

# MATHEMATICS GRADE 8



DATE: .....  
**TOPIC: FUNCTIONS AND RELATIONSHIPS**

<b>CONCEPTS &amp; SKILLS TO BE ACHIEVED:</b>	
<b>By the end of the lesson learners should know and be able to:</b>	
<ul style="list-style-type: none"> <li>Determine input values, output values or rules for patterns and relationships using: flow diagrams, tables, formulae, equations</li> <li>Determine, interpret and justify equivalence of different descriptions of the same relationship or rule presented verbally, in flow diagrams, in tables, by formulae or by equations</li> </ul>	
<b>RESOURCES:</b>	DBE Workbook, Sasol-Inzalo book, Textbooks,
<b>ONLINE RESOURCES</b>	<a href="https://www.visnos.com">https://www.visnos.com</a> <a href="http://www.virtualnerd.com">http://www.virtualnerd.com</a>

## DAY 1:

**INTRODUCTION: READ THE FOLLOWING TO FAMILAIRISE YOURSELF WITH WHAT THIS TOPIC IS ABOUT:**

A functional relationship shows the **connection between a set of input values and a set of output values**. The input value is changed in a calculation to give the output value. For example, if apples are sold at R16,00 per kilogram then the more kilograms we buy, the higher the cost for the apples.

This is an example of a situation in which **one variable quantity** (in this case the cost of the apples) **depends** on **another variable quantity** (in this case the number of kilograms bought), and is uniquely determined by it.

In Mathematics, we refer to the **relationship between the corresponding values of such related variables as a “function”**.

- Input variable = independent variable, usually denoted by a symbol,  $x$
- Output variable = dependent variable, usually denoted by a symbol,  $y$ .

A **functional relationship** is usually **represented** by a **function rule** where the dependent variable,  $y$ , is expressed in terms of the independent variable,  $x$ . In the example above the cost,  $y$ , for  $x$  kilograms of apples will be given by  $y = 16,00x$ . The cost,  $y$ , depends on the number of kilograms,  $x$ , of apples bought.

A function can be represented in more than one way: in words, in a table with each input value matching an output value, in a flow diagram, symbolically in an equation, in a graph.



**LESSON DEVELOPMENT: Constant and variable quantities - Looking for connections between quantities**

**ACTIVITY 1:**

Work through the following exercises and write the answers in your classwork book. The answers can be found at the end of the day's lesson:

Consider the following seven situations. There are **two quantities** in each situation. For **each quantity**, state whether it is **constant** (always the same number) or whether it

**changes**. Also state, in each case, whether **one quantity** has an **influence** on the **other**.

If it has, try to say how the one quantity will influence the other quantity.

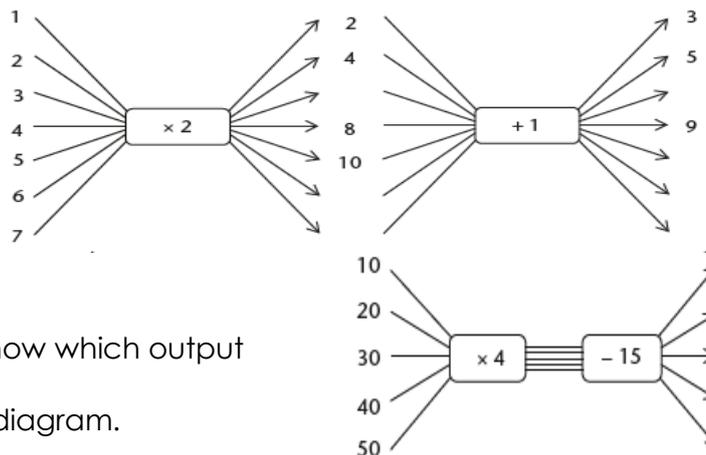
- Your age and the number of fingers on your hands
- The number of calls you make and the airtime left on your cell phone
- The length of your arm and your ability to finish Mathematics tests quickly
- The number of identical houses to be built and the number of bricks required
- The number of learners at a school and the length of the school day
- The number of learners at a school and the number of classrooms needed
- The number of matches in each arrangement, and the number of triangles in the arrangement:



- Look at the match arrangements in question 7. If you know that there are three triangles in an arrangement, can you say with certainty how many matches there are in that specific arrangement?
- How many matches are there in the arrangement with ten triangles?
- Is there another possible answer for question (b)?

**A quantity that changes is called a variable quantity, or just a variable**

- Copy and complete the flow diagram that represents the matches pattern in no.7



**Flow diagram and a table representation**

10 a. Describe, in words, how the following output numbers can be calculated:

b. Copy the following table and use it to show which output numbers are connected to which input numbers in the above flow diagram.

