



Western Cape
Government

FOR YOU

MATHEMATICS GRADE 7

NUMERIC AND GEOMETRIC PATTERNS



Western Cape
Government

QUALITY EDUCATION

for every child | in every classroom | in every school in the province



PRINCIPLES OF INTERVENTION



- **FOCUS ON TEACHING MATHS WITH CONCEPTUAL UNDERSTANDING – TMU FRAMEWORK**
- **Topics as per ATP (CAPS)**
- **Afr & Eng PPT for teacher training – without memo**
- **Afr & Eng PPT to use in class with learners – with Memo**
- **Learner Books with consolidation exercises**
- **Progressive development of topics**
- **Aligned to WCED lessons – links in Quarterly Teacher Resource Packs**

GOOD PRACTICE IN CLASS:

- Review the main concepts covered in each lesson, including vocabulary and the use of tables to represent numeric patterns.
- Provide feedback on the learners' work and address any questions or concerns they may have.

METHODOLOGY



- **I Do**: This is the section of our lesson where I explain concepts that we are learning about to the class.
- **We Do**: This is the section of our lesson where we discuss and work on concepts together as a class.
- **You Do**: This is the section of our lesson where you work on an activity independently or in small groups.



The “I Do – We Do – You Do model” explained



When used well, the “I Do – We Do – You Do model”:

- Helps all students to master what they need to learn
 - Suits novice learners (which most learners are at new topics)
 - Nurtures self-efficacy
 - Reduces task anxiety
-
- **Learner feel less anxious due to the clear modelling and the scaffolded opportunities to practice. These same factors help learners to experience independent success, which in turn builds their self-efficacy.**
-
- **The “I Do, We Do, You Do – model” is based upon the gradual release of responsibility from teacher to learner.**

MATH IS NOT A
SPECTATOR
Sport
THE ONLY WAY
TO LEARN MATH
IS TO DO MATH



9 hrs.

NUMERIC AND GEOMETRIC PATTERNS

Investigate and extend patterns

- Investigate and extend numeric and geometric patterns looking for relationships between numbers, including patterns:
 - represented in physical or diagram form
 - not limited to sequences involving a constant difference or ratio
 - of learner's own creation
 - represented in tables
- Describe and justify the general rules for observed relationships between numbers in own words

SENIOR PHASE FOCUS



What is different to the Intermediate Phase?

- In the Senior Phase the emphasis is less on merely extending a pattern, and **more on describing a general rule for the pattern or sequence and being able to predict unknown terms in a sequence using a general rule.**
- Investigating number patterns is an **opportunity to generalize – to give general algebraic descriptions of the relationship between terms and its position in a sequence** and to justify solutions.
- The range of number patterns are **extended to** include patterns **integers, square numbers and cubic numbers**
- As learners become used to describing patterns in their own words, their descriptions should become more precise and efficient with the use of algebraic language to describe general rules of patterns.
- It is useful also to introduce the language of 'term in a sequence' in order to distinguish the term from the position of a term in a sequence

Lesson 1: Objectives



By the end of this lesson learners should be able to:

- recognise and use terminology relevant to number patterns,**
- recognise, investigate, extend constant differences, constant ratios, and sequences not limited to constant differences and ratios.**

Grade 7 TERMINOLOGY



A set of numbers **in a given order** is called a **number sequence**. In some cases, each number in a sequence can be formed from the previous number by **performing the same or a similar action**. In such a case, we can say there is a **pattern in the sequence**.

The numbers in a sequence are called the **terms of the sequence**.

Terms that follow one another are said to be **consecutive terms**.

Examples: 1; 2; 3; 4; ... or 1; 4; 9; 16;

**WORD
WALL**

Grade 7: TERMINOLOGY



A sequence can be formed by repeatedly adding or subtracting the same number. **In this case the difference between one term and the next is constant.: SEQUENCE A: 4; 7; 10; 13; 16; ...**

A sequence can also be formed by repeatedly multiplying or dividing by the same number. In this case the **ratio between one term and the next is constant. SEQUENCE B: 5; 10; 20; 40; 80; ...**

A sequence can also be formed in such a way that neither the difference nor the ratio between one term and the next is constant. **SEQUENCE C: 2; 5; 10; 17; 26; ...**

In a number sequence each term has its own position which we indicate with the symbol n . This position, n , is the input value in the relationship between the position of a term and the output value, which shows the value of that term.

Lesson 1: Class Activity 1:Patterns



We can also write the sequence in a table and indicate the **position number**, like this:

3; 6; 9; 12; 15; ...

Position Number	1	2	3	4	5	6	7	100
Sequence	3	6	9	12	15	18	21	300

+3 +3 +3 +3 +3 +3 +3

Answer the following questions:

1. If Mandy continues counting in the same way, what are the next three numbers she will count in each sequence?
2. What will be the 100th number Mandy will count in this sequence?
3. If Mandy continues and continues, will the number 324 be in her sequences or not? How do you know?

300; 303; 306; 309; 312; 315; 318; 321; 324;

Lesson 1:Class Activity 2a – What comes next?



In some cases, each number in a sequence can be formed from the previous number by performing the same or a similar action.

1. Write down the next three numbers in each of these sequences:

Sequence A: 4; 7; 10; 13; 16; ...

Sequence B: 5; 10; 20; 40; 80; ...

Sequence C: 2; 5; 10; 17; 26; ...

2. Write down how you decided what the next numbers would be in each of the three sequences.

Lesson 1 – Class Activity 2b – DISCUSSION

How a sequence is formed



A sequence can be formed by **repeatedly ADDING** or **SUBTRACTING** the **same number**.

In this case the **difference** between one term and the next is **constant**.

1. In sequence A there is a **constant difference** between consecutive terms, as shown below.

Sequence A: 4; 7; 10; 13; 16; . . .

A. 4; 7; 10; 13; 16;
 +3 +3 +3 +3

Lesson 1 – Class Activity 2c – DISCUSSION

How a sequence is formed



A sequence can be formed by **repeatedly MULTIPLYING** or **DIVIDING** by the **same number**.

In this case the **ratio** between one term and the next is **constant**.

This is called the **CONSTANT RATIO**.

2. In sequence B there is a **constant ratio** between consecutive terms, as shown below.

Sequence B: 5; 10; 20; 40 80; ...

B. 5; 10; 20; 40; 80

x2 x2 x2 x2

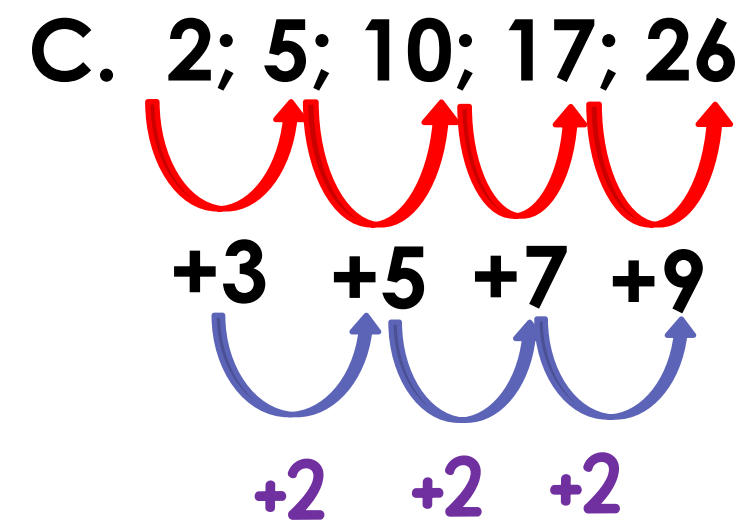
Lesson 1 – Class Activity 2d – DISCUSSION

How a sequence is formed



In sequence C there is **neither** a **constant difference** nor a **constant ratio** between consecutive terms.

There **is**, however, **a pattern in the differences between the terms**, which makes it possible to extend the sequence. **Consecutive odd numbers**, starting with 3, are added, to form the next term.



Lesson 1: Learner Activity 1 – Extending Patterns



Write down the next three terms in each of the number sequences below.
In each case, describe the relationship between consecutive terms.



1. 6; 18; 54; 162; ...

2. 20; 31; 42; 53; ...

3. 18 000; 1 800; 180; 18; ...

