

Markscheme

November 2017


























Extended mathematics

On-screen examination

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The following are the annotations available to use when marking responses.

Annotation	Explication	Annotation	Explication	Shortcut
	Unclear		Award 0 marks	Alt+0
	Special case		Award 1 mark	Alt+1
	Misread		Award 2 marks	Alt+2
NWS	No working shown		Award 3 marks	Alt+3
	Error carried forward		Award 4 marks	Alt+4
	Words to that effect		Award 5 marks	Alt+5
	Benefit of the doubt		Award 6 marks	Alt+6
AG	Answer Given		Award 7 marks	Alt+7
	Highlight tool		Award 8 marks	Alt+8
	Ellipse tool		Award 9 marks	Alt+9
	On page comment tool		Award 10 marks	
	Seen		Award 11 marks	
	Caret - Omission		Award 12 marks	
	Wavy underline tool			

The markscheme may make use of the following abbreviations:

RM Assessor has the following annotations that should be used to award marks:

A0 only use to award a zero mark for an answer that has no merit e.g. awarded for the candidate that has a wrong answer with no working

NR only use when the candidate has not made any response also stamp the response with 



Marks awarded by stamping the tick



Seen; must be stamped on all blank response areas and on concatenated responses



unclear

- 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

BOD Benefit of the doubt

MR misread

NWS no working shown

SC special case

OE or equivalent

WTTE or words to that effect or accept incomplete calculator display

AG Answer given

Example 1

- 1 mark awarded and corresponding notes are aligned

b	<ul style="list-style-type: none"> •¹ Show clear line of reasoning in the method •² 4 	<ul style="list-style-type: none"> •¹ 45 & 49 seen OE eg, $49 = 45 + x$ •² ACCEPT $45 + X/10 = 4.9$ and Ans 4 	2
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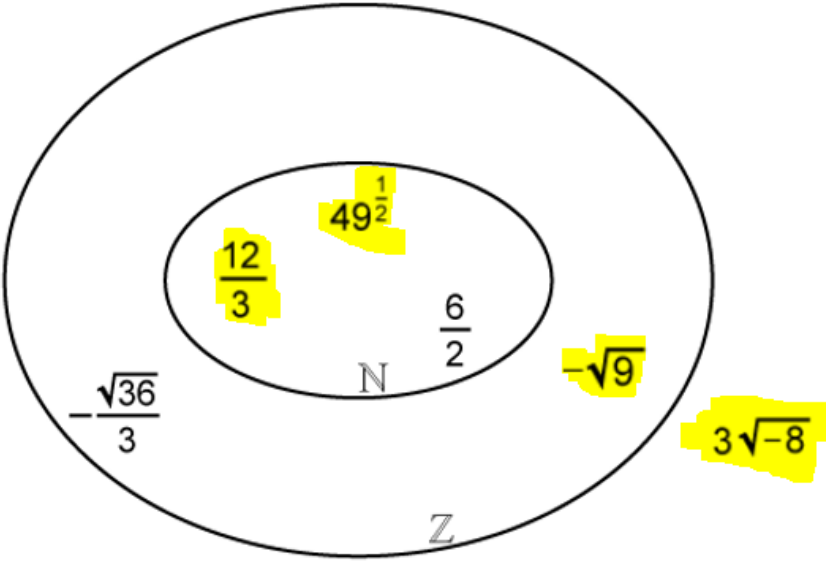
Error Carried Forward (ECF) marks

