



HSC COLLEGE
HSC Specialist Since 2000

M YEAR 11 MATHEMATICS

ADVANCED
FUNCTIONS

📍 Level 5, Suite 7 / 11 The Boulevard, Strathfield 2135

☎ (02) 8012 8488

✉ enquiry@skyedu-hsc.com



Chapter 1. Introduction to Functions	4
1.1 Functions and Relations	5
1.2 Type of Functions and Relations	6
1.3 Vertical and Horizontal Line Test.....	8
Homework Exercise 1A.....	9
1.4 Independent and Dependent Variables and Function Notation	10
1.5 Composite Functions	13
1.6 Piecewise Functions	15
Homework Exercise 1B.....	18
1.7 Domain & Range and Interval Notation	20
1.8 Finding the Domain & Range by Graphs	20
1.9 Finding the Domain and Range from Equations.....	22
1.10 Finding the Domain and Range of Composite Functions	24
1.11 Even and Odd Functions	28
Homework Exercise 1C	32
Chapter 2. Linear, Quadratic and Cubic Functions	33
2.1 General Form of a Straight Line.....	34
2.2 Gradient of a Straight Line.....	34
2.3 The Angle of Inclination	35
2.4 The Equation of a Straight Line.....	37
2.5 Parallel and Perpendicular Lines.....	39
Homework Exercise 2A	42
2.6 Quadratic Function (Parabola)	43
2.7 Properties of a Parabola.....	43
2.8 Sketching the Graph of a Quadratic Function.....	45
2.9 Finding the Equation of a Quadratic Function.....	47
2.10 Problems Involving Simultaneous Equations and Discriminant Theorem.....	49

Homework Exercise 2B	53
2.11 Applied Studies – Break Even Point.....	54
Homework Exercise 2C	58
2.12 The Graph of $y = kx^3$	59
2.13 The Graph of $y = k(x - b)^3 + c$	59
2.14 The Graph of $y = k(x - a)(x - b)(x - c)$	60
Homework Exercise 2D	62
Chapter 3. Further Functions and Relations.....	63
3.1 Polynomials.....	64
Terms of a Polynomial	64
Behaviour of the Curve at Simple and Multiple Zeroes	64
Homework Exercise 3A	66
3.2 Hyperbola.....	68
3.3 Absolute Values	69
Sketching the function of $y = ax + b $	70
Solving Absolute Value Equation of the Form $ f(x) = k$	71
Solving Absolute Value Equation of the Form $ f(x) = g(x)$	72
Solving Absolute Value Equation of the Form $ f(x) = g(x) $	74
Homework Exercise 3B	76
3.4 Transformation of the Given Graph	77
The graph of $y = -f(x)$	77
The graph of $y = f(-x)$	78
The graph of $y = -f(-x)$	79
Homework Exercise 3C	81
3.5 Circles	83
3.6 Semicircles.....	86
Homework Exercise 3D	87

Chapter 1. Introduction to Functions

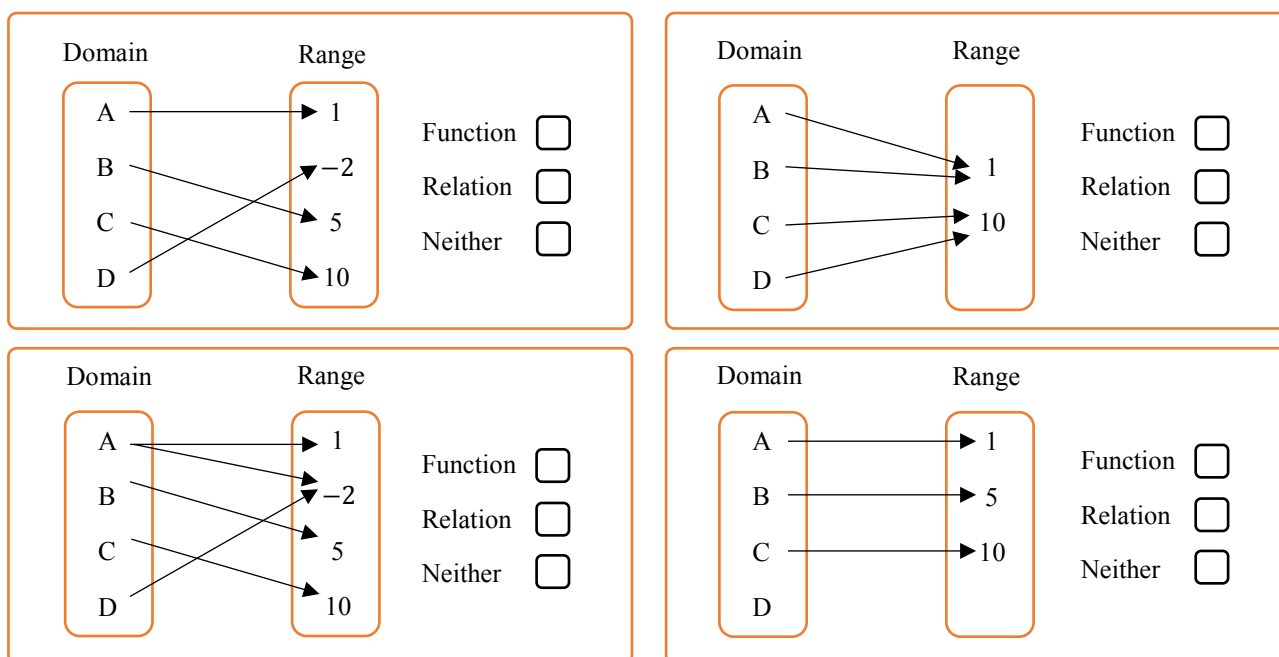
1.1 Functions and Relations

The mathematical language, notation and functionality concepts that will be introduced in this chapter will continue to be used throughout all subsequent chapters.

A "relation" is just a relationship between sets of information. Think of all the people in a class, and think of their test marks. The pairing of names and marks is a relation. In relations and functions, the pairs of names and marks are "ordered", which means if names come first then marks come second and vice versa. To put it another way, we could set up this pairing so that either you give me a name, and then I give you that person's mark, or else you give me a mark, and I give you the names of all the people who have that mark. The set of all the starting points is called "the domain" and the set of all the ending points is called "the range." The domain is what you start with; the range is what you end up with. The domain is the x 's; the range is the y 's. (We will learn more on the subject of determining domains and ranges later.)

A function is a "well-behaved" relation. When we say that a function is "a well-behaved relation", we mean that, given a starting point, we know exactly where to go; given an x , we get only and exactly one y .

The relation "mark indicates name" is not well-behaved. It is not a function. Given the relationship $(x, y) = (\text{mark}, \text{name})$, there might be different possibilities for $y = \text{"name"}$. For a relation to be a function, there must be *only and exactly* one y that corresponds to a given x . Here are some mappings of this:



In summary

- An ordered pair is a set of inputs and outputs and represents a relationship between the two values.
- A function is a set of ordered pairs in which every x values is paired to a unique y value.
- A relation is any set of ordered pairs.

So all functions are relations.

