| 1 | (a) | 243 | 1 | B1 | cao |
|---|-----|--------------------|---|----|------------------------------------|
| | (b) | Multiplying | 1 | B1 | for multiplying previous term by 3 |
| | | previous term by 3 | | | oe |
| | | | | | "×3" or 81×3 |
| | (c) | 19 683 | 1 | B1 | cao |
| | | | | | Total 3 marks |

| 2 | a | | 23 | 1 | B1 | |
|---|---|---|----------------|---|----|--|
| | b | | Added 4 | 1 | B1 | accept $+4$, 4 more, oe, $4n - 1$ |
| | | | | | | (need to know 4 and we need to add/go up oe) |
| | | | | | | |
| | c | (23) 27, 31, 35, 39, 43, 47, 51, 55, 59, 63, 67, 71 | | 2 | M1 | allow list of numbers going up in |
| | | OR 4n - 1 = 70 | | | | 4's up to 71 or more (allow one |
| | | | | | | error) |
| | | | 71 | | A1 | |
| | d | No and identifying all terms in sequence are odd | No with reason | 1 | B1 | must have 'No' oe or 'is not' oe |
| | | OR | | | | and a reason. |
| | | No and method to count on as far as 95 (or | | | | |
| | | clearly showing 95) | | | | |
| | | OR | | | | |
| | | | | | | |
| | | No and method to find n when term is 96 | | | | |
| | | e.g. solving $4n - 1 = 96$ | | | | |
| | | | | | | Total 5 marks |

| 3 (a) | °0,0000 | 1 | B1 | Correct diagram |
|-------|------------------|-------|----|--|
| (b) | 13, 16 | 1 | B1 | Both values correct |
| (c) | 22 | 1 | B1 | |
| (d) | C = 3P - 2 oe | 2 | B2 | B1 for 3 <i>P</i> |
| | | | | or $3P$ + constant (constant \neq – 2) |
| (e) | (Yes) pattern 28 | nas 1 | B1 | or $5 \times 28 - 4 = 136$ oe |
| | 136 triangles | | | Sight of 28 is sufficient |
| | | | | Total 6 marks |

| 4 | (a) | | pattern 4 drawn | 1 | B1 |
|---|-----|--|--------------------|---|---|
| | (b) | | 10, 12 | 1 | B1 |
| | (c) | 14, 16, 18, 20, 22, 24, 26, 28, 30, 32 or $2 \times 30 + 2$ or $12 + (25 \times 2)$ or $4 + (29 \times 2)$ or 31×2 or uses or states $2n + 2$ | | 2 | M1 for adding 2 and continuing to at least pattern 15 (allow one error) or for a correct diagram or any correct method which would lead to 62 |
| | | | 62 | | Al |
| | (d) | E.g. n th term is $2n + 2$ oe or gives a counter example e.g. when $n = 1$, $2n$ gives 2 (not 4) | No with reason | 1 | B1 oe |
| | | | | | Total 5 marks |

| 5 | 91 – 6n | 2 | B2 | for a correct answer in any form |
|---|---------|---|----|---|
| | | | | eg |
| | | | | $91 - 6 \times n$ or |
| | | | | -6n + 91 or |
| | | | | 85 + (n-1)(-6) oe |
| | | | | |
| | | | | (B1 for $-6n + k$ oe (k may be zero |
| | | | | or absent)) |
| | | | | |
| | | | | NB: award full marks for eg |
| | | | | x = 91 - 6n or <i>n</i> th term = $91 - 6n$ |
| | | | | but only B1 for $n = 91 - 6n$ |
| | | | | Total 2 marks |

| shaded squares are or the sequence is all odd of a 49 is in the sequence s as it's only one more | | 6 (a) | Correct shape | 1 | B1 | cao |
|---|---------------------------------------|-------|--------------------|---|----|---|
| (d) The numbers of shaded squares are odd numbers The numbers of shaded squares are odd numbers The numbers of shaded squares are or the sequence is all odd or 49 is in the sequence of as it's only one more | (b) | (b) | 17, 21 | 1 | В1 | cao |
| shaded squares are or the sequence is all odd of a 49 is in the sequence s as it's only one more | (c) | (c) | 33 | 1 | B1 | cao |
| and 53 are in the sequence or nth term is $4n + 1$ and $n = 12.25$ / not an integer | (d) | (d) | shaded squares are | 1 | B1 | or 53 is the next number after 49 or 49 and 53 are in the sequence (so not 50) or nth term is $4n + 1$ and for 50 $n = 12.25 / \text{not an integer}$ |
| | · · · · · · · · · · · · · · · · · · · | | | | | Total 4 marks |

