Level 3 Certificate

Mathematical Studies

1350/1 Paper 1

Final Mark Scheme

1350

June 2017

Version/Stage: v1.0

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

Key to mark scheme abbreviations

M	mark is for method
m or dM	mark is dependent on one or more M marks and is for method
A	mark is dependent on M or m marks and is for accuracy
B	mark is independent of M or m marks and is for method and accuracy
E	mark is for explanation
√ or ft or F	follow through from previous incorrect result
CAO	correct answer only
CSO	correct solution only
AWFW	anything which falls within
AWRT	anything which rounds to
ACF	any correct form
AG	answer given
SC	special case
OE	or equivalent
A2,1	2 or 1 (or 0) accuracy marks
–*x* EE	deduct *x* marks for each error
NMS	no method shown
PI	possibly implied
SCA	substantially correct approach
c	candidate
sf	significant figure(s)
dp	decimal place(s)

No Method Shown

Where the question specifically requires a particular method to be used, we must usually see evidence of use of this method for any marks to be awarded.

Where the answer can be reasonably obtained without showing working and it is very unlikely that the correct answer can be obtained by using an incorrect method, we must award **full marks**. However, the obvious penalty to candidates showing no working is that incorrect answers, however close, earn **no marks**.

Where a question asks the candidate to state or write down a result, no method need be shown for full marks.

Where the permitted calculator has functions which reasonably allow the solution of the question directly, the correct answer without working earns **full marks**, unless it is given to less than the degree of accuracy accepted in the mark scheme, when it gains **no marks**.

Otherwise we require evidence of a correct method for any marks to be awarded.

Q	Answer	Mark	Comments
1(a)	$\frac{10}{24}$ (× 100)	M1	OE
	41 or 42 or 41.6(…) or 41.7	A1	
	Additional Guidance		
	Sight of 0.41(6…)	M1	
	$\frac{5}{12}$ seen	M1	
	Beware 42.6 comes from the average of the ten scores over 33		

Q	Answer	Mark	Comments
1(b)	**Alternative method 1**		
	Median or mean = 30	B1	
	In general the students in this class/they performed better than the national average	E1ft	OE correct comment for their median or mean
	Alternative method 2		
	15 out of 24/more than half the students scored more than the national average or 9 out of 24/ less than half the students scored below the national average	B1	OE eg 62.5% scored more than the national average
	In general the students in this class/they performed better than the national average	E1ft	OE correct comment for their proportion/values
	Additional Guidance		
	Do not accept 'The median was higher' for the E mark However 'they got higher marks than the national average/ on average they got higher marks' would score E1		
	In general students were above the national average	E0	

Q	Answer	Mark	Comments
2	£83	B1	

<table>
<tr><th>Q</th><th>Answer</th><th>Mark</th><th colspan="2">Comments</th></tr>
<tr><td rowspan="8">3</td><td colspan="4">Alternative method 1</td></tr>
<tr><td>Package
744 × 3 × 0.9 or (£)2008.8(0)</td><td>M1</td><td>OE</td><td rowspan="2">Award M2 for
744 × 3 × 0.9 ×1.03 in any order
Award M1 for any 3 of these values multiplied in any order</td></tr>
<tr><td>their (£)2008.(..) × 1.03 or (£)2069.(..)</td><td>M1</td><td>OE</td></tr>
<tr><td>Independent
Hotel 480 ÷ 1.33 × 3
or 360.9(0) × 3
or (£)1082.(..)</td><td>M1</td><td colspan="2">or 480 ÷ 1.33 + 312 or (£)672.90</td></tr>
<tr><td>Total cost
Their (£)1082.(..) + 312 × 3
or (£)2018.(..)</td><td>M1</td><td colspan="2">their (£)672.90 × 3</td></tr>
<tr><td>(£)2069.(…) and (£)2018.(…) and independent is cheaper
or
independent is 50.35 cheaper/over £50 cheaper</td><td>A2</td><td colspan="2">A1 for two values with one correct and correct ft conclusion
or
A1 for both values correct but incorrect or no conclusion</td></tr>
<tr><td colspan="4">Additional Guidance</td></tr>
<tr><td colspan="4">If there is evidence of multiplying by 3 people at some point then use alt 1 (in pounds) or alt 3 (in euros)
If there is no evidence of multiplying by 3 then use alt 2 (in pounds) or alt 4 (in euros)
Do not swap between alts for a response
Example (using alt 1)
744 × 3 × 0.9 × 1.03 = 2069.06 M2
480 ÷ 1.33 = 360.90
360.90 + 312 = 672.90 M1 (in comment box)
independent is cheaper A1 (one correct value – 2069- and correct ft conclusion)</td></tr>
</table>