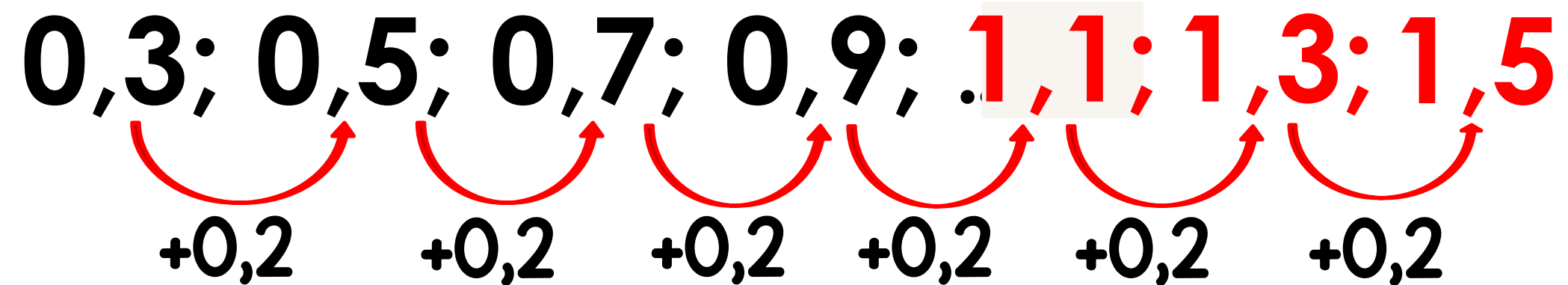
4. 1; 3; 6; 10; 15; ...

5. 10; 9,7; 9,4; 9,1; ...

Lesson 1 – Class Activity 2d – Extending Patterns



Let's write the next three terms in each of the sequences below.
Describe the relationship between consecutive terms.



This pattern has a **constant difference** of 0,2 between consecutive terms.

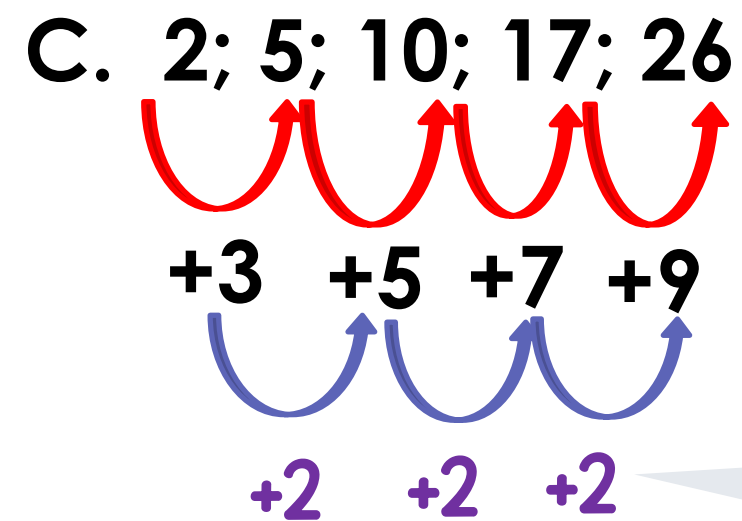
Lesson 1 – Class Activity 3 – DISCUSSION

How a sequence is formed



In sequence C there is **neither a constant difference nor a constant ratio** between consecutive terms.

There **is**, however, **a pattern in the differences between the terms**, which makes it possible to extend the sequence. **Consecutive odd numbers**, starting with 3, are added, to form the next term.



THE DIFFERENCE BETWEEN CONSECUTIVE TERMS IS 2 MORE EACH TIME

Lesson 1: Class activity 3

The introduction of the **INDEPENDENT** and **DEPENDANT VARIABLES**, the **CONSTANT** and calculating patterns to the n^{th} term.



Mr Twala pays a fee to park his car in a parking lot every day. He has to pay **R3** to enter the parking lot and then **a further R2** for **every hour** that he leaves his car there. The information is represented in the table. Let us complete:

Number of hours	1	2	3	4	5	6	7	8
Cost of parking in R's	5	7	9	11	13	15	17	19

Describe different strategies to complete the table.

Lesson 1: Class activity 3

Constant (never changes)

Number of hours	1	2	3	4	5	6	7	8
Cost of parking in R's	5	7	9	11	13	15	17	19
How did we get to the answer?	$1 \times 2 + 3$	$2 \times 2 + 3$	$3 \times 2 + 3$	$4 \times 2 + 3$	$5 \times 2 + 3$	$6 \times 2 + 3$	$7 \times 2 + 3$	$8 \times 2 + 3$

Independent variable: can stand on its own

Dependent variable: The total cost he has to pay depends on the number of hours he parks.

Lesson 1: Class activity 3 : Conclusion

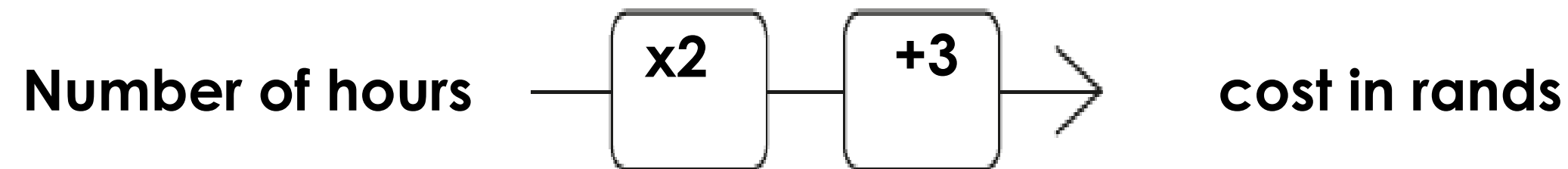


THE RULE: MULTIPLY BY 2 AND THEN ADD 3 describes the relationship between the two variables in this situation. The **number of hours** is the **independent variable**.

The number of the term (or the position) can be assigned a variable, for example, n .

The **cost** of Mr Twala's parking is the **dependent variable** because the amount he has to pay depends on the number of hours that he parks.

This **rule** describes how you **can calculate the value of the dependent variable if the corresponding value of the independent variable is known**. It **differs from a recursive rule**, which describes how you can calculate the value of the dependent variable that follows on a given value of the dependent variable.



Lesson 1: Learner activity 2: Relationships between dependent and independent variables



In the case of a number sequence, the position (number) of the term can be taken as the independent variable, as shown for the sequence 15; 19; 23; 27; 31; . . . Us ethe table to complete the following:

Term number	1	2	3	4	5	6	7	8	50
Term	15	19	23	27	31				

- (a) Copy and complete the table.
- (b) How can we calculate term number 50?
- (c) Lungile reasoned like this:

I added 4 each time to complete the table. I counted backwards to see what comes before term 1. I got 11 and then I knew I had to add one 4 to 11 to get the first term.

Complete the pattern below to show Lungile’s thinking:

- Term 1: $11 + 1 \times 4 = 11 + 4 = 15$

Term 2: $11 + 2 \times 4 = 11 + 8 = 19$

Term 3:

Term 4:

Term 5:

Term 6:

Term 10:

Term 50:

- (d) Write down the rule to calculate the term for any term number in terms of *n*

Conclusion to learner activity 2:



The rule is formulated using the assigned variable and the specific description of how the dependent variable is calculated.

For example, multiply by 4 and add 11.

The strong point of using the formula, and not the recursive method, is important.

Using the formula allows you to calculate any term, but if the recursive method is used, you have to add on (or subtract) the required number of times until you reach the term.

For example, if you add 4 to each term to get the next and you want to know the value of term 50, you have to start at term 1 and add 4 repeatedly 49 times, whereas the rule allows you to replace the value of n with 50 and calculate term 50 immediately:

$$4 \times 50 + 11 = 211$$

Lesson 2: Objectives



By the end of this lesson learners should be able to:

- recognise and use terminology relevant to patterns,**
- recognise, investigate, extend constant differences, constant ratios, and sequences not limited to constant differences and ratios,**



Lesson 2: Describing patterns

Question to investigate: When a son was born, his father was 30 years old. How old is the father when the son is 10 years old? **He is 40 years old.**

How can we describe the father and son's ages in different ways:



In **WORDS:**

As a **CALCULATION PLAN:**

Son's age:	0	1	2	3	4	5	6	10
Father's age:	30	31	32	33	34	35	36	40

Lesson 2: Class Activity 1: Describing patterns

Question to **investigate**: When a son was born, his father was 25 years old. How old is the father when the son is 20 years old? **He is 45 years old.**

Son's age:	0	1	2	3	4	5	10	20
Father's age:								

How can we describe the father and son's ages in different ways:



In **WORDS**:



As a **CALCULATION PLAN**:



1. When a son was born, his father was 28 years old. How old is the father when the son is 10, 15 and 20 years old?

Son's age:	0	1	2	3	4	10	15	20
Father's age:								

2. How do you calculate the son's age if the father's age is 60 years old?
Show your calculations! Number sentence etc. must be there! 😊

3. Find the son's age when the father is 58, 70 and 80 years old.

4. Write down the rule to calculate the term for any term number in terms of n .

Lesson 2: Learner Activity 2 – Describing patterns



1. Copy and complete the following table:

Term Number	1	2	3	4	5	6	7	8	9
With constant difference of 10						30			
With constant difference of -5						30			

2. Investigate each of the patterns below:

Find the pattern and write the next four terms in the sequence.