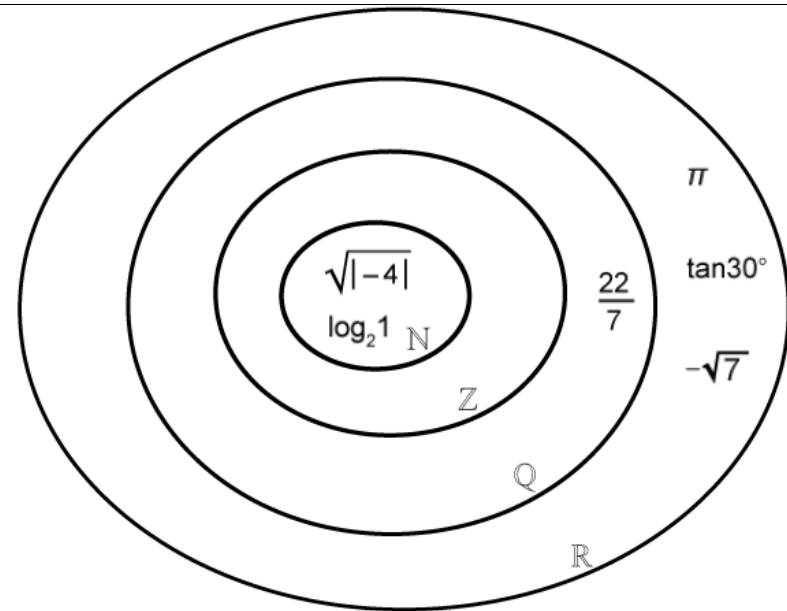
Errors made at any step of a solution affect all working that follows. In general, **Error Carried Forward (ECF)** marks are awarded after an error.

- a) **ECF** applies from one part of a question to a subsequent part of the question and also applies within the same part.
- b) If an answer resulting from **ECF** is inappropriate (eg, negative distances or $\sin x > 1$) then subsequent marks should not be awarded.
- c) If a question is transformed by an error into a **simpler question** then **ECF** may not be fully awarded.
- d) To award **ECF** marks for a question part, **there must be working present for that part**.
- e) **ECF** is only applied to working which is correct. This means that all working subsequent to an error must be checked for accuracy.
- f) A misread (**MR**) is an error. **ECF** is normally awarded.

General points

- a) As this is an international examination, accept all alternative forms of **notation**, for example 1.9 and 1,9 or 1 000 or 1.000. However **DO NOT ACCEPT** incorrect mathematical notation e.g x^2 for x^2 unless noted otherwise in the MS.
- b) Ignore further working after a correct answer **unless** it indicates a lack of mathematical understanding **i.e. if the further working contradicts the correct answer**, then the last mark cannot be awarded.
- c) Where candidates have written two solutions to a question, mark the response that deserves more marks.
- d) In the markscheme, equivalent examples of **numerical** and **algebraic** forms or **simplified** answers will generally be written in the notes preceded by **OE** or equivalent e.g. $\frac{1}{2}$ or $1/2$ or $1 \div 2$ and $\frac{x}{2}$ or $x/2$ or $x \div 2$
- e) In the markscheme, information provided in brackets indicate detail that may be seen in a candidate response but is not necessary to award the marks.
- f) Special case marks **SC** can be allocated instead of but not in addition to the marks prescribed in the markscheme.
- g) Accept seeing equation not in-line,
- h) Accept notation errors in intermediate steps.
- i) When a calculator screenshot is taken, accept not seeing the whole operation.
- j) In task 2 and 3 where the markscheme is set out in a table then, unless noted otherwise, awarding the highest mark in a category includes all the lower marks in that category. It is probably best to look for the top category mark answer and if you don't find it look at the next mark down.

Question	Answers	Notes	Total
1 a	<ul style="list-style-type: none"> •¹ two correctly placed •² four correctly placed 	<p>The correct places are</p>  <p>(insert Venn diagram)</p>	2
b	<ul style="list-style-type: none"> •¹ two correctly placed •² four correctly placed •³ six correctly placed 	<p>The correct places are</p>	3