	So although both values are correct on different alts they should have multiplied 672.9 by 3 or divided 2069 by 3 to be consistent so treat as incorrect method (marking on alt 2 would give the same total of 4 marks –M1M0M1M1A1)
	Accept alternative ways of subtracting 10% and/or adding 3%
	Multiplying by an incorrect percentage can still score one of the first 2 method marks Examples 744 × 3 × 0.1 × 1.03 or 229.(…) scores M0M1 (3 correct values multiplied) 744 × 3 × 1.1 × 1.03 or 2528.(…) scores M0M1 (3 correct values multiplied) 744 × 3 × 0.9 × 0.97 or 1948.(..) scores M0M1 (3 correct values multiplied) 744 × 3 × 0.1 × 0.97 scores M0M0 These are only examples.
	They **must** compare using consistent units example £2069 and €2685 and packages 4 u are cheaper does **not** gain the A1 for one value correct and correct ft conclusion. This would gain maximum M2 for either 2069 or 2685

3	**Alternative method 2**			
	Package per person 744 × 0.9 or (£)669.(..)	M1	OE	Award M2 for 744 × 0.9 ×1.03 in any order Award M1 for any 2 of these values multiplied in any order
	their (£)669.(..) × 1.03 or (£)689.(..)	M1	OE	
	Independent per person Hotel 480 ÷ 1.33 or (£)360.(9..)	M1		
	Their (£)360.(9..) + 312 or 672.(..)	M1		
	(£)689.(…) **and** (£)672.(…) **and** independent is cheaper per person or independent is (£)17 cheaper per person or total cost is (£)51 cheaper for independent	A2	A1 for two values with one correct and correct ft conclusion or A1 for both values correct but incorrect or no conclusion	
	Additional Guidance			

	Accept alternative ways of subtracting 10% and/or adding 3%	
	Multiplying by an incorrect percentage can still score one of the first 2 method marks Examples 744 × 0.1 × 1.03 or 76.(…) scores M0M1 (2 correct values multiplied) 744 × 1.1 × 1.03 or 842.(…) scores M0M1 (2 correct values multiplied) 744 × 0.9 × 0.97 or 649.(..) scores M0M1 (2 correct values multiplied) 744 × 0.1 × 0.97 scores M0M0 These are only examples.	
	They must compare using consistent units	

Q	Answer	Mark	Comments	
3	**Alternative method 3**			
	Package 744 × 1.33 × 0.9 or (€)890.5(..)	M1	OE	Award M2 for 744 × 1.33 × 0.9 ×1.03 × 3 in any order Award M1 for any 3 of these values multiplied in any order
	their (€)890.56 × 1.03 × 3 or (€)2751.(..)	M1	OE	
	Independent Hotel 312 × 1.33 × 3 or (€)1244.88	M1	or 312 × 1.33 + 480 or (€)894.96	
	Total cost Their (€)1244.88 + 480 × 3 or (€)2684.(88)	M1	their (€)894.96 × 3	
	(€)2751.(...) **and** €2684.(88) **and** independent is cheaper	A2	Deduct one mark if € signs are missing from their answer A1 for two values with one correct and correct ft conclusion or A1 for both values correct but incorrect or no conclusion	
	Additional Guidance			
	Accept alternative ways of subtracting 10% and/or adding 3%			
	Multiplying by an incorrect percentage can still score one of the first 2 method			

	marks Examples 744 ×1.33 × 0.1 × 1.03 × 3 or 305.(…) scores M0M1 (at least 3 correct values multiplied) 744 × 1.33 × 0.1 × 1.03 or 101.(…) scores M0M1 (3 correct values multiplied) These are only examples.	

