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LEARNER NAME: _____

SUBJECT	:	MATHEMATICS
CLASS	:	GRADE 9
TASK	:	INFORMAL ACTIVITIES FUNCTIONS AND RELATIONSHIPS
NUMBER	:	6 ACTIVITIES

This document consists of 27 pages including cover page

ACKNOWLEDGEMENTS

Acknowledgement is made to the following authors, whose books were referred to during the compilation of this document.

MD, Phillips., J, Basson., J, Odendaal. (2015) Mind Action Series Mathematics Grade 8 and 9 3rd edn., Sanlamhof: Allcopy Publishers.

Kevin Smith. (2017) Maths Handbook and Study Guide. Berlut Books CC.

2. PATTERNS, FUNCTIONS AND ALGEBRA

FUNCTIONS AND RELATIONSHIPS

A function is a rule or a relationship between two sets of values. The first set is called the set of **input values**. The second set is called the set of **output values**. A value in the first set is “operated” on by a given rule and the result yields the corresponding output value.

Example: Consider the set of input values {4 ; 5 ; 6}. The rule states that “multiply each value by 2 and add 3”, we will obtain the following output value:

$$4 \times 2 + 3 = 11$$

$$5 \times 2 + 3 = 13$$

$$6 \times 2 + 3 = 15$$

The set of output values are {11 ; 13 ; 15}

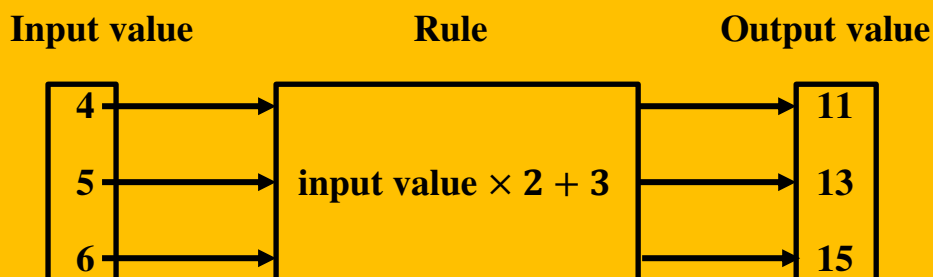
The input values are chosen **independently**. The output values are **dependent** on the input values.

The relationship between input and output values under a given rule can be represented in any of the following ways:

1. Verbally

Multiply each value by 2 and add 3

2. In flow diagrams



3. In tables

Input	n	4	5	6
Output	$n \times 2 + 3$	11	13	15

4. By means of equations

Use input value as x and output value as y .

$$\therefore y = 2x + 3 \text{ with } x \in \{4; 5; 6\}$$

We call x the independent variable and y the dependent variable. Like for instance if the input value is 11 chosen as we like, then the output value is dependent on 11 for its value.

$$\therefore \text{the output value for } x = 11 \text{ is } y = 2(11) + 3 = 25$$

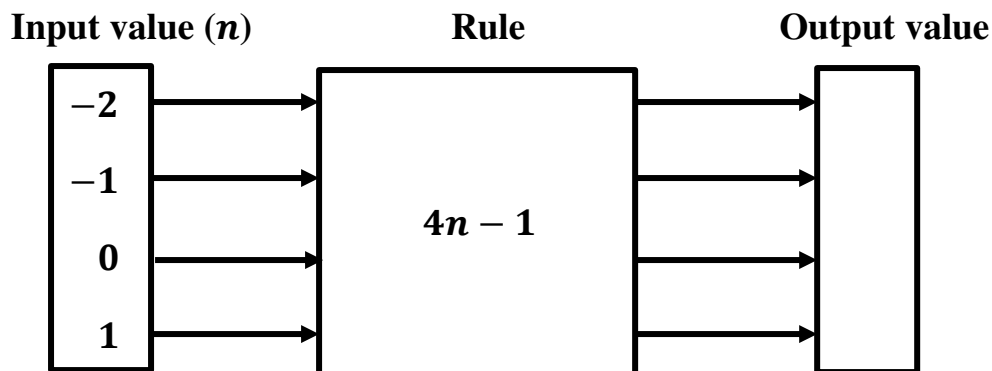
NB: We can determine the input values if given output values by reverse process, i.e. subtract 3 from the output value and then divide by 2.