(a) 1; 4; 9; 16; 25

(b) 3; 6; 11; 18; 27

(c) 20; 19; 17; 14; 10

(d) 20; 25; 29; 32; 34

Lesson 3: Objectives



By the end of this lesson learners should be able to:

- **recognise, investigate, extend constant differences, constant ratios, and sequences not limited to constant differences and ratios in number patterns,**
- **describe and justify the general rules for observed relationships between numbers**

Lesson 3: Class Activity 1 – Recognising and describing patterns



Scenario: Peter buys a packet of Lays at the tuck shop for all his friends. Each packet of Lays costs R6.

1. Complete the following table to calculate the costs:



No. of packets of chips	1	2	3	4	5
Cost (Rands)	6	12	18	24	30

2. Describe two methods, to calculate the answer, in words.

Peter added R6 to the cost for each packet added (**Constant Difference**).

OR

Cost = No. of packets $\times$ 6 (**Constant Ratio**)

TAKE NOTE: The constant difference is the relationship between the cost (horizontal relationship) – increase in cost is constant - while the constant ratio is the relationship between the number of packets of chips and the cost (vertical relationship).

Lesson 3: Multiples in tables: Class Activity 3



Use the multiplication table at the back of your learner book and identify as many multiples/patterns as possible. You may work with a friend.

X	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

Lesson 3: Tables or multiples



Patterns we find in the 100-chart

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Lesson 3:

Patterns we find in the 100-chart

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Lesson 3: Tables or multiples

Patterns we find in 100-chart.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Lesson 3: Tables or multiples

Patterns we find in the multiplication table:

x	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

Lesson 3 – TAKE NOTE!



The multiplication table consists of **sequences** of **multiples**. For example:

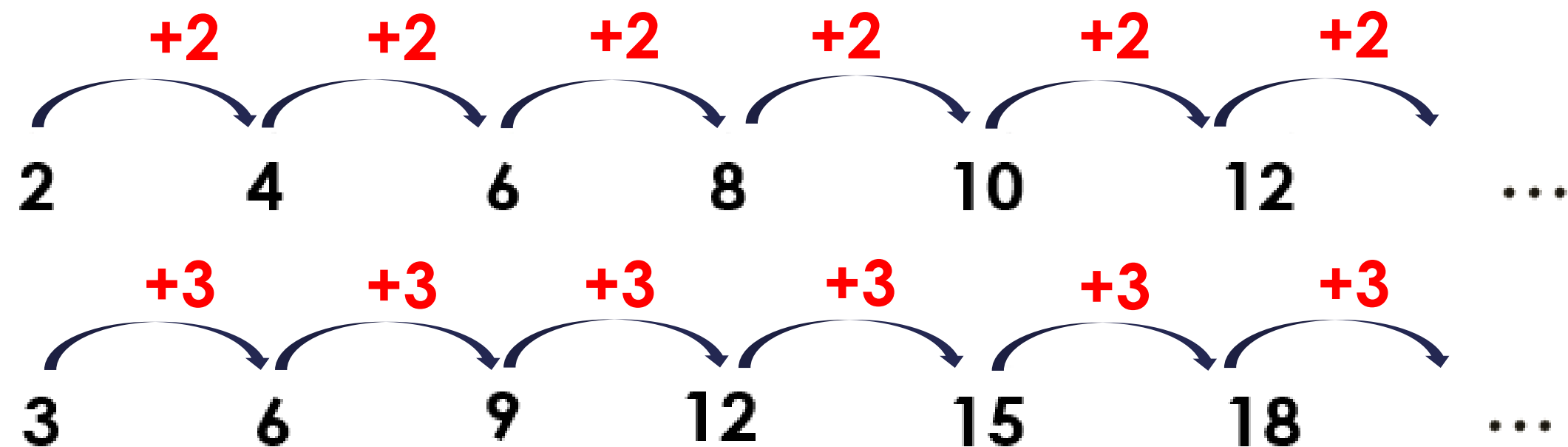
2; 4; 6; 8; 10; 12; ... are the multiples of 2 (or even numbers).

3; 6; 9; 12; 15; ... are the multiples of 3.

These sequences are all different, but they are the **same in two ways**:

In all the “tables” or sequences of multiples, we add the same number (the multiple) to get the next number in the sequence.

For example:



Lesson 3 – TAKE NOTE!

The sequences of multiples all have the same kind of calculation plan (rule), namely multiplication only:

<i>Position no.</i>	1	2	3	4	5	6	...
	↓	↓	↓	↓	↓	↓	
<i>Multiple no.</i>	2	4	6	8	10	12	...

Multiple number = Position number × 2

What will the calculation plan therefore be for the following?

<i>Position no.</i>	1	2	3	4	5	6	...
	↓	↓	↓	↓	↓	↓	
<i>Multiple no.</i>	3	6	9	12	15	18	...

Therefore, to work out your calculation plan, we can describe the sequence 3; 6; 9; 12; ... with a calculation plan:

Multiple number = Position number × 3

So: multiple 100 = $100 \times 3 = 300$

Lesson 3: Learner Activity 1

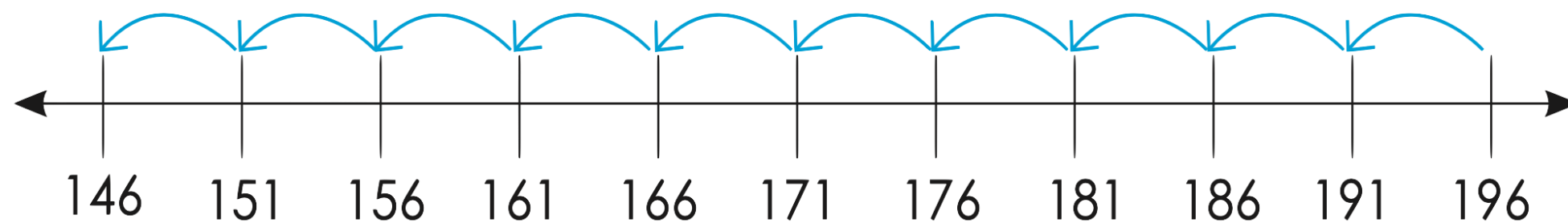
1. Calculate the next five numbers and the 100th number in each sequence.
Describe your methods.

Sequence A: 5; 10; 15; 20; 25; 30; 35; ...

Sequence B: 7; 14; 21; 28; 35; 42; 49; ...

Sequence C: 9; 18; 27; 36; 45; 54; 63; ...

2. What is the same, and what is different, in each of these sequences above?
3. Describe the pattern below and extend it by 5 more numbers.



i.

ii.

Lesson 3: Learner Activity 1

4. Identify the pattern in each case.

65; 68; 71; 74; ...

92; 89; 86; 83; ...

Lesson 4: Objectives



By the end of this lesson learners should be able to:

- **recognise, investigate, extend constant differences, constant ratios, and sequences not limited to constant differences and ratios in geometric patterns,**
- **Describe and justify the general rules for observed relationships between numbers**

Lesson 4: Class Activity 2.



- 1. Describe in words how the pattern grows.
- 2. Copy and complete the table:

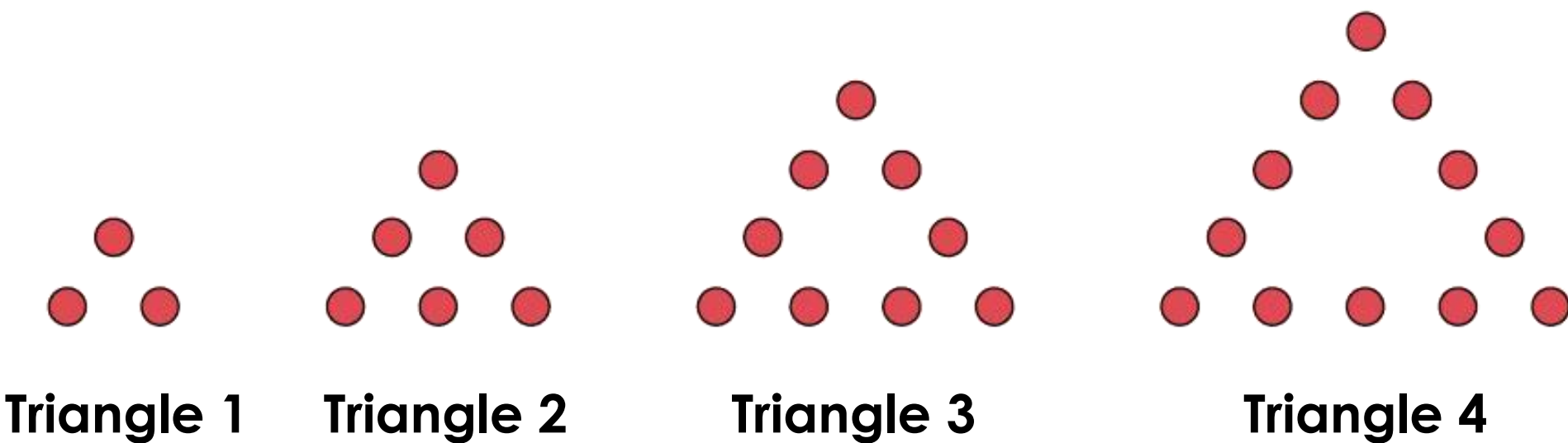


Table:

Picture	1	2	3	4	5	<i>n</i>
Number of dots	3	6	9			

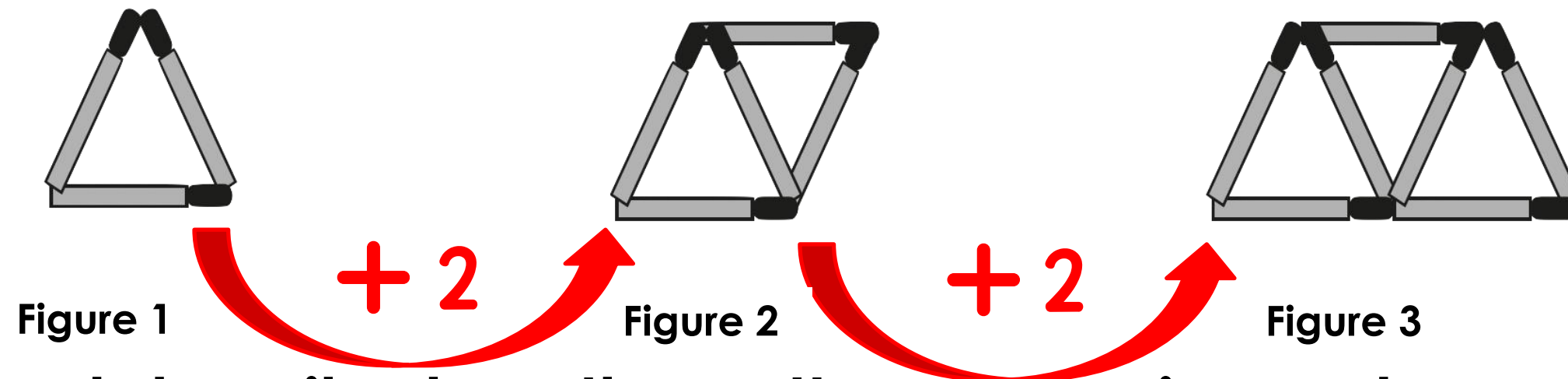
Lesson 4

WHAT IF THE CONSTANT IS NOT GIVEN TO US?

Remember: A pattern always starts with **A CONSTANT**

'Something' was there for the pattern to start with or from.

A pattern with matches is shown below.

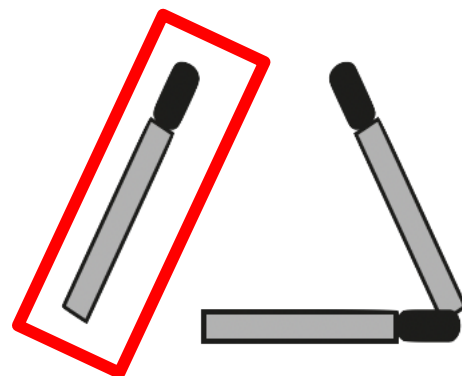


1. Look at the pattern and describe how the pattern grows in words.

2 matches are added each time.

2. What is the constant difference? **2 matches**

3. To find the constant you must add to each pattern, subtract the constant difference from the first figure.



Constant (the same in each pattern) = 1 match.

Lesson 4: Learner Activity 1

A pattern with matches is shown:

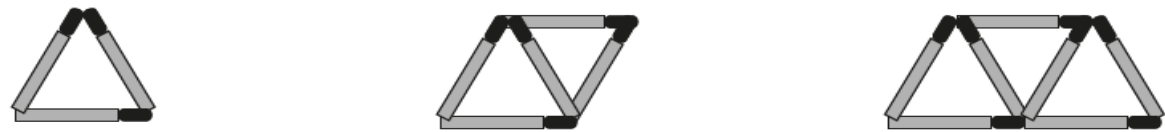
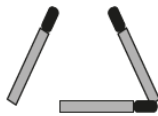


Fig 1

Fig 2

Fig 3

- Explain how the patterns is formed:
- Complete the table
- What rule did you use to complete the table?
- How many matches are needed to form Figure number 9?
- How many matches are needed to form Figure number 17? Explain.
- If you used the recursive rule to complete the table, it would have taken a long time to answer question (5) because you had to add the same number many times. Try to find an easier way to answer question (5). Describe your method.
- Copy and complete the pattern below. (Hint: It may help to think of Figure number 1 or term 1 like this: 
There is one match at the beginning and two more are added every time. It helps to “see” the two matches that are added each time.)
- Term 1: $1 + 1 \times 2 = 3$

Term 3: $1 + 3 \times 2 = 7$

Term 5:

Term 2: $1 + 2 \times 2 = 5$

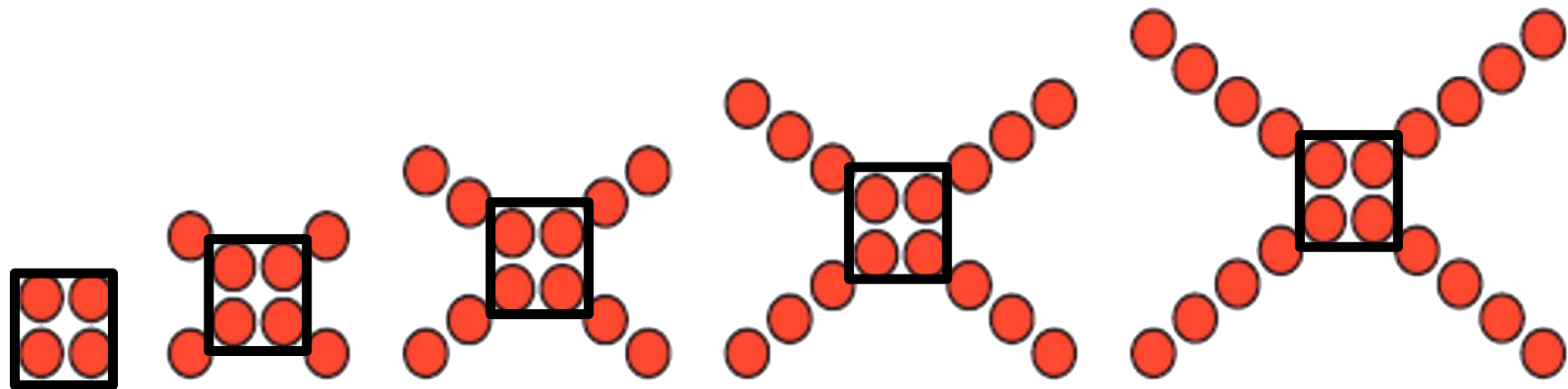
Term 4:

Term 10:

Term 17:
- What stays the same in the pattern and what varies?
- How many matches will be at figure number “*n*”?

Lesson 4: Class Activity 2

Look at the pattern below and how it grows.
It can be recorded as indicated

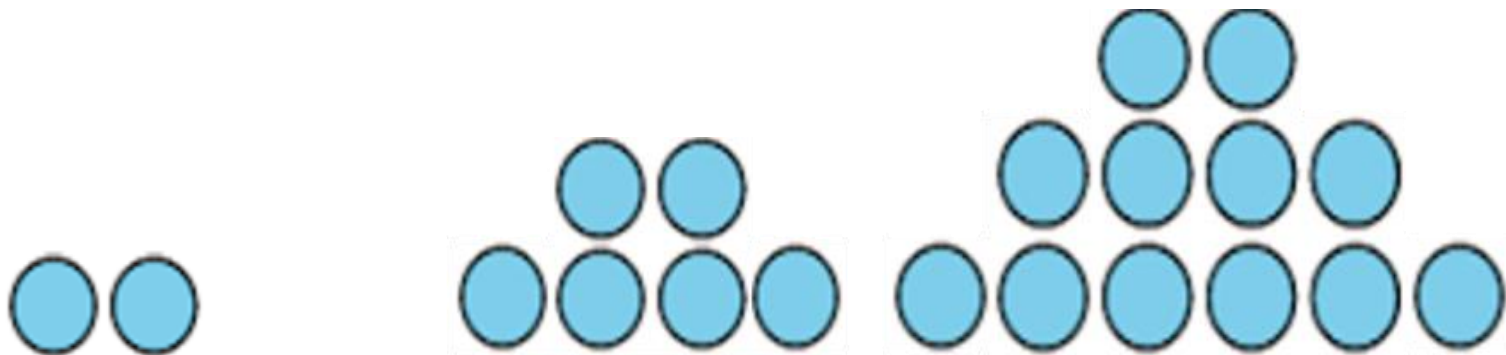


Pattern	1	2	3	4	5	6	7	8
Circles	4	8	12	16	20	24	28	32
Circles: clever counting	4	4 + 4	4 + 8	4 + 12	4 + 16	4 + 20	4 + 24	4 + 28