3	**Alternative method 4**			
	Package 744 × 1.33 × 0.9 or (€)890.5(..)	M1	OE	Award M2 for 744 × 1.33 × 0.9 ×1.03 in any order Award M1 for any 3 of these values multiplied in any order
	their (€)890.56 × 1.03 or (€)917.(..)	M1	OE	
	Independent Flight 312 × 1.33 or (€)414.(..) or 415	M1		
	Total cost Their (€)414.(..) + 480 or (€)894.(..) or (€)895	M1		
	(€) 917.(...) **and** (€)894.(..) **and** independent is cheaper	A2	A1 for two values with one correct and correct ft conclusion or A1 for both values correct but incorrect or no conclusion	
	Additional Guidance			
	Accept alternative ways of subtracting 10% and/or adding 3%			
	Multiplying by an incorrect percentage can still score one of the first 2 method marks Examples 744 ×1.33 × 0.1 × 1.03 or 98.(…) scores M0M1 (at least 3 correct values multiplied) 744 × 1.33 × 0.9 × 0.97 or 863.(…) scores M0M1 (3 correct values multiplied) These are only examples.			

Q	Answer	Mark	Comments
4	Makes an assumption about number of litres per person per day in the range 1 litre to 10 litres (or ml equivalents) **and** assumes a number of days in a month in the range 28 to 31 **and** Makes an assumption about number of people in a small town in the range 1000 to 100000	B3	Must state units eg Minimum for B3 (Assume) 5 litres, 28 days,15000 people or B2 for 2 correct assumptions (one missing or not in range) eg (Assume) 3 litres, 30 days, 300000 people or B2 for all 3 values within range but not stated as assumptions eg 4 × 30 × 10000 seen gets B2 M1 or B1 Any one correct assumption stated eg drink about 3 litres per day or Multiplication of 3 values with 2 in range and no units eg 12 × 31 × 20000
	Multiplies their 3 values together	M1	This may be done in two steps
	Accurate answer to their calculation	A1ft	ft their 3 values May be rounded
	Additional Guidance		
	Ignore any calculations to get the number of litres per day eg 4 × 300ml glass is 1.5 litres scores B1 for 1.5 litres (even though arithmetic is wrong)		
	The amount of liquid they multiply by must be per person not per household		
	28 to 31 days can come from various calculations eg 7 days × 4 weeks, 365(.25) ÷ 12 Again just award the B1 for a number of days within the range		

	they could use households to estimate population eg small town 2000 houses × 4 people = 8000 population	
	If working in ml they can still gain the method mark but they must convert to litres for the accuracy mark	
	The three values may be multiplied in 2 steps eg litres per day × days in month at one point in their working, then this answer × number of people	
	If they just state a number of litres per month eg 65 litres per month they do not score the marks for assumptions but can score M1 and A1 for multiplying this correctly by their population	
	Allow rounding at any point eg uses 7 litres and 31 days in a month, 7 × 31 = 217 and rounds to 200 or 220	
	Final answer must be an integer	

Q	Answer	Mark	Comments
5(a)	Collect prices from estate agents/websites for house prices/ recent house sales/newspapers **and** across different areas of London	E2	E1 Partial explanation (only one of the comments)
	Additional Guidance		
	For different area allow different suburbs/estates/streets		

Q	Answer	Mark	Comments
5(b)	(No,) London prices may not be representative of the whole country or London prices are likely to be higher/different than some other parts of the country	B1	
	Additional Guidance		
	No may be implied eg It would not be sensible		
	Ignore other non-contradictory comments eg sample size too small		
	Its London/it's the capital		B0

