MARKSCHEME

SPECIMEN

MYP MATHEMATICS STANDARD

ON-SCREEN EXAMINATION

17 pages

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The markscheme may make use of the following abbreviations:

- Bullet notation means award 1 mark – see example 1 below

ECF Marks that can be awarded as **error carried forward** from previous results in the question

WTTE words to that

BOD Benefit of the doubt

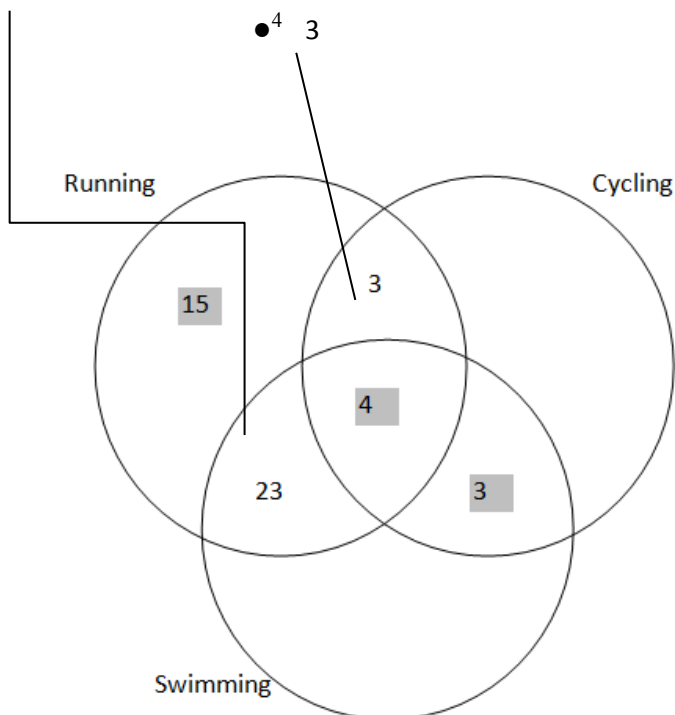**MR** misread

NWS no working shown

SC special case

Example 1
- 1 mark awarded and corresponding notes are aligned

b			
	• Show clear line of reasoning in working	45 & 49 seen or equivalent e.g. $49 = 45 + x$	**2**
	• 4	**ACCEPT** 45+X/10=4.9 **and** Ans 4	

		Answers	Notes	Total
1		• Correctly plotted line	At least 10 units long	
		• point A (-4,1) correctly plotted • point B (8,1) correctly plotted	Guidance for point tolerance providing the area of the point covers the correct coordinate.	
		• Both points C lie on x=2	**ACCEPT** line x = 2	
		• Reflective symmetry in the line y =1	**ACCEPT** both C's on line y = 1, providing they are both within 10 units from A or B	
		• Selecting the appropriate mathematics	*For example: correct substitution of points into distance formula* $$d = \sqrt{\left(x_1 - x_2\right)^2 + \left(y_1 - y_2\right)^2}$$ Pythagoras theorem: Mark correct methods indicating a right angled triangle with lengths 6,8,10 **ACCEPT** intersecting circles with radius 10 and centre A & B Point tolerance providing the area of the point covers the correct coordinate.	**7**
		• Both y coordinates of C correct -7 & 9	Correct position for C without shown method: award 3 marks	

2	a	• 5			1
	b	• Show clear line of reasoning in working	45 & 49 seen or equivalent e.g. $49 = 45 + x$		2
		• 4	**ACCEPT** 45+X/10=4.9 **and** Ans 4 Answer 4 without method: award 1 mark		
	c	• Attempting to calculate mean with additional grades of 1 *or* 7			4
		• Mean 4.5454 with additional grade of 1 *or* Mean 5.0909 with additional grade of 7	1 correct mean		
		• Both means seen *and* difference= 0.5454	Candidate might round here		
		• Answer to 2 significant figures: 0.55	**ACCEPT** 2 sig fig value **only**		

