

UNIT 8 *Number Sequences*

CSEC Revision Test

1. Write the next number in each of the following sequences.

In each case give a reason for your answer.

(a) 55, 49, 43, 37, 31, ...

(b) 1, 4, 9, 16, 25, ...

(4 marks)

2. Each sequence of shapes below is made up of lines which join two points.

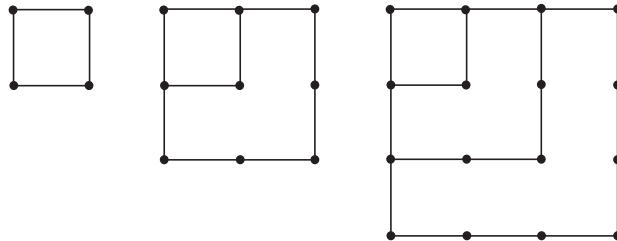
For each sequence,

(i) write down the number of lines, as a sequence;

(ii) explain how to obtain the next term of the sequence;

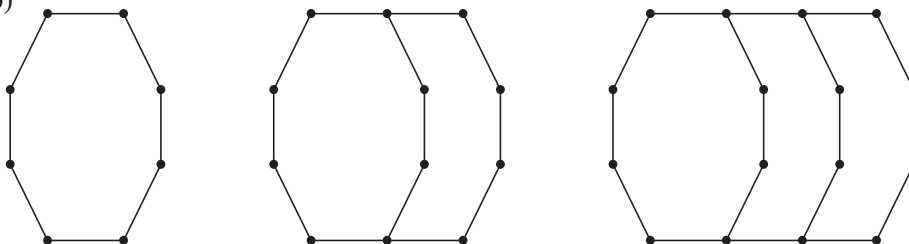
(iii) draw the next shape and check your answer.

(a)



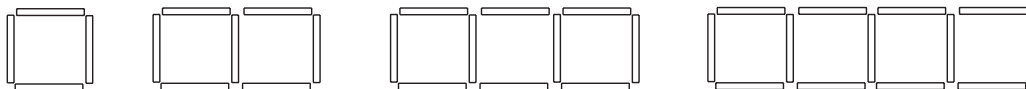
(3 marks)

(b)



(3 marks)

3. Patterns of squares are formed using sticks. The first four patterns are drawn below.



Pattern 1

Pattern 2

Pattern 3

Pattern 4

The table shows the number of sticks needed for each pattern.

<i>Pattern</i>	1	2	3	4
<i>Number of sticks</i>	4	7	10	13

Patterns continue to be drawn.

(a) One pattern needs 25 sticks. How many squares will there be?

(1 mark)

(b) How many sticks are required for a pattern of 10 squares?

(1 mark)

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- (c) There is a rule for finding the number of sticks needed to make any of these patterns of squares. If the number of squares in a pattern is s , write down the rule by completing the boxes.

$$\text{Number of sticks} = \square \times s + \square \quad (1 \text{ mark})$$

- (d) A pattern needs 100 sticks. What is the number of this pattern? (2 marks)

4. A sequence of numbers is shown below.

The first two terms are 3 and 4.

The remaining terms are found by adding together the two previous terms.

$$3, 4, 7, 11, 18, 29, \dots$$

- (a) Write down the next two terms in the sequence. (1 mark)

- (b) The numbers from the first sequence are used to find the terms of a second sequence as shown below.

The terms are given to 2 decimal places.



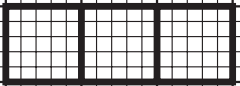
$$4 \div 3 = 1.33$$

$$7 \div 4 = 1.75$$

$$11 \div 7 = 1.57$$

- (i) Calculate the next three terms of this second sequence.
 (ii) Write down what you notice about the terms in the second sequence. (3 marks)

5. The table below shows a sequence of shapes made from squares with sides of 1 unit.

Shape	Area of Shape	Perimeter of Shape
	1	4
	2	6
	3	8

(6 marks)

- (a) On graph paper, draw the next TWO shapes to continue the sequence.

