ per litre**</td><td>[£1.24]</td><td>(£)0.56(53...)</td></tr><tr><td>**£ per US gal**</td><td>(£)4.69(96)</td><td>(£)2.14(28...)</td></tr><tr><td>**$ per litre**</td><td>($)1.82(28)</td><td>($)0.83(11...)</td></tr></table> Cost in £ per US gal of UK fuel= £1.24 × 3.79 = £4.6996 Cost in $ per US gal of UK fuel = $1.47 × 4.6996 = $6.908412 **OR** Cost in £ of 1 US gal of US fuel = $3.15 ÷ 1.47 = £2.14 Cost in £ per litre of US fuel = £2.14 ÷ 3.79 =£0. 56(5.. **OR** Cost in UK in £ per US gal = £1.24 × 3.79 (=£4.6996) Cost in USA in £ per US gal = £3.15 ÷ 1.47 (=2.1428) **OR** Cost in UK is $ per litre = £1.24 × 1.47 (=1.8228) Cost in USA in $ per litre = 3.15 ÷ 3.79 (=0.8311...)	Cheaper in US	4	M1 for 1.24 × 3.79 (= 4.6996) **or** 1.24 × 1.47 (=1.8228) M1 for 1.47 × '4.6996' **or** 3.79 × '1.8228' A1 for 6.90(8412) C1 (dep on M2) for $'6.90(8412)' or $'6.91' and reaching a conclusion consistent with their calculation **OR** M1 for 3.15 ÷ 1.47 (=2.1428..) **or** 3.15 ÷ 3.79 (=0.8311) M1 for '2.14' ÷ 3.79 **or** '0.8311' ÷ 1.47 A1 for 0. 56(53…) C1 (dep on M2) for £'0. 56(53...)' or '£0.57' and reaching a conclusion consistent with their calculation **OR** M1 1.24 × 3.79 (= 4.6996) M1 3.15 ÷ 1.47 (=2.1428..) A1 4.69(96) and 2.14(28...) C1 (dep on M2) for £'4.69(96)' **or** £'4.70' **AND** £'2.14(28...)' and reaching a conclusion consistent with their calculation **OR** M1 for 1.24 × 1.47 (=1.8228) M1 for 3.15 ÷ 3.79 (=0.8311...) A1 for 1.82(28) **and** 0.83(11...) C1 (dep on M2) for $'1.82(28)' and $'0.83(11...)' and reaching a conclusion consistent with their calculation **NB:** Throughout values can be rounded or truncated to 1 or more decimal places. In order to award the communication mark, correct currency must be shown with the calculated value(s) but these can still be rounded or truncated to one or more decimal places as they are being used for comparison.

1MA0_2H

Question		Working	Answer	Mark	Notes
11	(a)		show	2	M1 for $x\times x\times x$ **or** $2\times 5\times x$ **or** vol of cube = x^3 **or** vol cuboid = $10x$ A1 correct completion leading to $x^3 - 10x = 100$
	(b)	$x = 1$: -9 $x = 2$: -2 $x = 3$: -3 $x = 4$: 24 $x = 5$: 75 $x = 6$: 156 $x = 10$: 900 $x = 5.1$: 81.(651) $x = 5.2$: 88.(608) $x = 5.3$: 95.(877) $x = 5.4$: 103.(464) $x = 5.5$: 111.(375) $x = 5.6$: 119.(616) $x = 5.7$: 128.(193) $x = 5.8$: 137.(112) $x = 5.9$: 146.(379) $x = 5.35$: 99.6(30375) $x = 5.36$: 100.3(90656) $x = 5.355$: 100.0(101139)	5.4	4	B2 for a trial $5 \le x \le 6$ evaluated correctly (B1 for any **two** trials evaluated correctly for positive values of x) B1 for a different trial $5.3 < x < 5.4$ evaluated correctly B1 (dep on at least one previous B1) for 5.4 Accept trials correct to the nearest whole number (rounded or truncated) if the value of x is to 1 d.p., but correct to 1 d.p. (rounded or truncated) if the value of x is to 2 or more d.p. NB. Allow 100 for a trial of $x = 5.355$

