Algebra 1

Framework objectives – Sequences and rules
Generate and describe simple integer sequences.

Oral and mental starter

- Start with, say, the number 105 and ask who knows which integers (whole numbers) divide exactly into this number. Many will offer the answer 5. Ask them why. Bring out the fact that any number ending in 5, or 0, will divide exactly by 5. 'It is divisible by 5.'
- Then ask for another number that divides exactly into 105. Lead them to 3. 'Does anyone know how we can tell from the digits that 105 is divisible by 3?'
- Put a few other numbers on the board that are divisible by 3. Ask what is common. Lead them to see that if we add up the digits of such a number, we will get another number that is also divisible by 3. Explain that this is a useful aid in testing for divisibility without having to go to the trouble of actually dividing. For example: 'Can I divide a group of 78 people into three equal groups?'
- Finish by holding up some number cards and asking which numbers are divisible by 5 or 3, or both.

Main lesson activities

- Ask the class for the next numbers in the sequence (on the board):
    2, 5, 8, 11, 14, …
    You should get some correct answers of 17, 20, 23, etc.
- Ask how they could tell. Get from the class the idea that there is a rule here of adding on 3 each time. You could introduce the term **difference** here.
- Ask whether this rule always gives the same sequence. It does not, since if we change the starting number, we will get a different sequence.
- Get someone to suggest a rule. Keep it simple and accept only add or multiply to start with. Subtraction and division are a little trickier and will be left until later (unless you feel like introducing the idea here).
- With the same rule, ask for some different starting points and get the class to tell you what the different sequences are.
- Do a few of these, making sure that you choose a variety of additions and multiplications. But do keep the numbers within the scope of the class.
- Write 1 and 2 on the board and ask: 'What comes next?'
- Get some answers and rules from the class, or prompt them. Examples are:
    1, 2, 3, 4, … Adding on 1 each time
    1, 2, 4, 8, … Doubling the number each time
    1, 2, 4, 7, … Add on 1, then 2, then 3, …
- The same starts can lead to different sequences with different rules.

- Write 1, …, 10 on the board and ask: 'What sequence of numbers can go in between?'
- Get some answers and rules from the class, or prompt them. Examples are:
    1, 5, 10   Add on 4 then 5
    1, 2, 3, 4, 5, 6, 7, 8, 9, 10   Adding on 1 each time
    1, 4, 7, 10   Adding on 3 each time

- **The class can now do Exercise 1A from Pupil Book 2.**

Exercise 1A   Answers

1 a i 1, 4, 7, 10, 13   **ii** 5, 8, 11, 14, 17   **b i** 1, 3, 9, 27, 81
ii 5, 15, 45, 135, 405   **c i** 1, 6, 11, 16, 21   **ii** 5, 10, 15, 20, 25
d i 1, 10, 100, 1000, 10 000   **ii** 5, 50, 500, 5000, 50 000   **e i** 1, 10, 19, 28, 37
ii 5, 14, 23, 32, 41   **f i** 1, 5, 25, 125, 625   **ii** 5, 25, 125, 625, 3125
g i 1, 8, 15, 22, 29   **ii** 5, 12, 19, 26, 33   **h i** 1, 2, 4, 8, 16   **ii** 5, 10, 20, 40, 80
i i 1, 12, 23, 34, 45   **ii** 5, 16, 27, 38, 49   **j i** 1, 4, 16, 64, 256
ii 5, 20, 80, 320, 1280   **k i** 1, 9, 17, 25, 33   **ii** 5, 13, 21, 29, 37
l i 1, 106, 211, 316, 421   **ii** 5, 110, 215, 320, 425
2 a 8, 10 add 2   **b** 12, 15 add 3   **c** 1000, 10 000 multiply by 10
d 8, 16 multiply by 2   **e** 250, 1250 multiply by 5   **f** 21, 28 add 7
g 16, 19 add 3   **h** 19, 24 add 5   **i** 16, 20 add 4   **j** 36, 45 add 9
k 48, 60 add 12   **l** 54, 162 multiply by 3

Extension   Answers

Students will start with trial-and-improvement methods, but some will develop a strategy of dividing to see what the remainder is, which will give them the 1st term

Plenary

- Finish by reminding the class that there are very many different sequences found within nature and life in general, and that part of mathematics is often to help find these patterns.
- The students need to be able themselves to generate a sequence from a basic rule. They need to be able to find the basic rule from the pattern of a sequence, and then use it to continue generating that sequence.
- Tell them they have been looking at only simple sequences today. There are some beautiful ones to come which are far more exciting.

Keywords

- integer
- sequence
- term
- rule
- starting point
- difference

Homework

1 Write the next two terms in each sequence. Describe the term-to-term rule you have used.

a 3, 7, 11, …   **b** 5, 10, 20, …   **c** 30, 25, 20, …   **d** 2, 4, 8, …   **e** 1, 8, 15, …

f 7, 9, 11, …   **g** 5, 14, 23, …   **h** 7, 13, 19, …   **i** 13, 26, 39, …

2 Find at least one sequence between each pair of numbers. Fully describe the term-to-term rule you have used.

a 1, … 9   **b** 1, … 16   **c** 5, … 21   **d** 4, … 36

e 10, … 20   **f** 16, …. 8

Homework Answers

1 a 15, 19 add 4   **b** 40, 80 multiply by 2   **c** 15, 10 subtract 5   **d** 16, 32 multiply by 2   **e** 22, 29 add 7
f 13, 15 add 2   **g** 32, 41 add 9   **h** 25, 31 add 6   **i** 52, 65 add 13
2 There could be a few for each one. Some examples are: **a** 1, 3, 9 multiply by 3 or 1, 5, 9 add 4
b 1, 4, 16 multiply by 4   **c** 5, 13, 21 add 8   **d** 4, 12, 36 multiply by 3   **e** 10, 15, 20 add 5
f 16, 12, 8 subtract 4