5(c)	**Alternative method 1**		
	2009 157 to 165 **and** **2014** 188 to 192	B1	condone 000's added eg 158000
	180 000 ÷ their [157,165] or [1090,1147]	M1	$180\,000 \times \dfrac{\text{their}[188,192]}{\text{their }[157,165]}$ implies M2
	their [1090,1147] × their [188,192]	M1	
	(£) [204 900,220 200]	A1ft	ft their values for 2009 and 2014 Answer must be to nearest £100
	Alternative method 2		
	2009 157 to 165 **and** **2014** 188 to 192	B1	condone 000's added eg 158000
	$\dfrac{\text{their}[188,192] - \text{their}[157,165]}{\text{their}[157,165]}$ (×100) or [13.9,22.3] or [0.139,0223]	M1	
	their [0.139,0223] × 180 000	M1	
	(£) [204 900,220 200]	A1ft	ft their values for 2009 and 2014 Answer must be to nearest £100

Q	Answer	Mark	Comments
6(a)	=B2*(1.14/100)	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
6(b)	Fully correct	B2	B1 for one error with correct ft calculations
	Additional Guidance		

	A	B	C	D
1		**Starting amount (£)**	**Interest (£)**	**Final amount (£)**
2	First 3 months	2800.00	31.92	2831.92
3	Second 3 months	2831.92	32.28	2864.20
4	Third 3 months	2864.20	32.65	2896.85
5	Fourth 3 months	2896.85	33.02	2929.87

Note these figures are worked out on rounding to 2 dp each year

If more dp are used in calculations then D4 may be 2896.86 and D5 would be 2929.88

so 2929.87 or 2929.88 in cell D5 scores B2

Q	Answer	Mark	Comments
6(c)	**Alternative method 1**		
	4 × 1.14 or 4.56(%) or 0.0456	M1	$(1 + 0.0114)^4$- 1 gains M2
	$\left(1+\frac{\text{their } 0.0456}{4}\right)^4 - 1$ or 0.04638(…)	M1	
	4.638(…) 4.64	A1	
	Alternative method 2		
	their 2929.87 – 2800 or 129.87	M1	ft their 2929.87 from part (b)
	$\frac{\text{their } 129.87}{2800} \times 100$	M1	
	4.638(…) 4.64	A1ft	ft their total interest from part (b)
	Alternative method 3		
	$\frac{\text{their } 2929.87}{2800} \times 100$ or 104.64	M1	ft their 2929.87 from part (b)
	their 104.64.. – 100	M1	
	4.63(…) 4.64	A1	ft their total interest from part (b)
	Additional Guidance		
	Alt 1 uses the AER formula from the formula sheet		
	Note $\left(1+\frac{0.0114}{4}\right)^4 - 1$ is a common incorrect substitution. Scores M0M1A0		
	For Alt 2 and Alt 3 If their 2929.87 is a different value the check to see it matches their final value in the spreadsheet (use full screen view)		
	Beware the use of 3 instead of 4 for the months This leads to $\left(1+\frac{0.0456}{3}\right)^3 - 1$ = 0.04629 or 4.63 scores M1M0A0		

Q	Answer	Mark	Comments
7(a)	**Alternative method 1**		
	Histogram chosen	B1	vertical scale labelled frequency density implies density unequal bar widths implies histogram unless values are cumulative
	Both axes scales appropriate with correct labelling	B1	Vertical scale must be labelled frequency density (or fd) not just frequency Horizontal scale minimum label is sugar, g
	Fully correct histogram 0-40 height 0.3 40-60 height 0.9 60-70 height 2.3 70-80 height 2.7 80-120 height 0.5	B2	B1 At least 3 bars correct or at least 3 correct frequency densities seen Heights ± ½ square Check table for frequency densities
	Additional Guidance		
	if a bar goes above the graph paper (eg used 5cm to 1) penalise B1 for an inappropriate scale but allow heights for final B marks		

