Q1. Here are some patterns made from sticks.

Pattern number 1 Pattern number 2 Pattern number 3

(a) Draw Pattern number 4 in the space below.

(1)

(b) How many sticks are needed for Pattern number 12?

.....

(2)

Sunil says that he will need 70 sticks for Pattern number 20

(c) Is Sunil correct?
You must give a reason for your answer.

.....

.....

.....

(2)

(Total 5 marks)

Q2. Here are some patterns made from dots.

Pattern number 1 Pattern number 2 Pattern number 3

(a) Draw Pattern number 4 in the space below.

(1)

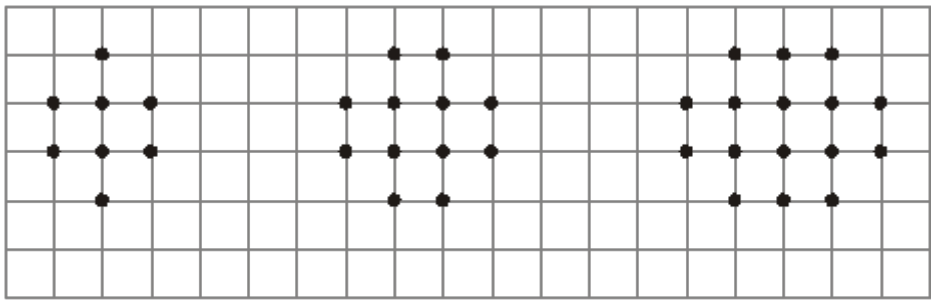
(b) How many dots are needed for Pattern number 15?

.....

(2)

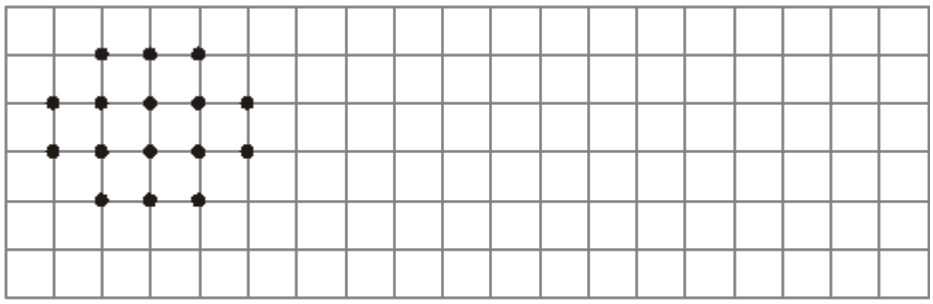
(Total 3 marks)

Q3. Here are some patterns made with dots.



Pattern number 1 Pattern number 2 Pattern number 3

(a) In the space below, complete Pattern number 4



Pattern number 4

(1)

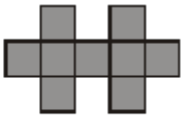
(b) Complete the table.

Pattern number	1	2	3	4	5
Number of dots	8	12	16		

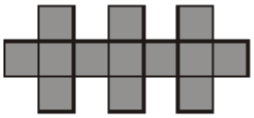
(2)
(Total 3 marks)

Q4. Here are some patterns made from squares.

Pattern number 1

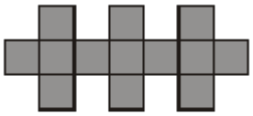


Pattern number 2



Pattern number 3

(a) The diagram below shows part of Pattern number 4
Complete the diagram for Pattern number 4



Pattern number 4

(1)

(b) Complete the table.

Pattern number	1	2	3	4	5
Number of squares	5	9	13		

(1)

(c) Find the number of squares used for Pattern number 10

.....

(1)
(Total 3 marks)

Q5. The first even number is 2.

(a) Write down the 3rd even number.

.....

(1)

Here are some patterns made from sticks.

Pattern number 1 Pattern number 2 Pattern number 3

(b) Complete Pattern number 4.

Pattern number 4

(1)

(c) Complete the table.

Pattern number	1	2	3	4	5
Number of sticks	3	6	9		

(2)

Jenny wants to find the number of sticks in Pattern number 100.

(d) Write down a method she could use.

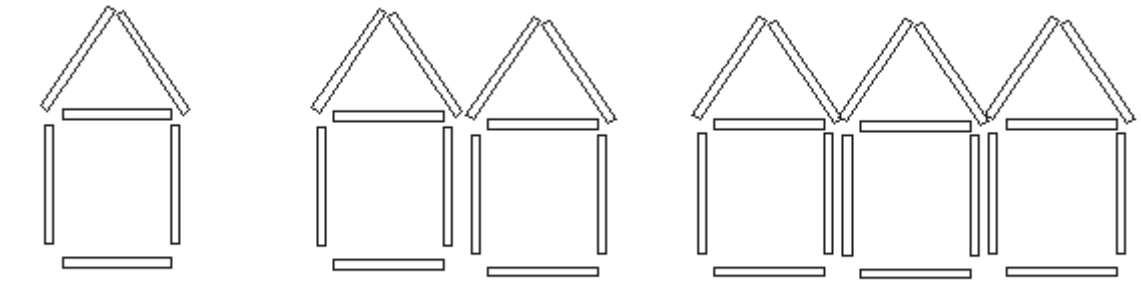
.....

.....

(1)

(Total 5 marks)

Q6. Here are some patterns made from sticks.