3	a	• 12 seen	Note: If method contradicts award 0 marks	4
		• Use of Pythagoras	Follow through incorrect PR>12 any clear use of Pythagoras e.g. $x^2 = 12^2 - 4^2$ or $x^2 = their 12^2 - 4^2$	
		• 11.3	= 11.3 (or 11 or 11.3137085 oe) ECF for any incorrect PR >12	
		• (Length of PQ=) $\sqrt{128}$ **or** $8\sqrt{2}$ (units not required)	11.3 given for final answer with correct method: award 3 marks 11.3 given for final answer without method: award 2 marks **DO NOT AWARD** final mark if not in exact surd form. **DO NOT ACCEPT** 11 unless method is seen	
	b	• any correct trig ratio $\cos PRQ = \dfrac{4}{12}$ or $\sin \dfrac{their\ a}{12}$ or $\tan \dfrac{their\ a}{4}$	eg $\cos PRQ = \dfrac{4}{12}$ **ACCEPT** ecf PR>12 from (a) **or** use of their PQ **ACCEPT** ecf only for a correct trig ratio	3
		• 70.529		
		• 71	ecf their angle 71 without method: award 2 marks 70.5 without method: award 1 mark Any other answer seen without method: award 0 marks	

| 4 | a |
• ^{1} Any two correct
• ^{2} A third correct

• ^{3} 23

 | 4, 15, 3
• ^{1} 1mark for any two correct
• ^{2} 2 marks for all three correct

All three correct 2 marks

• ^{3} 23 is found by 50 – 15 -12

• ^{4} 3 depends on 23, it is 45 – 15 -23 -4, do not award ecf | 4 |
| | b | • ^{5} **Must** sum **their** values from the diagram
Correct answer = 60 | • ^{5} ecf from numbers on their diagram.
60 following an incorrect diagram has been seen: award 0 marks. | 1 |

5	a	• 1 correct intercept		4
		• 2nd correct intercept or correct gradient	The line passes through a correct point	
		• Fully correct line	Extended beyond the two intercepts	
		• Correct solution set (above their line) identified with REGION icon	allow alternative text only methods for identifying region 'this side' **DO NOT ACCEPT** shading or the word "shade"/ "shading"	
	b	• All 5 strict inequalities $\geq$ or $\leq$ • three correct • all five correct $\quad x \geq 0$ $\quad y \geq 0$ $\quad x + 2y \leq 16$ $\quad 2x + y \leq 24$ $\quad y \leq x + 4$		3

6	a	• -1,1 seen	minimum **and** maximum both needed **ACCEPT** "-1 and 1"	2
		• $-1 \leq y \leq 1$ or $y \in [-1,1]$	correct notation of range for $y \,/\, f(x) \,/\, \sin x$ **ACCEPT** $1 \geq y \geq -1$: award 2 marks y = (-1,1) **or** [-1,1]: award 1 mark – notation not fully provided	
	b	• One transformation fully described or both transformations with limited information • The other transformation fully described	For example: Translated upwards 2 (vertically+2) units For example: Vertical stretch factor 3 **ACCEPT**: vertical dilation for stretch **ACCEPT**: vertical shift for translate **DO NOT ACCEPT**: distortion or amplitude or amplified or multiplied To be fully described we need to see stretch/vertical dilation **and** translation/vertical shift/moved up	3
		• Correct order of transformations: stretch (x3) **then** translate (2) or translate ($+\frac{2}{3}$) **then** stretch (x3) **And** in place of **then** is enough to get the mark	Order needs to be specified. A list is usually sufficient. A numbered list gets the mark. Limited descriptions without a factor do not get the last mark for order as the order differs depending on the factors used.	
	c	• -4 seen • 6 seen	**ACCEPT** incorrect notation here Other working may indicate that the candidate does not understand what the range is and may deny the mark	2

7		• One correct comment made on the " student's conclusion" • 2 correct reasons • 3rd correct reason		
		3 **different** mathematical reasons Appropriate discussion seen for each reason Any three from time of day, day of week, sample method, sample size, location, question flaws or bias • 1st correct discussion • 2nd correct discussion • 3rd correct discussion	*for example:* *Reason: only one locality is sampled* *Discussion: locality might be poorer or richer than average so location is a factor* *Reason: pride may prevent a person saying they live in poverty* *Discussion: responses not likely to be honest* *Reason: No sampling method is used* *Discussion: survey not likely to be representative / Government data could be angled to support an agenda/ potential bias*	6