Lesson 4: Learner activity 2



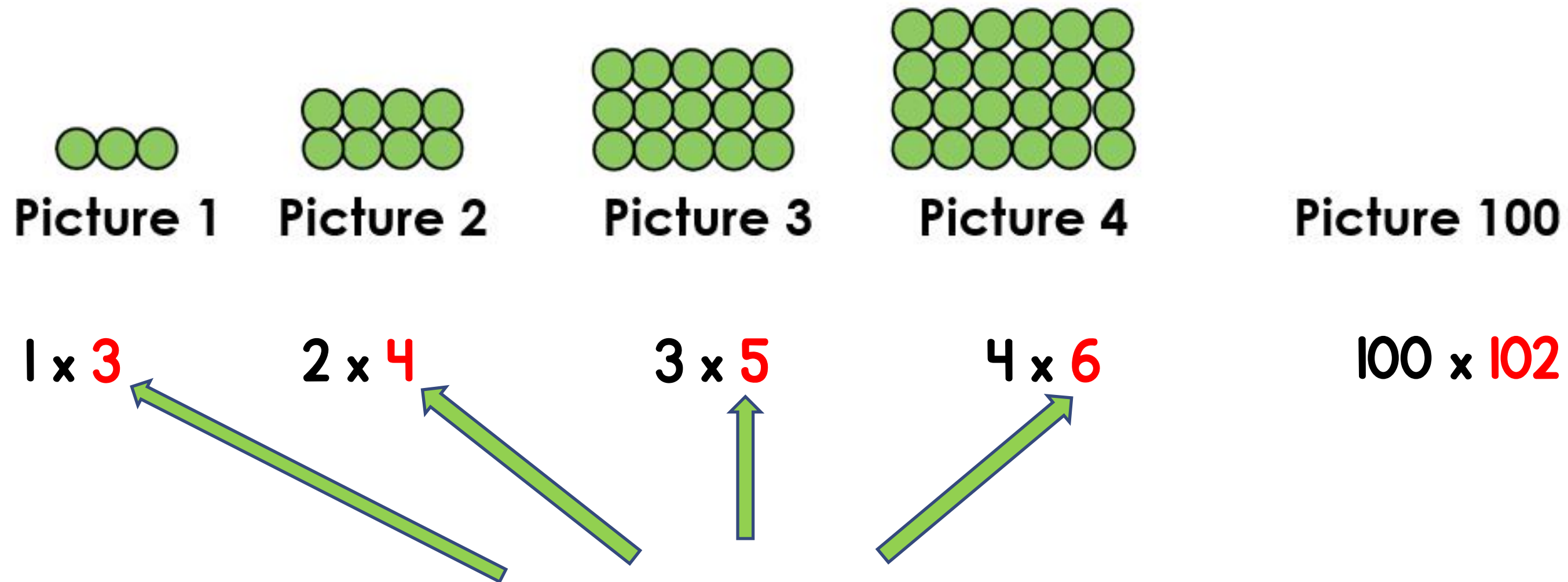
Look at the pattern below. Copy and complete the table.



Pattern	1	2	3	4	5	6
Circles						
Circles: clever counting	2	2 + 4				

Lesson 4: Class activity 3

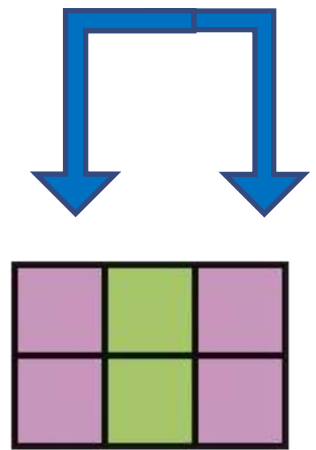
Let's investigate patterns to determine the possible rule!



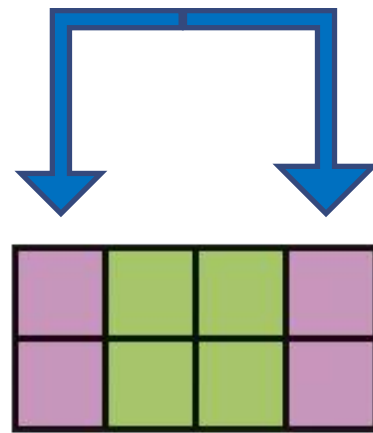
What do you think these numbers mean?

Lesson 4: Class Activity 4

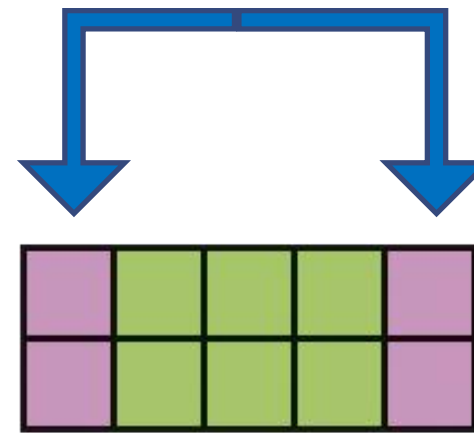
Let's investigate patterns to determine the possible rule! 😊



