

Mathematics A

General Certificate of Secondary Education

Unit **A502/01**: Mathematics B (Foundation Tier)

Mark Scheme for June 2012

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All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Annotations used in the detailed Mark Scheme.

Annotation	Meaning
✓	Correct
×	Incorrect
BOD	Benefit of doubt
FT	Follow through
ISW	Ignore subsequent working (after correct answer obtained), provided method has been completed
M0	Method mark awarded 0
M1	Method mark awarded 1
M2	Method mark awarded 2
A1	Accuracy mark awarded 1
B1	Independent mark awarded 1
B2	Independent mark awarded 2
MR	Misread
SC	Special case
^	Omission sign

These should be used whenever appropriate during your marking.

The **M**, **A**, **B** etc annotations must be used on your standardisation scripts for responses that are not awarded either 0 or full marks.

It is vital that you annotate these scripts to show how the marks have been awarded.

It is not mandatory to use annotations for any other marking, though you may wish to use them in some circumstances.

Subject-Specific Marking Instructions

- M** marks are for using a correct method and are not lost for purely numerical errors.
A marks are for an accurate answer and depend on preceding **M** (method) marks. Therefore **M0 A1** cannot be awarded.
B marks are independent of **M** (method) marks and are awarded for a correct final answer or a correct intermediate stage.
SC marks are for special cases that are worthy of some credit.

- 2 Unless the answer and marks columns of the mark scheme specify **M** and **A** marks etc, or the mark scheme is 'banded', then if the correct answer is clearly given and is not from wrong working **full marks** should be awarded.

Do not award the marks if the answer was obtained from an incorrect method, ie incorrect working is seen and the correct answer clearly follows from it.

- 3 Where follow through (**FT**) is indicated in the mark scheme, marks can be awarded where the candidate's work follows correctly from a previous answer whether or not it was correct.

Figures or expressions that are being followed through are sometimes encompassed by single quotation marks after the word *their* for clarity, eg FT $180 \times (\textit{their} '37' + 16)$, or FT $300 - \sqrt{(\textit{their} '5^2 + 7^2')}$. Answers to part questions which are being followed through are indicated by eg FT $3 \times \textit{their} (a)$.

For questions with FT available you must ensure that you refer back to the relevant previous answer. You may find it easier to mark these questions candidate by candidate rather than question by question.

- 4 Where dependent (**dep**) marks are indicated in the mark scheme, you must check that the candidate has met all the criteria specified for the mark to be awarded.
- 5 The following abbreviations are commonly found in GCSE Mathematics mark schemes.

- **figs 237**, for example, means any answer with only these digits. You should ignore leading or trailing zeros and any decimal point eg 237000, 2.37, 2.370, 0.00237 would be acceptable but 23070 or 2374 would not.
- **isw** means **ignore subsequent working** (after correct answer obtained).
- **nfw** means **not from wrong working**.
- **oe** means **or equivalent**.
- **rot** means **rounded or truncated**.
- **seen** means that you should award the mark if that number/expression is seen anywhere in the answer space, including the answer line, even if it is not in the method leading to the final answer.
- **soi** means **seen or implied**.

- 6 Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise, indicated for example by the instruction 'mark final answer'.
- 7 As a general principle, if two or more methods are offered, mark only the method that leads to the answer on the answer line. If two (or more) answers are offered, mark the poorer (poorest).

- 8 When the data of a question is consistently misread in such a way as not to alter the nature or difficulty of the question, please follow the candidate's work and allow follow through for **A** and **B** marks. Deduct 1 mark from any **A** or **B** marks earned and record this by using the MR annotation. **M** marks are not deducted for misreads.
- 9 Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures even if this is rounded or truncated on the answer line. For example, an answer in the mark scheme is 15.75, which is seen in the working. The candidate then rounds or truncates this to 15.8, 15 or 16 on the answer line. Allow full marks for the 15.75.
- 10 If the correct answer is seen in the body of working
- and the answer given in the answer space is a clear transcription error allow full marks unless the mark scheme says 'mark final answer'. Place the annotation ✓ next to the correct answer.
 - but the answer space is blank, allow full marks. Place the annotation ✓ next to the correct answer.
 - but a completely different answer is seen in the answer space, then accuracy marks for the answer are lost. Method marks could still be awarded. Use the M0, M1, M2 annotations as appropriate and place the annotation ✖ next to the wrong answer.
- 11 Ranges of answers given in the mark scheme are always inclusive.
- 12 For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work. If in doubt, consult your Team Leader.
- 13 Anything in the mark scheme which is in square brackets [...] is not required for the mark to be earned, but if present it must be correct.