$$\text{If the output value is 11, the input value is } (11 - 3) \div 2 = 4$$

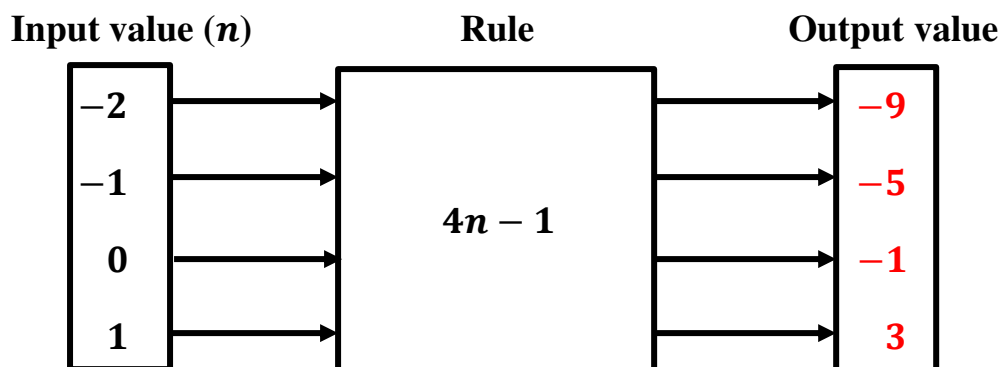
$$\text{If the output value is 13, the input value is } (13 - 3) \div 2 = 5$$

$$\text{If the output value is 15, the input value is } (15 - 3) \div 2 = 6$$

Example 1: Determine the output values in the given flow diagram



Solution:



Example 2: The equation $y = 4x - 1$ is given. If the output values are $x \in \{-2 ; -1 ; 0 ; 1\}$, determine the output values.

Solution:

For $x = -2$ $y = 4(-2) - 1 = -9$

For $x = -1$ $y = 4(-1) - 1 = -5$

For $x = 0$ $y = 4(0) - 1 = -1$

For $x = 1$ $y = 4(1) - 1 = 3$

$\therefore$ The set of output values is $\{-9 ; -5 ; -1 ; 3\}$

Example 3: If the rule for finding y in the table below is $y = 4x - 1$, determine the output values (y) for the given input values (x).

x	-2	-1	0	1
y				

Solution:

For $x = -2$ $y = 4(-2) - 1 = -9$

For $x = -1$ $y = 4(-1) - 1 = -5$

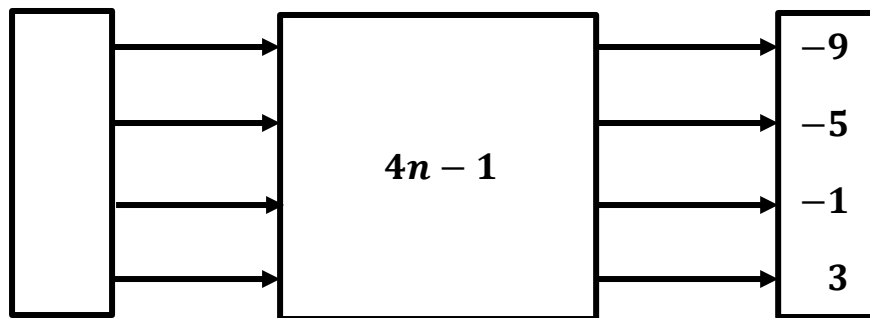
For $x = 0$ $y = 4(0) - 1 = -1$

For $x = 1$ $y = 4(1) - 1 = 3$

x	-2	-1	0	1
y	-9	-5	-1	3

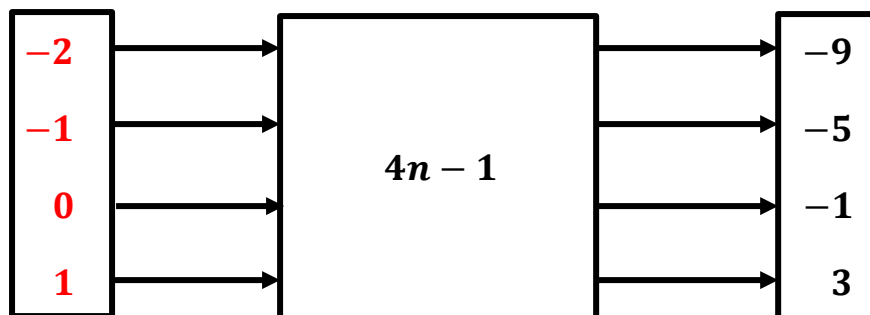
Example 4: Determine the input values in the given flow diagram.

