Lesson 3

Number Sequences : Year 9

Non-Calculator

3.1 Harder Sequence Code

Consider this number sequence;

$$A_n = (2n + 1)(3n - 2)$$

To find the first four terms we can set out our working as follows;

When : $n = 1$: $A_1 = 3 \times 1 =$

$n = 2$: $A_2 = 5 \times 4 =$

$n = 3$: $A_3 = \times =$

$n = 4$: $A_4 = \times =$

As a table....

Position, n	1 st	2 nd	3 rd	4 th
Term, $A_n = (2n + 1)(3n - 2)$				

NOTICE: The 'jump' from one term to the next is changing each time.

3.2 Exercise

Question 1

Find the first four terms of the sequence;

$$B_n = (2n - 1)(5n - 4)$$

Working:

When : $n = 1$: $B_1 = 1 \times 1 =$

$n = 2$: $B_2 = 3 \times 6 =$

$n = 3$: $B_3 = \times =$

$n = 4$: $B_4 = \times =$

Write your answers in this table....

Position, n	1 st	2 nd	3 rd	4 th
Term, $B_n = (2n - 1)(5n - 4)$				

Question 2

Find the first four terms of the sequence;

$$C_n = (4n - 1)(n + 2)$$

Working:

When : $n = 1$: $C_1 =$ $\times$ $=$

$n = 2$: $C_2 =$ $\times$ $=$

$n = 3$: $C_3 =$ $\times$ $=$

$n = 4$: $C_4 =$ $\times$ $=$

Write your answers in this table....

Position, n	1st	2nd	3rd	4th
Term, $C_n = (4n - 1)(n + 2)$				

Question 3

Find the first six terms of the sequence,

$$D_n = 7 - 2n$$

Position, n	1st	2nd	3rd	4th	5th	6th
Term, $D_n = 7 - 2n$						

Question 4

Find the first four terms of the sequence;

$$E_n = (8 - n)(3n + 2)$$

Working:

When : $n = 1$: $E_1 =$ $\times$ $=$

$n = 2$: $E_2 =$ $\times$ $=$

$n = 3$: $E_3 =$ $\times$ $=$

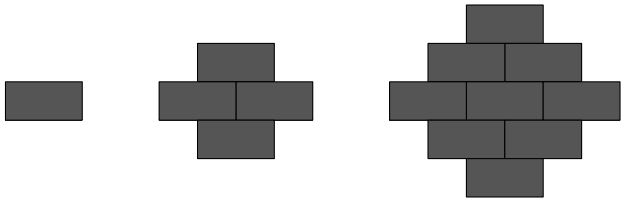
$n = 4$: $E_4 =$ $\times$ $=$

Write your answers in this table....

Position, n	1st	2nd	3rd	4th
Term, $E_n = (8 - n)(3n + 2)$				

Question 5

Study this sequence of pictures;



1 brick **4 bricks** **9 bricks** **??? bricks**

(a) Draw the fourth diagram.

(b) How many bricks were needed to make the fourth diagram ?

(c) This number sequence is world famous.
What is its world famous name ?

Question 6

Find the first four terms of the sequence;

$$F_n = \frac{60}{(n+1)}$$

Working:

When $n = 1$: $F_1 = \frac{60}{\quad} =$

$n = 2$: $F_2 = \frac{60}{\quad} =$

$n = 3$: $F_3 = \frac{\quad}{\quad} =$

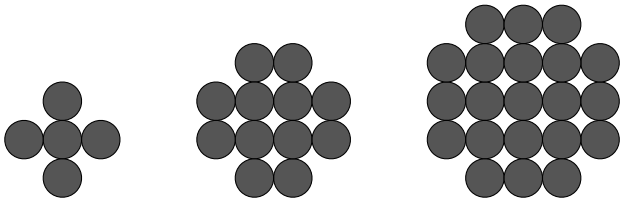
$n = 4$: $F_4 = \frac{\quad}{\quad} =$

Write your answers in this table....

Position, n	1 st	2 nd	3 rd	4 th
Term, $F_n = \frac{60}{(n+1)}$				

Question 7

Study this sequence of pictures;



5 balls **12 balls** **21 balls** **??? balls**

(a) Draw the fourth diagram.

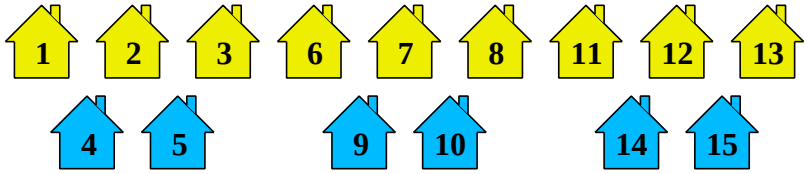
(b) How many balls were needed to make the fourth diagram ?

(c) Which ONE of the following formula is the correct formula for this sequence of pictures ?

$$X_n = 4 + n \qquad Y_n = n(n + 4) \qquad Z_n = \frac{5}{n}$$

Question 8

The diagram shows how the houses are numbered along a part of *Stanley Road*.



The Up Side

The Down Side

(a) Will house 22 be on Up or Down Side ?

(b) Will house 39 be on Up or Down Side ?

(c) If the house number divides by five exactly, which side ?

(d) If the house number has a remainder of 1 when divided by 5, which side ?