(Insert correct diagram)

c

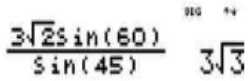
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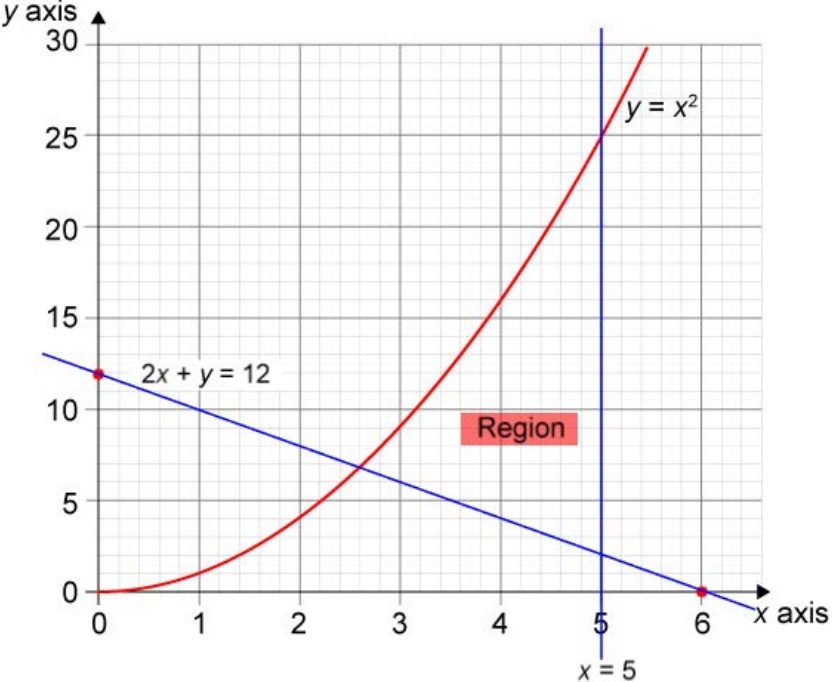
Question		Answers	Notes	Total
2	a	<ul style="list-style-type: none"> •¹ substituting 7 into $g(x)$ •² Substituting their value for $g(7)$ into $f(x)$ AG 3	<ul style="list-style-type: none"> •¹ $2(7) - 1$ or 13 •² $\sqrt{13 - 4}$ or $\sqrt{9}$ 	2
	b	<ul style="list-style-type: none"> •¹ substituting $g(a)$ into $f(x)$ and equating with 4 •² calculating value of $g(a)$ correctly or one correct step of simplification for equation involving only one unknown a •³ calculating their value of a correctly 	<ul style="list-style-type: none"> •¹ $\sqrt{g - 4} = 4$ or $\sqrt{2a - 1 - 4} = 4$ •² $g = 20$ or $2a - 1 = 20$ or $16 = 2a - 5$ •³ $a = \frac{21}{2}$ 	3

Question	Answers	Notes	Total
<p>3</p> <p>a</p>	<ul style="list-style-type: none"> •¹ two correct values •² four correct values 	<div style="text-align: center;"> <p>First ball Second ball</p> <pre> graph LR A["3/7 even"] --- B["2/6 even"] A --- C["4/6 odd"] D["4/7 odd"] --- E["3/6 even"] D --- F["3/6 odd"] </pre> </div> <p>ACCEPT: fractions cancelled down</p>	<p>2</p>
<p>b</p>	<ul style="list-style-type: none"> •¹ the numerator (branch of intersection even-even) seen •² adding the two multiplications of probabilities (even-even and odd-odd) •³ calculating the value above correctly •⁴ dividing by their calculated addition of multiplied probabilities AG $\frac{1}{3}$ 	<ul style="list-style-type: none"> •¹ $\frac{3}{7} \times \frac{2}{6}$ •² $\frac{3}{7} \times \frac{2}{6} + \frac{4}{7} \times \frac{3}{6}$ •³ $\frac{3}{7}$ •⁴ $\frac{\frac{3}{7} \times \frac{2}{6}}{\frac{3}{7}}$ <p>AG $\frac{1}{3}$</p>	<p>4</p>