Input value (n) Rule Output value



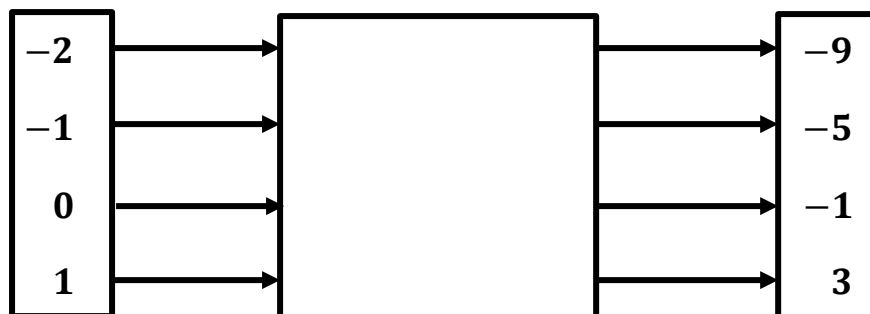
Solution:

Input value (n) Rule Output value



Example 5: Determine the rule in the given flow diagram.

Input value (n) Rule Output value



Solution: The constant difference between the output values is 4.

$$-9 = -2 \times 4 - 1$$

$$-5 = -1 \times 4 - 1$$

$$-1 = 0 \times 4 - 1$$

$$3 = 1 \times 4 - 1$$

$$\therefore \text{output value} = \text{input value} \times 4 - 1$$

OR

Input value	-2	-1	0	1	x
The constant difference between output values $\times$ input values	$4(-2)$	$4(-1)$	$4(0)$	$4(1)$	$4(x)$
What to do to get the actual term	-1	-1	-1	-1	-1
The actual term in the sequence	-9	-5	-1	3	$4x - 1$

$$\therefore y = 4x - 1$$

Example 6: The circumference of a circle is given by the formula $C = 2\pi r$.

1. If $r = 7$ and we take the value of π to be $\frac{22}{7}$, calculate the value of C .
2. If $C = 30\pi$, calculate the value of r .

Solution: 1. $C = 2\pi r$

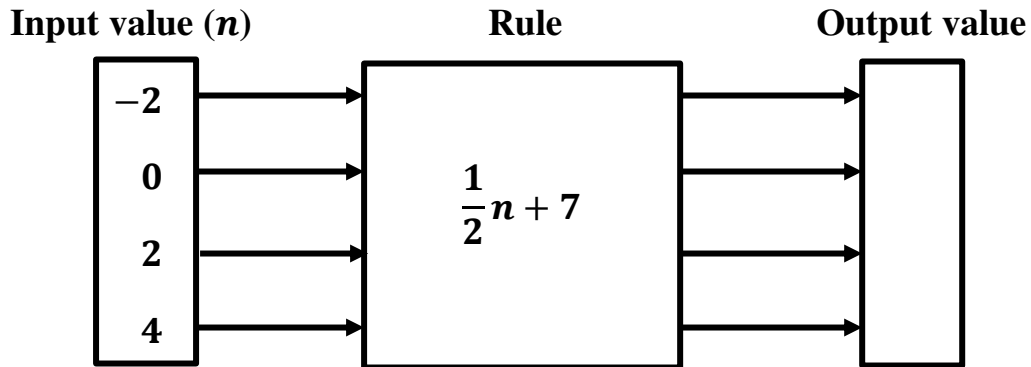
$$\begin{aligned}
 C &= 2 \left(\frac{22}{7} \right) (7) \\
 &= 44
 \end{aligned}$$