Pattern number 1 Pattern number 2 Pattern number 3

(a) Draw Pattern number 4 in the space below.

(1)

(b) How many sticks are used for Pattern number 10?

.....

(2)

Jim says there is a pattern with 123 sticks in it.

(c) Is Jim correct? You must explain your answer.

.....

.....

.....

(2)
(Total 5 marks)

M1.

	Answer	Mark	Additional Guidance
(a)	Pattern drawn	1	**B1** for correct pattern
(b)	37	2	**M1** for continuation or diagrams **A1** cao **OR** **M1** for sequence of numbers seen 4, 7, 10, 13, 16 etc **A1** cao **OR** **M1** for use of formula $3n + 1$ with $n = 12$ **A1** cao
(c)	No	2	**M1** for attempt to divide 69 by 3 **A1** for 'No' and comment on the fact that this is the number needed for pattern 23 **OR** **M1** for Starts at 3 and builds up to 61 **A1** for 'No' and comment on fact that 61 sticks are needed for pattern 20 NB: 0 for an answer that is an incorrect mathematical statement, or an answer that has an incorrect conclusion (eg "yes")
			Total for Question: 5 marks

M2.

	Working	Answer	Mark	Additional Guidance
(a)		Pattern	1	**B1**
(b)	7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49; or $3n + 4$	49	2	**M1** for method eg counting up in 3s (to at least pattern number 6; allow errors if intention is clear), diagram extension (ft), use of $3n + 4$ (could be shown as part of

				a valid calculation eg 15 × 3) **A1** 49
				Total for Question: 3 marks

M3.

	Answer	Mark	Additional Guidance
(a)	Diagram	1	**B1** cao
(b)	20, 24	2	**B1** for 20 or ft from drawing in (a) **B1** for 24 or ft from "20" + 4
			Total for Question: 3 marks

M4.

	Answer	Mark	Additional Guidance
(a)	Correct diagram	1	**B1** for correct diagram, accept squares drawn at either end shaded or unshaded. Ignore internal lines.
(b)	17, 21	1	**B1** cao
(c)	41	1	**B1** cao
			Total for Question: 3 marks

M5.

	Working	Answer	Mark	Additional Guidance
(a)		6	1	**B1** for 6 cao
(b)	I I I I	diagram	1	**B1** for correct diagram (4 vertical sticks and 8 horizontal sticks)
(c)		12, 15	2	**B2** for 12 and 15 (**B1** for either 12 or 15 or '12' + 3
(d)		reason	1	**B1** eg for '100 multiplied by 3' or '100 × 3' or '× 3' or $3n$ (but not 3n + a number) or 'keep adding 3' oe, as long as "3" is mentioned.
				Total for Question: 5 marks

M6.

	Working	Answer	Mark	Additional Guidance
(a)		Correct diagram	1	**B1** 4 identical shapes to the previous patterns
(b)		60	2	**M1** continues pattern 6, 12, 18, as far as the 10th A1 cao **OR** **M1** indicates that the number of sticks is 6 times the pattern number A1 cao **OR** **M1** doubles 30 sticks for pattern

				number 5 A1 cao
(c)	123 ÷ 6 leaves a remainder of 3, so 'no'	No + justification	2	**M1** Attempts to divide 120 by 6 **A1** 'No' + comment on remainder **OR** **M1** Starts at 6 and builds up to 120 and 126 A1 'No' + sight of 120 and 126
				Total for Question: 5 marks

##

Part (a) was well answered, the only common error of a few was to draw them as separate rectangles (i.e. adding 4 on each time). In part (b) common approaches included drawing an extension to the diagram, or writing out an extended sequence of numbers. Rarely was derivation of an algebraic rule seen. Unfortunately many candidates concluding incorrectly that 4 was added on each time, thereby using an incorrect sequence with which to work out their answer. Most gave an explanation in part (c), and the marks were awarded on the basis of how detailed their explanation was. The best answers included a conclusion ("no") and a calculation showing the 20^{th} number was 61, or showing it has to be an odd number.

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The diagram was usually drawn correctly, but some candidates had difficulty in lining up the dots, resulting in diagrams that were ambiguous. In part (b) a variety of methods were used by candidates. Those who attempted diagram extensions found counting their many dots quite a challenge. The most common approach was to generate the sequence 7, 10, 13, 16, 19 … but poor arithmetic resulted in many wrong answers. Either an error was made in adding on 3s, or an incorrect number of terms were used, resulting in many answers of 46, or more commonly 52. A common misconception resulted in "3 × 15".

E3. The majority of candidates scored well on this question. Incorrect diagrams sometimes scored marks when used to obtain the numbers in the table. Frequently candidates ignored their diagrams and used the "+4" rule to obtain the numbers in the table, which was also credited.

E4. In part (a) of this question the diagram was usually correct with the most common error being the addition of 5 squares (in a cross formation) or 3 squares. Some candidates did not answer this question. It appears that they may not have read the question with enough care. The two entries in the table were usually correct and there was only a small minority of candidates who made arithmetic errors here. Part (c) was correct in 59% of cases. Many candidates doubled the number of squares in pattern 5 to obtain the number of squares in pattern 10. Others made careless arithmetic errors.

E5. A well answered question in which the only mark lost was usually in part (d). In this part it was the quality of the explanations on which the mark was awarded. Failure to mention the significance of the “3” usually rendered the explanation incomplete.