

# Contents

## Section One — Number

Order of Operations .....	1
Calculator Buttons .....	2
Place Value and Ordering Numbers .....	3
Negative Numbers .....	4
Special Types of Number .....	5
Powers and Roots .....	6
Questions .....	7
Prime Numbers .....	9
Multiples, Factors and Prime Factors .....	10
LCM and HCF .....	11
Questions .....	12
Fractions .....	14
Fractions, Decimals and Percentages .....	17
Fractions and Recurring Decimals .....	18
Questions .....	19
Percentages .....	21
Compound Growth and Decay .....	24
Questions .....	25
Ratios .....	27
Proportion .....	30
Questions .....	31
Rounding Numbers .....	33
Bounds .....	35
Standard Form .....	36
Questions .....	38
Sets .....	40
Venn Diagrams .....	43
Questions .....	45
Revision Questions for Section One .....	47

## Section Two — Algebra

Algebra Basics .....	48
Powers .....	49
Expanding Brackets .....	51
Factorising .....	52
Questions .....	53
Solving Equations .....	55
Making Formulas from Words .....	57
Rearranging Formulas .....	58
Algebraic Fractions .....	60
Questions .....	61

Factorising Quadratics .....	63
The Quadratic Formula .....	65
Completing the Square .....	66
Questions .....	68
Simultaneous Equations .....	70
Solving Equations Using Graphs .....	72
Inequalities .....	73
Graphical Inequalities .....	74
Questions .....	75
Sequences .....	77
Algebraic Proportion .....	80
Questions .....	81
Revision Questions for Section Two .....	83

## Section Three — Graphs, Functions and Calculus

Coordinates .....	84
Straight-Line Graphs .....	85
Plotting Straight-Line Graphs .....	86
Finding the Gradient .....	87
“ $y = mx + c$ ” .....	88
Parallel and Perpendicular Lines .....	89
Questions .....	90
Quadratic Graphs .....	92
Harder Graphs .....	93
Trig Graphs .....	96
Questions .....	97
Real-Life Graphs .....	100
Distance-Time Graphs .....	101
Speed-Time Graphs .....	102
Gradients of Real-Life Graphs .....	103
Questions .....	104
Functions .....	106
Differentiation .....	107
Questions .....	109
Revision Questions for Section Three .....	111

## Section Four — Geometry and Measures

Geometry .....	112
Parallel Lines .....	113
Geometry Problems.....	114
Bearings .....	115
Polygons.....	116
Symmetry .....	117
Questions .....	118
Circle Geometry .....	120
Questions .....	123
Congruence.....	125
Similarity.....	126
The Four Transformations.....	127
Questions .....	130
Unit Conversions.....	132
Area and Volume Conversions.....	133
Time.....	134
Speed, Density and Pressure.....	135
Questions .....	137
Perimeter and Area.....	139
Circles.....	140
Scale Drawings.....	141
Triangle Constructions.....	142
Questions .....	143
3D Shapes.....	145
Surface Area and Nets.....	146
Volume.....	147
Questions .....	149
Revision Questions for Section Four ....	151

## Section Five — Pythagoras, Trigonometry and Vectors

Pythagoras' Theorem .....	152
Trigonometry — Sin, Cos and Tan.....	153
Questions .....	155
The Sine and Cosine Rules.....	157
Sin, Cos and Tan for Larger Angles.....	159
3D Pythagoras.....	160
3D Trigonometry .....	161
Vectors .....	162
Questions .....	164
Revision Questions for Section Five ....	166

## Section Six — Probability and Statistics

Probability Basics.....	167
Listing Outcomes and Expected Frequency .....	168
The AND/OR Rules .....	169
Questions .....	170
Tree Diagrams .....	172
Probability from Venn Diagrams .....	174
Relative Frequency .....	175
Questions .....	176
Collecting Data .....	178
Mean, Median, Mode and Range.....	179
Frequency Tables.....	180
Grouped Frequency Tables .....	181
Questions .....	182
Simple Charts .....	184
Pie Charts.....	185
Scatter Diagrams .....	186
Histograms .....	187
Questions .....	189
Box and Whisker Plots.....	191
Cumulative Frequency .....	192
Interpreting Data .....	194
Comparing Data Sets.....	195
Questions .....	196
Revision Questions for Section Six.....	198
Practice Paper 1 (Core) .....	199
Practice Paper 2 (Core) .....	208
Practice Paper 1 (Extended).....	219
Practice Paper 2 (Extended).....	229

Answers.....	242
Glossary .....	263
Index.....	266
Formula Sheet.....	268

Some of the content in this book will only be assessed if you're taking the Extended version of the Cambridge International GCSE. We've marked up all the content that's only for the Extended course with purple brackets, like the ones around this text, or the example below.