8	a	• 1.495 x 10^6 (EUR) only	**DO NOT ACCEPT** 1.495 x 10^6, 1.495 x 10 to the power 6	**1**
	b	• (185 000 000 (DKK) only		**1**
	c	• 6000000 x 1.50718	Misread with correct method: award 1 mark	**2**
		• 9043080 (CAD)	9043080 without method: award 1 mark Ignore incorrect currency	
	d	• 250000000/1.50718	Ignore incorrect currency	**3**
		• 165872689.40	165872689.40 without method: award 1 mark	
		• 165872689 (EUR)	165872689 without method: award 2 marks	
	e	• e.g. 170 million (EUR) or 170 000 000 etc	Ignore incorrect currency **ACCEPT** other accurate rounding to no greater than 3 significant figures. **SC ACCEPT 165 000 000**	**2**
		• Suitable justification provided	**ACCEPT** any suitable justification **ACCEPT** other accurate regional notation e.g. 165 872 689 and 165,872,689 and 165.872.689	

9	a	• (14000+26000+41000+61000)÷4	Acceptable method to find the mean Calculator screen shot accepted (If stats function used on calculator – correct value must be selected for 1 mark)	2
		• 35 500	35 500 without method: award 1 mark	
	b	• $\left\lvert\dfrac{13849-14000}{13849}\right\rvert \times 100\%$	Correct substitution **ACCEPT** if the substitution is made without the absolute value notation	3
		• -1.090331432	If -1.09 seen without method: award 1 mark only	
		• 1.09 (%)	(Their) percentage answer positive **and** correct to 2 dp If 1.09 seen without method: award 2 marks only	
	c	• Growing/increasing/positive gradient	For any suggestion of increasing/adding/going up. e.g. It is more: award 1 mark	2
		• <u>Increasing</u> rate/exponential	Any suggestion of an exponential increase. e.g. It is increasing more and more: award 2 marks Exponential only: award 1 mark	
	d	• The business will need to grow/increase/they will need to grow etc	OWTTE e.g. how much more food packages they will need e.g. they can estimate how many packages in the next year e.g. they will have an idea of the demand from (c) e.g. continue opening new food bank	1

e		Mark holistically				**6**
		Strand	1	2		
		Prediction	any value above 62 000	AND in range 82 000 to 100 000		
		Strategy	valid (incorrect or weak strategy)	valid and correct		
		Justification/ Makes sense in context	justification attempted (even to incorrect strategy or inaccurate values)	justification correct		
		ACCEPT strategy seen in the table, for example writing differences in the columns or identifying percentage increase.				

10	a	• 0.72	Or equivalent correct percentage, fraction **ACCEPT** simplified fraction **DO NOT ACCEPT** 72 out of 100	1
	b	• (their 0.72) ^{2} • 0.52 *rounding not required*	*their* answer from part 10a **ACCEPT** 0.5184... or equivalent **ACCEPT** 0.5183... (without replacement method) $\dfrac{2592}{3600} \times \dfrac{2591}{3599}$	2

10	c	Strand	Holistic Mark-scheme	Mark band		10
		Factors FAC:	Factor not seen	**0**		
		Apply strategy APP:	Application not seen			
		Factors FAC:	One factor is identified;	**1 - 2**		
		App strategy APP:	An attempt to apply stated ratio to BRL 10 000 BRL			
		Factors FAC:	Two factors identified but these are not linked;	**3 - 5**		
		Select strategy SEL:	The factors modelled to the 10 000 BRL			
		Apply strategy APP:	The 10 000 BRL shared between the communities			
		Solution SOL:	Discuss whether their answer makes sense			
		Factors FAC:	Two factors identified and linked	**6 - 8**		
		Select strategy SEL:	Valid new ratio stated			
		Apply strategy APP:	New ratio applied to 10 000 BRL and shared between the communities			
		Solution SOL:	Explain whether their answer makes sense			
		Factors FAC:	Two or more linked factors including a rate identified for both communities; two or more factors correctly combined for both communities	**9 - 10**		
		Select strategy SEL:	Correct new ratio stated			
		Apply strategy APP:	New ratio correctly applied to 10 000 BRL and correctly shared between the communities			
		Solution SOL:	Explanation and justification of whether their answer makes sense			
		SC ratio not stated but the funding is divided: award 2 marks				