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
12	(a)		Correct Frequency Polygon	2	B2 Fully correct polygon. Points plotted at the midpoint (B1 All points plotted accurately not joined, **or** one error in plotting but joined **or** all points plotted accurately and joined with, additionally, first joined to last **or** all points at the correct heights and consistently within or at the ends of the intervals **and** joined (Includes joining last to first to make a polygon)) NB: ignore polygon before 1st point, and after last point. Ignore any histograms.
	(b)		$30 < t \leq 40$	1	B1 Allow any notation eg, 30-40 ft polygon
	(c)	$(6+2) = 8$, $(4 + 8 + 14 + 16 + 6 + 2) = 50$	$\frac{8}{50}$ oe	2	M1 $(6+2) \div (4 + 8 + 14 + 16 + 6 + 2)$ **or** ft figures from polygon **or** $\frac{8}{a}$ with $a > 8$ **or** $\frac{c}{50}$ with $c < 50$ **or** 8 and 50 used but notation incorrect (eg. 8:50 , 8 out of 50) A1 $\frac{8}{50}$ oe (eg. 0.16) **or** ft figures from polygon

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
13		Volume = $\frac{5\times12}{2}\times15$ Mass = $\frac{5\times12}{2}\times15\times6.6$	2970	3	M1 $\frac{5\times12}{2}\times15$ (=450) M1 (dep on 1st M1) $'450'\times6.6$ A1 cao SC: If no marks awarded then award B1 for an answer of 5940
14	(a)		$x(x+7)$	1	B1 cao
	(b)		$(y-8)(y-2)$	2	M1 $(y \pm 8)(y \pm 2)$ **or** $y(y-2) - 8(y-2)$ **or** $y(y-8) - 2(y-8)$ A1 cao
	(c)(i)	$2t^2+5t+2 = (2t+1)(t+2)$	$(2t+1)(t+2)$	3	M1 $(2t+2)(t+1)$ oe **or** $2t(t+2) + 1(t+2)$ **or** $t(2t+1) + 2(2t+1)$ A1 $(2t+1)(t+2)$
	(ii)	This is always a product of two whole numbers each of which is greater than 1	Correct explanation		B1 ft from (i) for a convincing explanation referring to factors found in (i)
15		$9-3=6$ $10^2-6^2=64$ $BC=8$ $AC^2=9^2+8^2=145$	12.0	5	M2 $10^2-(9-3)^2$ (=64) **or** $BC=8$ (M1 $9-3$ (=6) may be seen on diagram) M1 (indep) $9^2+'BC'^2$ where BC is a numerical value M1 (dep on previous M1) $\sqrt{81+'64'}$ A1 12.0 – 12.042

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
16		$\frac{64.8-59.3}{64.8}\times 100$ (=8.487...) **OR** $\frac{59.3}{64.8}\times 100$ = 91.512 100 – '91.512' =8.487...)	8.49	3	M1 64.8 − 59.3 (=5.5) M1 (dep) $\frac{'5.5'}{64.8}\times 100$ oe A1 8.48 – 8.49 **OR** M1 $\frac{59.3}{64.8}\times 100$ oe (= 91.5(12...)) M1 (dep) 100 – '91.5' A1 8.48 – 8.49 **OR** M1 $\frac{59.3}{64.8}$ (=0.915(12...)) M1 (dep) 100 × (1 − '0.915') A1 8.48 − 8.49

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
17		$\sin 60^o = \frac{x}{32}$ $x = 32 \times \sin 60$ (=27.712...)	27.7	3	M1 $\sin 60 = \frac{x}{32}$ **or** $\frac{x}{\sin 60} = \frac{32}{\sin 90}$ oe M1 (x =) 32 × sin 60 **or** (x =) $\frac{32}{\sin 90} \times \sin 60$ A1 27.7 − 27.72 **OR** M1 cos(90 − 60) = $\frac{x}{32}$ M1 (x =) 32 × cos(90 − 60) A1 27.7 − 27.72 Radians : − 9.7539398... Gradians : 25.888554... SC : B2 for an answer in the range (−) 9.75 to (−)9.754 **or** 25.8 to 25.9
18	(a)	x | 0.5 | 1 | 2 | 3 | 4 | 5 | 6 y | 12 | (6) | (3) | 2 | (1.5) | 1.2 | (1)	Correct table	2	B2 all 3 correct (B1 1 or 2 correct)
	(b)		Correct graph	2	M1 at least 6 points plotted correctly from their table A1 cao for correct curve drawn from (0.5, 12) to (6, 1)