Question		Answer	Marks	Part Marks and Guidance	
1	(a)	Rectangle 7cm by 4cm \pm 2mm	2	B1 for any rectangle outside limits, including square	Accept good freehand and lines "running on" at corners
	(b)	Two diagonals only	1	Mark intention	Condone poor accuracy For other shapes accept all diagonals only
	(c) (i)	Any square drawn Two diagonals only	1 1	 Intended straight	 Roughly connecting opposite corners
	(ii)	[Square] [Diagonals] cross or meet (at) 90° oe or [Diagonals] cross or meet sides (at) 45° oe OR [Rectangle] [Diagonals] cross or meet not (at) 90° oe or [Diagonals] cross or meet sides not (at) 45° oe	1	Cross or meet at equal angles Accept description of lines of symmetry (includes folding) Cross or meet not at equal angles Condone extra statements so long as they do not contradict	eg (italicised are superfluous but not wrong) <i>They are straight and cross at right angles</i> or <i>The sides are the same length and diagonals meet them at 45°</i> or <i>The sides are the same length and diagonals bisect the corners</i>
2	(a)	6.4	2	6.40 or 06.4 B1 for figs 64 Or M1 for attempt to calculate 1.6×4 with evidence of both digits $\times 4$	Condone extra 0s Including $1.6 + 1.6 + 1.6 + 1.6$ implied or $1 \times 4 + [0.]6 \times 4$ Implied by figs 424

Question		Answer	Marks	Part Marks and Guidance	
	(b)	27.3	2	27.30 or 027.30 B1 for figs 273 Or M1 for attempt to calculate $81.9 \div 3$	Condone extra 0s Attempt division leading to 2[.....] 2[...] without division working or division set out as multiplication scores 0
3	(a)	250 or [0].25[0] kg	1	Accept other equivalent forms	

