GCSE (9–1)
MATHEMATICS

Foundation Check In - 6.06 Sequences

1. Write down the first five terms of the sequence generated by $19 - 4n$.

2. Find the next two numbers in this sequence.

   3, 9, 27, 81, ……, ……

3. Which of the following *n*th term formulae describe descending sequences?

   2^{-n} $-3n+1$ $(-n)^2$ $2^{(n+1)}$ $\frac{1}{n}$

4. Write the formula for the *n*th term of this sequence.

   2, 8, 14, 20, ……

5. Write down the first five terms of the sequence generated by $n^2 - 2n$.

6. Jack says that 83 is in the sequence with *n*th term $7n - 1$. Show that he is correct.

7. Two sequences have *n*th terms $5n + 20$ and $2n + 65$ respectively. Which sequence will pass 100 for the smallest value of *n*? Explain your answer.

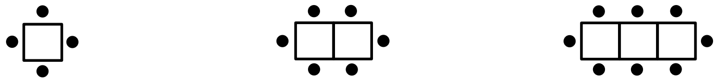
8. Explain in words how to continue this sequence.

   4, 4, 8, 12, 20, 32, ……

9. The sequence with *n*th term $2n^2 + 3n + c$ has second term 19. Work out the value of *c*.

10. The diagram below shows a sequence with squares and dots labelled Pattern A.

    Pattern A

    The number of dots in Pattern B is described by the *n*th term $65 - n$. Patterns A and B share a term with an equal number of dots which is in the same position in both sequences. Work out which term in Patterns A and B has the same number of dots and state the number of dots.

Extension

Martin thinks that the sum of any two consecutive triangular numbers is always a square number. Investigate whether he is correct.

Answers

1. 15, 11, 7, 3, $^{-}1$

2. 243, 729

3. 2^{-n}, $-3n+1$ and $\frac{1}{n}$

4. $6n-4$

5. $^{-}1$, 0, 3, 8, 15

6. If 83 is in the sequence, solving $7n-1=83$ would give a whole number (integer) value of *n*.

   $7n-1=83$
   $7n=84$
   $n=12$ so 83 is the 12th term of the sequence.

7. When $2n+65=100$, $n=17.5$. When $5n+20=100$, $n=16$. So $5n+20$ passes 100 sooner.

8. To get the next number in the sequence you need to add the two previous terms.
   So the next term would be $20+32=52$.

9. When $n=2$, $2\times(2)^2+3\times(2)+c=19$
   $8+6+c=19$
   so $c=5$

10. Equating and solving $2n+2$ and $65-n$ gives $n=21$. The 21st term has 44 dots.

Extension
Yes he is correct. The triangular numbers are: 1, 3, 6, 10, 15, 21, 28, 35, …..
$1+3=4=2^2$
$3+6=9=3^2$
$6+10=16=4^2$
$10+15=25=5^2$ and so on.

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AO1	1	Generate an arithmetic sequence from a formula for the *n*th term			
AO1	2	Recognise simple geometric progressions			
AO1	3	Identify descending sequences			
AO1	4	Find a formula for the *n*th term of an arithmetic sequence			
AO1	5	Generate a quadratic sequence from a formula for the *n*th term			
AO2	6	Use a formula for the *n*th term to locate the position of a term in a sequence			
AO2	7	Use a formula for the *n*th term to locate the position of a term in a sequence			
AO2	8	Recognise and describe Fibonacci sequences			
AO3	9	Solve a problem involving the *n*th term formula of a quadratic sequence			
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