<table>
<tr><td rowspan="4">7(a)</td><td colspan="3">Alternative method 2</td></tr>
<tr><td>Cumulative frequency graph chosen</td><td>B1</td><td>cf scale or heights plotted at cf values implies cf graph</td></tr>
<tr><td>Both axes scales appropriate with correct labelling</td><td>B1</td><td>Vertical axis must be cumulative frequency (or cf) not just frequency
Horizontal scale minimum label is sugar, g
horizontal axis must start from 0 (no broken axis)</td></tr>
<tr><td>Fully correct cumulative frequency graph joined with lines or smooth curve
<table><tr><td>less than 40</td><td>12</td></tr><tr><td>less than 60</td><td>30</td></tr><tr><td>less than 70</td><td>53</td></tr><tr><td>less than 80</td><td>80</td></tr><tr><td>less than 120</td><td>100</td></tr></table></td><td>B2</td><td>± ½ square
B1 All heights correct and joined with line/curve but plotted at incorrect horizontal position
or
Plotted at upper class values and joined with line or curve with at least 3 heights correct
or
All points correct but no line/ curve or poor line/curve</td></tr>
<tr><td rowspan="6"></td><td colspan="3">Additional Guidance</td></tr>
<tr><td colspan="3">Can be joined to (0,0)</td></tr>
<tr><td colspan="3">If heights are incorrect check if they have shown their cf values and follow through 1 error
eg they show their cf values as 12,20,43,70,90 and then plot these values accurately award B1 of the final B2
Just seeing the cf values does not gain the first B1 –they must attempt the graph!
Some are working out cf values and plotting at these heights but as cf ‘bars’ not single points
eg a sort of ‘cumulative frequency histogram’
Award B1 for choosing cf graph and B1 if scales are appropriate and labelled correctly</td></tr>
<tr><td colspan="3">Deduct 1 mark if end of curve drops down.</td></tr>
<tr><td colspan="3">The tolerance of ½ sq applies to horizontal position, heights and the curve/line going through the points.</td></tr>
<tr><td colspan="3">A ‘poor’ curve is ‘feathered’ and/or misses the points by more than ½ square</td></tr>
</table>

<table>
<tr><td rowspan="9">7(a)
cont</td><td colspan="3">Alternative method 3</td></tr>
<tr><td>Frequency polygon chosen</td><td>B1</td><td></td></tr>
<tr><td>Both axes scales appropriate with correct labelling</td><td>B1</td><td>vertical scale must be frequency
Horizontal scale minimum label is sugar, g</td></tr>
<tr><td>Fully correct frequency polygon plotted at mid class intervals, with all heights correct and joined with straight lines</td><td>B2</td><td>± ½ square
B1 All heights correct and joined with straight lines but plotted at incorrect horizontal position
or
Plotted at mid-class values with 3 or 4 heights correct, and joined
Ignore lines before first point and after last point
or
All points correct but no line or poor line</td></tr>
<tr><td colspan="3">Additional Guidance</td></tr>
<tr><td colspan="2">In Alt 2, the points can be joined by straight lines or a smooth curve
Lines must be ‘straight’ not curved or ‘wiggly’.</td><td></td></tr>
<tr><td colspan="2">Non-linear scale on the horizontal axis loses the 2nd B1 but can access the last two B marks for plotting at their correct positions</td><td></td></tr>
<tr><td colspan="2">The tolerance of ½ sq applies to horizontal position, heights and the line going through the points.</td><td></td></tr>
</table>

Q	Answer	Mark	Comments
7(b)	**Alternative method 1** - working out number above 30g		
	(Before =) 91	B1	
	10 × 1.6 or 16 or 20 × 2.8 or 56 or 40 × 0.1 or 4 or 20 × 0.4 or 8	M1	These can be written on the bars of the histogram Ignore any units
	(After =) 76	A1	
	Yes, the number/percentage of children consuming more than the recommended amount had decreased (by 15(%)) or Yes it was 91(%) before and now it's only 76(%)	B1ft	ft their values if M1 awarded and a value seen for both before and after
	Alternative method 2 - working out number below 30g		
	(Before =) 9	B1	
	20 × 0.4 or 8 or 10 × 1.6 or 16	M1	Ignore any units
	(After =) 24	A1	
	Yes, the number/percentage of children consuming below the recommended amount had increased (by 15(%))	B1ft	ft their values if M1 awarded and a value seen for both before and after
	Additional Guidance		
	check histogram for values		