Input value	10	20			
Output Value					





**IT IS IMPORTANT TO REMEMBER:**

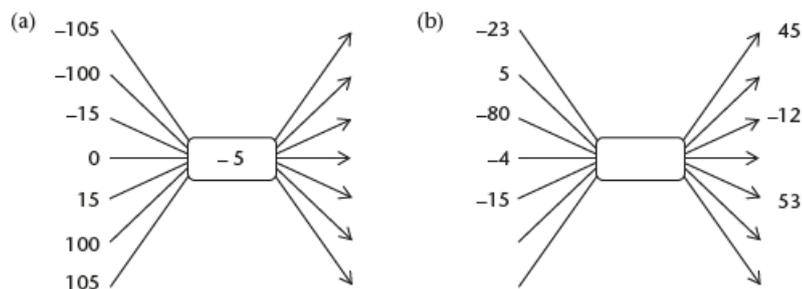
A quantity that changes is called a variable quantity, or just a variable



**HOMEWORK:**

**Do the following exercises, applying what you have learnt today. FIRST ATTEMPT TO DO ALL YOUR HOMEWORK BEFORE YOU CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW TODAY'S LESSON**

1. Copy and complete



2. The following information is available about the floor space and cost of houses in a new development. The cost of an empty stand is R180 000.

Floor space	90	120	150	180	210
Cost of house and stand	540 000	660 000	780 000	900 000	1 020 000

- Represent the above information in the following flow diagram
- Show what the houses only will cost, if you get the stand for free
- Try to figure out what the cost of a house and stand will be, if there are exactly  $100 m^2$  of floor space in the house

**MEMORANDUM: DAY 1:**

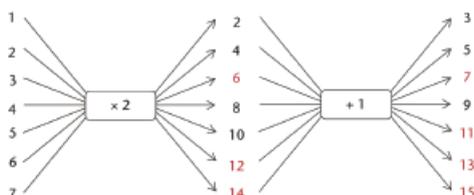
**Activity 1:**

- Age – changes; Number of fingers on hands – constant. No influence.
- Number of calls – change.; Airtime left on cellphone – changes.  
The more calls you make, the less airtime will be left on your cellphone.
- Length of your arm – constant.; How quickly you can finish Mathematics tests – changes; No influence.
- Number of houses – changes; Number of bricks – changes; The more houses, the more bricks required.



5. Number of learners at a school – changes; Length of the school day – constant; No influence.
6. Number of learners – changes; Number of classrooms – changes; The more learners, the more classrooms needed.
7. Number of triangles – changes; Number of matches – changes; As more triangles are made, more matches are needed.
8. (a) Yes, seven matches. (b) 21. For every triangle added to the (c) No already existing ones, you have to add two matches.

9.



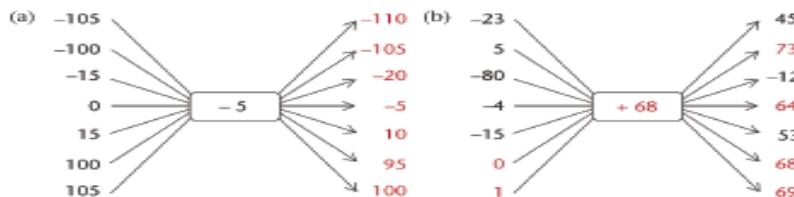
10(a) Multiply the input number by 4 and then subtract 15 to get the output number.

10 (b)

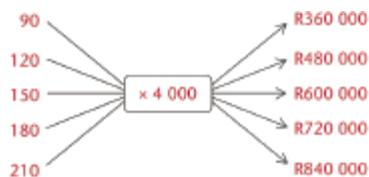
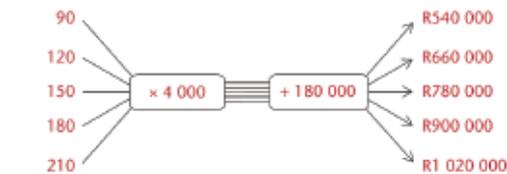
Input number	10	20	30	40	50
Output number	25	65	105	145	185

**Homework :**

1



2. a



b.

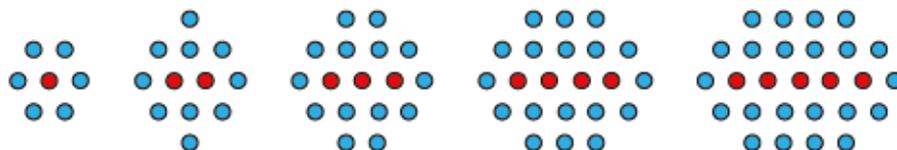
c. The input number is 100 square metres; apply the input number to the flow diagram in (a);  $100 \times 4\,000 + 180\,000 = R580\,000$ .

