MARKSCHEME

SPECIMEN

MYP MATHEMATICS EXTENDED

ON-SCREEN EXAMINATION

17 pages

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
oe **or equivalent**

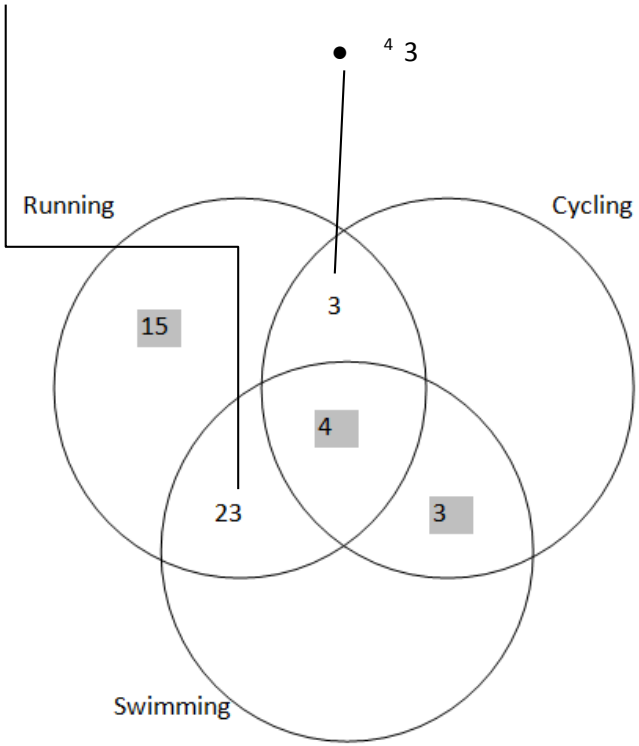
Example 1
- 1 mark awarded and corresponding notes are aligned

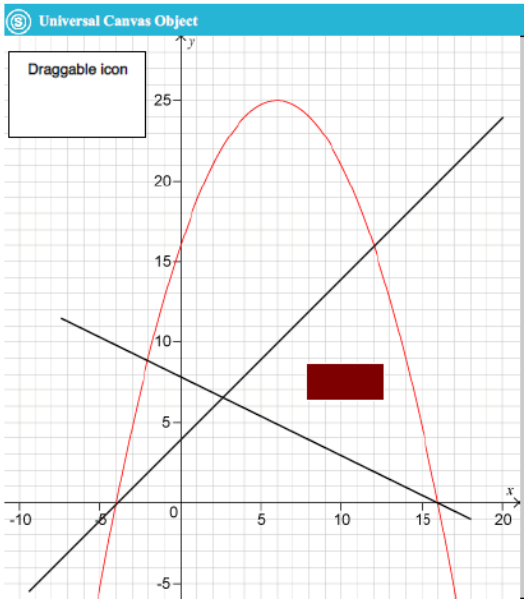
b	• Show clear line of reasoning in the method • 4	45 & 49 seen or equivalent e.g. $49 = 45 + x$ **ACCEPT** 45+X/10=4.9 **and** Ans 4	**2**

		Answers	Notes	Total
1	a	• $\cos X = 8/(3\times 7)$ • $(angle\ X =) 67.6(°)$ ***or*** 1.18 (radians)	Correct substitution into formula **ACCEPT** answers which round to $67.6(°)$ or 1.18. Do **not** penalize for extra significant figures.	**2**
	b	• $c^2 = 3^2 + 7^2 - 2.3.7.(8/21)$ • $c^2 = 58 - 16 = 42$ • $c = 6.48$ ***or*** $\sqrt{42}$	Correct substitution into cosine rule Do **not** penalize for extra significant figures.	**3**
	c	• Any sensible example		**1**

2	a	• Show clear line of reasoning in working • 4	45 and 49 seen or equivalent e.g. $49 = 45 + x$ **ACCEPT** 45+X/10=4.9 **and** Ans 4 Answer 4 without method: award 1 mark	**2**
	b	• Attempting to calculate mean with additional grades of 1 ***or*** 7 • Mean 4.5454 with additional grade of 1 ***or*** Mean 5.0909 with additional grade of 7 • Both means seen ***and*** difference= 0.5454 • Answer to 2 significant figures: 0.55	1 correct mean Candidate might round here **ACCEPT** 2 sig fig value **only**	**4**
	c	• the standard deviations are the same	**DO NOT ACCEPT** references to the mean	**1**

3	a	• $\frac{\pi}{10}$		**1**
	b	• $0.5\times\frac{\pi}{10}\times168^2 (=4433.415553)$ • 4433 (mm^2)	*oe in an alternative unit for example cm^2*	**2**
	c	• substitute into correct formula • correct substitution $\sqrt{5^2+15^2-(2\times5\times15\times\cos\frac{2\pi}{3}^\circ)}$ • correct answer 18.03 (mm)	*oe in an alternative unit for example cm*	**3**

4	a	• [1] Any two correct • [2] A third correct • [3] 23 • [4] 3  	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	**3**
	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**

<table>
<tr>
<td>5</td>
<td>a</td>
<td>
• y= x +4 intercepts (-4,0) and (0,4)
• x+2y=16 intercepts (0,8) and (16,0)
• correct region identified


</td>
<td>Lines correctly plotted</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td>
• showing clear line of reasoning in working
• draw conclusion
• (Maximum P=) 68
</td>
<td>
eg table
<table>
<tr><td>12</td><td>16</td><td>68</td></tr>
<tr><td>16</td><td>0</td><td>48</td></tr>
<tr><td>$\frac{8}{3}$</td><td>$\frac{20}{3}$</td><td>no need to test</td></tr>
</table>
Answer 68 with justification no method: award 2 marks
Answer 68 with no justification and no method: award 1 mark
</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>c</td>
<td>
• $f^{-1}(x) = -2x + 16$
• $-2x + 3 = 8 - 0.5x$
• $x = \frac{16}{3}$
</td>
<td></td>
<td>3</td>
</tr>
</table>