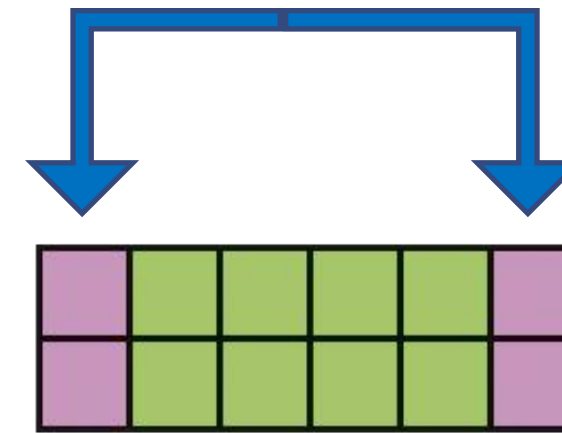
Picture 1



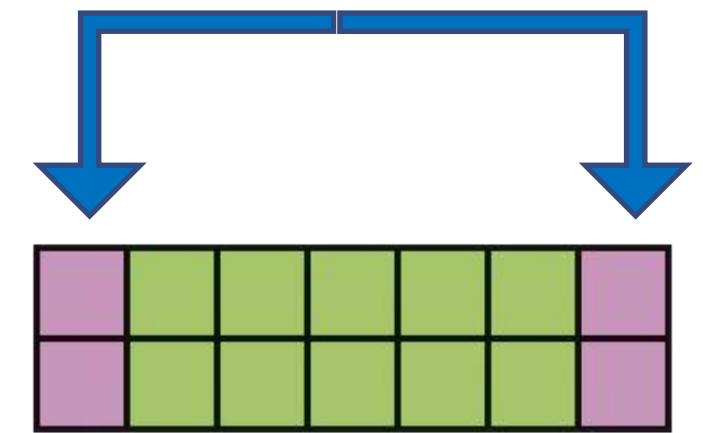
Picture 2



Picture 3



Picture 4

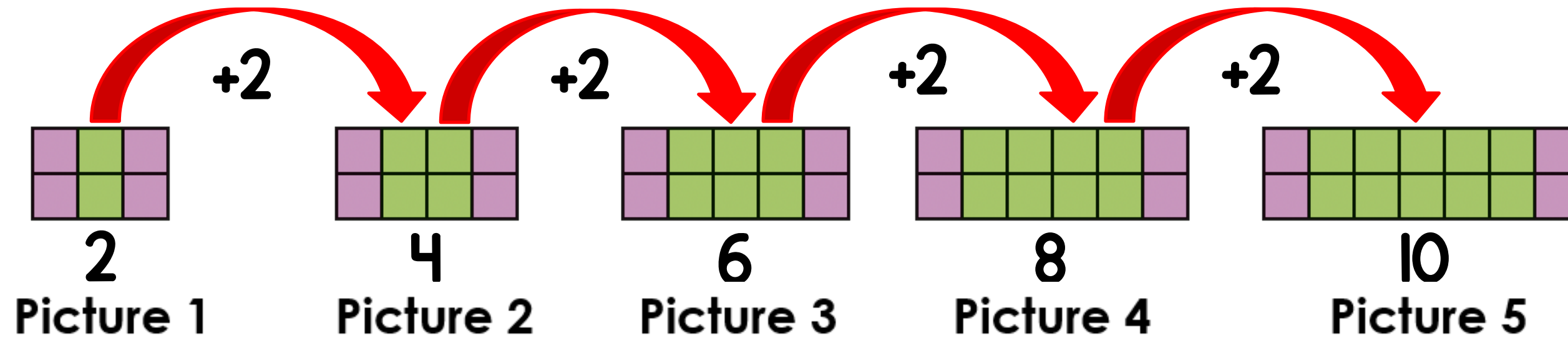


Picture 5

DON'T FORGET

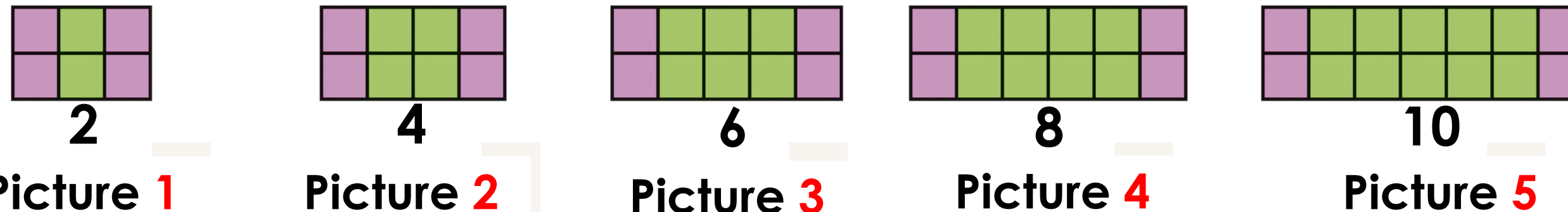
The four pink squares are the same (constant) in each pattern/picture.
Therefore, when calculating the total number of squares in each pattern we add the four pink tiles to the number of green tiles.
 The constant difference only applies to the green tiles.

Lesson 4: Class Activity 4b



This constant pattern of addition is called the **CONSTANT DIFFERENCE**.

CALCULATION PLAN



$$1 \times 2 + 4 = 6 \quad 2 \times 2 + 4 = 8 \quad 3 \times 2 + 4 = 10 \quad 4 \times 2 + 4 = 12 \quad 5 \times 2 + 4 = 14$$

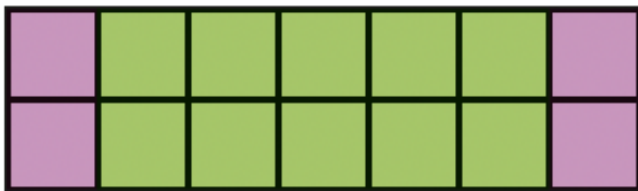
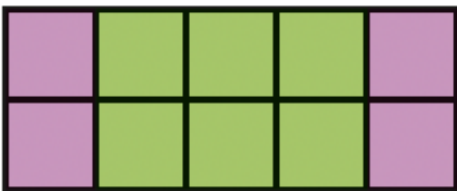
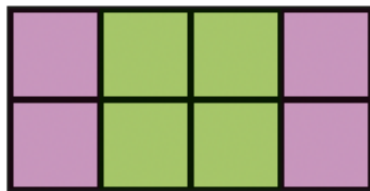
Constant Difference (only applies to the green tiles)

Lesson 4: Learner Activity 3



GROWING PATTERNS

Complete the table below.



Picture 1

Picture 2

Picture 3

Picture 4

Picture 5

Pattern Number	In Words	Drawing	Number of Squares/tiles
6			
60			

Lesson 5: Objectives

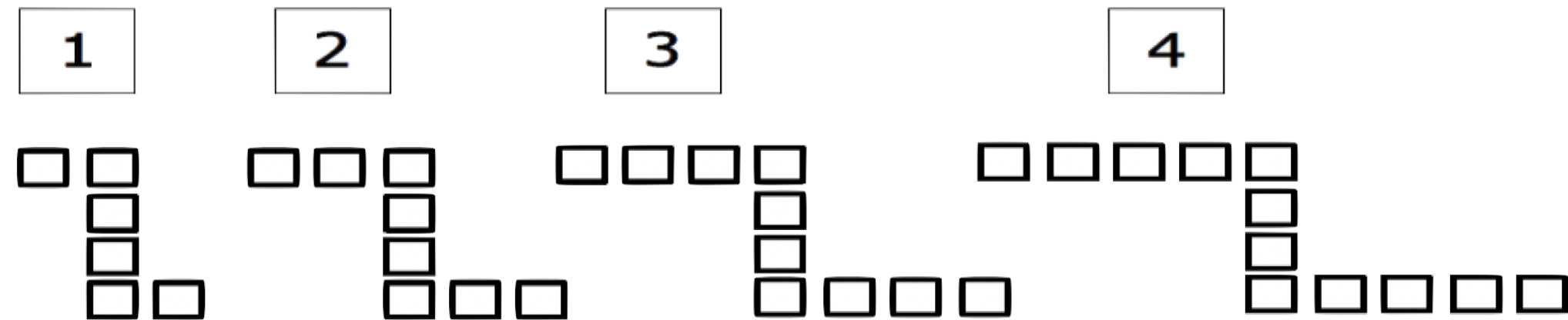


By the end of this lesson learners should be able to:

- **recognise, investigate, extend constant differences, constant ratios, and sequences not limited to constant differences and ratios,**
- **Describe and justify the general rules for observed relationships between numbers**

Lesson 5: Learner Activity 1

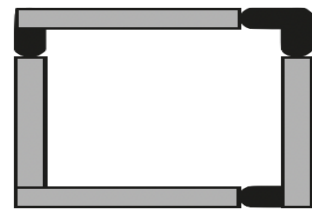
Study the patterns below and answer the questions based on the pattern



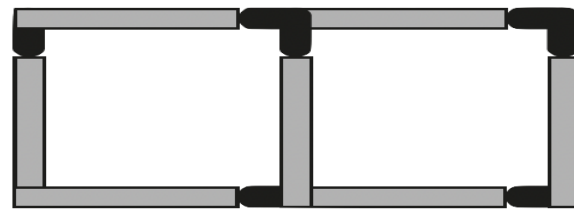
1. Draw the 6th figure in this pattern.
2. Explain in your own words how the pattern develops or how the pattern grows from one figure to the next.
3. Develop a calculation plan (RULE).

Lesson 5: Learner Activity 2

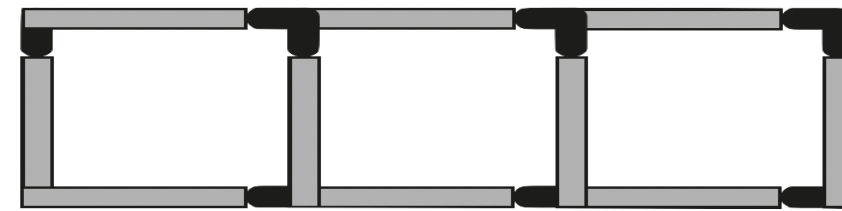
Study the patterns and answer the questions following



Pattern 1



Pattern 2



Pattern 3

1. Explain how the pattern is formed.
2. Copy and complete the table
3. What rule did you use to complete the table?

Pattern Number (Term Number)	1	2	3	4	5	6	7	8	n
Number of Matches	4								

4. How many matches are needed for Figure 9 (or term 9)?
5. How many matches are needed for Figure 20 (or term 20)?
6. What rule did you use to calculate the number of matches in question 5?
7. Complete the pattern:
Term 1: $1 + 1 \times 3 = 4$
Term 2: $1 + 2 \times 3 = 7$
Term 3: $1 + 3 \times 3 =$
Term 4:
Term 5:
Term 10:
Term 17:
8. What stays the same in the pattern and what varies?

Lesson 5: Learner Activity 3

Consider the figures below formed with red dots.