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
19		16 metres: 8×10^8 km. 16: $8 \times 10^8 \times 1000$ 16: 8×10^{11} 1: 5×10^{10} **OR** 2 m to 10^8 km 2m to 100 000 000 000m 1m to 50 000 000 000m	1: 5×10^{10}	3	M1 (indep) correct method to convert to consistent units M1 $\frac{'8\times10^8'}{'16'}$ (units may not be consistent) **or** 5×10^{10} oe **or** 5×10^7 oe A1 1: 5×10^{10} **or** 1: 50 000 000 000 **OR** M1 (indep) correct method to convert to consistent units M1 $\frac{'16'}{8}$ to $'10^8'$ A1 1: 5×10^{10} **or** 1: 50 000 000 000
20		$\frac{3(x+1)}{6}+\frac{2(x+3)}{6}=\frac{3x+3+2x+6}{6}$	$\frac{5x+9}{6}$	3	M1 Use of common denominator of 6 (**or** any other multiple of 6) and at least one numerator correct Eg. $\frac{3(x+1)}{6}$ or $\frac{2(x+3)}{6}$ M1 $\frac{3(x+1)}{6}+\frac{2(x+3)}{6}$ oe A1 cao

<table>
<tr><th colspan="6">1MA0_2H</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>21</td><td>(a)</td><td>$\frac{2}{7}\times\frac{1}{6}$

OR

<table>
<tr><td></td><td>1</td><td>1</td><td>2</td><td>2</td><td>2</td><td>3</td><td>3</td></tr>
<tr><td>1</td><td>X</td><td>√</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>1</td><td>√</td><td>X</td><td></td><td></td><td></td><td></td><td></td></tr>
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<tr><td>2</td><td></td><td></td><td></td><td>X</td><td></td><td></td><td></td></tr>
<tr><td>2</td><td></td><td></td><td></td><td></td><td>X</td><td></td><td></td></tr>
<tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td>X</td><td></td></tr>
<tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td>X</td></tr>
</table></td><td>$\frac{2}{42}$</td><td>2</td><td>M1 $\frac{2}{7}\times\frac{1}{6}$
A1 $\frac{2}{42}$ oe

OR

M1 Fully correct sample space with the correct cases identified
A1 $\frac{2}{42}$ oe
SC : B1 for an answer of $\frac{4}{49}$</td></tr>
</table>

1MA0_2H

Question		Working	Answer	Mark	Notes
21	(b)	$\frac{2}{7}\times\frac{5}{6}+\frac{3}{7}\times\frac{2}{6}$ **OR** **1 1 2 2 2 3 3** **1** X √ √ √ √ √ **1** X √ √ √ √ √ **2** X √ √ **2** X √ √ **2** X √ √ **3** X **3** X	$\frac{16}{42}$	3	M1 for identifying all 3 possibilities of (1,2) and (1,3) and (2,3) **OR** at least one of $\frac{2}{7}\times\frac{3}{6}$ (1, 2) **or** $\frac{2}{7}\times\frac{2}{6}$ (1, 3) **or** $\frac{3}{7}\times\frac{2}{6}$ (2, 3) **or** $\frac{2}{7}\times\frac{5}{6}$ (1, 2 or 3) M1 $\frac{2}{7}\times\frac{5}{6}+\frac{3}{7}\times\frac{2}{6}$ **or** $\frac{2}{7}\times\frac{3}{6}+\frac{2}{7}\times\frac{2}{6}+\frac{3}{7}\times\frac{2}{6}$ A1 $\frac{16}{42}$ oe **OR** M2 Fully correct sample space with the correct cases identified (M1 for 1,2 and 1,3 and 2,3 identified on a sample space) A1 $\frac{16}{42}$ oe SC: B2 for an answer of $\frac{16}{49}$