11	a	• 49 • 64		2
	b	• (the pattern is) the square numbers	OWTTE e.g. The term squared	1
	c	• Working (e.g $25 = 5^2$) must be shown and a correct general rule (e.g $x_n = n^2$)	any reasonable alternative expressed as a general rule $t^2 = n$ method can be rewarded if seen in 11d	1
	d	• Attempt to verify the rule with one number beyond the sequence provided • Correct verification of the rule with one number beyond the sequence provided	If candidates use a number within the sequence this counts as method for part 11c	2

12	a	• Evidence of squaring minimum $5^2 + 12^2 = 13^2$ • Evidence of equating $5^2 + 12^2 = 13^2 = 169$	**DO NOT ACCEPT** inappropriate notation e.g. 5^2+12^2=13^2	2
	b	<table><tr><td>**row**</td><td>**a**</td><td>**b**</td><td>**c**</td></tr><tr><td>**1**</td><td>**3**</td><td>**4**</td><td>**5**</td></tr><tr><td>**2**</td><td>**5**</td><td>**12**</td><td>**13**</td></tr><tr><td>**3**</td><td>**7**</td><td>**24**</td><td>**25**</td></tr><tr><td>**4**</td><td>**9**</td><td>**40**</td><td>**41**</td></tr><tr><td>**5**</td><td>**11**</td><td>**60**</td><td>**61**</td></tr><tr><td>**6**</td><td>**13**</td><td>**84**</td><td>**85**</td></tr><tr><td>**7**</td><td>**15**</td><td>**112**</td><td>**113**</td></tr></table>	Award 1 mark for each correct value inserted into the table	
	c	• one pattern correctly described in words • A second pattern correctly described in words (different)	NOTE: for "a an odd number, b even number and c odd number" : award 1 mark only **ACCEPT** pattern described as a formula	2

	d	**First general rule**
		• Suggest a general rule i.e. formula
		• Attempt to apply mathematical technique
		• Correctly apply mathematical technique
		    Second general rule
		• Suggest a general rule i.e. formula
		• Attempt to apply mathematical technique
		• Correctly apply mathematical technique
		    Example of general rules
		
		$a_n = 2n + 1$
		
		$b_n = 2(n^2 + n)$
		
		$c_n = 2(n^2 + n) + 1$
		
		$c_n = b_n + 1$
		
		$a_n^{\,2} = 2b_n + 1$
			Others are possible and should be rewarded
			For values identified in the search of each general rule i.e. the common difference: award 1 mark
				6

	e	• Attempt to verify one rule with a number beyond the sequence provided • Attempt to verify the second rule with a number beyond the sequence • Correct verification of one rule with one number beyond the sequence provided • Correct verification of second rule with two numbers beyond the sequence provided	Candidates must verify with numbers beyond the sequence. **Methods using numbers within the sequence here may be considered as support to part d. Award marks in d if that is the case.**	**4**

12	f		Strand	Holistic markscheme	Mark band
			Discover patterns DIS:	No pattern seen; no triple is found	0
			Describe patterns DES:	No prediction is made	
			Discover patterns DIS:	One triple is found	1 - 3
			Describe patterns DES:	Prediction stated is consistent with findings	
			Discover patterns DIS:	More than one triple is found	4 - 6
			Describe patterns DES:	A pattern is clearly described Prediction stated is consistent with findings; suggests a general rule; lines of reasoning are complete	
			Discover patterns DIS:	More than one triple is found	7 - 9
			Describe patterns DES:	Prediction stated is consistent with findings; two patterns described as general rules consistent with findings; evidence of testing; lines of reasoning are complete and correct	
			Prove, verify, justify PVJ:	A general rule is verified only	
			Discover patterns DIS:	More than one triple is found	10 - 12
			Describe patterns DES:	Two patterns correctly and clearly described and a further complex pattern found; Prediction stated is consistent with findings; lines of reasoning are complete, correct and the structure of the response is logical	
			Prove, verify, justify PVJ:	A general rule is found and fully proved *or* verified and justified	

SC two or more correct triples in the table with no supporting method: award 2 marks

The triples cited must not duplicate those provided in the question and must satisfy the conditions **b>a**

					120