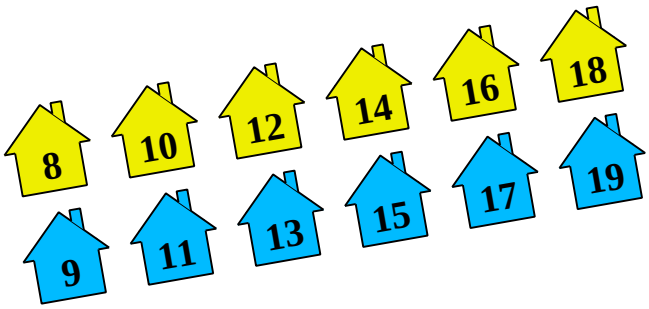
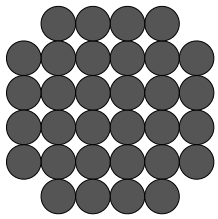
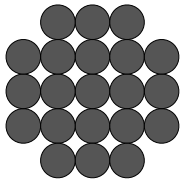
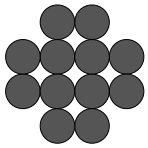
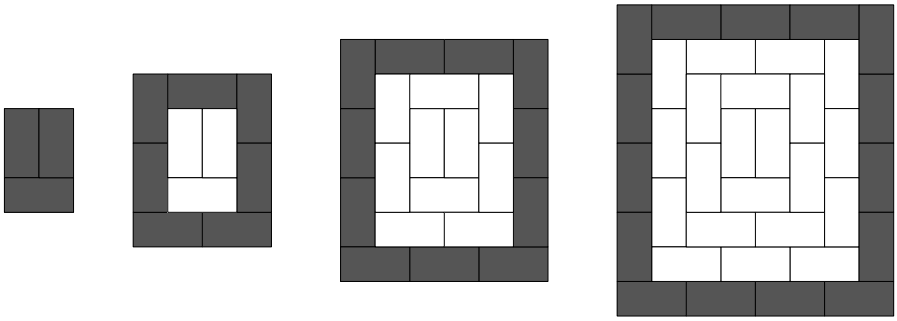


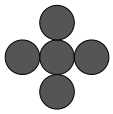




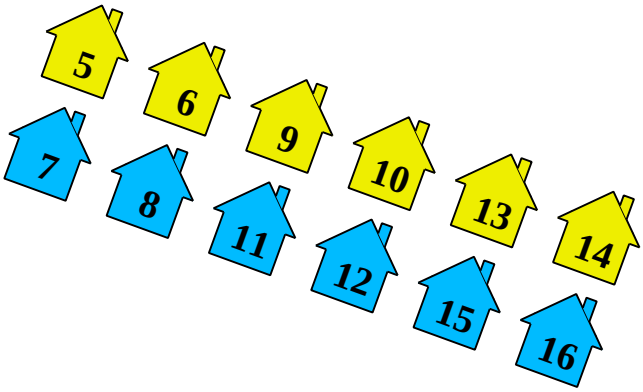
Number Sequences

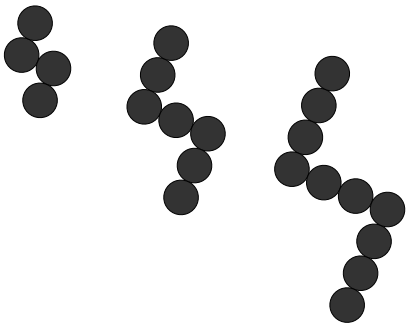






1 1 2 3 5 8 13 21 34 55 89





Number Sequences I

Lesson 1

Number Sequences : Year 9

Non-Calculator

Mathematicians are sometimes referred to as pattern searchers: people who try to make sense of the chaos of numbers that surround us in everyday life. A mathematician sees numbers, not is isolation, but in sequences.

So, for example, when a mathematically aware person walks down a street, they might notice that the numbers on one side of the street are running,

..., 46, 48, 50, 52, 54, ...

whilst those on the other go,

..., 47, 49, 51, 53, ...

Being aware that there are two sequences is useful.
If you're looking for house number 104, you know which side of the street to look.

1.1 Example 1

Start with 6, and keep adding 5.