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- (b) For EACH shape drawn, in Part (a), find
- the area of the shape
 - the perimeter of the shape. (4 marks)
- (c) A shape in the sequence has an area of 12 square units.
What is the perimeter of this shape? (2 marks)
- (d) A shape in the sequence has a perimeter of 40 units.
What is the area of this shape? (2 marks)
- (e) On graph paper, draw TWO shapes EACH made up of 4 unit squares so that one has a perimeter of 8 units and the other has a perimeter of 16 units. (2 marks)
6. The table below shows an attempt at calculating the sum of cubes of the first n natural numbers. Information is missing from some rows of the table.
- (a) Study the pattern and complete the rows marked (i), (ii) and (iii).

n	Series	Sum	Formula
1	1^3	1	$\frac{1^2}{4}(1+1)^2$
2	$1^3 + 2^3$	9	$\frac{2^2}{4}(1+2)^2$
3	$1^3 + 2^3 + 3^3$	36	$\frac{3^2}{4}(1+3)^2$
4	$1^3 + 2^3 + 3^3 + 4^3$	100	$\frac{4^2}{4}(1+4)^2$
(i) 5	<input type="text"/>	<input type="text"/>	<input type="text"/>
6	$1^3 + 2^3 + 3^3 + 4^3 + 5^3 + 6^3$	441	$\frac{6^2}{4}(1+6)^2$
(ii) <input type="text"/>		<input type="text"/>	$\frac{8^2}{4}(1+8)^2$
(iii) n			<input type="text"/>

(6 marks)

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6. (b) It was further noted that:

$$1 + 2 = \sqrt{9} = 3, \quad 1 + 2 + 3 = \sqrt{36} = 6 \quad \text{and} \quad 1 + 2 + 3 + 4 = \sqrt{100} = 10$$

Using information from the table above and the pattern in the three statements above, determine

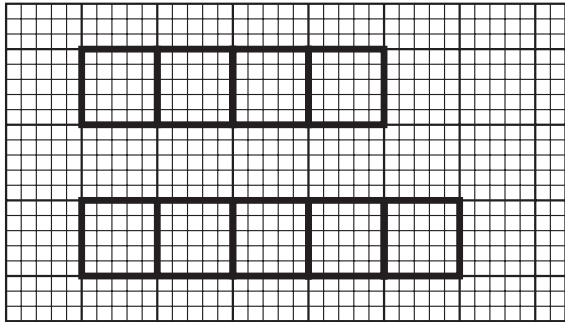
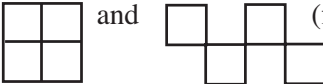
- (i) the value of x for which $1 + 2 + 3 + 4 + 5 + 6 = \sqrt{x}$
- (ii) a formula in terms of n for the series: $1 + 2 + 3 + 4 + \dots + n$
- (iii) the value of: $1 + 2 + 3 + 4 + \dots + 30$

(4 marks)

(TOTAL 45 MARKS)

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CSEC Revision Test ANSWERS

1. (a) 25, decreasing by 6 B1 B1
 (b) 36, square numbers B1 B1 (4 marks)
2. (a) (i) 4, 10, 18 B1
 (ii) add 10 \Rightarrow 28 B1
 (iii) diagram B1
 (b) (i) 8, 13, 18 B1
 (ii) add 5 \Rightarrow 23 B1
 (iii) diagram B1 (6 marks)
3. (a) 8 B1
 (b) 31 B1
 (c) $3 \times s + 1$ B1
 (d) $100 = 3s + 1 \Rightarrow s = 33$ M1 A1 (5 marks)
4. (a) 47, 76 B1
 (b) (i) $\frac{18}{11} = 1.64, \frac{29}{18} = 1.61, \frac{47}{29} = 1.62$ (B1 for 2 correct) B2
 (ii) they are converging (to about 1.62) B1 (4 marks)
- 5 (a)  B3
B3
(6 marks)
- (b) (i) 4, 5 (ii) 10, 12 B1 B1 B1 B1 (4 marks)
- (c) $2 \times 12 + 2 = 26$ M1 A1 (2 marks)
- (d) $(40 - 2) \div 2 = 19$ M1 A1 (2 marks)
- (e)  (for example) B1 B1 (2 marks)
6. (a) (i) $1^3 + 2^3 + 3^3 + 4^3 + 5^3 = 225 = \frac{5^2}{4} (1 + 5)^2$ B1 B1 B1 (for each term)
 (ii) $1296 = \frac{8^2}{4} (1 + 8)^2$ B1 B1
 (iii) $\frac{n^2}{4} (1 + n)^2$ B1 (6 marks)
- (b) (i) 441 (ii) $\frac{n(n+1)}{2}$ (iii) $\frac{30 \times 31}{2} = 465$ B1 B1 M1 A1 (4 marks)

(TOTAL MARKS 45)