6	a	• $(u_1 =) 2$		**1**
	b	• $(d =) 3$		**1**
	c	• $(u_8 =) 2 + 3(7)$ • $(u_8 =) 23$	**ACCEPT** $\log_2(8\,388\,608)$ 23 **and** states **full** list: award 2 marks Partial correct list: award 1 mark	**2**
	d	**METHOD 1** • Use of correct formula • $\frac{20}{2}(2(2) + (20-1) \times 3)$ • 610	correct substitution 610 **and** states full list to find S_{20} : award 3 marks Partial correct list at least 10 terms: award 2 mark Partial correct list at least 5 terms: award 1 mark	**3**

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	• 6000000 x 1.50718 • 9043080 CAD	Misread with correct method: award 1 mark 9043080 without method: award 1 mark Ignore incorrect currency	**2**
	b	• 250000000/1.50718 • 165872689.40 EUR • 165872689 EUR	Ignore incorrect currency 165872689.40 without method: award 1 mark 165872689 without method: award 2 marks	**3**
	c	• e.g. 170 million (EUR) or 170 000 000 etc • Suitable justification provided	Ignore incorrect currency **ACCEPT** other accurate rounding to no greater than 3 significant figures. **SC ACCEPT 165 000 000** **ACCEPT** any suitable justification **ACCEPT** other accurate regional notation e.g. 165 872 689 and 165,872,689 and 165.872.689	**2**
	d	• 40 000 000 CAD = 26528541.39 EUR • $\frac{185000000}{their(26528541.39)}$ • 6.97362125 (DKK)	*their* value from a correct method **ACCEPT** rounded answer 6.971 (DKK) Correct answer without method: award 2 marks	**3**

9	a	• $\left\lvert\frac{13849-14000}{13849}\right\rvert\times 100\%$ • –1.090331432 • 1.09 (%)	Correct substitution **ACCEPT** if the substitution is made without the absolute value notation If –1.09 seen without method: award 1 mark only (Their) percentage answer positive **and** correct to 2 dp If 1.09 seen without method: award 2 marks only	**2**
	b	• Growing/increasing/positive gradient • <u>Increasing</u> rate/exponential	For any suggestion of increasing/adding/going up. e.g. It is more: award 1 mark Any suggestion of an exponential increase. e.g. It is increasing more and more: award 2 marks Exponential only: award 1 mark	**2**
	c	• 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**

d

Mark holistically		
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.

6

10	a	• [1] • [2] $\left(\frac{4}{9}\times 0.72\right)+\left(\frac{5}{9}\times 0.81\right)$ • 0.77	• [1] correct values in the brackets • [2] adding values 0.77 without method: award 1 mark	**2**
	b	• $\frac{5\times 0.81}{9\times 0.77}$ • 0.58	ecf from part a Accept 0.58(44516...) 0.58 without method: award 1 mark Incorrect answer without method: 0 marks	**2**

w

10 c

Strand	Holistic Mark-scheme	**Mark band**
Factors FAC: Apply strategy APP:	Factor not seen Application not seen	**0**
Factors FAC: App strategy APP:	One factor is identified; An attempt to apply stated ratio to 20 000 BRL	**1 - 2**
Factors FAC: Select strategy SEL: Apply strategy APP: Solution SOL:	Two factors identified but these are not linked; The factors modelled to the 20 000 BRL The 20 000 BRL shared between the communities Discuss whether their answer makes sense	**3 - 5**
Factors FAC: Select strategy SEL: Apply strategy APP: Solution SOL:	Two factors identified and linked Valid new ratio stated New ratio applied to 20 000 BRL and shared between the communities Explain whether their answer makes sense	**6 - 8**
Factors FAC: Select strategy SEL: Apply strategy APP: Solution SOL:	Two or more linked factors including a rate identified for the communities; two or more factors correctly combined for the communities Correct new ratio stated New ratio correctly applied to 20 000 BRL and correctly shared between the communities Explanation and justification of whether their answer makes sense	**9 - 10**

10

		SC ratio not stated but the funding is divided: award 2 marks	

<table>
<tr><td>11</td><td>a</td><td>• n+2
• $x_n=(n+2)^2$</td><td>or any reasonable alternative expressed as a general rule</td><td>2</td></tr>
<tr><td></td><td>b</td><td>• Attempt to verify the rule with one number beyond the sequence provided
• Correct verification of the rule with one number beyond the sequence provided</td><td></td><td>2</td></tr>
</table>

<table>
<tr><td>12</td><td>a</td><td>• Evidence of squaring minimum $5^2+12^2=13^2$
• Evidence of equating $5^2+12^2=13^2=169$</td><td>DO NOT ACCEPT inappropriate notation e.g. 5^2+12^2=13^2</td><td>2</td></tr>
<tr><td></td><td>b</td><td>
<table>
<tr><th>row</th><th>a</th><th>b</th><th>c</th></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>
</td><td>Award 1 mark for each correct value inserted into the table</td><td>6</td></tr>
<tr><td></td><td>c</td><td>• one pattern correctly described in words
• A second pattern correctly described in words (different)</td><td>NOTE: for “a an odd number, b even number and c odd number”: award 1 mark only

ACCEPT pattern described as a formula</td><td>2</td></tr>
</table>

	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 for each rule	**4**
	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**

f

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

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**

12

120