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
22	(a)	$x = \frac{-9 \pm \sqrt{9^2 - 4\times 2\times -7}}{2\times 2} = \frac{-9 \pm \sqrt{137}}{4}$	0.676, − 5.18	3	M1 $\frac{-9 \pm \sqrt{9^2 - 4\times 2\times -7}}{2\times 2}$ allow substitution of ±7 for c M1 $\frac{-9 \pm \sqrt{137}}{4}$ A1 answers in ranges 0.67 - 0.68 **and** − 5.17 to − 5.18 **OR** M1 $(x + \frac{9}{4})^2$ oe M1 for method leading to $\pm\sqrt{\frac{137}{16}} - \frac{9}{4}$ A1 answers in ranges 0.67 - 0.68 **and** − 5.17 to − 5.18
	(b)	Put $y = \frac{1}{x}$ and use part (a) Or $7y^2 - 9y - 2 = 0$ $y = \frac{--9 \pm \sqrt{(-9)^2 - 4\times 7\times (-2)}}{2\times 7}$ $\frac{9 \pm \sqrt{137}}{14}$	1.48, − 0.193	2	M1 $y = \frac{1}{x}$ **or** $x = \frac{1}{y}$ A1 (ft) answers in range 1.47 - 1.48 **and** − 0.19 to − 0.194 **OR** M1 fully correct method which leads to $7y^2 - 9y - 2 = 0$ **or** $-7y^2 + 9y + 2 = 0$ with correct method to solve (condone sign errors in substitution) A1 (ft) answers in range 1.47 - 1.48 **and** − 0.19 to − 0.194

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
23	(a)	Let O be the centre of the base. $OB^2 + OC^2 = 10^2$; $OB^2 = 50$ $AO^2 = AB^2 - OB^2 = 50$ Vol = $\frac{1}{3}\times 10^2 \times \sqrt{50}$ **OR** Let M be the midpt of side BC and let O be the centre of the base. $AM^2+MC^2 = 10^2$; $AM^2 = 75$ $AO^2 = AM^2 - MO^2 = 50$ Vol = $\frac{1}{3}\times 10^2 \times \sqrt{50}$	236	4	M1 correct method to start to find BD or BO using triangle OBC or triangle BCD (oe) Eg. $OB^2 + OC^2 = 10^2$ **or** $BO^2 = 50$ **or** $BO = \sqrt{50}$ (=7.07..) **or** $BO = \frac{\sqrt{200}}{2}$ **or** $10^2 + 10^2 = BD^2$ **or** $BD^2 = 200$ **or** $BD = \sqrt{200}$ (=14.1..) M1 (dep) correct method to find height of pyramid using triangle AOB Eg. $AO^2 = 10^2 - '\sqrt{50}'^2$ **or** $AO^2 = 50$ **or** $AO = \sqrt{50}$ (=7.07..) M1 (indep) $\frac{1}{3}\times 10^2 \times '\sqrt{50}'$ (but **not** $\frac{1}{3}\times 10^2 \times 10$) A1 235 – 236 **OR** M1 correct method to start to find height of a face using triangle AMC (oe) Eg. $AM^2 + 5^2 = 10^2$ **or** $AM^2 = 75$ **or** $AM = \sqrt{75}$ (=8.66...) M1 (dep) correct method to find height of pyramid using triangle AOM Eg. $AO^2 = '\sqrt{75}'^2 - 5^2$ **or** $AO^2 = 50$ **or** $AO = \sqrt{50}$ (=7.07..) M1 (indep) $\frac{1}{3}\times 10^2 \times '\sqrt{50}'$ (but **not** $\frac{1}{3}\times 10^2 \times 10$) A1 235 – 236

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
23 cont.	(a)				**OR** M1 for $\sin 45 = \frac{x}{10}$ **or** $\cos 45 = \frac{x}{10}$ M1 for $h = 10 \times \sin 45$ **or** $h = 10 \times \cos 45$ (=7.07..) M1 (indep) $\frac{1}{3} \times 10^2 \times '7.07...'$ (but **not** $\frac{1}{3} \times 10^2 \times 10$) A1 235 – 236