<p>c</p>	<p>$\frac{3+b}{2} = 5$ or $3+b = 10$ AG 7</p>	<p>Accept $(3 + 7)/2 = 5$ Do not accept $3 + 7/2 = 5$ Accept explanation in words provided the numbers are written. e.g. The average of 7 and 3 is 5</p>	<p>1</p>
<p>d</p>	<ul style="list-style-type: none"> •¹ setting equation for range OR showing understanding of concept of range •² setting equation for mean OR showing understanding of concept of mean •³ simplifying correctly equation for mean •⁴ attempt to solve using substitution OR elimination •⁵ their value for a or c correct •⁶ the other value for a or c correct 	<ul style="list-style-type: none"> •¹ $c - a = 34$ OR difference between their a and c is 34 •² $\frac{a - 12 - 9 + 0 + 3 + 7 + 7 + 10 + 15 + c}{10} = 2.7$ •³ $a + c = 6$ •⁴ Attempt to solve simultaneously, adding OR substitution OR $2c = 40$ OR $2a = -28$ •⁵ $c = 20$ •⁶ $a = -14$ ALLOW ECF from one of their equations <p>(a =) -14 without working award 2 marks (c =) 20 without working award 2 marks (a =) -14 with one correct step award 3 marks (c =) 20 with one correct step award 3 marks</p>	<p>6</p>

Question	Answers	Notes	Total		
4	<p>a</p> <ul style="list-style-type: none"> •¹ correct substitution into sine rule •² substituting both sine of angles with their exact values <p>AG $3\sqrt{3}$</p>	<ul style="list-style-type: none"> •¹ $\frac{AB}{\sin \frac{\pi}{3}} = \frac{3\sqrt{2}}{\sin \frac{\pi}{4}}$ •² substitute $\sin \frac{\pi}{3} = \frac{\sqrt{3}}{2}$ and $\sin \frac{\pi}{4} = \frac{\sqrt{2}}{2}$ or $\frac{1}{\sqrt{2}}$ <p>Accept a calculator screen shot which shows $3\sqrt{3}$</p> 	2		
	<p>b</p> <ul style="list-style-type: none"> •¹ finds AOB or OBA •² correctly substitutes into a trig rule •³ correct attempt to solve their equation for r •⁴ their exact value of r after solving 	<ul style="list-style-type: none"> •¹ $\angle AOB = \frac{2\pi}{3}$ (2.09439....) or $\angle OBA = \frac{\pi}{6}$ •² second mark is for substituting correctly in the cosine rule or sine rule or cos ratio •³ one correct algebra step •⁴ $r = 3$ Do not award if their value of r is not in exact form 	4		
	$\angle AOB = \frac{2\pi}{3}$ $r^2 + r^2 - 2 \times r^2 \cos \frac{2\pi}{3} = (3\sqrt{3})^2$ $r^2 + r^2 + r^2 = (3\sqrt{3})^2$	$\angle AOB = \frac{2\pi}{3}$ $\frac{r}{\sin \frac{\pi}{6}} = \frac{3\sqrt{3}}{\sin \frac{2\pi}{3}}$ $r = \frac{3\sqrt{3} \times \frac{1}{2}}{\frac{\sqrt{3}}{2}}$	$\angle OBA = \frac{\pi}{6}$ $\cos \frac{\pi}{6} = \frac{1.5\sqrt{3}}{r}$ $r = \frac{1.5\sqrt{3}}{\frac{\sqrt{3}}{2}}$	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> Examples of answers for 4b </div>	2

4	c	<ul style="list-style-type: none"> •¹ substituting their value of angle AOB into arc length formula correctly •² adding their arc length to $3\sqrt{3}$ 	<ul style="list-style-type: none"> •¹ $\frac{2\pi}{3} \times (\text{their } 3)$ $\frac{2\pi}{3} \times (\text{their } 3)$ ACCEPT $\frac{120}{360} \times 2\pi \times (\text{their } r)$ •² $\frac{2\pi}{3} \times \text{their}(3) + 3\sqrt{3}$ or $2\pi + 3\sqrt{3}$ 	2
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Question	Answers	Notes	Total
<p>5</p> <p>a</p>	<ul style="list-style-type: none"> •¹ $2x + y = 12$ one intercept correct OR the line passes through two correct points •² $2x + y = 12$ y-intercept correct AND crossing the line $x = 5$ at (5,2) •³ $x = 5$ line correctly drawn 	 <p>To award the intercept (or intersection with $x = 5$) mark the line has to be ± 0.5 unit accurate</p> <p>Accept equations placed incorrectly</p>	<p>4</p>
<p>b</p>	<p>function maximum is 40 (at point (5,25))</p>	<p>Don't need coordinates. Only the 40</p>	

