

1. Here are the first four terms of a number sequence.

|          |          |          |          |
|----------|----------|----------|----------|
| 2        | 5        | 11       | 23       |
| <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> |

The rule to continue this sequence is

multiply the **previous** term by 2 and then add 1

Work out the 5th term of this sequence.

$$23 \times 2 = 46$$

$$46 + 1 = 47$$

47

(Total for Question is 1 mark)



$$L = a - 1 + a + a + a + a + 4$$

$$L = 5a + 3$$

$$5a + 3$$

2. Here is a sequence of patterns made with counters.



+3



+3



pattern number 1

pattern number 2

pattern number 3

- (a) Find an expression, in terms of  $n$ , for the number of counters in pattern number  $n$ .

|          |   |   |          |
|----------|---|---|----------|
| Term     | 1 | 2 | 3        |
| Counters | 4 | 7 | 10       |
| $3n$     | 3 | 6 | 9        |
| $3n + 1$ | 4 | 7 | 10       |
|          |   |   | $3n + 1$ |
|          |   |   | (2)      |

Bayo has 90 counters.

- (b) Can Bayo make a pattern in this sequence using all 90 of his counters?  
You must show how you get your answer.

$$\begin{aligned}
 3n + 1 &= 90 \\
 (-1) \quad (-1) & \\
 3n &= 89 \\
 (\div 3) \quad (\div 3) & \\
 n &= 29.67
 \end{aligned}$$

No, because 90 is not a term in the sequence  $3n + 1$

(2)

(Total for Question is 4 marks)

Convert Fraction to Decimal

$$\frac{9}{10} = 9 \div 10 = 0.9$$

FRACTION DECIMAL  
÷ divide

0.9

Convert Decimal to Percentage

DECIMAL PERCENTAGE  
× 100

$$0.3 \times 100 = 30\%$$

30

Round to the nearest 100

2538  
↑ tens  
hundreds column

3 < 5 so we round down  
to the nearest 100 = 2500

2500

3. Here are the first 4 terms of a sequence.

$$2 \xrightarrow{+7} 9 \xrightarrow{+7} 16 \xrightarrow{+7} 23$$

- (a) (i) Write down the next term in the sequence.

Common difference of +7

$$23 + 7 = 30$$

30

(1)

- (ii) Explain how you got your answer.

Increases by 7

(1)

- (b) Work out the 10th term of the sequence.

Di n O method

$$= 7n - 5$$

term number

Difference = 7

when  $n=10$

65

$$0^{\text{th}} \text{ term} = 2 - 7 = -5$$

$$= (7 \times 10) - 5 = 70 - 5$$

(1)

(Total for Question is 3 marks)

4. The  $n$ th term of a sequence is  $2n^2 - 1$

The  $n$ th term of a different sequence is  $40 - n^2$

Show that there is only one number that is in both of these sequences.

|            | $n=1$ | $n=2$ | $n=3$ | $n=4$ | $n=5$ | $n=6$ | $n=7$ |
|------------|-------|-------|-------|-------|-------|-------|-------|
| $2n^2 - 1$ | 1     | 7     | 17    | 31    | 49    | 71    | 97    |
| $40 - n^2$ | 39    | 36    | 31    | 24    | 15    | 4     | -9    |

clear that  
as these sequences  
continue they  
won't cross again

$$\begin{aligned} \frac{3.42 \times 10^{-7}}{7.5 \times 10^{-6}} &= 0.456 \times \frac{10^{-7}}{10^{-6}} = 0.456 \times 10^{-7-(-6)} = 0.456 \times 10^{-7+6} \\ &= 0.456 \times 10^{-1} = 4.56 \times 10^{-2} \end{aligned}$$

$$4.56 \times 10^{-2}$$

$$1\text{ km} = 1000\text{ m}$$

$$\downarrow \times 4 \quad \downarrow \times 4$$

$$4\text{ km} = 4000\text{ m}$$

$$4000 \checkmark$$

| 1 | 2 | 3 | 5 |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

Shaded: unshaded

$$3:5$$

$$3:5 \checkmark$$

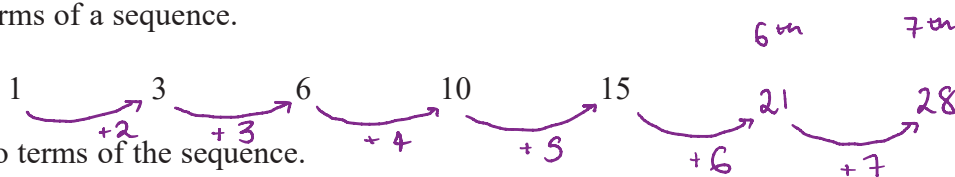
$$W = 4(8) + 3 \checkmark$$

$$W = 32 + 3$$

$$W = 35$$

$$35 \checkmark$$

5. Here are the first five terms of a sequence.



Write down the next two terms of the sequence.

$$21, 28 \checkmark \checkmark$$

(Total for Question is 2 marks)

6. The first five terms of an arithmetic sequence are

1      4      7      10      13

Write down an expression, in terms of  $n$ , for the  $n$ th term of this sequence.

$\times_{27}$  rule:

$1 \quad 4 \quad 7 \quad 10 \quad 13$

↘ ↘ ↘ ↘  
+5 +3 +3 +3 →  $3n$

|            |    |    |    |    |    |
|------------|----|----|----|----|----|
| $n$        | 1  | 2  | 3  | 4  | 5  |
| Term       | 1  | 4  | 7  | 10 | 13 |
| $3n$       | 3  | 6  | 9  | 12 | 15 |
| Term- $3n$ | -2 | -2 | -2 | -2 | -2 |

→ Term-term rule is  $3n-2$

$3n-2$  ✓✓

**(Total for Question 1 is 2 marks)**

7. Here are the first five terms of a number sequence.

45      40      35      30      25

- (a) (i) Write down the next two terms of this sequence.

45    40    35    30    25    20    15

$\xrightarrow{-5}$     $\xrightarrow{-5}$     $\xrightarrow{-5}$     $\xrightarrow{-5}$     $\xrightarrow{-5}$     $\xrightarrow{-5}$

①

|       |    |
|-------|----|
| 20    | 15 |
| ----- |    |
| (1)   |    |

A term of this sequence is -5

- (ii) Which term?

5    6    7    8    9    10    11  
 25    20    15    10    5    0    -5

$\xrightarrow{-5}$     $\xrightarrow{-5}$     $\xrightarrow{-5}$     $\xrightarrow{-5}$     $\xrightarrow{-5}$     $\xrightarrow{-5}$

①

|       |
|-------|
| 11    |
| ----- |
| (1)   |

The  $n$ th term of a different sequence is given by the expression  $4n + 3$

- (b) Find the 9th term of this sequence.

$\curvearrowright n = 9$

$$4n + 3 = 4(9) + 3 = 36 + 3 = \underline{\underline{39}}$$

①

|       |
|-------|
| 39    |
| ----- |
| (1)   |

(Total for Question is 3 marks)