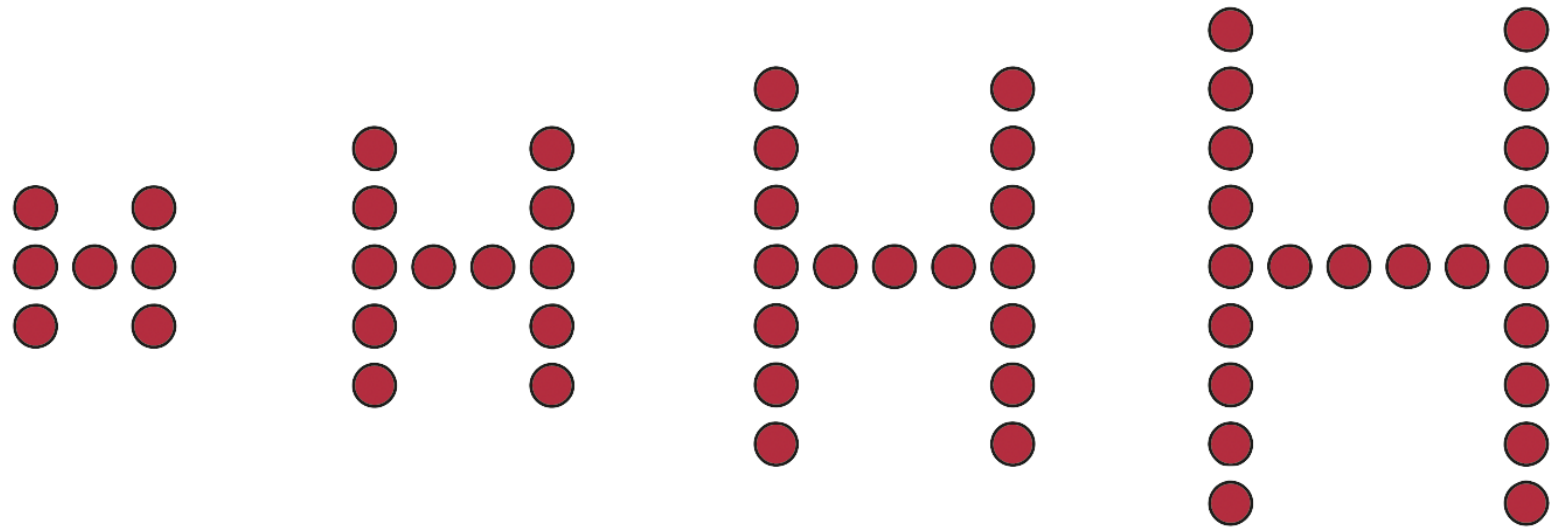


Figure 1

Figure 2

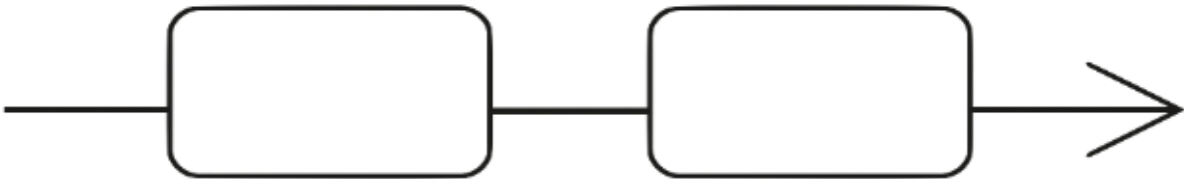
Figure 3

Figure 4

- How many dots are used to form Figure 5 (what is the constant difference)?
- Draw figure 5.
- Complete the table:

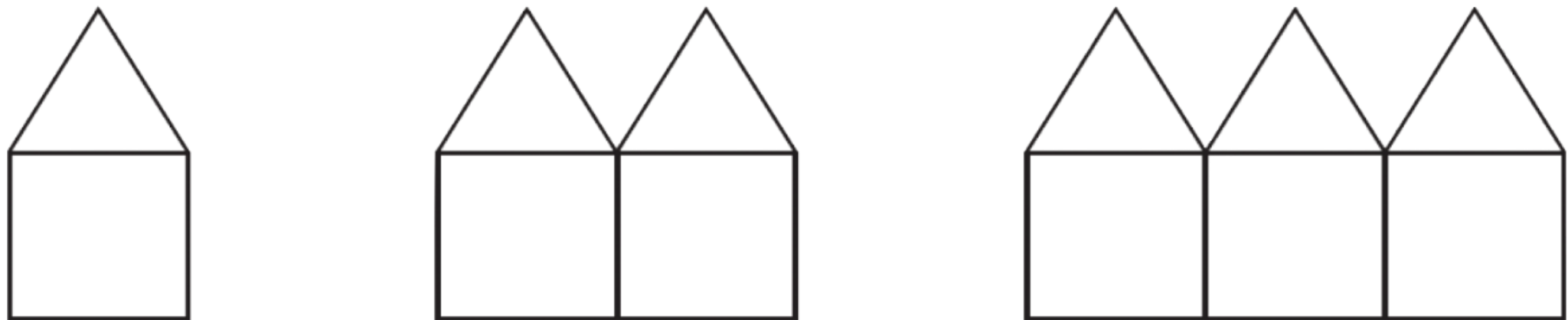
Figure number	1	2	3	4	5	6	7	8
Number of dots	7	12	17					

- Copy and complete the flow diagram (what is the rule?).



Lesson 5: Learner Activity 4

Ralph built houses with match sticks. It looks like the figures below.



- (a)Explain how the pattern is formed.
- (b)Complete the table.

Figure No. (Term no.)	1	2	3	4	5	6	7	8	9	n
# Matches	6	11	16							

- (c) What rule did you use to complete the table?
- (d) How many matches are needed for figure 9 (or term 9)?

Lesson 5: Learner Activity 4



- (e) How many matches are needed for figure 20 (or term 20)?
- (f) What rule did you use to calculate the number of matches in question (e)?
- (g) Complete the pattern:

Term 1: $1 \times 5 + 1$

Term 2: $2 \times 5 + 1$

Term 3: $3 \times 5 + 1$

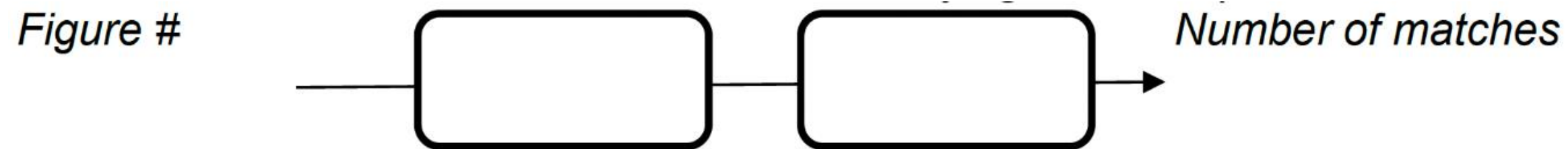
Term 4: _____

Term 5: _____

Term 10: _____

Term 17: _____

- (h) What stays the same in the pattern in (g) and what varies?
- (i) Use the flow diagram below to write down **the rule that you can use** to calculate the number of matches needed for any figure in the pattern.



- (j) Write down the rule to calculate the term, for any term number, in terms of ***n***.

Lesson 6: Objectives

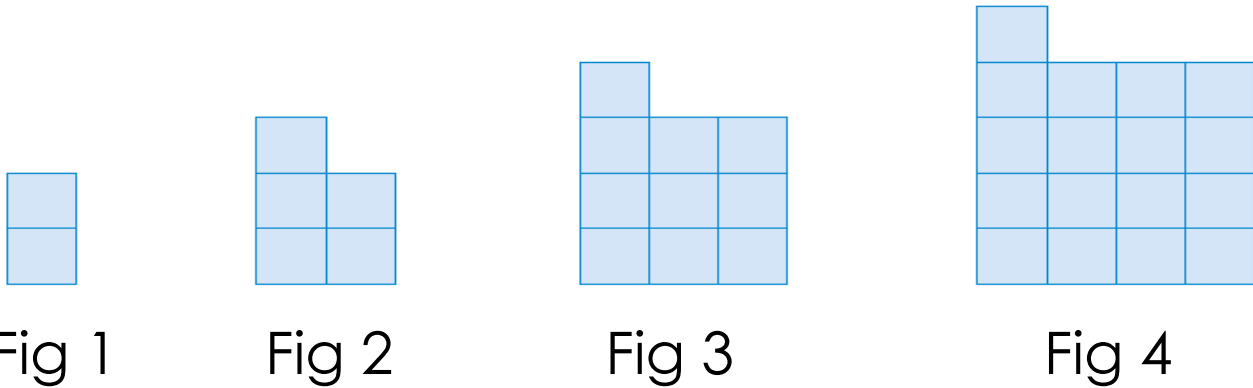


By the end of this lesson learners should be able to:

- **recognise, investigate and extend sequences not limited to constant differences and ratios in geometric patterns, squares and cubes,**
- **Describe and justify the general rules for observed relationships between numbers**

Lesson 6: Learner activity 1

Squares are arranged to form figures as shown below, according to a rule.



1. Copy and complete the table. Then determine the differences between consecutive terms.

Figure number	1	2	3	4	5	6	7	8
Number of squares	2	5						

2. Describe the recursive rule that you can use to extend the pattern in words.

3. Nombuso played around with the differences between consecutive terms. She noticed that the pattern (+ 3; + 5; + 7; ...) was similar to the one that you get when you calculate the differences between square numbers. This made her think that she should investigate square numbers to help her find a rule that could link the figure number and the number of squares. Complete the following pattern along the lines of Nombuso’s thinking:

Figure 1: $1 \times 1 + 1 = 1 + 1 = 2$

Figure 2: $2 \times 2 + 1 = 4 + 1 = 5$

Figure 3:

Figure 4:

Figure 5:

Figure 6:

Figure 7:

Figure 8:

Figure 50:
4. Write a rule to calculate the number of squares for any figure number.