1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
23	(b)	Angle $ABO = 45^o$ Angle $DAB = 180 - 45 - 45$ **OR** In ΔBAD, $\cos A = \frac{10^2 + 10^2 - '\sqrt{200}'^2}{2 \times 10 \times 10} = 0$ **OR** In ΔBOA, $\cos B = \frac{'\sqrt{50}'}{10}$ Angle $BAD = 180 - $ '45' $-$ '45' **OR** $\sin A = \frac{'\sqrt{50}'}{10}$ $A = 45$ Angle $BAD = 2 \times$ '45'	90	2	M1 Angle $DAB = 180 - 2 \times$ '45' A1 89.98 - 90 **OR** M1 $\cos BAD = \frac{10^2 + 10^2 - '\sqrt{200}'^2}{2 \times 10 \times 10}$ A1 89.98 - 90 **OR** M1 $\sin A = \frac{'\sqrt{50}'}{10}$ A1 89.98 - 90

<table>
<tr><th colspan="5">1MA0_2H</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>24</td><td></td><td>
<table>
<tr><th>Height h m</th><th>Freq</th><th>FD</th></tr>
<tr><td>$0 < h \leq 2$</td><td>7</td><td>3.5</td></tr>
<tr><td>$2 < h \leq 4$</td><td>14</td><td>7</td></tr>
<tr><td>$4 < h \leq 8$</td><td>18</td><td>4.5</td></tr>
<tr><td>$8 < h \leq 16$</td><td>24</td><td>3</td></tr>
<tr><td>$16 < h \leq 20$</td><td>10</td><td>2.5</td></tr>
</table>
</td><td>3</td><td>3</td><td>B3 fully correct histogram with horizontal axis correctly scaled
(B2 for 4 correct blocks or 5 correct blocks with incorrect or no scale)
(B1 for 2 correct blocks of different widths or any 3 correct blocks)
SC : B1 for key, eg. 1 cm^2 = 2 (trees) or correct values shown for (freq ÷ class interval) for at least 3 frequencies (3.5, 7, 4.5, 3, 2.5)</td></tr>
<tr><td>25</td><td></td><td>$A = \frac{1}{2} \times x \times 2x \times \sin 30^o$
$A = \frac{1}{2} \times 2x^2 \times 0.5$

OR

Height = $2x \sin 30^o = x$
$A = \frac{x \times x}{2} = \frac{x^2}{2}$

OR
Height = x sin 30 = $\frac{x}{2}$
$A = \frac{1}{2} \times 2x \times \frac{x}{2} = \frac{x^2}{2}$</td><td>$x = \sqrt{2A}$
shown</td><td>3</td><td>M1 $(A =) \frac{1}{2} \times x \times 2x \times \sin 30^o$
A1 $A = x^2 \times 0.5$ or $A = \frac{x^2}{2}$
C1 for completion with all steps shown

OR
M1 height = 2$x$sin 30 (= x)
A1 $A = x^2 \times 0.5$ or $A = \frac{x^2}{2}$
C1 for completion with all steps shown

OR
M1 for height = x sin 30 (= $\frac{x}{2}$)
A1 $A = x^2 \times 0.5$ or $A = \frac{x^2}{2}$
C1 for completion with all steps shown</td></tr>
</table>