2. $C = 2\pi r$

$$\begin{aligned}
 30\pi &= 2\pi r \\
 \therefore r &= 15
 \end{aligned}$$

CLASSWORK 1**DATE:**

1. Determine the output values in the following flow diagram.

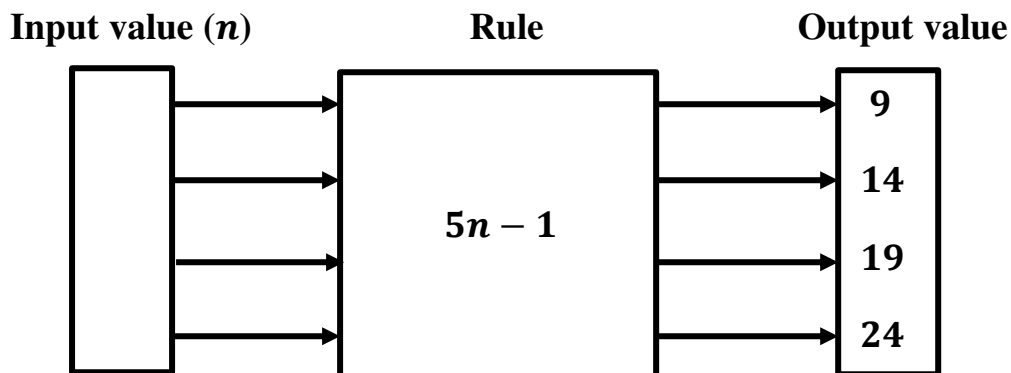


2. Determine the output values corresponding to the input values $x \in \{-2; -1; 0; 1; 2; 3\}$ using the equation $y = -3x - 2$.
3. If the rule for finding y in the table below is $y = 2x + 1$, determine the output values (y) for the given input values (x).

x	-3	-2	-1	0	1	2	3
y							

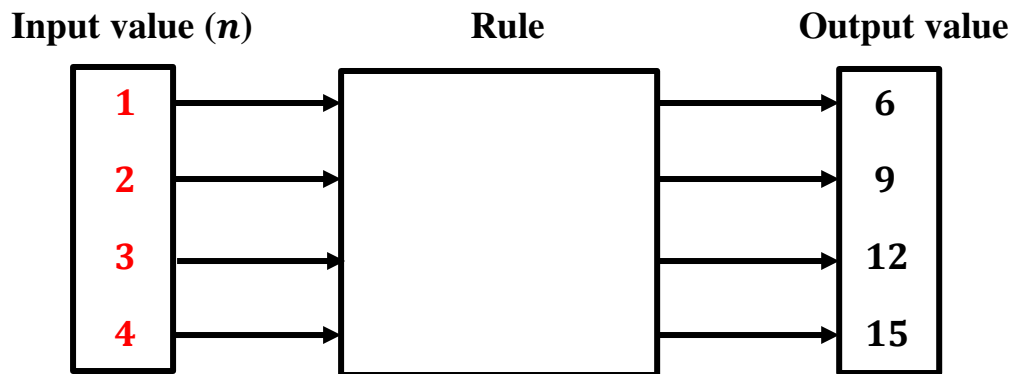
HOMEWORK 2**DATE:**

1. Determine the input values in the following flow diagram.



2. The equation $y = x + 2$ is given. If the output values are $y \in \{4; 7; 10; 13\}$, determine the input values.

6. Determine the rule in the following flow diagrams.



OR

Input value	1	2	3	4	x
The constant difference between output values $\times$ input values					
What to do to get the actual term					
Output value	6	9	12	15	

3. The surface area of a sphere is given by the formula $S = 4\pi r^2$.

3.1 If $r = 7$ and $\pi = 3, 14$, calculate the value of S .

3.2 If $S = 100\pi$, calculate the value of r .

CLASSWORK 3**DATE:**

1. Determine the rule in the following in the following table.

Input	-1	0	1	2	3	4	x
Output	-4	-2	0	2	4	6	y

OR

Input value	-1	0	1	2	3	4	x
The constant difference between output values $\times$ input values							
What to do to get the actual term							
Output value	-4	-2	0	2	4	6	

2. Calculate the values of a and b in the following table.

Input (x)	-1	0	1	2	5	13	b
Output (y)	3	4	5	6	9	a	24

OR

Input value	-1	0	1	2	5	x
The constant difference between output values $\times$ input values						
What to do to get the actual term						
Output value	3	4	5	6	9	