(a) Write down the first ten terms in the sequence.

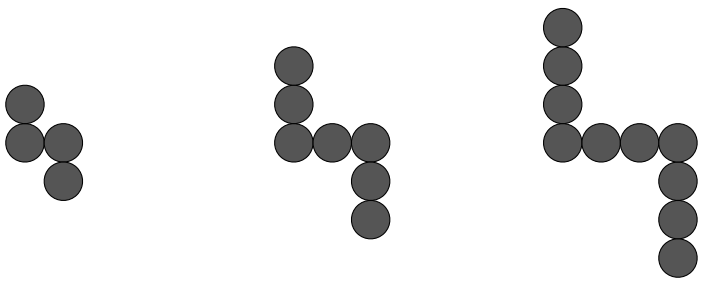
6 , _____ , _____ , _____ , _____ ,

_____ , _____ , _____ , _____ , _____ , ...

(b) Will the number 1006 eventually be in this sequence ?
Give a reason for your answer.

1.2 Example 2

Draw the next pattern in this sequence, which will use 13 balls;



4 balls **7 balls** **10 balls** **13 balls**

1.3 Exercise

Question 1

Start with 3, and keep adding 4.

(a) Write down the first ten terms in the sequence.

3 , _____ , _____ , _____ , _____ ,

_____ , _____ , _____ , _____ , _____ , ...

(b) Will the number 1008 eventually be in this sequence ?
Give a reason for your answer.

Question 2

Start with - 5, and keep adding 2.

(a) Write down the first ten terms in the sequence.

- 5 , _____ , _____ , _____ , _____ ,

_____ , _____ , _____ , _____ , _____ , ...

(b) Will the number 1007 eventually be in this sequence ?
Give a reason for your answer.

Question 3

Start with 19, and keep subtracting 3.

(a) Write down the first ten terms in the sequence.

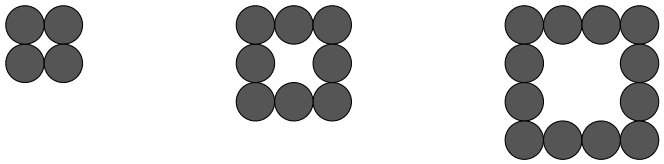
_____ , _____ , _____ , _____ , _____ ,

_____ , _____ , _____ , _____ , _____ , ...

(b) Will the number 203 eventually be in this sequence ?
Give a reason for your answer.

Question 4

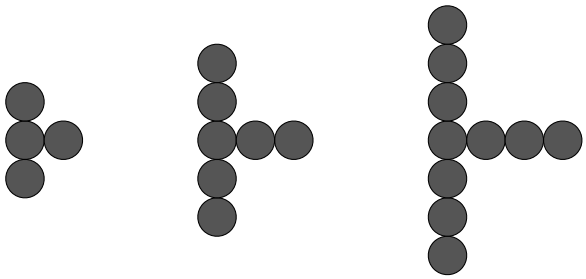
Draw the next pattern in this sequence, which will use 16 balls;



4 balls **8 balls** **12 balls** **16 balls**

Question 5

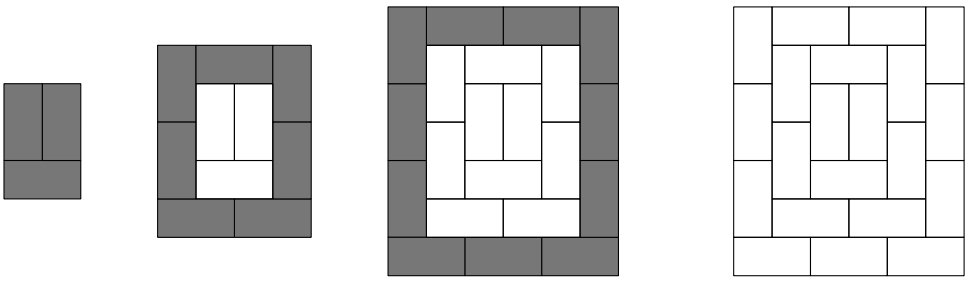
Draw the next pattern in this sequence, which will use 13 balls;



4 balls **7 balls** **10 balls** **13 balls**

Question 6

Draw the next pattern in this sequence, which will use 15 bricks;



3 bricks **7 bricks** **11 bricks** **15 bricks**

Question 7

Start with 128, and keep dividing by 2.