•⁴ Their correct closed region (Most of the icon "region" has to be in the correct region in order to award the mark)

•⁴ **ECF** can be awarded for a region to the left of $x = 5$ and above their $2x + y = 12$ and below $y = x^2$

Question		Answers	Notes				Total
6	a	<ul style="list-style-type: none"> •¹ calculation of tax for 30 % band •² their amount of tax for 30 % band calculated correctly •³ calculation of tax for 41 % band •⁴ their amount of tax for 41 % band calculated correctly from a subtraction followed by multiplication •⁵ their amount of total tax paid calculated correctly 	Annual income bands in EUR	Tax rate	Calculation of tax	Amount of tax EUR	5
			0 < income ≤ 6000	0 %	0	0	
			6000 < income ≤ 12 000	5.5 %	(12 000 – 6000) x 5.5 %	330	
			12 000 < income ≤ 25 000	14 %	(25 000 – 12 000) x 14 %	1820	
			25 000 < income ≤ 70 000	30 %	(70000-25000)x30%	13500	
			Above 70 000	41 %	(80000-70000)x41%	4100	
					Total tax paid on 80 000 EUR	19750	

Question		Answers	Notes	Total	
6	b		(1 mark)	(2 marks)	10
		Identify Factors (F)	Identify two elements from: Income, taxes, expenses, the relocation place OR family	Identify more than two elements from: Income, taxes, expenses, the relocation place OR family	
		Calculation Home (H) For scenario 1	Attempt to calculate monthly OR yearly net saved value Example: Calculate Total Tax correctly: Tax: $330+1820+15000 \times 0.3 (=6650)$ OR Calculate Total expenses correctly $(400+900+500) \times 12 (=21600)$ OR 40000-their calculated taxes-their calculated yearly expenses	Correctly calculating scenario 1 monthly net saved value OR yearly net saved value (Saved value= $40000-21600-6650=$)11750 OR 979.166... monthly Accept the result with rounding eg. 12000 yearly OR 1000 monthly	
		Calculation Relocate (R) For scenario 2	Attempt to calculate monthly OR yearly net saved value in DKK Example: Expenses: $(4000+7000+4500+2000) \times 12+1500=210000+1500=211500$ OR Calculate correctly total expenses excluding home travel $(4000+7000+4500+2000) \times 12 = 210000$ OR Assuming a certain number of times to visit home but making an error in calculation eg. $(4000+7000+4500+2000+their 2 \times 1500=17500+2 \times 1500=20500$ Accept $17500+1500 = 19000$ OR 40000- 90000-their yearly incorrect expenses	Correctly calculating scenario 2 monthly net saved value OR yearly net saved value in euro (Saved value= $400000-their 211500-90000=$)98500 yearly OR $98500/12=8208$ monthly = 13133€ yearly 1094€ monthly Accept the result with rounding eg. 13000€ yearly OR 1100€ monthly Accept any number of trips home (Allow for candidates that confuse 'return' for 'one way' only) Final answer must be in euro.	
Justify accuracy of calculations (J)	Weak unsupported justification OR Sensible rounding used OR Recognizing that these are approximate calculations and not accurate Do not accept: My calculations are accurate with any justification	Recognizing the calculation is not accurate with good reasoning: because many of the monthly expenses are estimates because medical expenses can vary because the number of journeys home vary because exchange rate can vary			

	<p>Decision (D)</p>	<p>Relocate OR do not relocate with weak supporting justification</p> <p>Examples:</p> <p>I will relocate because I will make more money</p> <p>I will not relocate because I don't want to move</p> <p>Relocate or do not relocate without justification OR with irrelevant justification award 0 marks</p>	<p>Relocate or do not relocate with good supporting justification (balanced reflection)</p> <p>Examples:</p> <p>I will relocate because I will make more money even if I come to visit home once a month</p> <p>I will not relocate because even though I will be making xxx more money, it is not much compared to staying with family.</p> <p>I will relocate because I will make more money and I will gain new experiences by moving</p>	
DKK	euro			
4000	533			
7000	933			
2000	267			
90000	12000			
400000	53333			
1500	2			