3. The perimeter of a rectangle is given by the formula $P = 2L + 2B$ where L = length and B = breadth.

3.1 Calculate the perimeter if the length is 10cm and the breadth is 6cm.

3.2 Calculate the breadth if the perimeter is 16cm and the length is 5cm.

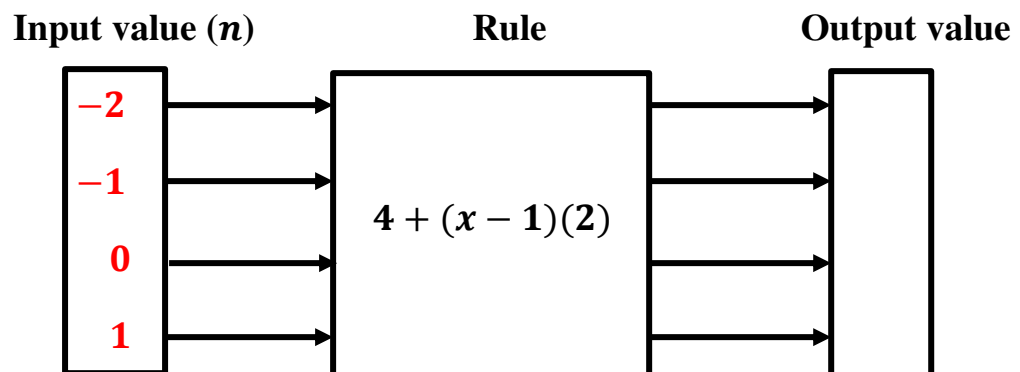
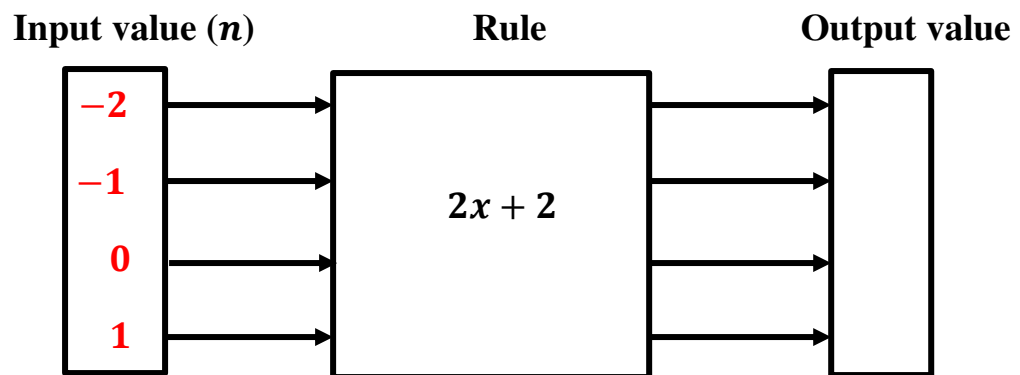
HOMEWORK 4

DATE:

Consider the rules $y = 2x + 2$ and $y = 4 + (x - 1)(2)$.

- 1 Using FOUR input values of your choice, draw a flow diagram for each rule to show that they are equivalent.

Input values: $\{-2; -1; 0; 1\}$



- 2 Hence show that they are equivalent using algebra.

THE GRAPHICAL REPRESENTATION OF RELATIONSHIP

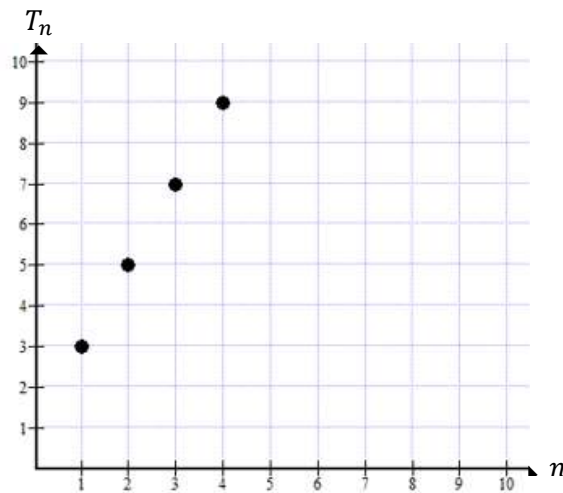
Another way of representing the relationship is graphically and focus will be on input values that are natural numbers.

Example 1: A number pattern has a general term (*n*th term) of $T_n = 2n + 1$ where *n* represents the position of the term.

