Q1. The diagram shows a pentagon.

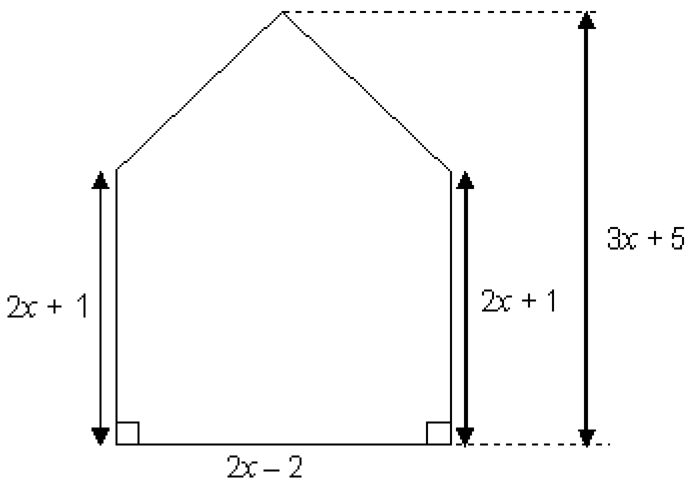

Diagram **NOT** accurately drawn

All measurements are in centimetres.

Show that the area of this pentagon can be written as $5x^2 + x - 6$

(Total 4 marks)

Q2. Prove that $(3n + 1)^2 - (3n - 1)^2$ is a multiple of 4, for all positive integer values of n.

(Total 3 marks)

Q3. Tarish says,

'The sum of two prime numbers is always an even number'.

He is **wrong**.
Explain why.

....

....

(Total 2 marks)

Q4. Prove that the difference between the squares of consecutive odd numbers is a multiple of 8

(Total 6 marks)

M1.

Working	Answer	Mark	Additional Guidance
$(2x - 2)(2x + 1)$	Show	4	**M1** for correct expression for a single rectangle area $(2x - 2)(2x + 1)$ or $(2x - 2)(3x + 5)$ **M1** for correct expression for triangle

Total for Question: 4 marks

M2.

Working	Answer	Mark	Additional Guidance
$(9n^2 + 6n + 1)$ $-(9n^2 - 6n + 1)$ $= 12n$	$12n$ correct comment	3	**M1** for $(3n)^2 + 3n + 3n + 1$ or $(3n)^2 - 3n - 3n + 1$ or $((3n + 1) - (3n - 1))((3n + 1) + (3n - 1))$ **A1** for $12n$ from correct expansion of both brackets **A1** for $12n$ is a multiple of 4 or $12n = 3 \times 4n$ or $12n = 4 \times 3n$ or $\frac{12n}{4} = 3n$ or $\frac{12n}{3} = 4n$ NB: Trials using different values for n score no marks.
Total for Question: 3 marks			

M3.

Answer	Mark	Additional Guidance
2 + 'prime number' is odd	2	**M1** for a counter example showing intent to add 2 and another prime number; ignore incorrect examples **A1** for a correctly evaluated counter example with no examples given that involve either non-primes or incorrect evaluation **Alternative method** **B2** for fully correct explanation '2 is a prime number, odd + even (or 2) = odd' oe with no accompanying incorrect statements or examples

		(**B1** for '2 is a prime number' **or** recognition that not all prime numbers are odd **or** odd + even (or 2) = odd; ignore incorrect examples or statements)
		Total for Question: 2 marks

M4.

	Working	Answer	Mark	Additional Guidance
QWC ii, iii	$(2n+1)^2 - (2n-1)^2 =$ $4n^2 + 4n + 1 - (4n^2 - 4n + 1)$ $= 8n$	Fully algebraic argument, set out in a logical and coherent manner	6	**B2** the nth term for consecutive odd numbers is $2n - 1$ oe (B1 $2n + k$, $k \neq -1$ or n = $2n - 1$ or $2x - 1$ **B1** use of $2n + 1$ and $2n - 1$ oe **M1** $(2n+1)^2 - (2n-1)^2$ **M1** $4n^2 + 4n + 1 - (4n^2 - 4n + 1)$ **C1** conclusion based on correct algebra **QWC: Conclusion should be stated, with correct supporting algebra.**
	OR $(2n+1)^2 - (2n-1)^2 =$ $((2n+1) - (2n-1))(2n+1 + 2n-1)$ $= 2 \times 4n = 8n$			**OR** **B1** use of $2n + 1$ and $2n - 1$ oe **M1** $(2n+1)^2 - (2n-1)^2$ **M1** $((2n+1) - (2n-1))(2n+1 + 2n-1)$ **C1** conclusion based on correct algebra **QWC: Conclusion should be stated, with correct supporting algebra.**
				Total for Question: 6 marks

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The main problems candidates faced were due to a lack of brackets in their original expressions for area. This invariably led to incorrect multiplication of linear expressions and when dividing the area of the triangular section by 2. A few candidates were let down by errors with signs or arithmetical slips which meant they did not reach the final expression given for the total area. Here Quality of Written Communication was being assessed, a candidate's work needed to be set out in a logical fashion.

E2. Many candidates struggled with the requirement for an algebraic proof and instead opted to substitute various values for n. Those attempting to simplify the expression often made errors with $(3n)^2$, expressing it as $9n$, $6n^2$ or $3n^2$. Sign errors and omission of brackets around the second half of the expansions accounted for many of the other errors with $1 \times 1 = 2$ causing a severe loss of marks for a few. A difference of two squares method was seen on a small number of occasions. Some candidates correctly simplified to $12n$ but failed to justify the final mark often stating that 12 rather than $12n$ was a multiple of 4.

E3. Many candidates thought that 1 was a prime number. Others had trouble with the word "sum", misinterpreting it as product.

Successful candidates usually offered a correct counter example, frequently 2 + 3 = 5, and often backed this up by a written explanation. On occasions, a correct counter-example worthy of full marks was spoiled by further embellishment including incorrect statements or other examples involving non-primes.