Higher Check In - 6.06 Sequences

1. Write x_3, x_4 and x_5 for the sequence generated by $x_{n+2} = x_{n+1} + x_n$ if $x_1 = 1$ and $x_2 = 1$.

2. Complete the term-to-term rule in subscript notation for the sequence 3, 8, 18, 38, 78.

$$u_{n+1} =$$

3. Write down the first five terms of the sequence whose formula for the nth term is $u_n = n^2 - 7n + 10$.

4. Find the nth term of this sequence.

$$\frac{1}{2}, \ \frac{2}{3}, \ \frac{3}{4}, \ \frac{4}{5}, \ \ ......$$

5. Write down the formula for the nth term of this quadratic sequence.

$$12, \quad 24, \quad 40, \quad 60, \quad ......$$

6. The position-to-term rule for a sequence is $u_n = 3n^2 + 5$. Huda says that 82 is a number in the sequence. Explain whether Huda is correct.

7. Louis states that the position-to-term rule for the sequence 4, 15, 26, 37, 48, 59, ... is $u_n = 2n^2 + 5n - 3$. Is he correct? Explain your answer.

8. Show that the sequences whose position-to-term rules are $u_n = 300 - 10n$ and $u_n = 8n^2 + 5n + 25$ have a term that is both equal in value and in the same position of the sequence.

9. A culture of bacteria doubles every 2 hours. If there are 300 bacteria at the beginning, how many bacteria will there be after 18 hours?

10. Laura is not well and is given some medication from her doctor. The doctor recommends that she takes 200 mg of her medication on the first day, and then decrease the dosage by one half each day for one week.
    Find the position-to-term rule for this sequence and use it to calculate the amount of medication Laura will take on the 7th day. Write your answer to the nearest milligram.

Extension

The sum of 8 consecutive even numbers is 280. What are the 1st and 3rd terms in the sequence?

Answers

1. 2, 3, 5

2. $u_{n+1} = 2(u_n + 1)$

3. 4, 0, ⁻2, ⁻2, 0

4. $\dfrac{n}{n+1}$

5. $u_n = 2n^2 + 6n + 4$

6. Huda is incorrect. Solving $3n^2 + 5 = 82$ does not give a whole number answer so 82 cannot be in the sequence.

7. No, he is not correct. The formula is for a quadratic sequence, but the sequence increases by 11 each time so it is a linear sequence.

8. Equating $8n^2 + 5n + 25 = 300 - 10n$ and solving $8n^2 + 15n - 275 = 0$ gives $n = 5$ or $n = -6.8755$. Disregarding the negative solution, the equivalent term is in 5th place and has a value of 250.

9. $u_n = 300 \times 2^{\frac{n}{2}}$, $300 \times 2^9 = 153\,600$

10. $u_n = 200 \times \left(\dfrac{1}{2}\right)^{n-1}$, $200 \times \left(\dfrac{1}{2}\right)^6 = 200 \times \dfrac{1}{64} = 3.125$

    The answer is $3\,$mg (to the nearest mg).

Extension

28 and 32

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Assessment Objective	Qu.	Topic	R	A	G
AO1	1	Generate a sequence from a term-to-term rule given in subscript notation			
AO1	2	Write a term-to-term rule in subscript notation			
AO1	3	Generate a sequence from a position-to-term rule given in subscript notation			
AO1	4	Generate and find nth terms of sequences that are not linear, quadratic or geometric			
AO1	5	Find a formula for the nth term of a quadratic sequence			
AO2	6	Use a formula for the nth term to locate the position of a term in a sequence			
AO2	7	Recognise the difference between a linear and a quadratic sequence			
AO2	8	Use a formula for the nth term to locate the position of a term in a sequence			
AO3	9	Solve a word problem using a formula for the nth term			
AO3	10	Solve a word problem using a formula for the nth term			