

AQA Qualifications

Level 3 Certificate Mathematical Studies

Mark scheme

Paper 2A
1350/2A

Version 1.0

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

Principal Examiners have prepared these mark schemes for practice papers. These mark schemes have not, therefore, been through the normal process of standardising that would take place for live papers.

Further copies of this Mark Scheme are available from aqa.org.uk

Glossary for Mark Schemes

Examinations are marked in such a way as to award positive achievement wherever possible. Thus, for mathematics papers, marks are awarded under various categories.

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

M	mark is for method
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
ft	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
PI	possibly implied
SCA	substantially correct approach
c	candidate
sf	significant figure(s)
dp	decimal place(s)

Q	Answer	Mark	Comments
1 (a)	25	B1	
1 (b)	<p>Error</p> <p>Question 1 is repeated in the 3rd column/3rd column has been mislabelled</p> <p>or</p> <p>Mode is in the same column as 'student'/some will assume 'mode' is a name of a student in the class</p>	E1	oe statement
	<p>Improvements</p> <p>Arrange list in alphabetical or numerical order/ list in ascending/descending order</p> <p>Remove 'Mode' from the last row/change 'Mode' to 'Modal mark'</p> <p>Use 'mean' instead of mode if he wants to analyse the overall performance of these four students</p> <p>Remove the repeated Question 1 heading and replace with Question 2</p> <p>Move "Student" to a new column to the left of the names</p> <p>Add total possible mark for each question</p> <p>Add total possible mark in 'Total mark' heading</p>	E3	oe statements E1 for each valid improvement Ignore any incorrect suggestions

Q	Answer	Mark	Comments
1 (c)	<p>Richard's statement</p> <p>Cannot possibly use this as the maximum mark for Question 1 is not known or the maximum mark could be anything from 3 to 6</p> <p>or</p> <p>Assuming the maximum mark for question 1 is three or four, the statement is correct</p>	E1	oe statement
	<p>Din's statement</p> <p>$(64 + 72 + 40 + 68 + 64) \div 5$</p> <p>or</p> <p>$308 \div 5$</p>	M1	Working out the mean
	61.6(%) or 62(%)	A1	
	<p>Din is wrong/His statement is incorrect/It should be 61.6(%) or 62(%)</p> <p>or</p> <p>Din is right in that it is 60(%) to the nearest 10(%) /to 1 sf</p>	E1ft	oe correct statement ft correct statement for their mean if M1A0 scored

Q	Answer	Mark	Comments
<p>2 (a)</p>	<p>There are no keys to indicate the meanings of abbreviations used (eg Q1/Q4/DTV/ISDN etc)</p> <p>Some data is only for adults/has no data shown for teenagers</p> <p>The number of active 4G mobile subscriptions for 2014 is shown as >6 million (Q1 2014), but this is a range of values/no definite number is shown</p> <p>Some data does not represent the whole year/some is only shown up to May 2014</p> <p>The data for the percentage of premises covered by outdoor 4G in 2013 is missing</p> <p>The two columns are for 2013 and 2014, but in the data some is showing 2012 and 2013/the previous year's figure</p> <p>The percentages of the market shares of fixed broadband providers in the UK in 2014 do not total 100/the percentages of the market shares of fixed line providers in the UK in 2013 do not total 100</p> <p>The method of calculation of availability of superfast broadband appears to have changed between 2013 and 2014</p>	<p>E3</p>	<p>oe examples</p> <p>E1 for each correct example up to E3</p> <p>Ignore incorrect examples</p>

Q	Answer	Mark	Comments
2 (b)	<p>It should be 31.4 (instead of 31.24)/24 minutes = 0.4 hours not 0.24 hours</p> <p>Christopher should divide by 365 (instead of 355)</p> <p>The final answer should 1.03... hours (instead of 1.06)</p> <p>The data was only for one month in 2013, so you can't use it for the whole of the year</p>	E3	<p>oe statements</p> <p>E1 for each correct statement up to E3</p> <p>Ignore incorrect statements</p>