(a) Write down the first ten terms in the sequence.

_____ , _____ , _____ , _____ , _____ ,

_____ , _____ , _____ , _____ , _____ , ...

(b) Will the number - 1 eventually be in this sequence ?
Give a reason for your answer.

Question 8

Start with - 1.5, and keep adding 1.5.

(a) Write down the first ten terms in the sequence.

_____ , _____ , _____ , _____ , _____ ,

_____ , _____ , _____ , _____ , _____ , ...

(b) Will the number 30 eventually be in this sequence ?
Give a reason for your answer.

Question 9

Start with 1.4, and keep adding 1.2.

(a) Write down the first ten terms in the sequence.

_____ , _____ , _____ , _____ , _____ ,

_____ , _____ , _____ , _____ , _____ , ...

(b) Will the number 20 eventually be in this sequence ?
Give a reason for your answer.

Question 10

Start with 19.3, and keep subtracting 2.1.

(a) Write down the first ten terms in the sequence.

_____ , _____ , _____ , _____ , _____ ,

_____ , _____ , _____ , _____ , _____ , ...

(b) Will the number 0 eventually be in this sequence ?
Give a reason for your answer.

Question 11

Start with - 0.8, and keep adding 0.2.

(a) Write down the first ten terms in the sequence.

_____ , _____ , _____ , _____ , _____ ,

_____ , _____ , _____ , _____ , _____ , ...

(b) Will the number 17.1 eventually be in this sequence ?
Give a reason for your answer.

Question 12

Start with $\frac{1}{81}$, and keep multiplying by 3 : HINT $81 = 3^4$

(a) Write down the first ten terms in the sequence.

_____ , _____ , _____ , _____ , _____ ,

_____ , _____ , _____ , _____ , _____ , ...

(b) Will the number 5605 eventually be in this sequence ?
Give a reason for your answer.

Question 13

Start with $\frac{3}{32}$, and keep multiplying by 2 : HINT $32 = 2^5$

(a) Write down the first ten terms in the sequence.

_____ , _____ , _____ , _____ , _____ ,

_____ , _____ , _____ , _____ , _____ , ...

(b) Will the number 812 eventually be in this sequence ?
Give a reason for your answer.

Question 14

Start with $\frac{243}{2}$, and keep multiplying by $\frac{1}{3}$: HINT $243 = 3^5$

(a) Write down the first ten terms in the sequence.

_____ , _____ , _____ , _____ , _____ ,

_____ , _____ , _____ , _____ , _____ , ...

(b) Will the number 0.000 001 eventually be in this sequence ?
Give a reason for your answer.

Question 15

Start with $\frac{16}{27}$, and keep multiplying by $\frac{3}{2}$

(a) Write down the first ten terms in the sequence.

_____ , _____ , _____ , _____ , _____ ,

_____ , _____ , _____ , _____ , _____ , ...

(b) Will a square number eventually be in this sequence ?
Give a reason for your answer.

Question 16

Start with $\sqrt{2}$, and keep multiplying by $\sqrt{2}$.

(a) Write down the first ten terms in the sequence.

_____ , _____ , _____ , _____ , _____ ,

_____ , _____ , _____ , _____ , _____ , ...

(b) Will the number $52\sqrt{2}$ eventually be in this sequence ?
Give a reason for your answer.

Question 17

Take any two-digit number which is divisible by 3.
Cube each digit and add the cubes together.
Now cube the digits of your sum and repeat the process.
Stop when something of significance occurs.

Example : Say 72 was the two digit number picked.

$7^3 + 2^3 = 343 + 8 = 351$

$3^3 + 5^3 + 1^3 = 27 + 125 + 1 =$ ... and so on

Cubes

$1^3 = 1$
$2^3 = 8$
$3^3 = 27$
$4^3 = 64$
$5^3 = 125$
$6^3 = 216$
$7^3 = 343$
$8^3 = 512$
$9^3 = 729$

Investigate as many two-digit starting numbers as you have time for.
Use the space over the page....