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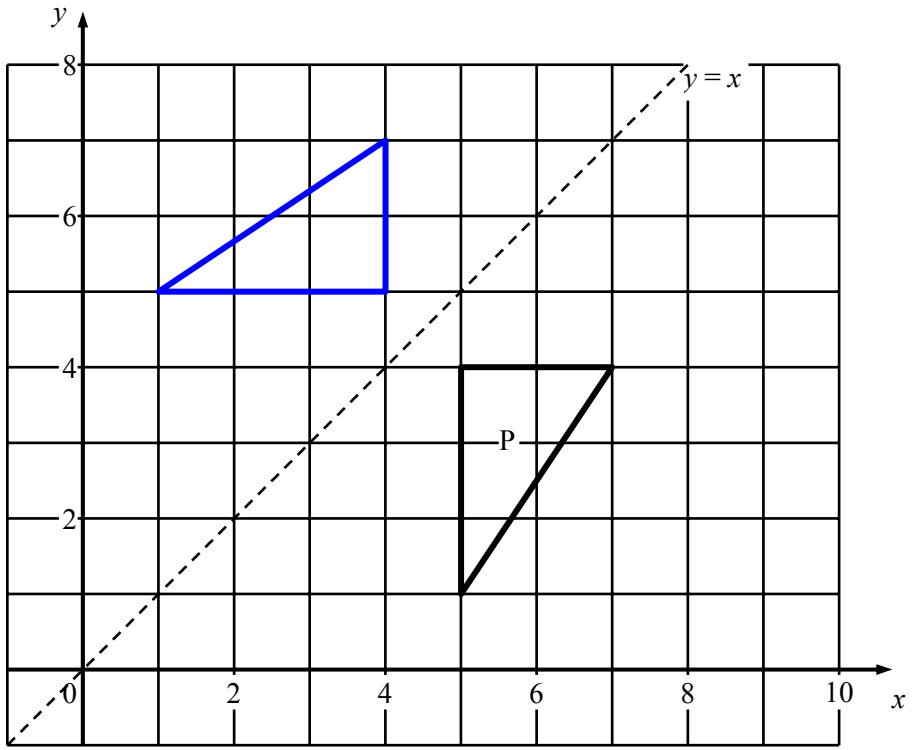

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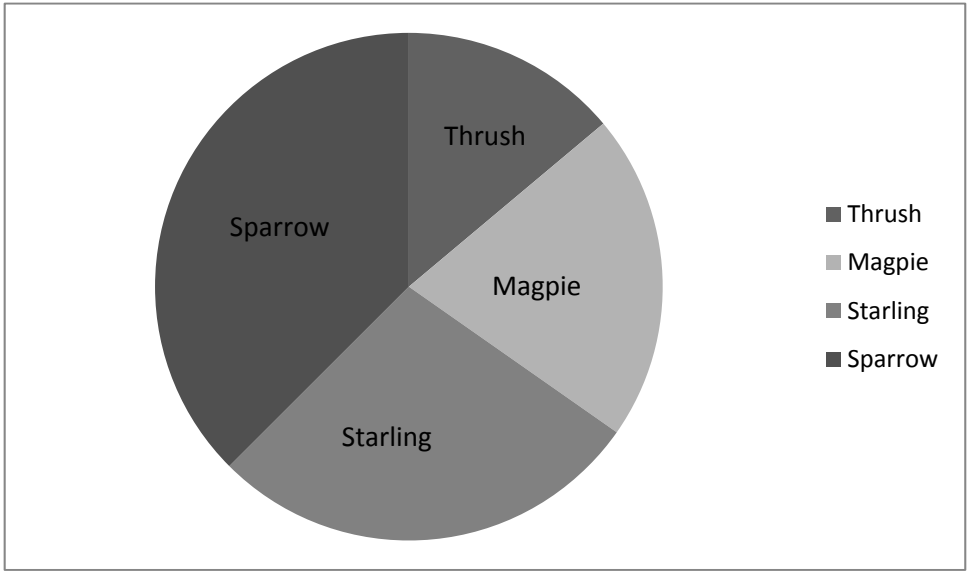
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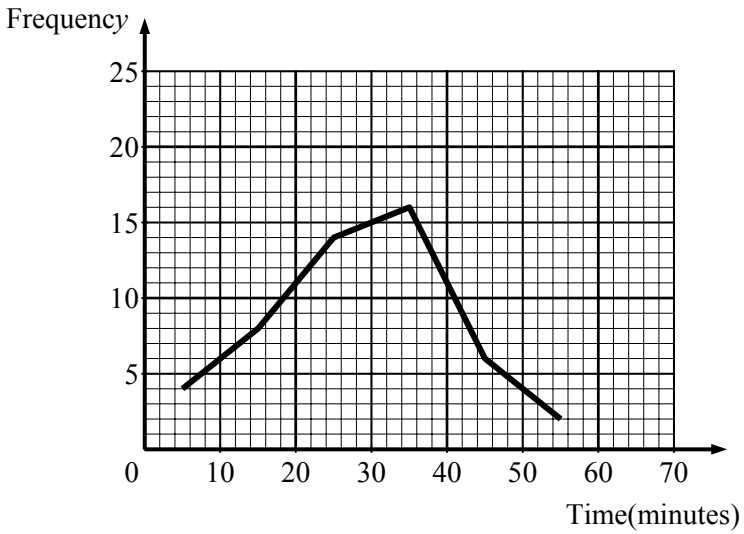
Sparrow
Magpie
Starling
Thrush
Magpie
Starling
Sparrow