Question	Answer	Marks	Answer and Guidance																																																																						
(b)	<p><i>Their</i> 3.95 saving with all steps in working identifiable and correct money conventions where appropriate (eg 2.40 in FT).</p> <ul style="list-style-type: none"> • $4.4 \times 5 = 22$ • $3.61 \times 5 = 18.05$ • $22 - 18.05 = 3.95$ <p>Or</p> <ul style="list-style-type: none"> • $4.4 - 3.61 = 0.79$ • $0.79 \times 5 = 3.95$ <p>3.95 with incomplete or no working or correct method with one numerical error in working eg 4 parcels or error in subtraction etc or 6.19 or 3.39 or 3.67</p> <p>One correct cost seen for <i>their</i> parcel weight 4.4 or 3.61 or one from 21.4, 20.8, 17.73, 17.41, 14.61</p>	<p>4</p> <p>3 – 2</p> <p>1 – 0</p>	<p>FT <i>their</i> masses from part (a)</p> <p>Condone “adding on” <i>their</i> 3.95 to make <i>their</i> 22 for subtraction</p> <table border="1" data-bbox="1458 280 2078 675"> <thead> <tr> <th colspan="4">Costing 5 parcels</th> </tr> <tr> <th>Mass</th> <th>First class</th> <th>Economy</th> <th>Saving</th> </tr> </thead> <tbody> <tr> <td>30 or less</td> <td>7</td> <td>6.45</td> <td>\$0.55</td> </tr> <tr> <td>50 to 31</td> <td>11</td> <td>9.7</td> <td>\$1.30</td> </tr> <tr> <td>100 to 51</td> <td>15</td> <td>12.6</td> <td>\$2.40</td> </tr> <tr> <td>150 to 101</td> <td>18.5</td> <td>15.35</td> <td>\$3.15</td> </tr> <tr> <td>200 to 151</td> <td>20</td> <td>16.6</td> <td>\$3.40</td> </tr> <tr> <td>250 to 201</td> <td>22</td> <td>18.05</td> <td>\$3.95</td> </tr> <tr> <td>500 to 251</td> <td>41</td> <td>34.5</td> <td>\$6.50</td> </tr> <tr> <td>1kg to 501</td> <td>82</td> <td>55</td> <td>\$27.00</td> </tr> </tbody> </table> <p><u>Attempt</u> one from</p> <p>$5 \times$ <i>their</i> 1st price [22]</p> <p>$5 \times$ <i>their</i> economy price [18.05]</p> <p>or</p> <p><i>Their</i> 1st and <i>their</i> economy correct soi... by</p> <p>4.4 and 3.61 or [0.]79</p> <p>20.8 and 14.61 From grouping</p> <p>20.8 and 17.41 parcels</p> <p>21.4 and 17.73</p> <p>or</p> <p>figs 395</p> <table border="1" data-bbox="1496 786 2029 1181"> <thead> <tr> <th colspan="3">Savings</th> </tr> <tr> <th>Mass</th> <th>One parcel</th> <th>5 parcels</th> </tr> </thead> <tbody> <tr> <td>30 or less</td> <td>0.11</td> <td>\$0.55</td> </tr> <tr> <td>50 to 31</td> <td>0.26</td> <td>\$1.30</td> </tr> <tr> <td>100 to 51</td> <td>0.48</td> <td>\$2.40</td> </tr> <tr> <td>150 to 101</td> <td>0.63</td> <td>\$3.15</td> </tr> <tr> <td>200 to 151</td> <td>0.68</td> <td>\$3.40</td> </tr> <tr> <td>250 to 201</td> <td>0.79</td> <td>\$3.95</td> </tr> <tr> <td>500 to 251</td> <td>1.3</td> <td>\$6.50</td> </tr> <tr> <td>1kg to 501</td> <td>5.4</td> <td>\$27.00</td> </tr> </tbody> </table>	Costing 5 parcels				Mass	First class	Economy	Saving	30 or less	7	6.45	\$0.55	50 to 31	11	9.7	\$1.30	100 to 51	15	12.6	\$2.40	150 to 101	18.5	15.35	\$3.15	200 to 151	20	16.6	\$3.40	250 to 201	22	18.05	\$3.95	500 to 251	41	34.5	\$6.50	1kg to 501	82	55	\$27.00	Savings			Mass	One parcel	5 parcels	30 or less	0.11	\$0.55	50 to 31	0.26	\$1.30	100 to 51	0.48	\$2.40	150 to 101	0.63	\$3.15	200 to 151	0.68	\$3.40	250 to 201	0.79	\$3.95	500 to 251	1.3	\$6.50	1kg to 501	5.4	\$27.00
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Question		Answer	Marks	Part Marks and Guidance	
4	(a)	Acute	1		
	(b)	Sketch of equilateral triangle	1	By eye or indication Equilateral triangle stated but no sketch get 0	If more than one different shape badges, regard as choice and mark the worst
		3 lines of symmetry only	1	Lines intended straight through corners and opposite midpoints If 0 scored then SC1 for sketch of any symmetrical shape or any triangle or any shape with all equal angles	
5	(a)	Point at (10, 103)	1	One square accuracy; may be implied by line ending at point	
	(b)	6 or 7	1	May be implied by figures 107 and 110 in correct statement	The line went up He took longer He was worse Mark the best bit of the statement
		Indication of increased time	1		

Question		Answer	Marks	Part Marks and Guidance	
6	(a)	24 ÷ 3 or teaspoon = 8[g] seen	1		
		8 × 4 or 24 + 8 oe [= 32]	1	Must have operation If 0 scored, then SC1 for 4 teaspoons or 1 $\frac{1}{3}$ tablespoons	Accept 8 + 8 + 8 + 8 24 + 8 or 8 × 4 only scores 1 mark
	(b)	29	2	M1 for [10%] = 58 seen or [1%] = 5.8 or 580 ÷ (10, 20 or 100) or figs 29 as final value	So 1% = 58 scores 0
	(c)	It is less by 138 g or [0].138 kg	5	If not 5 M1 for 5 × 115 soi And M1 for attempt to add all weights in same units A1 for figs 1262 If 0 so far then SC1 for 687[g] And then M1FT for converting <i>their</i> total (may be from SC) to kg or 1.4kg to g And B1dep for agree or disagree with Graham	soi by 575(g) (flour) (May be in total calculation) Must include flour (soi by 1262) but NOT 5 (cups) If total written in kg straight away award A1 and M1 Accept correct approximation or truncation eg 1262g = 1.3 or 1.2 (may be implied by “less by just over 100 g” oe) Dependent on <i>their</i> total in same units as Graham