1. Determine the first four terms.
2. Represent the relationship graphically.

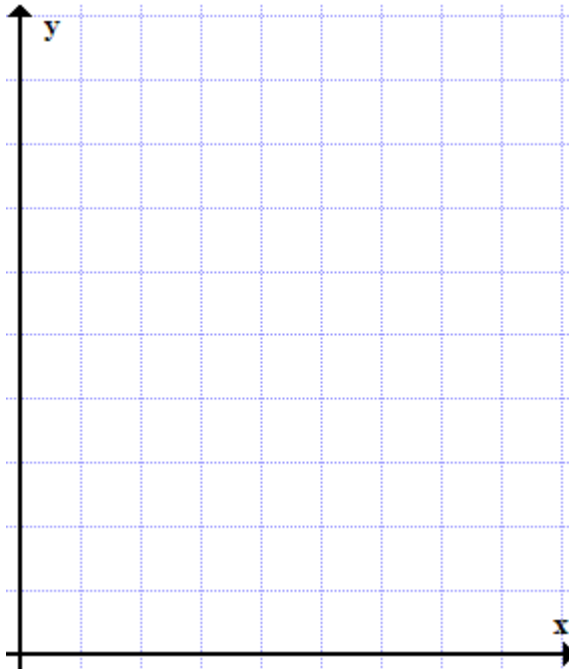
Solutions: 1. $T_1 = 2(1) + 1 = 3$ $T_2 = 2(2) + 1 = 5$
 $T_3 = 2(3) + 1 = 7$ $T_4 = 2(4) + 1 = 9$

2.

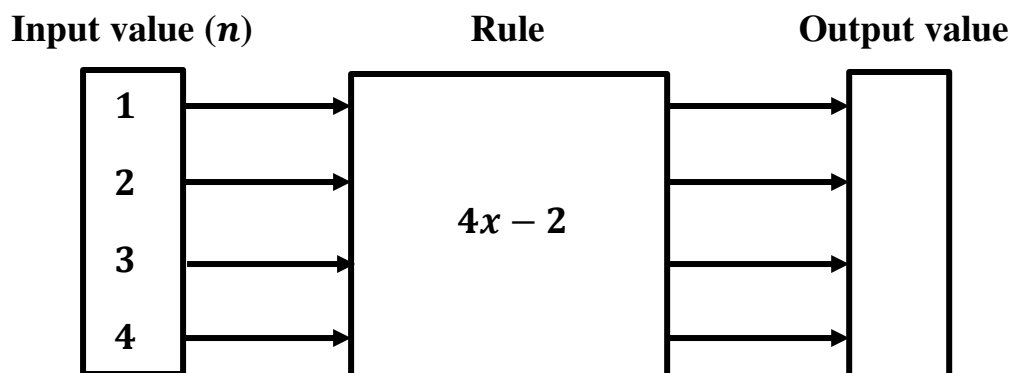


CLASSWORK 5**DATE:**

1. A number pattern has a general term (*nth term*) of $T_n = 2n - 1$ where n represents the position of the term.
 - 1.1 Determine the first four terms (take values of n as natural numbers).
 - 1.2 Represent the relationship graphically.

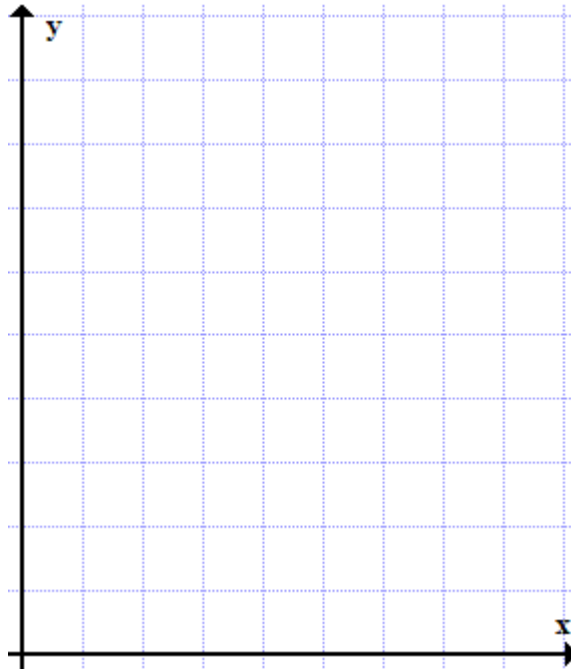


2. For the following flow diagram, determine the output values and hence represent the relationship graphically.



HOMEWORK 6**DATE:**

1. A number pattern has a general term (*nth term*) of $T_n = -2n + 9$ where n represents the position of the term.
 - 1.1 Determine the first four terms (take values of n as natural numbers).
 - 1.2 Represent the relationship graphically.



2. For the following flow diagram, determine the output values and hence represent the relationship graphically.