**DAY 2:**

**LESSON DEVELOPMENT: Different ways to describe relationships**

**LET'S US WORK THROUGH THE NEXT ACTIVITY TO EXPLAIN TO YOU HOW WE CAN USE DIFFERENT WAYS TO DESCRIBE RELATIONSHIPS:**

**ACTIVITY 1: Work through the example and answer in your classwork book**



1. How many blue dots are there if there is **one** red dot?
2. How many blue dots are there if there are **two** red dots?
3. How many blue dots are there if there are **three** red dots?
4. How many blue dots are there if there are **four** red dots?
5. How many blue dots are there if there are **five** red dots?
6. How many blue dots are there if there are **six** red dots?
7. How many blue dots are there if there are **seven** red dots?
8. How many blue dots are there if there are **ten** red dots?
9. How many blue dots are there if there are **20** red dots?
10. How many blue dots are there if there are **100** red dots?
11. Which of the following descriptions correctly describe the relationship between the number of blue dots and the number of red dots in the above arrangements?

Test each description thoroughly for all the above arrangements.

a) The number of red dots  $\xrightarrow{\times 4} \xrightarrow{+ 2} \rightarrow$  the number of blue dots

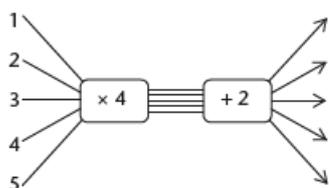
(b) To calculate the number of blue dots you multiply the number of red dots by 2, add 1 and multiply the answer by 2

(c) The number of blue dots =  $2 \times$  the number of red dots + 4

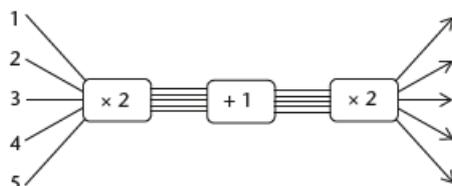
(d)

Number reds dots	1	2	3	4	5	6
Number blue dots	6	10	14	18	22	26

(e)



(f)



(g) The number of blue dots =  $4 \times$  the number of red dots + 2

(h) The number of blue dots =  $2 \times (2 \times$  the number of red dots + 1)

Remember that the calculations inside the brackets are done first.)

**IMPORTANT: The descriptions in (c), (g) and (h) above are called word formulae.**

**ACTIVITY 2:**

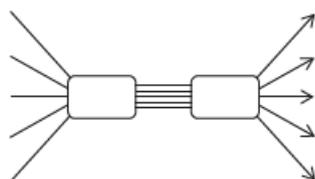
We will now work together through an example demonstrating different descriptions. Answer the questions in your classwork book:

The relationship between two quantities is described as follows:

*The second quantity is always three times the first quantity plus 8.*

*The first quantity varies between 1 and 5, and it is always a whole number*

1(a) Describe this relationship using the flow diagram. (copy the diagram and complete)



(b) Describe the relationship between the two quantities using this table: (copy and complete the table)




(c) Describe the relationship between the two quantities using a word formula

**IT IS IMPORTANT TO REMEMBER:**

A relationship between two quantities can be described in different ways, including:

- a table of values of the two quantities
- a flow diagram
- a word formula
- a symbol formula (or symbolic formula).



**HOMEWORK:**

Do the following exercises, applying what you have learnt today. **FIRST ATTEMPT TO DO ALL YOUR HOMEWORK BEFORE YOU CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW TODAY'S LESSON**

1. The relationship between two quantities is described as follows:

*The input numbers are the first five odd numbers.*

Value of the one quantity  $\xrightarrow{+5} \xrightarrow{\times 3} \rightarrow$  the corresponding value of the other quantity



(a) Describe this relationship using a table.

(b) Describe the relationship using a word formula.

**MEMORANDUM: DAY 2:**

**ACTIVITY 1:**

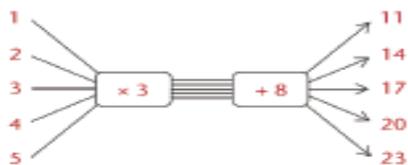
- 6
- 10
- 14
- 18
- 22
- 26
- 30
- 42
- 82
- 402
- (a); (b); (d); (e); (f); (g); (h)



**ACTIVITY 2:**



1a



b.

Input number	1	2	3	4	5
Output number	11	14	17	20	23

c.  $\text{output number} = \text{input number} \times 3 + 8$

**Homework:**

1a.