Question		Answer	Marks	Part Marks and Guidance							
7	(a)	S	1	May be seen on diagram							
	(b) (i)	3	1	Accept $\times 3$ or $+ 3$ or in words	Triple						
	(b) (ii)	24	2	M1 for $8 \times$ <i>their</i> 3 or 12×2 or figs 24							
	(c) (i)	Correct reflection	1	Mark intention							
	(c) (ii)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">The smallest angle in C is the same size as the smallest angle in D.</td> <td style="width: 5%;"></td> <td style="width: 15%; text-align: center;">✓</td> </tr> <tr> <td>The perimeter of C is longer than the perimeter of D.</td> <td></td> <td style="text-align: center;">x or nr</td> </tr> </table>	The smallest angle in C is the same size as the smallest angle in D .		✓	The perimeter of C is longer than the perimeter of D .		x or nr	2	B2 for 0 false Or B1 for ✓ ✓ or □ x or x x	Eg B2 ✓ x ✓ □ Eg B0 x ✓ □ ✓
The smallest angle in C is the same size as the smallest angle in D .		✓									
The perimeter of C is longer than the perimeter of D .		x or nr									
8	(a)	[£]17.4 to 17.8 18	1 1								
	(b)	(£)2.1[0] - 2.3[0]	1								
	(c)	$C = 2b$ oe	2	Accept $C = 2 \times b$ or $b = \frac{1}{2}C$ oe B1 for $2b$ (no subject) $C = 2$ or $b = \frac{1}{2}$	Includes $b = 2C$ Do not accept $C2b$ or other misplacements of C						
	(d) (i)	7	2	M1 for $15.4 \div 2.2$ soi	Implied by $7C$ or $7b$ for 1 mark						

Question			Answer	Marks	Part Marks and Guidance	
		(ii)	27.5 is not a multiple of 2.2 oe or 27.5 is more than 22 and the formula only goes up to 10 bags	2	M1 for $27.5 \div 2.2$ or 27.5 is for 12.5 bags or 27.5 is for 13.[...] bags B1 for comment implying that 27.5 can't be for a whole number of bags or the formula only goes up to 10 bags or [£]22	
	(e)		[No] 10 cost the same as 11 [bags] oe	1	Statement must imply same price for 10 as 11 "Yes"..... scores 0	It's the same as 11 11 is the same price Buy 11, it costs the same as 10 She can get more for the same price
9	(a)	(i)	No correlation / relation(ship) oe	1		Allow 'None', 'No pattern' Not 'Random', 'No', 'Neutral'
		(ii)	'No' + reasonable comment about the lack of correlation	1	Yes with or without reason scores 0	Comment must describe zero correlation or give an example where increased height does not give decreased temp. Mark best bit
	(b)	(i)	Labelled scatter graph of latitude against average temp	4	B2 for both axes scaled and labelled Or B1 for one axis scaled and labelled or for both axes either scaled or labelled AND B2 for ≥ 9 points correctly plotted Or B1 ≥ 4 points correctly plotted If 0 scored then SC1 for attempt at graph of latitude against height	Overlay available Scale must fit on grid and be linear ie not labelling latitude as 0, 4, 8, 15 etc ie 2, 1 or 0 wrong points Mark points within range of <i>linear</i> scale covering most points Tolerance ± 1 whole square Ignore any line of best fit or other trend line