| 7 | (a) | $eg 6 \times 2.4 + 5 \times 3.5$ | | 2 | M1 | |
|---|-----|------------------------------------|------------|---|----|----------------------------------|
| | | | 31.9 | | A1 | oe |
| | (b) | (W=) 5.9n or $(W=) 5.9(n-1) + 2.4$ | | 2 | M1 | for $2.4n + 3.5n$ or $5.9n$ seen |
| | | or $(W =) 2.4n + 3.5(n - 1)$ | | | | |
| | | | 5.9n - 3.5 | | A1 | oe but must be in simplest form |
| | | | | | | eg -3.5 + 5.9n |
| | | | | | | Total 4 marks |

| 8 | (a)(i) | 31 | 1 | B1 | |
|---|--------|---------------------|---|----|---|
| | (ii) | Correct explanation | 1 | B1 | e.g. 'I added 6', 'add 6', +6, 6n – 5 (need to know 6 and we need to add/go up oe) |
| | (b) | Correct explanation | 1 | B1 | Acceptable e.g. Should be 187 oe 188 is even or not odd 187 and 193 (are in the sequence) Terms end in 1, 3, 5, 7, 9 or odd numbers Sequence is odd 6n-5=188 gives a decimal or not a whole number Need to minus 1 oe Not acceptable e.g. It goes past 188 oe 193 is after 188 oe |
| | | | | | Total 3 marks |

| 9 (a) | | 2 | M1 for $4n + k$ ($k \neq -3$) or |
|-------|--------|---|--|
|) (a) | | _ | |
| | | | $4 \times n + k \ (k \neq -3)$ or |
| | | | $n \times 4 + k (k \neq -3)$ |
| | | | (k may be zero or absent) |
| | 4n - 3 | | A1 oe e.g. $1 + (n-1)4$ oe or $4 \times n - 3$ oe or |
| | | | $n \times 4 - 3$ oe |
| | | | NB: award full marks for eg |
| | | | $x = 4n - 3$ oe or $x = 4 \times n - 3$ oe or |
| | | | $x = n \times 4 - 3$ oe or <i>n</i> th term = $4n - 3$ oe or |
| | | | n th term = $4 \times n - 3$ oe or |
| | | | n th term = $n \times 4 - 3$ oe |
| | | | but only M1 for $n = 4n - 3$ oe |
| (b) | 6m + 5 | 1 | B1 for $3(2m) + 5$ oe or $6m + 5$ or |
| | | | $3 \times 2m + 5$ oe or $6 \times m + 5$ |
| | | | Allow $3(2n) + 5$ or $6n + 5$ oe |
| | | | Total 3 marks |

| 10 | (a)(i) | 37 | 1 | B1 | |
|----|--------|----------------------|---|----|--------------------------------------|
| | (ii) | +6 | 1 | B1 | oe eg 'added 6' or 'plus 6' or |
| | | | | | 6n + 1 allow $31 + 6 = 37$ |
| | | | | | increase by 6 / goes up by 6 |
| | (b) | 169 | 1 | B1 | |
| | (c) | All the numbers in | 1 | B1 | 96 is not odd / 96 is even |
| | | the sequence are odd | | | 96 is a multiple of 6 (and terms are |
| | | numbers | | | not multiples of 6) or |
| | | | | | No numbers in the sequence end in |
| | | | | | 6 / all end in 1, 3, 5, 7, 9 |
| | | | | | or the sequence is $6n + 1$ or |
| | | | | | it goes91, 97, oe or |
| | | | | | it should be 97 |
| | | | | | They need to add 1 |
| | • | | | | Total 4 marks |

| 11 | (a)(i) | 27 | 1 | B1 | |
|----|--------|---------------|---|----|---|
| | (ii) | Add 5 | 1 | B1 | accept $+5$ or use of $5n+2$ |
| | (b) | No and reason | 1 | B1 | e.g. 'because the unit digit of 256 is not 2 or 7' or it is not in the form 5 <i>n</i> +2 |
| | | | | | Total 3 marks |

| 12 (a) | | දිංදිංදිංදිං | 1 | B1 | correct diagram drawn |
|--------|---|---------------|---|----|---|
| (b) | | 12, 15 | 1 | B1 | |
| (c) | | 30 | 1 | B1 | |
| (d) | eg Pattern number 25 needs 75 counters (or $3 \times 25 = 75$) or 70 counters can make only up to Pattern number 23 $\frac{70}{25} = 2.8 \text{ or } \frac{70}{3} = 23.(3)$ 70 is 5 short or sight of e.g. $3n$ or 69, 72, 70 is not a multiple of 3 | No and reason | 1 | B1 | 'No' with reason given (reason can be in words or shown as a calculation) |
| · | | | | | Total 4 marks |