Input number	1	3	5	7	9
Output number	18	24	30	36	42

b.  $\text{output number} = (\text{input number} + 5) \times 3$

## DAY 3:

### LESSON DEVELOPMENT: Formulae with symbols

#### CLASSWORK:

Instead of writing "input number" and "output number" in formulae, you may just write a single letter symbol as an abbreviation.

Many years ago, mathematicians adopted the convention of using the letter symbol  $x$  as an abbreviation for the "input number", and the letter symbol  $y$  as an abbreviation for the "output number".

The word formula for: **input number**  $\xrightarrow{\times 10} \xrightarrow{+ 15}$  **output number** can be written more shortly as:  $y = 10 \times x + 15$

Mathematicians have also agreed that one may leave the  $x$  sign (multiplication sign) out when writing **symbolic formulae**.

Thus we can write it as:  $y = 10x + 15$

**ACTIVITY 1: Work through the following exercises and write the answers in your classwork book. The answers can be found at the end of the day's lesson:**

1a. Write a word formula for the following relationship:  $y = 7x + 10$

#### IT IS IMPORTANT TO REMEMBER:

The convention of using the letter symbol  $x$  as an abbreviation for

the "input number", and the letter symbol  $y$  as an abbreviation for the "output number".



#### HOMEWORK:

Do the following exercises, applying what you have learnt today. **FIRST ATTEMPT TO DO ALL YOUR HOMEWORK BEFORE YOU CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW TODAY'S LESSON**

2. Describe each of the following relationships with a symbolic formula:
  - a. To calculate the output number, the input number is multiplied by 4 and 7 is subtracted from the answer.

### MEMORANDUM: DAY 3:



### ACTIVITY 1

1a. output number = input number  $\times$  7 + 10

### HOMEWORK:

2.  $y = 4x - 7$



## DAY 4:

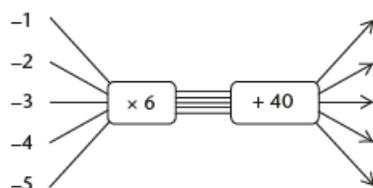
### CONSOLIDATION

TODAY WE WILL WORK THROUGH MORE EXAMPLES TO CONSOLIDATE WHAT YOU HAVE LEARNT FROM FUNCTIONS

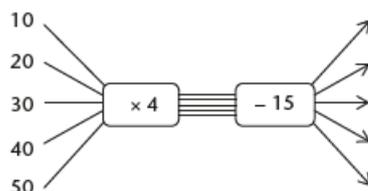
### HOMEWORK:

Do the following exercises, applying what you have learnt today. FIRST ATTEMPT TO DO ALL YOUR HOMEWORK BEFORE YOU CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW TODAY'S LESSON

1. Copy and complete the following flow diagram:



2 a. Describe, in words, how the following output numbers can be calculated:



b. Copy the following table and use it to show which output numbers are connected to which input numbers in the above flow diagram.

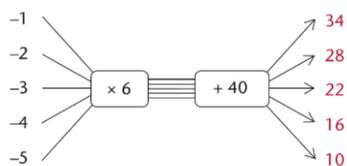
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**MEMORANDUM: DAY 4:**

1.



2. a. Multiply the input number by 4 and then subtract 15 to get the output number.

b.

Input number	10	20	30	40	50
Output number	25	65	105	145	185

## DAY 5:

**CONSOLIDATION:**

**TODAY WE WILL WORK THROUGH MORE EXAMPLES TO CONSOLIDATE WHAT YOU HAVE LEARNT FROM FUNCTIONS**

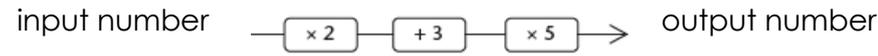
**HOMEWORK:**

**Do the following exercises, applying what you have learnt today. FIRST ATTEMPT TO DO ALL YOUR HOMEWORK BEFORE YOU CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW TODAYS LESSON**



1. Write a word formula for each of the following relationships:  
 a)  $y = 7(x + 10)$                       b.  $y = 7(2x + 10)$
  
2. Describe each of the following relationships with a symbolic formula:
  - a. To calculate the output number, 7 is subtracted from the input number and the answer is multiplied by 5.
  - b. To calculate the output number, 7 is subtracted from the input number, the answer is multiplied by 5 and 3 is added to this answer

3. Complete the table using the word formula:



Input number	5	10	15	20	25	30
Output number						



### MEMORANDUM: DAY 5:

1.
  - a. output number = (input number + 10) × 7
  - b. output number = (input number × 2 + 10) × 7

2.
  - a.  $y = 5(x - 7)$
  - b.  $y = 5(x - 7)$

3.

Input number	5	10	15	20	25	30
Output number	65	115	165	215	265	315