Q	Answer	Mark	Comments
8	**Alternative method 1**		
	40 × 50p or 40 × 0.5 or 40 × 7.2(0) – 40 × 6.7(0) or 288 – 268 or (£)20	M1	extra gross pay per week
	their 20 × 0.2 or (£)4	M1	OE extra tax paid per week
	their 20 × 0.12 or (£)2.40	M1	OE extra N.I paid per week
	their 20 – (their 4 + their 2.40) or 13.6(0)	M1	
	their 13.6(0) ÷ 40 or 0.34	M1	or 35 × 40 or 1400(p) or (£)14
	£0.34 or 34(p) **and** Yes or 13.60 and 14 **and** Yes	A1	If leave 34p in pounds must show £ sign condone £0.34p
	Alternative method 2		
	7.2(0) – 6.7(0) or 50 (p)	M1	extra gross pay per hour
	their 50 × 0.2 or 10 (p)	M1	OE extra tax paid per hour
	their 50 × 0.12 or 6 (p)	M1	OE extra NI paid per hour
	their 10 + their 6 or 16	M1	
	50 – their 16	M1	
	34p **and** Yes	A1	

	Alternative method 3		
	40 × 7.2(0) × 52 or 14 976	M1	
	(their 14 976 – 11 000) × 0.2 or 3976 × 0.2 or 795.2(0)	M1	OE Tax their 14976 cannot come from 6.7 × 40 × 52 (= 13936) (using the current salary)
	(their 14 976 – 8060) × 0.12 or 6916 × 0.12 or 829.92	M1	OE NI
	their 14 976 – (their 795.2(0) + their 829.92) or 13350.88	M1	Annual net pay
8 (cont)	$\left(\frac{\text{their } 13350.88}{52}\text{-}243.15\right) \div 40$ or 0.34	M1	or $\left(\frac{\text{their } 13350.88}{52}\text{-}243.15\right)$ or 13.6(0) **and** 35(p) × 40 or 1400 or (£)14 new and old weekly pay can be divided by 40 separately- leads to 6.42 – 6.08
	£0.34 or 34(p) **and** Yes or 13.6(0) **and** 14 **and** Yes	A1	If leave 34p in pounds must show £ sign condone £0.34p
	Additional Guidance		
	Allow truncated values for all method marks but answer must be 34p		
	14180.8(0) comes from 14976 – the tax and scores M1M1		
	795.2(0) **or** 829.92 scores M2 795.2(0) **and** 829.92 scores M3 13350.88 scores M4		
	Penalise the use of 48 weeks in a year (from 4 weeks × 12)		
	Working out tax and national insurance for their current wage of 6.70 gains no marks. (the net pay is given) Please ignore any work using this 6.70		

8 (cont)	**Alternative method 4**		
	40 × 7.2(0) or 288	M1	New gross pay per week
	(their 288 – $\frac{11000}{52}$) × 0.2 or (their 288 – their 211.54) × 0.2 or 76.46 × 0.2 or 15.29	M1	OE Tax per week their 288 cannot be 268 (from 40 × 6.70)
	(their 288 –155) × 0.12 or 15.96	M1	OE NI per week Condone 155.01 used
	their 288 – (their 15.29 + their 15.96) or 256.75	M1	
	(their 256.75 – 243.15) ÷ 40 or 13.6(0) ÷ 40 or 0.34 or their 256.75 – 243.15 **and** 35(p) × 40	M1	or $\frac{256.75}{40} - \frac{243.15}{40}$ or 6.42 – 6.08 or 6.08 + 0.35
	£0.34 or 34(p) **and** Yes or 13.6(0) **and** 14 **and** Yes or 6.43 **and** 6.42 **and** Yes	A1	If leave 34p in pounds must show £ sign condone £0.34p
	Additional Guidance		
	Allow truncated values for all method marks but answer must be 34p		
	13.60 scores M4 256.75 scores M4 15.29 **or** 15.96 scores M2 15.29 **and** 15.96 scores M3		
	Working out tax and national insurance for their current wage of 6.70 gains no marks. (the net pay is given) Please ignore any work using this 6.70		