| 13 (a)(i) | 34 | 1 | B1 | |
|------------------|---------------------|---|----|---|
| (ii) | Added 6 | 1 | B1 | accept eg add 6, +6 |
| (b) | 76 | 1 | B1 | |
| (c) | Correct explanation | 1 | B1 | eg 467 is odd or the numbers in the sequence are even or $6n - 2$ or , 466, 472, |
| | | | | Total 4 marks |

| 14 (a) | Pattern number 4 | Correct shape | 1 | B1 |
|--------|---|----------------|---|--|
| (b) | 1 2 3 4 5 1 4 7 10 13 | 10 and 13 | 1 | B1 for 10 and 13 |
| (c) | | 22 | 1 | B1 |
| (d) | 10 13 16 19 22 25 28 31 34 37 40 43 or 3 × 15 - 2 (= 43) and 3 × 14 - 2 (= 40) or (42 + 2) ÷ 3 (= 14.6) | Correct reason | 1 | B1 for correct reason, for e.g. $3n-2=42$ does not have a whole number (integer) answer/it's a decimal or 42 is a multiple of 3 or 42 is in the 3 times table or 40 and 43 are in the sequence or 40 is in the sequence and $40 + 3$ does not equal 42 or its 1 less than 43 |
| | | | | Total 4 marks |

| 15 | (a) | | Correct explanation | 1 | B1 | eg 'she added 4', 'add 4', +4, |
|----|-----|---|---------------------|---|----|----------------------------------|
| | | | | | | rule is $4n - 2$, goes up by 4, |
| | | | | | | $4 \times 5 - 2 (= 18)$ |
| | (b) | Acceptable answers | Correct explanation | 1 | B1 | |
| | | 1. (the) sequence is even | | | | |
| | | 2. (217) is odd or not even | | | | |
| | | 3. 'nth term is $4n - 2$ which will always be | | | | |
| | | even' | | | | |
| | | 4. 'sequence goes 214, 218' | | | | |
| | | 5. (the) 54 th term is 214 | | | | |
| | | 6. it would be 218 (not 217) | | | | |
| | | 7. $4n - 2$ so n is not an integer/whole number | | | | |
| | | $8.219 \div 4$ oe (= 54.75) not an integer/whole | | | | |
| | | number | | | | |
| | | 9. not 2 less than a multiple of 4 | | | | |
| | | 10. does not end with 0, 2, 4, 6 and 8 | | | | |
| | | (must have all 5 numbers) | | | | |
| | | 11. each digit has an even digit at the end/does | | | | |
| | | not end in an even number | | | | |
| | | Not acceptable answers | | | | |
| | | 1. adding 4 each time will not lead to 217 | | | | |
| | | 2. it goes past 217 | | | | |
| | | $3.217 \div 4 (= 54.25)$ not an integer/whole | | | | |
| | | number | | | | · |
| | | | | | | Total 2 marks |

| 16 | | | 2 | M1 for $-7n + k \ (k \neq 45)$ or |
|----|---|---------|---|---|
| | | | | $-7 \times n + k \ (k \neq 45) \text{ or }$ |
| | | | | $n \times -7 + k \ (k \neq 45)$ |
| | | | | (k may be zero or absent or negative) |
| | | 45 - 7n | | Al oe |
| | | | | eg $45 - 7 \times n$ oe or |
| | | | | $-7 \times n + 45$ oe or |
| | | | | $U_n = 45 - 7n$ oe or |
| | | | | 38 - 7(n-1) oe |
| | | | | NB: award full marks for eg |
| | | | | x = 45 - 7n oe or |
| | | | | n th term = $-7 \times n + 45$ oe or |
| | | | | but only M1 for $n = 45 - 7n$ oe |
| | Correct answer scores full marks (unless from | | | Total 2 marks |
| | obvious incorrect working) | | | |

| 17 | (a) | IZIZIZI | 1 | B1 | |
|----|-----|------------------|---|----|---|
| | (b) | 17, 21 | 1 | B1 | Ignore any extra numbers if the 2 that are required are there |
| | (c) | 41 | 1 | B1 | |
| | (d) | A correct reason | 1 | B1 | The numbers of sticks are always an odd number (always ends in 1,3,5,7,9) 102 is even, pattern 25 has 101 sticks, The pattern goes97, 101, 105 It is $4n + 1$ oe $4 \times 25 + 1 = 101$ (or does not =102) The pattern never ends in a 2 |
| | | | | | Total 4 marks |