12.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10
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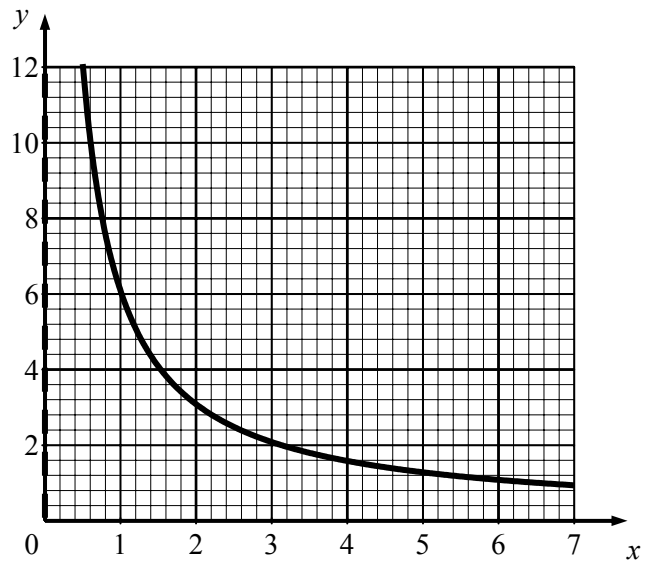
0
10
20
30
40
50
60
70
Time(minutes)

18.



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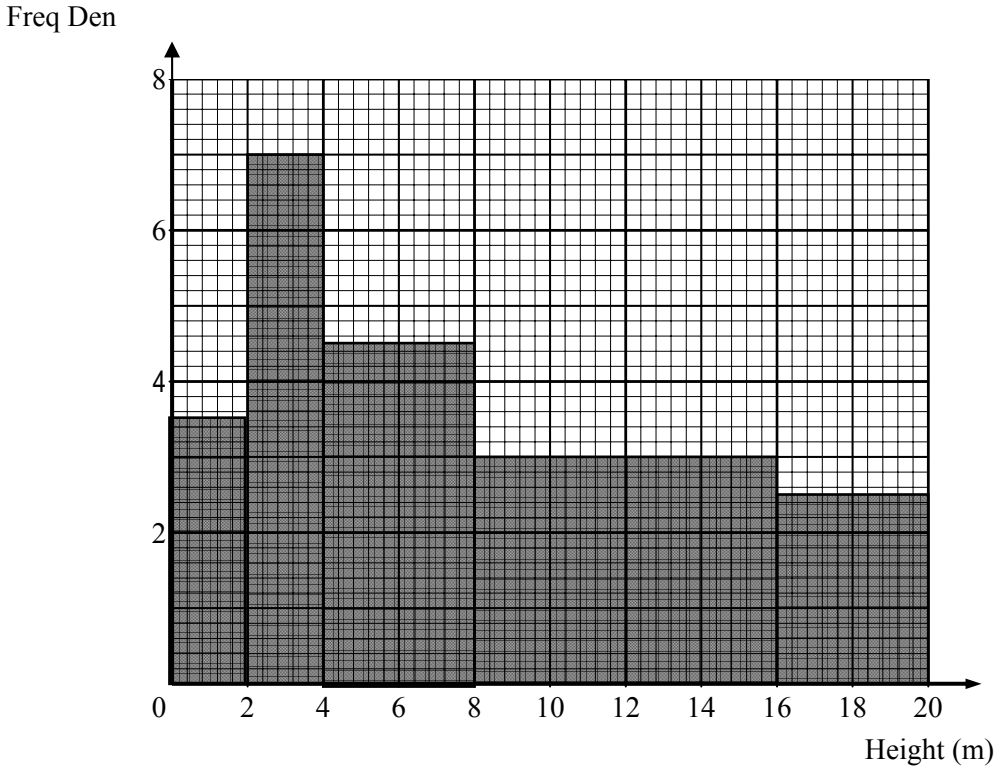

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