Q	Answer	Mark	Comments
2 (c)	<i>Rasheed's claim</i>		
	$\frac{3}{5} \times 3.9$ or 2.34 (m) or $\frac{8}{5} \times 3.9$ or 6.24 (million) or $6.1 \div 3.9$ or 1.56... or $(6.1 - 3.9) \div 3.9$ or $2.2 \div 3.9$ or 0.56...	M1	
	6.24 (million) and No or 1.56... and No	A1	Correct evaluation of the number of connections needed for the scale factor given or of the actual scale factor
	<i>Francoise's claim</i>		
	33200000×0.379 or 12582800 or 33400000×0.376 or 12558400 or 24400	M1	Allow digits 125828 or 125584
	24 400 and Yes	A1	
	<i>Eugene's claim</i>		
	It is not possible to check/tell/confirm Eugene's statement as the data does not cover an entire year of 2014. or He might be right if the declining trend follows throughout the year or The decline might have happened during the rest of 2013	E1	oe statement

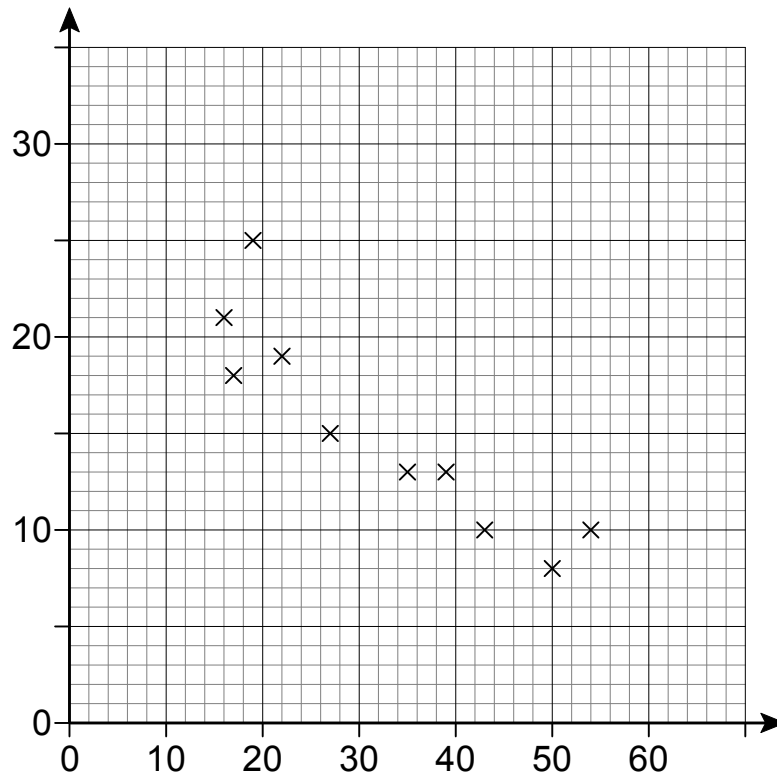
Q	Answer	Mark	Comments
3 (a)	$(z =) (7 - 6) \div 1.5$ or $(z =) 1 \div 1.5$	M1	
	$(z =) 0.\dot{6}$ or 0.667 or 0.67	A1	Any correct rounding
	$1 - [0.74537, 0.74857]$	M1	Correct method for finding $P(X > 7)$ ft their z value if >0
	0.25...	A1ft	ft their z value if >0
	$0.25 < \frac{1}{3}$, so claim is justified	E1ft	correct decision for their 0.25... with M1A1 scored from their z value
	Additional Guidance		
	If candidates use 2.25 instead of 1.5 they can score M0A0M1A1E1		
	Accept rounding to two decimal places or better		
3(b)	Mean of the sample = 6.2	B1	
	Standard deviation of the sample = [1.0657, 1.066] or 1.07 or 1.0296 or 1.03	B2	B1 for variance 1.1357.or 1.06 or 1.136 or 1.14
	They sleep (slightly) longer than the general adult population	B1ft	oe statement ft their sample mean
	Their sleeping hours have a smaller spread than the general adult population	B1ft	oe statement eg less variation or more consistent etc ft their standard deviation

Q	Answer	Mark	Comments
3 (c)	One sd below mean is 4.5 One sd above mean is 7.5	B2	B1 4.5 or 7.5
	J, K and O	B1	

4 (a)	Suitable axes drawn	B1	
	All 10 correct points plotted	B2	B1 8 or 9 correct points plotted

