

## Grade 9 Mathematics Worksheet

### Number sequence

#### Questions:

1.
  - a) Write down the sequence of Fibonacci numbers up to the 10<sup>th</sup> term.
  - b) Peter has read somewhere that “When you write out any 10 consecutive numbers in a Fibonacci sequence, multiplying the seventh number by 11 gives the total sum of all 10 numbers”. Use your numbers in (a) to help show that this is true.
  - c) Now using the sequence where  $T_1 = x$  and  $T_2 = y$ , write down the first 10 terms in the Fibonacci sequence in terms of  $x$  and  $y$ .
  - d) Use your working in (c) to show that the rule in (b) holds for any sequence of 10 consecutive Fibonacci numbers.
2. Below the incomplete input and output table has been given:

Input	0	1	2	3	4	7	11	25
Output	1	2	5	10				

- a) Complete the table, showing your calculations.
- b) Find a general rule that represents the pattern in the number sequence.
- c) If the output started at 5 and kept the same structure, how will your rule change?

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**Solution:**

1. a) **1, 1, 2, 3, 5, 8; 13 ; 21 ; 34; 55**

b)  $7^{\text{th}}$  term = 13. So  $13 \cdot 11 = 143$  and the sum of the ten terms = 143

c)  $T_1 = x$

$T_2 = y$

$T_3 = x + y$

$T_4 = x + 2y$

$T_5 = 2x + 3y$

$T_6 = 3x + 5y$

$T_7 = 5x + 8y$

$T_8 = 8x + 13y$

$T_9 = 13x + 21y$

$T_{10} = 21x + 34y$

d) Now the sum of this is:  $55x + 88y$  and this is equal to  $11(5x + 8y) = 11 \times T_7$

2. a)

Input	0	1	2	3	4	7	11	25
Output	1	2	5	10	17	50	122	577

b)  $\text{Output} = (\text{input})^2 + 1$

c) Since the pattern moves to the third term that is now term 1, we have a rule that adjusts to :  $\text{Output} = (\text{input} + 2)^2 + 1$

The focus in this activity is the idea of proof and reasoning and the use of algebra to argue generalities.

This question can be asked at grade 8 level too with no adjustment necessary.