Question	Answers				Notes	Total
7	a <ul style="list-style-type: none"> •¹ any correct area •² the corresponding other correct area •³ show appropriate operation either adding OR subtracting 800 AG				SC seeing only: 1800 – 1000 = 800 award 2 marks OR 600 + 200 = 800 award 2 marks 60 x 10 + 30 x 8 – 40 = 800 award 1 mark for 60 x 10	3
Example method 1. <ul style="list-style-type: none"> • 30 x 60 (= 1800) • 4 x 10 x 25 = (1000) • (30 x 60) – 4 x 10 x 25 Total 800 AG		Example method 2. <ul style="list-style-type: none"> • 60 x 10 (= 600) • 10 x 10 x 2(= 200) • 60 x 10 + 10 x 10 x 2 Total 800 AG	Example method 3 <ul style="list-style-type: none"> • 10 x 25 (= 250) and 10 x 25 (= 250) • 10 x 30 (=300) • 250 + 250 + 300 Total 800 AG	Example method 4 <ul style="list-style-type: none"> • 10 x 10 x 3 (= 300) • 10 x 25 x 2 (= 500) • 300 + 500 Total 800 AG		
	b $\tan \theta = \frac{30}{60}$				Accept $\tan \theta = \frac{15}{30}$	1
	c <ul style="list-style-type: none"> •¹ using tan ratio to determine correct value of θ •² using correct ratio to set equation in x •³ rearranging x on one side correctly 				<ul style="list-style-type: none"> •¹ $(\arctan \frac{1}{2} =) 26.565... \text{deg}$ •² $\sin(\text{their } \theta) = \frac{3}{x}$ OR $\frac{3}{\sin(\text{their } \theta)} = \frac{x}{\sin 90}$ OR $\frac{3}{x} = \text{their } 0.447...$ •³ $x = \frac{3}{\sin(\text{their } \theta)}$ OR $x = \frac{3}{\text{their } 0.447...}$ 	5

	<ul style="list-style-type: none"> •⁴ the correct value of x •⁵ rounding their result correctly to 1 dp <p>Alternative method</p> <ul style="list-style-type: none"> •¹ using Pythagoras to determine correct value of $\sin\theta$ •² using correct ratio to set equation in x •³ rearranging x on one side correctly •⁴ the correct value of x •⁵ rounding their result correctly to 1 dp 	<ul style="list-style-type: none"> •⁴ ($x =$) $3\sqrt{5}$ OR 6.708... (cm) •⁵ ($x =$) 6.7 (cm) 1 dp <p>6.7 without working award 4 marks ($x =$) $3\sqrt{5}$ OR 6.708... (cm) without working Award 3 marks</p> <p>Alternative method</p> <ul style="list-style-type: none"> •¹ $\sin\theta = \frac{1}{\sqrt{5}}$ OR 0.447.... •² $\frac{3}{x} = \text{their } \frac{1}{\sqrt{5}}$ OR $\frac{3}{\text{their } \sin\theta} = \frac{x}{\sin 90}$ OR $\frac{3}{x} = \text{their } 0.447...$ •³ $x = \frac{3}{\text{their } \sin\theta}$ OR $x = \frac{3}{\text{their } 0.447...}$ •⁴ ($x =$) $3\sqrt{5}$ OR 6.708... (cm) •⁵ ($x =$) 6.7 (cm) 1 dp <p>Seeing only $\frac{3}{\sin 26.565..} = 6.708..$ award 4 marks</p> <p>Seeing only $\frac{3}{\sin \text{their}\theta} = \text{their value not rounded}$ OR exact value that doesn't need rounding award 3 marks</p> <p>6.7 without working award 4 marks</p>	
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<p>d</p>	<ul style="list-style-type: none"> •¹ calculating their base of the triangle correctly •² using trigonometric ratio correctly to set equation involving H •³ rearranging their equation correctly to have H on one side •⁴ calculating correctly Area of triangle using their height and their x •⁵ adding the quadruple of 44 to quadruple of their area of triangle •⁶ their correct total rounded to nearest cm² 	<ul style="list-style-type: none"> •¹ (Base of triangle = 25-their 6.7 =)18.3 •² $\frac{1}{2} = \frac{H}{25 - 3\sqrt{5}}$ or $\frac{H}{\text{their } 18.3}$ OR $\frac{H}{\sin(\text{their } 26.565\dots)} = \frac{\text{their } 18.3}{\sin(90 - \text{their } 26.565\dots)}$ •³ (H =) $\frac{1}{2} \times \text{their } 18.3$ OR $\frac{25 - 3\sqrt{5}}{2}$ OR 9.146... •⁴ (T₁ =) $\frac{1}{2} \times \text{their } 18.3 \times \text{their } 9.146\dots = 83.6\dots$ Accept 83.7... •⁵ 4 x 44 + 4 x 84 •⁶ 512 (cm²) 	<p style="text-align: center;">6</p>
<p>e</p>	<ul style="list-style-type: none"> •¹ dividing by total area of flag •² calculating their percentage correctly 	<ul style="list-style-type: none"> •¹ Seeing 60 x 30 or 1800 in denominator •² (% represented =) $\frac{\text{their blue total area}}{\text{their total area}} \times 100$ 28.444.. OR 28 % without working award 2 marks 	<p style="text-align: center;">2</p>

