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Order of Operations & Rounding Numbers

IGCSE Mathematics

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Quality Mathematics Education for Students

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1 Introduction

Note

The order of operations and rounding are two essential skills that underpin almost every area of mathematics. Getting the order of operations wrong can turn a correct method into a wrong answer, and rounding correctly is vital for estimation, measurement, and presenting results sensibly.

In this chapter, we will explore:

- The BIDMAS/BODMAS rules for order of operations
- Working with brackets, indices, and the four operations
- Rounding to decimal places
- Rounding to significant figures
- Truncation vs rounding
- Estimation using rounding
- Upper and lower bounds

2 Order of Operations (BIDMAS)

Definition

The **order of operations** is the set of rules that determines the sequence in which calculations are carried out. In the UK and IGCSE syllabuses, this is remembered using the mnemonic **BIDMAS** (also known as BODMAS or PEMDAS).

B Brackets	() — work out the contents of brackets first
I Indices	Powers and roots, e.g. 3^2 , $\sqrt{16}$
D Division	$\div$ — left to right with multiplication
M Multiplication	$\times$ — left to right with division
A Addition	$+$ — left to right with subtraction
S Subtraction	$-$ — left to right with addition

Note**Key points about BIDMAS:**

- Division and multiplication have **equal priority** — evaluate them left to right.
- Addition and subtraction have **equal priority** — evaluate them left to right.
- If there are nested brackets, work from the **innermost** brackets outward.
- A fraction bar acts like a bracket around the numerator and denominator.

2.1 Brackets

Method**Working with Brackets**

Step 1: Identify all brackets in the expression

Step 2: If brackets are nested, start with the innermost pair

Step 3: Evaluate the expression inside each pair of brackets using BIDMAS

Step 4: Replace the bracket with its result and continue

Types of brackets you may encounter:

- Parentheses: ()
- Square brackets: [] — often used as outer brackets
- The numerator and denominator of a fraction each act as implied brackets

Example

Evaluate $7 \times (3 + 6)$.

Solution:

$$\begin{aligned} 7 \times (3 + 6) &= 7 \times 9 \quad (\text{brackets first}) \\ &= 63 \end{aligned}$$

Preview ends here

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