**Extended** [ Information or questions with a bracket like this are for the Extended course only. ] **Extended**

## Section Four — Geometry and Measures

Geometry .....	112
Parallel Lines .....	113
Geometry Problems.....	114
Bearings .....	115
Polygons.....	116
Symmetry .....	117
Questions .....	118
Circle Geometry .....	120
Questions .....	123
Congruence.....	125
Similarity.....	126
The Four Transformations.....	127
Questions .....	130
Unit Conversions.....	132
Area and Volume Conversions.....	133
Time.....	134
Speed, Density and Pressure.....	135
Questions .....	137
Perimeter and Area.....	139
Circles.....	140
Scale Drawings.....	141
Triangle Constructions.....	142
Questions .....	143
3D Shapes.....	145
Surface Area and Nets.....	146
Volume.....	147
Questions .....	149
Revision Questions for Section Four ....	151

## Section Five — Pythagoras, Trigonometry and Vectors

Pythagoras' Theorem .....	152
Trigonometry — Sin, Cos and Tan.....	153
Questions .....	155
The Sine and Cosine Rules.....	157
Sin, Cos and Tan for Larger Angles.....	159
3D Pythagoras.....	160
3D Trigonometry .....	161
Vectors .....	162
Questions .....	164
Revision Questions for Section Five ....	166

## Section Six — Probability and Statistics

Probability Basics .....	167
Listing Outcomes and Expected Frequency .....	168
The AND/OR Rules .....	169
Questions .....	170
Tree Diagrams .....	172
Probability from Venn Diagrams .....	174
Relative Frequency .....	175
Questions .....	176
Collecting Data .....	178
Mean, Median, Mode and Range.....	179
Frequency Tables.....	180
Grouped Frequency Tables .....	181
Questions .....	182
Simple Charts .....	184
Pie Charts.....	185
Scatter Diagrams .....	186
Histograms .....	187
Questions .....	189
Box and Whisker Plots.....	191
Cumulative Frequency .....	192
Interpreting Data .....	194
Comparing Data Sets.....	195
Questions .....	196
Revision Questions for Section Six.....	198
Practice Paper 1 (Core) .....	199
Practice Paper 2 (Core) .....	208
Practice Paper 1 (Extended).....	219
Practice Paper 2 (Extended).....	229

Answers.....	242
Glossary .....	263
Index.....	266
Formula Sheet.....	268

Some of the content in this book will only be assessed if you're taking the Extended version of the Cambridge International GCSE. We've marked up all the content that's only for the Extended course with purple brackets, like the ones around this text, or the example below.

**Extended** [ Information or questions with a bracket like this are for the Extended course only. ] **Extended**

# Order of Operations

Welcome to the wonderful world of maths. We're going to start off with something easy — the **order of operations** like addition, subtraction and multiplication — also known as **BODMAS**.

## BODMAS

**BODMAS** tells you the **ORDER** in which these operations should be done:



**BODMAS: Brackets, Other, Division & Multiplication, Addition & Subtraction**

Work out **Brackets** first, then **Other** things like squaring, then **Divide / Multiply** groups of numbers before **Adding / Subtracting**. To decide between dividing and multiplying, or between adding and subtracting, just work from **left to right**.

This set of rules works really well, so remember “BODMAS”.

### EXAMPLES:

#### 1. Work out $7 + 9 \div 3$

- 1) Follow BODMAS — do the **division** first...  $7 + 9 \div 3$
- 2) ...then the **addition**:  $= 7 + 3$

$$= 10$$

If you don't follow BODMAS, you get:  
 $7 + 9 \div 3 = 16 \div 3$   
 $= 5.333... \times$

#### 2. Calculate $15 - 7^2$

- 1) The square is an ‘**other**’ so that's first:  $15 - 7^2$
- 2) Then do the **subtraction**:  $= 15 - 49$

$$= -34$$

#### 3. Find $(5 + 3) \times (12 - 3)$

- 1) Start by working out the **brackets**:  $(5 + 3) \times (12 - 3)$
- 2) And now the **multiplication**:  $= 8 \times 9$

$$= 72$$

#### 4. $e = (f - 7)^2 + \frac{4g}{h+1}$ , where $f = 4$ , $g = 3$ , $h = -2$ .

Work out the value of  $e$ .