Question	Answers	Notes	Total
8 a	<ul style="list-style-type: none"> •¹ one suitable pattern •² two suitable patterns 	<p>For example: goes up 1,2,3 OR triangle numbers OR goes up by one more than the previous increase OR quadratic progression (ACCEPT non-linear) OR comment on differences eg second is constant OR first goes up by one</p> <p>Do not accept: As the number of males increases the number of handshakes goes up</p>	2
b	<ul style="list-style-type: none"> •¹ correct general rule with poor notation •² correct general rule with correct notation <p>Alternative with differences</p> <ul style="list-style-type: none"> •¹ one correct equation for difference •² correct general rule with correct notation 	<ul style="list-style-type: none"> •¹ $(m^2-m)/2$ OR $m^2/2-m/2$ •² $(h =) \frac{m(m-1)}{2}$ OR $(h =) \frac{m^2}{2} - \frac{m}{2}$ Answer must be in terms of m 	2
c	<ul style="list-style-type: none"> •¹ substitute $m \geq 5$ into their rule •² correctly calculate their value of h after substitution $m \geq 5$ •³ recognise that their result is the same as their predicted value 	<ul style="list-style-type: none"> •³ ACCEPT seeing the 15 in the table and seeing $h=15$ from their calculation <p>SC if “tested” correctly award 1 mark Tested correctly is when they apply the steps of verification mentioned in the left column on a value of $m \leq 5$</p>	3

d	Mark	Predictions (P)	Description (D)	Testing (T)	Verifying (V)	Justify/proof (J)	Notation and terminology (N)	Communication (L)	
	1	Correctly predict one term for any two sets of data s or b or k or G (when $m \geq 6$)	Attempt to describe a pattern Ex: they are all increasing or Recognize that pattern for s and b are the same or recognise that $h = k/2$	Attempted to test their described pattern or general rule of k or b or s or G for $m \leq 5$ ex: substitutes in their rule value of $m \leq 5$	Attempt to verify their general rule of k or b or G for $m \geq 6$ ex: substitute in their rule value of $m \geq 6$	Attempt to justify any of their described patterns or general rules Ex: refer to difference between terms or test at least two values for s and say it works or after stating the rule they say every time it is male times male	The notation or terminology is correct OR The notation and terminology have significant errors	Lines of reasoning are incomplete OR incoherent. Ex: Only two lines of calculations or algebraic steps	
	2	Correctly predict one row for the five sets of data (when $m \geq 6$) OR Correctly predict four values in the columns of s or b or k or G (when $m \geq 6$)	Recognize that pattern for s and b are the same and recognise that $h = k/2$	Correctly calculating their value of k or b or s or G using their value of $m \leq 5$ and recognizing that their result is the same as the table value (ACCEPT seeing their calculated value and their predicted value in the table being equal)	Correctly calculate their value of k or b or G using their value of $m \geq 6$	Justify any of the general rules correctly Ex: The second difference is constant Ex: The s (or b) are the square numbers Ex: h are the triangle numbers OR Attempt to justify the general rule for Greeting (G) Ex: Attempt to add any of their rules for b , s , k or h together or test at least two values for G and say it works.	The notation of a general rule and terminology describing pattern is correct OR Correct general rule in correct notation but not simplified Ex: $G = m(m-1)/2 + m(m-1) + m^2 + m^2$	Lines of reasoning are coherent OR answer is organised using a logical structure.	24