Q	Answer	Mark	Comments
9(a)	15.8(4)	B2	B1 for $\sum fx$ = 792 seen SC1 15.59 or 15.6 or 16.09 or 16.1 (using lower or upper class boundaries)
	Additional Guidance		
	If 15.84 is seen then ignore any attempt to change to minutes and seconds		
	Ignore further rounding eg to 16 after 3 or 4 sf answer seen		

Q	Answer	Mark	Comments
9(b)	The answer is within the range of the data/ close to the intervals with the highest frequencies/in/near the modal class or work out the median and check its similar/compare with the mean	B1	OE
	Additional Guidance		

Q	Answer	Mark	Comments
9(c)	0.6759(…) or 0.676 or 0.6828(…) or 0.683 or 0.68	B2	B1 for $\sum fx^2$ = 12568.125
	Additional Guidance		
	If correct sd is seen then ignore any attempt to change to minutes and seconds **But** penalise by one mark any invalid further working after correct sd seen example sd = 0.68 0.68 × 50 = 34		B1

9(d)	Correct evaluation of difference between the mean before and after training	B1ft	ft their (a) and (c) 1.6(4) if their 9a is correct
	Correct comparison in context about the means eg after training he was faster/ he's swimming quicker/his times have decreased	B1 ft	ft their (a) and (c)
	Correct comparison of sd's in context eg he is now more consistent/ his times are less varied	B1ft	ft their (a) and (c)
	Additional Guidance		
	If there are no values for their part a and/or c then they must state the mean and/sd they are using		
	eg He decreased his average time by 1.6(4) minutes and his times were minutes more consistent		B3
	eg He decreased his average time by 1.6(4) minutes		B2
	eg After coaching he was faster and more consistent		B2
	He was faster after training		B1
	After training he had a lower mean time		B0
	After training his mean was lower by about 1.6 seconds and he was more consistent		B1B0B1

Q	Answer	Mark	Comments
10(a)	**Alternative method 1**		
	Occupancy rate of 70% to 85% used eg 0.8 × 25 = 20 rooms with 1 bed eg 0.7 × 10 = 7 rooms with 2 beds	B1	Can be for all 35 rooms eg 0.8 × 35 = 28 rooms
	Makes assumption about average number of sheet changes per room eg 4 times a week 20 times per month guests stay on average 4 days so about 7 times per month	B1	Accept 2 – 6 changes per week or 6 – 26 changes per month Must be changes –not number of nights stayed
	Works out **total** number of sheet changes per month for **double** rooms eg their 20 × their 4 per week × 4 weeks or their 20 rooms × their 20 times	M1	Answers may be rounded eg to nearest 10 costs per room may be worked out first and then multiplied by number of sheet changes Working out total costs for all their rooms and then multiplying by their number of sheet changes gains M2
	Works out **total** number of sheet changes per month for **single** bed(s) rooms (can use 1 or 2 beds consistently) eg their 8 × 2 × their 3 per week × 4 weeks (double occupancy) eg assuming only one bed used their 8 × their 7 changes per month	M1	
	Room with double bed costs (£)5.40 or (£)6.40	B1	2 pillowcases or 4 pillowcases used can be implied by their total cost for their number of rooms eg 20 double rooms costs £108 implies 20 × 5.40
	Room with 2 single beds costs (£)7.60 or (£)8.60 or room with one single bed used costs (£) 3.8(0) or (£)4.3(0)	B1	2 pillowcases or 4 pillowcases used can be implied by their total cost for a single room