(e) A sequence is described by the following algebra;

$$G_n = 5n - 2$$

Write down the first six terms;

Position, n	1 st	2 nd	3 rd	4 th	5 th	6 th
Term, $G_n = 5n - 2$						

(f) Are the houses that have numbers in sequence G on Up or Down Side ?

Question 9

Find the first four terms of the sequence;

$$G_n = \frac{20\,(2n - 1)}{(n + 1)}$$

Working:

When $n = 1$: $G_1 = \frac{20 \times}{\qquad} =$

$n = 2$: $G_2 = \frac{20 \times}{\qquad} =$

$n = 3$: $G_3 = \frac{\qquad}{\qquad} =$

$n = 4$: $G_4 = \frac{\qquad}{\qquad} =$

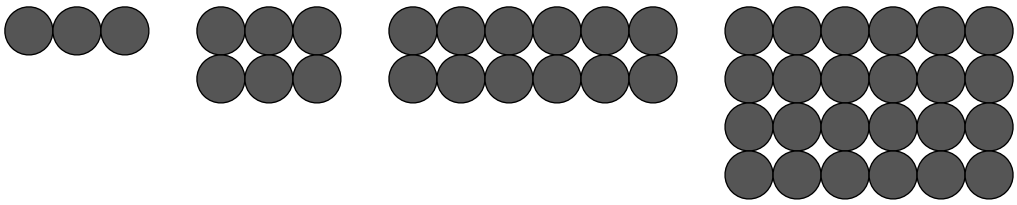
Write your answers in this table....

Position, n	1 st	2 nd	3 rd	4 th
Term, $G_n = \frac{20\,(2n - 1)}{(n+1)}$				

Kevin predicts that G_5 will equal 29.
Show that Kevin is wrong.

Question 10

On a computer three small circles are drawn.
Using *copy and paste* the number of dots grows as shown;



The sequence is described by the formula;

$$H_n = 1.5 \times 2^n$$

Write out the first six terms of this number sequence in the following table;

Position, n	1 st	2 nd	3 rd	4 th	5 th	6 th
Term, $H_n = 1.5 \times 2^n$						

Question 11

Here is a *position-to-term* formula that describes a world famous sequence of numbers.

$$A_n = 2n - 1$$

(a) Write out the start of this number sequence in the following table;

Position	1st	2nd	3rd	4th	5th	6th
Term						

(b) What is A_{100} ?

(c) What is this sequence's world famous name ?

Question 12

Here is a *position-to-term* formula that describes a world famous sequence of numbers.

$$T_n = \frac{n(n+1)}{2}$$

(a) Write out the start of this number sequence in the following table;

Position	1st	2nd	3rd	4th	5th	6th
Term						

(b) What is T_{200} ?

(c) What is this sequence's world famous name ?

(d) Explain why this sequence is so called.

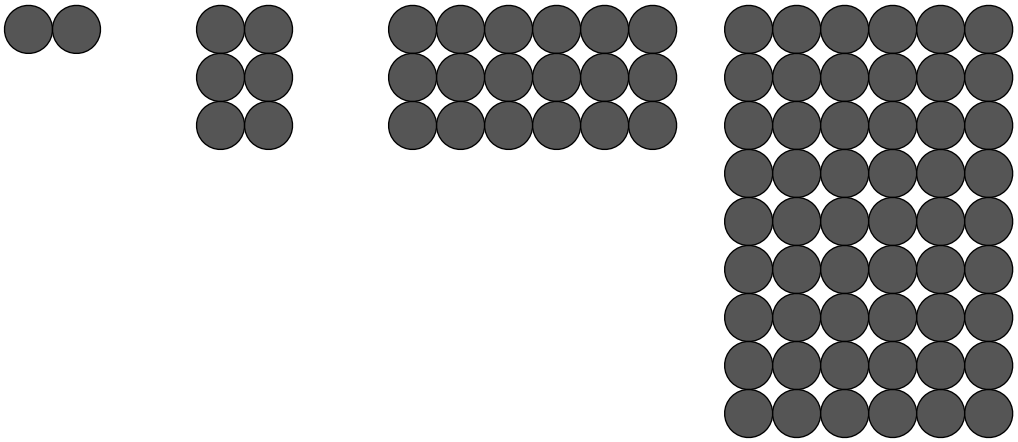
Question 13

For each sequence use the *position-to-term* formula to generate the first four terms of the sequence.

Name	1st term	2nd term	3rd term	4th term	Position-to-term formula
B					$B_n = 8n - 5$
D					$D_n = n^2 + 1$
E					$E_n = (n + 1)(n + 3)$
H					$H_n = 100 - 3n$
K					$K_n = 0.1n + 8$
M					$M_n = 5n^2$
N					$N_n = (5n)^2$
P					$P_n = \frac{12}{n}$
Q					$Q_n = \frac{24}{n} + 3$
W					$W_n = 4 + 2^n$
X					$X_n = 2 \times 3^{(n-1)}$
Y					$Y_n = n^0$

Question 14

On a computer two small circles are drawn.
Using *copy*, *paste* and *paste* again, the number of dots grows as shown;



The sequence is described by the formula;

$$P_n = \frac{2}{3} \times 3^n$$

(a) Write out the start of this number sequence in the following table;

Position	1 st	2 nd	3 rd	4 th	5 th	6 th
Term						

(b) How would you find P_{10}

(i) Without a calculator ?

(ii) With a calculator ?