- 1) Write down the formula:  $e = (f - 7)^2 + \frac{4g}{h+1}$

- 2) Put the numbers in:  $e = (4 - 7)^2 + \frac{4 \times 3}{-2 + 1}$

- 3) Then work it out **in stages**:  $= (-3)^2 + \frac{12}{-1}$

Putting brackets round the negative number makes it clear that  $-3$  is squared, not just 3.

$$= 9 + \frac{12}{-1}$$

$$= 9 + -12$$

$$= -3$$

Work **brackets** out first.

Around the top and bottom of a fraction there are ‘**invisible brackets**’. You just have to imagine they're there.

Then **other** stuff — in this case square the first bit.

Then **divide**.

Finally **add or subtract**.

**Make sure you're confident with this before moving on**

BODMAS comes up all the time, so it's really important that you can do it without getting confused.

# Calculator Buttons

This page is really important — it's all about using **calculators**.

## Know Your Buttons

Look for these buttons on your calculator — they might be a bit different on yours.

**$x^{-1}$**  The **reciprocal** button. The reciprocal of a number is 1 divided by it. So the reciprocal of 2 is  $\frac{1}{2}$ .

**$\sqrt[3]{\phantom{x}}$**  The **cube root** button. You might have to press **shift** first.

**Ans** This uses your **last answer** in your current calculation — very useful.

**$\frac{\square}{\square}$**  Swaps your answer from a **fraction** to a **decimal** and vice versa.

## BODMAS on Your Calculator

BODMAS questions can be packed with **tricky decimals** and maybe a **square root** and **sin/cos/tan**. You **could** do it on your calculator in one go, but you could lose precious marks if you make a mistake.

**EXAMPLE:** Work out  $\left(\frac{64 \cos 80^\circ}{0.48 + \sqrt{0.79}}\right)^3$ .  
Write down all the figures on your calculator display.

You **MUST** write down the numbers as you go. That way, even if you mess up at the end, you may still get a mark.

$$\begin{aligned} & \left(\frac{64 \cos 80^\circ}{0.48 + \sqrt{0.79}}\right)^3 \\ & = \left(\frac{11.11348337}{1.368819442}\right)^3 \\ & = 8.119027997^3 \\ & = 535.1950858 \end{aligned}$$

There are lots of **slightly different ways** of working out this type of calculation. Here's one:

1) Work out the **bottom** of the fraction:  $0.48 + \sqrt{0.79} =$

Write the answer down and store it in the **memory** by pressing: **STO M+**

2) Now work out the **top** of the fraction:  $64 \cos 80 =$

3) Do the division: **Ans  $\div$  RCL M+ =** This gets the value of the bottom of the fraction out of the memory.

4) And cube the answer: **Ans  $x^3$  =**

### NOTE:

- On some calculators, a **bracket** opens when you use a trig function or the square/cube root function. So to enter something like  $\tan 40^\circ + 1$ , you have to close the bracket: **tan 40 ) + 1**
- On some calculators, the cursor stays under the square root bar until you move it out by pressing the right arrow.

## Check Your Answer Using Brackets ( and )

Check your answer to a question like the one above by typing it into your calculator in fewer steps.

1) To work out  $\frac{64 \cos 80^\circ}{0.48 + \sqrt{0.79}}$  you **CAN'T** just press **64 cos 80  $\div$  0.48 +  $\sqrt{\phantom{x}}$  0.79 =**

2) The calculator follows BODMAS, so it'll think you mean  $\frac{64 \cos 80^\circ}{0.48} + \sqrt{0.79}$ .

3) You need to use the **BRACKETS BUTTONS** — the calculator will do the bits in brackets first. So you can press:

$$\left( 64 \cos 80 \right) \div \left( 0.48 + \sqrt{0.79} \right) =$$

(Cube this to check the question above.)

Your calculator might need you to add an extra ")" here. See the note above.

You might also need an extra ")", or to move right one space here.

## Your calculator can save you time in the exam

Different calculators have different ways of doing things. Make sure you're familiar with how your calculator works before the exam — it might save you some marks as well as some time.