	3	<p>Correctly predict two rows for the five sets of data (when $m \geq 6$)</p> <p>OR Correctly predict eight values in the columns of s or b or k or G (when $m \geq 6$)</p>	<p>Correctly describe pattern in words for bows (b) AND recognise it is the same as for smiles (s)</p> <p>Ex: They are the square numbers or the second difference is constant or it is quadratic or second degree or $s = m \times f$</p>		<p>Recognise that their result for G is the same as their predicted value (ACCEPT seeing their calculated value and their predicted value in the table being equal)</p> <p>Allow V3 only if they verify their rule for G correctly.</p>	<p>Justify any of the general rules correctly Ex: The second difference is constant Ex: The s (or b) are the square numbers AND Attempt to justify the general rule for Greeting (G) Ex: Attempt to add any of the rules for b, s or k together or test at least two values for s and say it works OR Justify correctly the general rule for Greeting (G) Ex: Add correctly their rules for b, s, h and k together</p>	<p>The notation of their general rule for G and terminology used are correct and their general rule is simplified as $G = \frac{7}{2}m^2 - \frac{3}{2}m$ or $\frac{1}{2}m(7m - 3)$</p> <p>Award only if D5 is achieved</p>	<p>Lines of reasoning are coherent AND answer is organised using a logical structure</p> <p>Award only if J2 is achieved</p>	
	4		<p>Correctly describe pattern as general rule for kisses (k) or bows (b) or smiles (s)</p> <p>OR recognise that $s = m^2$ and b the same</p> <p>writing only $s = m^2$ award D3</p>			<p>Justify any of the general rules correctly Ex: The second difference is constant Ex: The s (or b) are the square numbers AND Justify correctly the general rule for Greeting (G)</p>			

							Ex: Add correctly the rules for b , s , h and k together		
		5	<p>Attempt to describe pattern as general rule for G Ex: the rule is $\frac{7}{2}m^2 - \frac{3}{2}m$ OR adding correct rules incorrectly $G = m(m-1)/2 + m(m-1) + m^2$ OR four rules correct and recognising that the four rules must be added</p>						
		6	<p>Correctly describe the pattern for G as a general rule $G = m(m-1)/2 + m(m-1) + m^2 + m^2$ OR $G = \frac{7}{2}m^2 - \frac{3}{2}m$ or $\frac{1}{2}m(7m-3)$ OE</p>						

Prediction table below

Table 3

Number of males (<i>m</i>)	Number of females (<i>f</i>)	Number of handshakes (<i>h</i>)	Number of kisses (<i>k</i>)	Number of bows (<i>b</i>)	Number of smiles (<i>s</i>)	Total number of greetings (<i>G</i>)
1	1	0	0	1	1	2
2	2	1	2	4	4	11
3	3	3	6	9	9	27
4	4	6	12	16	16	50
5	5	10	20	25	25	80
6	6	15	30	36	36	117
7	7	21	42	49	49	161
8	8	28	56	64	64	212
9	9	36	72	81	81	270
10	10	45	90	100	100	335
11	11	55	110	121	121	407
12	12	66	132	144	144	486
13	13	78	156	169	169	572
14	14	91	182	196	196	665
15	15	105	210	225	225	765