AQA

Level 3 Certificate
Mathematical Studies
Mark scheme

Paper 1
1350/1

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.

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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)	Ticks 'primary' and explains that he is collecting the data himself	B1	

Q	Answer	Mark	Comments
1(b)	Ticks 'yes' as **Medians** calculated Hurdlers 233 Distance runners 236 or **Means** calculated Hurdlers 232.(13..) Distance runners 237.(63…) and concludes hurdlers are quicker on average as median/mean is lower or he is correct as median/mean is lower for hurdlers	B2	B1 one correct median/mean and correct ft conclusion with reason or two correct medians/means with incorrect choice
	Compares a second average from median or mean or compares the proportions of hurdlers and distance runners with quick or slow times eg almost half the distance runners took over 240 ms whereas only about a quarter of the hurdlers took over 240ms or eg fewer hurdlers took over 240 seconds	B1	
	Additional Guidance		
	For the final B1 it is not sufficient to say that fewer hurdlers were slow, oe. There must be some indication of the values/times they are comparing		

Q	Answer	Mark	Comments
1(c)	$\dfrac{30}{50}$ × 24 or 14.4 or 14 or $\dfrac{30}{50}$ × 15 or 9 or $\dfrac{30}{50}$ × 11 or 6.6 or 7	M1	
	14 sprinters 9 hurdlers 7 distance runners or 15 sprinters 9 hurdlers 6 distance runners	A1	

Additional Guidance	
The two possible answers allow for rounding 14.4 up to 15 and then ensuring total is 50 or for rounding 6.6 down to 6 first and then ensuring total is 50	
14, 9, 6	M1
15, 9, 7	M1

Q	Answer	Mark	Comments
2	Assumes an amount of exercise per day/week/month	M1	
	Their value per day × 365 or per week × 52 or per month × 12	M1	Allow rounding of 365 or 52 or 12 if explained
	Accurate answer based on their assumed amounts	A1	
	Additional Guidance		
	Assumed amount can be hours or minutes or sessions eg 3 sessions per week.		

Q	Answer	Mark	Comments
3	**Alternative method 1**		
	(11 – 1) × 635 or 10 × 635 or 6350	M1	
	their 6350 × 0.88 (÷11) or 5588 (÷11) or their 6350 × 0.12 or 762 and (their 6350 – their 762) (÷11)	M1	
	£508	A1	
	Alternative method 2		
	635 × 0.88 or 558.8(0)	M1	
	their 558.8(0) × 10 (÷11) or 5588 (÷11)	M1	
	£508	A1	

Q	Answer	Mark	Comments
4	**Alternative method 1**		
	(22 023 – 10 600) × 0.2	M1	
	2284.6(0)	A1	Tax
	22 023 – 8064 or 13 959	M1	
	their 13 959 × 0.12 or 1675.08	M1	NI
	22023 – (their 2284.60 + their 1657.08)	M1	
	18063.32	A1	Annual net pay
	(25 000 – their 18063.32) ÷ 12 or 25 000 – their 18063.32 and 500 × 12	M1	
	Yes and 578.(..) or Yes and 6936.68 and 6000	A1	
	Alternative method 2		
	(22 023 – 10 600) × 0.2 (÷12)	M1	
	2284.6(0) or 190.38	A1	Annual tax or monthly tax
	(22 023 ÷ 12) – 672 or 1835.25 – 672 or 1163.25	M1	
	their 1163.25 × 0.12 or 139.59	M1	NI
	their 1835.25 – (their 190.38 + their 139.59)	M1	
	1505.28	A1	Monthly net pay
	(22023 ÷ 12) – their 1505.28 or 2083.33 – their 1505.28	M1	
	Yes and 578.(..)	A1	

Q	Answer	Mark	Comments
5(a)	Shows/explains their scaling factor and gives reasonable estimate of distance eg 45 miles is about 1cm	M1	
	Measures distance from John O'Groats to Lands End (about 20 cm)	M1	
	Their 20 × their 45 with correct result [500, 1500]	A1	
	Assumption of average distance a car can travel per gallon [35, 60] miles	B1	
	Their distance ÷ their distance per gallon = number of gallons	M1	
	Their number of gallons × 4.5 ×1.1 or their number of gallons × 4.5 ×1.099	M1	
	Cost of journey accurately evaluated for their values	A1	
Additional Guidance		
	Rounding to 1.1 for cost per litre is preferable for an estimate but allow use of 1.099 Allow sensible rounding of interim values		

Q	Answer	Mark	Comments
5(b)	States one refinement eg find the actual distance from Land's End to John O'Groats using internet/sat nav, etc	B1	