Question			Answer	Marks	Part Marks and Guidance
		(ii)	'Yes', 'No', 'Partially', 'Maybe' etc and convincing explanation relating to whole data set	2	<p>B1 for 'Yes' or 'No' and partial explanation Mark best part for B1</p> <p>Complete Temp between latitude 0° and 15° are high, then they drop and beyond latitude 30° to 35° they are cooler. Apart from Khartoum, temperatures from 0° to 30° are about the same, then there is a negative correlation There is a (weak) negative correlation meaning that countries near the equator are warmer. Two points are outliers Yes only Khartoum is wrong Yes but first 3 are wrong</p> <p>Partial Countries near the equator are warmer or Countries far from the equator are cooler or No – negative correlation Yes – negative correlation</p>
10	(a)	(i)	$\frac{7}{24}$ final answer	2	<p>M1 for common denominator ie $\frac{x}{24n}$</p> <p>0 for decimals in (i) and (ii)</p>
		(ii)	$3\frac{1}{3}$	3	<p>B2 for $\frac{10}{3}$ or $3\frac{2}{6}$ oe</p> <p>Or M1 for $\frac{5}{6} \times \frac{4}{1}$ soi by $\frac{20}{6}$</p> <p>If 0 scored then SC1 for any correct conversion from top heavy to mixed or for correct cancelling of any fraction</p> <p>isw after a correct or partially correct answer</p> <p>Condone 3.3 for 3 marks 3.3 etc scores 0</p> <p>eg $\frac{20}{24} = \frac{5}{6}$</p>

APPENDIX 1

Exemplar responses for question 1c(ii)	Reason	Mark awarded
Rectangle diagonals are longer than square diagonals	Not necessarily true	0
A square has all four sides the same length but a rectangle has 2	No correct diagonal fact	0
Square diagonals match the dots and the rectangles don't	Not 90 degrees	0
They are different angles	Does not say cross at	0
The triangles that are formed after drawing the diagonals will be a different size	Does not describe diagonals	0
The angles they meet the edges are different on the rectangle but they are the same on the square	Equivalent to 45 degrees	1
A square can fold from corner to corner but a rectangle can't	Enough to imply symmetry	1
You can match the two corners of a square when folded diagonally but not rectangles	Enough to imply symmetry	1
The angles are all the same in a square's diagonals	True at centre or edge (condone not crossing point)	1

Exemplar responses for question 5b	Reason	Mark awarded
7 His progress decreased	Decreasing progress implies that the reduction in times reduced	2
7 His time increased from 107 to 110	Accept	2
6 His time has gone back to the same as his third and he improves otherwise	Implies that it has gone up	2
7 He was getting better then all of a sudden goes bad <i>and gets a lower mark than week 5 and 6</i>	Award for first part of statement	2
6 He stops on week 6 and it goes straight up on week 7 <i>showing he recovered from his injury</i>	Award for first part of statement	2
7 It is one that is different from the rest	Does not explain different	1
7 Significant drop in lap time	7 gets the mark but the time appears to be decreasing	1

Exemplar responses for question 8d(ii)	Reason	Mark awarded
It is never that expensive	No mention of £22	0
Because the figures after the decimal point will always be even as you are multiplying by 2.2	Implies, "Not a multiple of 2.2"	2
Because there isn't an amount of bags of logs that will cost £27.50	Implies "Not a whole number of bags"	1
You can't have half a bag	True	1
It would have gone over the total number of bags	Does not say maximum is 10 bags	0
Because it is from 1 to 10 and 10 is only £22	Gets the mark for max 22 but does not say 27.5 is more	1
Because isn't a whole number of logs	Implies "Not a whole number (of bags)" BOD	1
Because it doesn't go up in 50s	True but irrelevant	0
Because you would end up with 13.4 logs	Condone "logs" for "bags"	1
It could never be that 27.5 as there is a gap in the graph and the number of bags is higher	Doesn't imply "Not a whole number"	0

Lizzie implies negative correlation so the comment has to describe no correlation or show that there is no negative correlation.