<table>
<tr><td rowspan="5"></td><td>x sheet changes with double bed × their cost per room + y sheet changes with (two) single bed(s) × their cost per room</td><td>M1</td><td colspan="2"></td></tr>
<tr><td>Correct answer for their calculations (may be rounded)</td><td>A1</td><td colspan="2">Answers must be rounded to the nearest pound</td></tr>
<tr><td colspan="4">Additional Guidance</td></tr>
<tr><td colspan="3">students may carry out the above stages of calculation in a different order</td><td></td></tr>
<tr><td colspan="3">Accept sensible rounding for any stage of their calculations
eg estimates on average bed linen is £6 per set (double bed)</td><td></td></tr>
<tr><td rowspan="2">10(a) cont</td><td colspan="3">Omitting to consider/ use a number of sheet changes per month gains a maximum of 3 marks – 1 for using an occupancy rate and 2 for each of the correct costs per set of double room linen or single room linen
Example
0.81 × 25 = 21 double rooms
0.81 × 10 = 8 single rooms
21 × 2.75 + 21 × 1.65 + 21 × 2 × 0.5 =113.40 113.4 implies 5.40
8 × 2.20 + 8 × 1.10 + 8 × 1= 34.40 34.4 implies 4.30
113.40 + 34.40 = 147.80
no further marks are possible as number of sheet changes has not been considered</td><td>B1
B1
B1

M0</td></tr>
<tr><td colspan="3">costs may be used in parts with numbers of rooms and then totalled
example
assume occupancy rate of 81%
double rooms
0.81 × 25 = 20.25 so assume 20 double rooms used
20 × 2.75 = 55
20 × 1.65 = 33
4 pillows cost £2 so 20 × £2 = 40
55 + 33 + 40 =128 (cost for 20 double rooms for 1 sheet change-implies 20 × 6.40)
assumes stay is on average 2 nights so 15 changes per month
128 × 15 =1920
rooms with single beds
0.81 × 10 = 8 rooms
8 × 2.20 + 8 ×1.10 + 8 × £1 = 34.40 (2 pillowcases used)
34.40 × 15 = 516
1920 + 516 = 2436</td><td>B1

B1

B1
M1

B1
M1
M1A1</td></tr>
</table>

10(a) cont	**Alternative method 2 –works on full occupancy first**		
	Room with double bed costs (£)5.40 or (£)6.40	B1	2 pillowcases or 4 pillowcases used implied by totals of a particular number of rooms eg (£)135 is 25 rooms at (£)5.40
	Room with 2 single beds costs (£)7.60 or (£)8.60 or room with one single bed used costs (£) 3.8(0) or (£)4.3(0)	B1	2 pillowcases or 4 pillowcases used implied by totals of a particular number of rooms eg (£)134.40 is 8 rooms at (£)4.30
	25 × their 5.40 + 10 × their 7.60	M1	finds total cost of laundry for one change
	Makes assumption about average number of sheet changes per room eg 4 times a week 20 times per month guests stay on average 4 days so about 7 times per month	B1	Accept 2 – 6 changes per week or 6 – 26 changes per month Must be changes –not number of nights stayed
	Works out **total** cost of sheet changes per month for **all** rooms eg their total cost per change × their 4 per week × 4 weeks eg their total cost per change × their 20 times	M1	Answers may be rounded eg to nearest 10
	Occupancy rate of 70% to 85% used	B1	
	Their cost per month × their occupancy rate	M1	their cost per month must include multiplication by the number of sheet changes
	Correct answer for their calculations (may be rounded)	A1	Answers must be rounded to the nearest pound
	Additional Guidance		
	Accept sensible rounding for any stage of their calculations eg estimates on average bed linen for double room is £6 per set		
	Answers may follow part of each alt eg works out occupancy rate first then finds cost of laundry for all rooms per night		

Q	Answer	Mark	Comments
10(b)	Occupancy rate may be (a lot) lower as it's a new hotel or Number of sheet changes may be different as guests may stay longer/ shorter period than estimated or In rooms with two single beds only one bed may need to be changed or Instead of 4 pillows for a double bed there may be only 2 pillows (or vice versa)	E1	OE
	Additional Guidance		
	Just restating their assumptions gains no credit eg I assumed there were 2 pillows per room		B0