5. Write your rule in, question 2, in terms of n where n is the symbol for any figure number.

Lesson 6: Class Activity 1

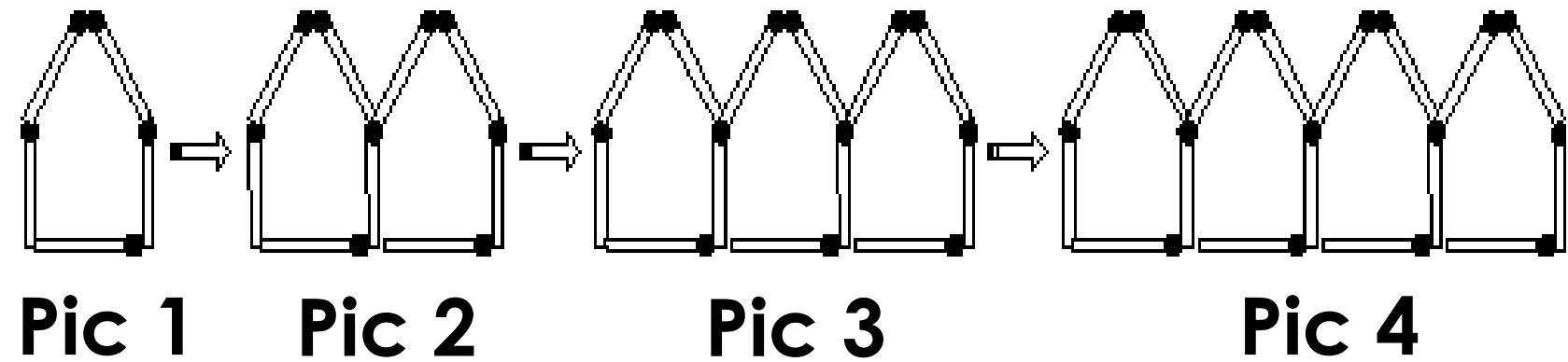
Example

Describe how the pattern grows:

Verbally

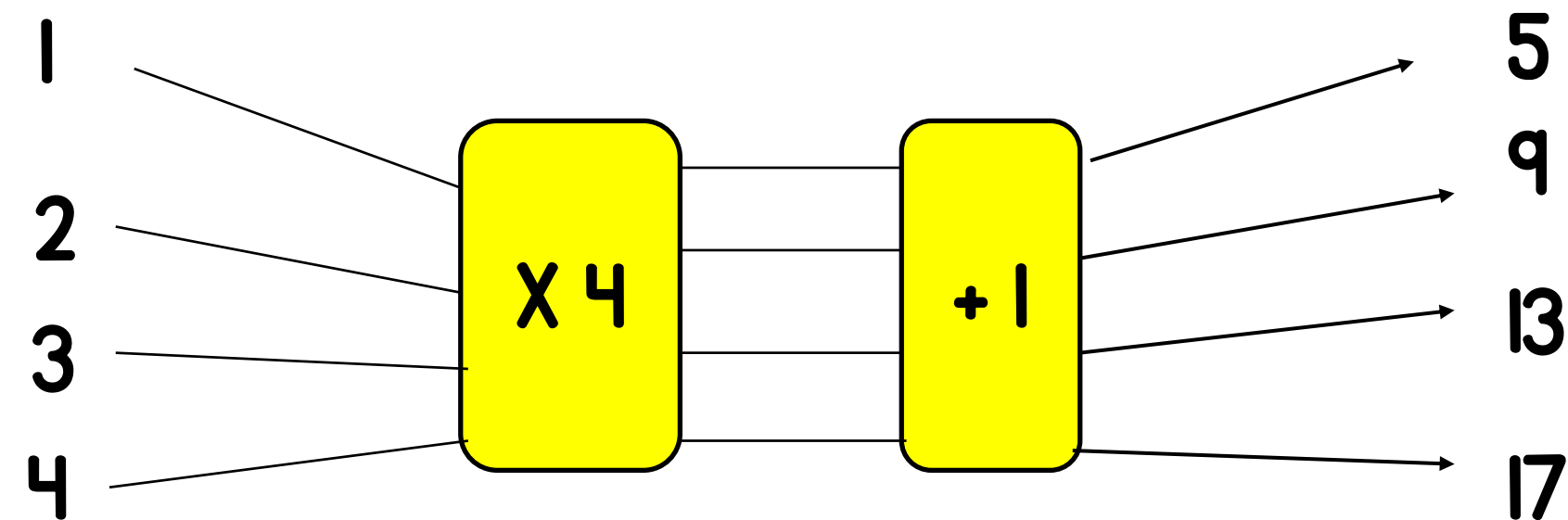
Using a flow diagram

By a number sentence



Verbally: Adding 4 matches to the previous term

Flow diagram:



Number sentence: picture number $\times 4 + 1$

$$1 \times 4 + 1 = 5$$

Lesson 6: Class Activity 2

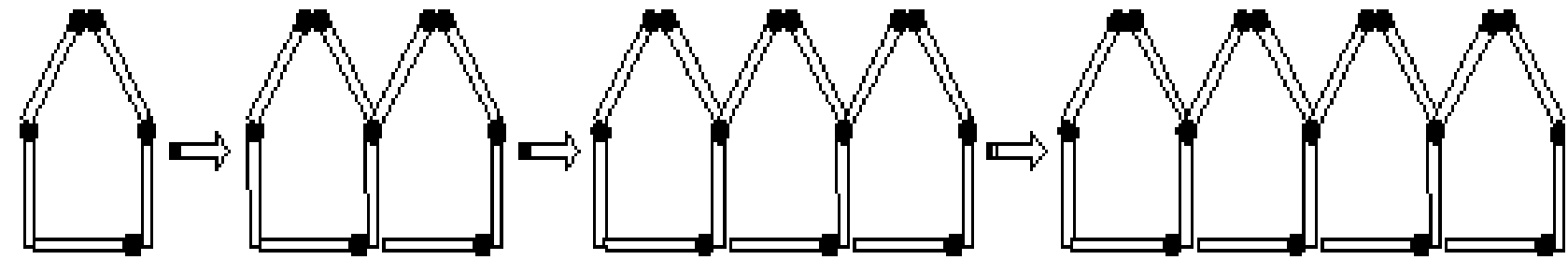
Example

Describe how the pattern grows:

Verbally

Using a flow diagram

By a number sentence



Pic 1

Pic 2

Pic 3

Pic 4

Table:

Picture	1	2	3	4	n
No. of matches	5	9	13	17	$4n+1$

Number sentence: $4 \times \text{Picture no.} + 1$

Rule: $4n + 1$



Lesson 6: Learner Activity 2

The numbers in each row of the table form a pattern, but not all of the numbers are given.

A						4	6	8	10					
B						10	8	6	4					
C						5	8	11	14					
D						20	17	13	8					

1. Copy the table and fill in the missing numbers.
2. What is the constant difference in row A?
3. What is the constant difference in row C?
4. Investigate each of the patterns below. Find the pattern and write the next four terms in the sequence.

(a) 1; 4; 9; 16; 25

(b) 3; 6; 11; 18; 27

(c) 20; 19; 17; 14; 10

(d) 20; 25; 29; 32; 34

Lesson 7: Objectives



By the end of this lesson learners should be able to:

- recognise, investigate and extend sequences not limited to constant differences and ratios**
- Describe and justify the general rules for observed relationships between numbers**



Lesson 7: Learner Activity 1

Study the sequences below:

Pattern A: 6; 11; 16; 21; 26

Pattern D: 1; -3; -7; -11; -15

Pattern G: 25; 31; 37; 43; 49

Pattern B: 13; 17; 21; 25; 29

Pattern E: 31; 33; 35; 37; 39

Pattern H: 26; 33; 40; 47; 54

Pattern C: 20; 23; 26; 29; 32

Pattern F: -20; -25; -30; -35; -40

Pattern I: -11; -17; -23; -29; -35

Sequence I in the above list is a decreasing sequence; the numbers become smaller as the sequence progresses:
-11; -17; -23; -29; -35

Sequence H is an **increasing sequence**; each term is bigger than the previous term: 26; 33; 40; 47; 54

1. (a) Which sequences are increasing sequences?
(b) Which sequences are decreasing sequences?
2. (a) By how much does sequence A increase from one term to the next?
(b) By how much does sequence B increase from one term to the next?
(c) Which of the sequences increases by the biggest amount from one term to the next, and by how much does it increase?

Sequence G increases by 6 from term to term, and sequence E increases only by 2. We may say that sequence G increases faster than sequence E.

3. (a) Which of the sequences above decreases the fastest?
(b) Which of the sequences above decreases the slowest?