Q	Answer	Mark	Comments
6(a)	1.055	B1	

Q	Answer	Mark	Comments
6(b)	**Alternative method 1**		
	1st year (9000 + 4800) × their 1.055 or 13 800 × their 1.055 or 14 559	M1	
	2nd year (their 14 559 + their 13 800) × their 1.055 or 29 918.75	M1	
	3rd year (their 29 918.75 + their 3800) × their 1.055 or 43 718.75 × 1.055	M1	
	(£)46 123.28	A1ft	ft their multiplier in 6(a)
	Alternative method 2		
	1st year (9000 + 4800) × (their 1.055)³ or 13 800 × (their 1.055)³ or 16 204.53	M1	
	2nd year (9000 + 4800) × (their 1.055)² or 13 800 × (their 1.055)² or 15 359.75	M1	
	3rd year (9000 + 4800) × their 1.055 or 13 800 × their 1.055 or 14 559	M1	
	(£)46 123.28	A1	ft their multiplier in 6(a)

Q	Answer	Mark	Comments
6(c)	**Alternative method 1**		
	43 000 – 21 000 or 22 000	M1	
	their 22 000 × 0.09 (÷ 12) or 1980 (÷ 12)	M1	
	(£)165	A1	
	Alternative method 2		
	(43 000 – 21 000) ÷ 12 or 1833.3333	M1	
	their 1833.3333 × 0.09	M1	
	(£)165	A1	

Q	Answer	Mark	Comments
7	**Alternative method 1**		
	$\dfrac{19+1}{4}$ or the 5th item or $\dfrac{19+1}{4}\times 3$ or the 15th item or divides set of numbers into 4 equal sections	M1	Attempts to find lower or upper quartile of Supplier A
	32.5 and 38.5	A2	A1 for one correct value
	IQR of Supplier B = 9	B2	B1 for 33.5 or 42.5 seen
	Supplier A as 6 < 9 or IQR of 6 for A and supplier A as the IQR is lower	B1ft	ft from an attempt at comparing IQR's SC1 no difference/both the same as ranges are both 20
	Alternative method 2		
	$\dfrac{19+1}{4}$ or the 5th item or $\dfrac{19+1}{4}\times 3$ or the 15th item or divides set of numbers into 4 equal sections	M1	Attempts to find lower or upper quartile of Supplier A
	32.5 and 38.5	A2	A1 for one correct value
	Draws box part of box plot for supplier A	B2	Both quartiles correct for their values and joined to form a box B1 for one correctly plotted value drawn as a line
	Supplier A as box is not as wide therefore IQR is smaller	B1ft	ft from an attempt at comparing IQR's SC1 no difference/both the same as ranges are both 20

Q	Answer	Mark	Comments
8(a)	Fully correct histogram 10-50 height 0.3 50-80 height 1.3 80-100 height 1.4 100-120 height 1.05	B2	B1 2 or 3 bars correct or 2 or 3 correct frequency densities seen

8(b)	**Before**: 35 calls above target	B1	65 calls below target
	After: 10 × 1.1 or 11 or 20 × 0.4 or 8	M1	40 × 0.7 or 28 or 30 × 1.4 or 42 or 10 × 1.1 or 11
	Their 35 – (their 11 + their 8) or 16	M1dep	Their 28 + their 42 + their 11 – their 65 or 16
	Decreased by 16	A1	

9	0.003 seen	B1	
	$$\dfrac{0.003{\times}172000(1{+}0.003)^{300}}{(1{+}0.003)^{300}\,{-}1}$$	M2	All values correctly substituted M1 for one error ft their 0.003 Allow 1.003 for 1 + 0.003
	[868,874]	A1	SC3 7151.(…)

Additional Guidance

The SC3 is for use of 25 instead of 300 but with the correct interest rate of 0.003	
An incorrect decimal for the interest can still gain M2 if substituted consistently eg $\dfrac{0.3{\times}172000(1{+}0.3)^{300}}{(1{+}0.3)^{300}\,{-}1}$ or 51 607(.27..) eg $\dfrac{0.03{\times}172000(1{+}0.03)^{300}}{(1{+}0.03)^{300}\,{-}1}$ or 5160 (.72…)	B0M2A0

Q	Answer	Mark	Comments
10	Makes an assumption about the number of cups of coffee sold per store per day with reasoning eg 10 hours per day × 30 cups per hour =300 cups per day	B2	B1 states a number of cups per day
	Their number of cups per day × number of days per year	M1	Number of cups per store per year Allow 365 or any one or two significant figure(s) number from 300 to 400 inclusive
	their number of cups per store × 2000	M1	2000 is number of stores in 2015 to 1sf Allow 1960
	Accurate answer for their values eg 300 × 350 × 2000 = 210 million	A1ft	Total number of cups of coffee ft if their number of cups per store per day = [100, 1000]
	Assumes an average number of grams per cup eg 20	B1	
	their total number of cups of coffee × their 20 ÷ 1000 (÷ 1000)	M1	Total number of kg of coffee beans
	Accurate calculation of number of tonnes based on their total number of cups of coffee	A1ft	ft their total number of cups of coffee with no restrictions on this value