

PATTERNS IN ALGEBRA

LEVEL

Level 7

ACTIVITY DESCRIPTION

Students develop knowledge, skills and understanding of patterns, generalisation and algebraic reasoning. They learn about describing patterns in words and algebraic symbols. They determine the rule which involves more than one operation to match a number pattern and are introduced to the concept of variables.

THEME

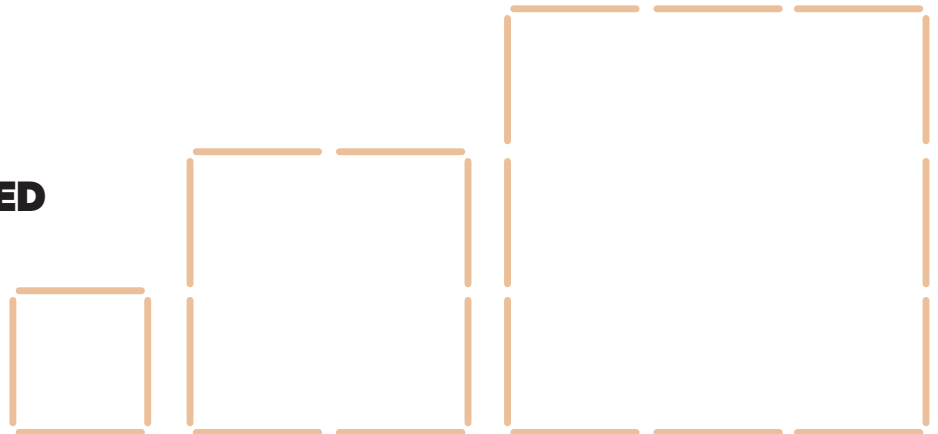
Algebra patterns and variables

MATERIALS REQUIRED

- “Matchsticks” worksheet
- “Variable” worksheet
- Matchsticks – 60 per student
- Counters -100 per student
- Pencil
- Pen

INSTRUCTIONS

1. Provide students with a collection of matchsticks. Students build a sequence of squares with different side lengths using the matchsticks. (Refer to the Matchsticks worksheet)
Model a sequence of squares with sides measuring 1 matchstick, 2 matchsticks, 3 matchsticks.
Students then make the next two squares of the pattern. The perimeter of a square is the distance all the way around. Students then independently complete the worksheet, predicting and discussing the rules of the matchstick pattern.



2. Students then complete the counter activity, again describing the patterns they see and determining a rule for the pattern.
3. Discuss the answers as a class.

✓ SUGGESTIONS FOR ASSESSMENT

Ability to work both independently and in groups to complete both the “Matchsticks” and “Variables” worksheets.

📍 CURRICULUM LINKS

Mathematics

Level 7

Maths - Number and Algebra, Patterns and Algebra

Introduce the concept of variables as a way of representing numbers using letters (VCMNA251)

Create algebraic expressions and evaluate them by substituting a given value for each variable (VCMNA252)

Design and implement mathematical algorithms using a simple general purpose programming language (VCMNA254)

🔍 BACKGROUND INFORMATION

VARIABLES - INDEPENDENT AND DEPENDENT

A **variable** is a symbol or letter which represents a number in an expression or equation. For example, “b” is a variable in the expression $3b + 5$. This means, “b” can be equal to any number in this expression.

In an equation, variables can be **independent** or **dependent**. For example, in the equation $c = 3b + 5$, b is the independent variable (can be equal to any number) and c is the dependent variable (the value of c is determined once we know the value of b).

For example, anthropologists have developed a formula to determine the height from femur length. In cm, a man’s height is given as:

$$\text{height} = 2.59 \times \text{femur length} + 66.4$$

Using pronumerals, we can use f to stand for femur length and h to stand for the man’s height. The formula may then be written as

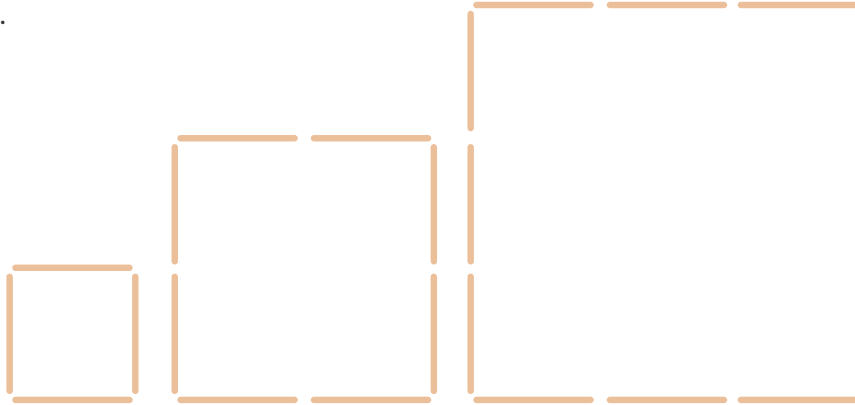
$$h = 2.59f + 66.4$$

The man’s height depends on the length of the femur, so we say that f is the independent variable and h is the dependent variable. The formula is written with the dependent variable (h) as the subject.

WORKSHEET – MATCHSTICKS AND COUNTERS

MATCHSTICKS

Copy the model below which is a sequence of squares with sides measuring 1 matchstick, 2 matchsticks, 3 matchsticks. Students then make the next two squares of the pattern. The perimeter of a square is the distance all the way around.



Fill in the table showing the perimeter of each of the squares.

Length of one side of the squares (in matchsticks)	Perimeter of squares (in matchsticks)
1	4
2	
3	
4	
5	
6	
7	
8	
9	
10	

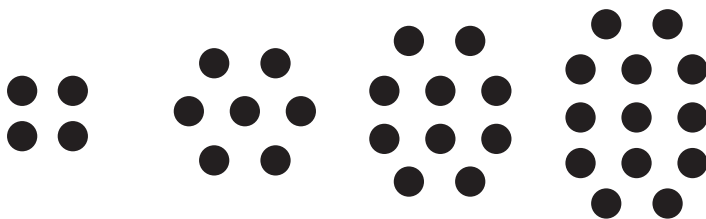
If the square has sides 20 matchsticks long, what is the perimeter?

If the square has sides 100 matchsticks long, what is the perimeter?

What is the rule to describe their matchstick pattern?

COUNTERS

Look at the pattern of counters and draw what you think the fifth and sixth shapes in the pattern would look like?



Describe the patterns you can see.

Develop a rule to show the counter pattern.

WORKSHEET – VARIABLES

Work through the following questions to identify the Independent and Dependent variables in an equation.

	Equation	Independent variable	Dependant variable
1	$y = 3x$		
2	$h = 3k + 2$		
3	$v = u + 5t$		
4	$p = 3q - 2$		
5	$t = 3x^2 + 2x - 5$		
6	$x + 3y = 4$		
7	$3x + 2y = 9$		
8	$3x + 2y - 9 = 0$		
9	$12m = 4n + 6$		

As a whole class, determine the rule giving the relationship between x and y in each of the following and write the corresponding equation.

EXAMPLE

x	-1	0	1	2	3	4
y	-2	0	2	4	6	8

The rule is y is always double x . The equation is $y = 2x$

QUESTION 1

x	-1	0	1	2	3	4
y	-4	0	4	8	12	16

The rule is _____ The equation is _____

QUESTION 2

x	-1	0	1	2	3	4
y	-5	0	9	16	23	30

The rule is _____ The equation is _____