Additional Guidance

Here is one possible completed grid



Q	Answer	Mark	Comments
4 (b)(i)	$w = 26.58 - 0.35a$	B3	oe B2 $y = 26.58 - 0.35x$ or 26.58 and -0.35 seen B1 26.58 or -0.35 seen
	Correct line drawn from at least $a = 20$ to $a = 50$	B2ft	ft their linear equation B1 plots or calculates at least two points from their equation or identifies/plots the mean point at (32.2, 15.2)
	Additional Guidance		
	For B3, B2 or B1 accept values rounded to 1 dp or better from 26.5767... and $-0.3533...$		
	A line of best fit scores 0		
4(b)(ii)	Generally, as age increases by 10 the number of words typed decreases by [3, 4]	E2ft	oe statement for any age increase ft their gradient E1 as age increases, number of words typed decreases
4(c)	Increase the sample size Use the same number of male and female in the study Use the same number/balance ratio of people in each age range i.e 15 – 20, 21 – 30, etc in the study Use the times for typing the whole script	E2	E1 for each valid suggestion or two imperfections identified without suggested improvement Ignore any incorrect suggestions

Q	Answer	Mark	Comments
5 (a)	81.25 (mg)	B1	Mean weight in sample
	1.96 seen	B1	Implied by [2.19, 2.2]
	Their $1.96 \times \sqrt{15} \div \sqrt{12}$ or their $1.96 \times 1.118(03\dots)$ or their 1.96×1.12 or [2.19, 2.2]	M1	
	Their $81.25 \pm$ their $1.96 \times \sqrt{15} \div \sqrt{12}$ or their $81.25 \pm$ their $1.96 \times 1.118(03\dots)$ or their $81.25 \pm$ their 1.96×1.12	M1	
	$81.25 \pm 2.19(\dots)$ or (79.0, 83.5)	A1ft	ft their 81.25 and their 1.96
	Additional Guidance		
	If candidates use 15 or 12 instead of $\sqrt{15}$ or $\sqrt{12}$ they can score B1B1M0M0A0		
5 (b)	82 lies within the 95% confidence interval	E1	oe statement
	The claim could be correct or incorrect or As the Lumusat mean is above the sample mean it is likely to be true	E1	oe statement
6 (a)	Method A = [0.930, 0.931]	B1	
	Method B = [0.947, 0.9475]	B1	

Q	Answer	Mark	Comments
6 (b)	Alternative method 1 – uses equation of regression line		
	Uses method B	B1ft	ft their values in 6(a)
	Uses substitution of 165 into the equation of a regression line as their method	B1	
	$a = 1.84P_A - 136.4$	B2	B1 for 1.84 or – 136.4
	Their 1.84×165 – their 136.4 or $303.6 - 136.4$	M1	
	167(.2) cm	A1ft	ft their equation if their answer is in the range [154, 179]
	Alternative method 2 – draws regression line		
	Uses method B	B1ft	ft their values in 6(a)
	Uses drawing the regression line and finding the required value from it as their method	B1	
	$a = 1.84P_A - 136.4$	B2	B1 for 1.84 or – 136.4
	Draws their line from at least $P_A = 160$ to $P_A = 170$	M1	
	167(.2) cm	A1ft	ft their equation if their line is correctly drawn and their answer is in the range [154, 179]
	Alternative method 3 – draws scatter diagram and line of best fit		
	Uses method B	B1ft	ft their values in 6(a)
	Uses plotting the points, drawing a line of best fit and finding the required value from it as their method	B1	
	Plots points accurately and draws suitable line of best fit	B2	B1 for plotting all points accurately or making at most errors in plotting but then plotting suitable line
	Uses their line to find value of a	M1	

6 (b) cont	167(.2) cm	A1	ft their scatter diagram if their line of best fit is correctly drawn for their points and their answer is in the range [154, 179]
	Additional Guidance		
	If they choose to use the values from the Method A table they can score all the marks only if their values in 6(a) indicated that Method A was the better predictor. If not, they can still score all but the first mark with correct use of the data from Method A.		
	If they use a regression line or line of best fit to find the required value it is preferable that they draw the requisite lines from their line to the axes, but if this is not done still award the mark if their answer is correct for their line.		