Exemplar responses for question 9a(ii)		Reason	Mark awarded
No	The highest point is hotter than the lowest	Uses two cities to contradict negative correlation	1
No	Some of the cities near sea level are still colder than some cities that are not		1
No	There is no clear pattern whether the temperature increases. At 580m it is 20°C, which is what it was at, at 12m		1
No	If you look at the graph places that are closer to sea level are cold and warm		1
No	There is a wide variety of temperatures at the same height above sea level		1
No	The highest above sea level is 530m and only 20°C whereas 280m above sea level is 33° C	This figure supports negative but should contradict it or suggest zero correlation	0
No	The temperature around 10m above sea level varies a lot		1
No	Lizzie's view would require a negative correlation but there is no link between height and temperature		1
No	There is no relationship or correlation between temperature and height above sea level		1
No	The correlation is weak for example at 357m the temperature is 34°C which is higher than the rest	Correlation weak gets the mark as the best bit	1
No	In general the higher it is the warmer it is, there is no correlation		1
No	If it did there would be a strong negative correlation	"Would be" implies it is not there	1
No	The highest point above sea level is the same as the lowest	Temperature not mentioned	0
No	It also gets cooler after a high amount of sea level change		0
No	The 2 lowest temperatures are at sea level	Contradicts negative though not true for all	1
No	Places that are higher have a higher average temperature	Contradict negative	1
No	The cities with lowest sea level are the coolest	False statement	0
No	The graph does not prove that the higher the sea level the higher the temperature because there isn't positive correlation	False statement reveals misunderstanding	0
No	The higher the sea water the higher the temperature making it hotter	False	0

Exemplar responses for question 9a(ii) ctd		Reason	Mark awarded
No	Places that are higher are also hot, for example Khartoum	Specific example contradicting negative	1
No	The results are far too scattered to give any strong data	Too scattered implies no correlation	1
No	It doesn't have a readable pattern	Describes no correlation	1
Yes	Most of the results that are closer to sea level area hotter with exceptions in one answer	Yes scores 0	0
No	The sea level can be low and the temperature still be high	Just repeats view and does not imply no correlation	0
No	The results are all different to what Lizzie said	Doesn't imply no correlation	0
No	The lower the height above sea level the lower the temperature	Implies positive correlation and contradicts negative	0
No	At 580m it is warmer than 380m	False	0
No	Most of the temperatures are similar	Not true	0
No	The temp varies depending on the weather	Maybe true but not relevant	0

Exemplar responses for question 9b(ii)		Reason	Mark awarded
Yes	Because the further away from the equator you get the colder it gets, however there a few anomalies just north of the equator that are hottest	Implies ones near equator are anomalous	2
Yes	After the latitude goes past 15 the average June temperature decreases	"After" implies "not decreasing" before 15	2
Yes	Because in general, except for a few points, temperature rises as you get closer to the equator		2
Yes	Most of the time the temperature decreases as the latitude increases	"Most of the time" implies anomaly	2
Yes	It does show that the closer you got to the equator the hotter it got. But when you got really close it seemed to cool down	Describes whole data set	2
Mostly	With the exceptions of latitudes 0-14, the lower the latitude the hotter the temperature. However, Libreville, Bangui & Freetown do not follow this pattern.	Describes whole data set	2

Exemplar responses for question 9b(ii) ctd		Reason	Mark awarded
Yes	The closer you get to the equator the temperature generally gets warmer. However, when it reaches 8 degrees and after of the equator, the temperature generally drops.	Describes whole data set	2
Yes	There is negative correlation between temperature and distance from the equator (cities near the equator are warmer)	Partial, only some of the nearer ones are warmer	1
Yes	At 15° latitude the temperature is 34°C and at 59° the temperature is 15°C	Partial, describes elements of negative correlation	1
Yes	The closer you are to the equator the hotter you will be	Partial, does not describe fluctuation at 15	1
Yes	It shows the closer you are to the equator the higher the temperature	Partial, describes elements of negative correlation	1
Yes	The graph shows that the closer it is to the equator the warmer it gets as it has weak negative correlation	Partial, describes elements of negative correlation	1
Yes	There is a strong negative correlation-the further away from the equator, the colder the June average temperature	Partial, describes elements of negative correlation	1
Yes	Roughly the smaller the latitude the higher the temperature	Partial, describes elements of negative correlation	1
No	As temps nearer the equator are about 25°C, whereas the highest temp recorded, 34°C was at latitude 15° - a lot hotter than nearer the equator	Partial, picks out anomaly	1
No	Khartoum's average June temperature is 34°C and that isn't the closest city to the equator	Partial, describes anomaly	1

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