

GCSE MATHEMATICS

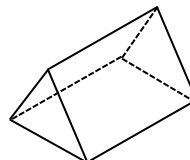
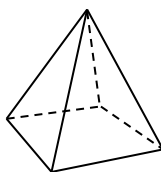
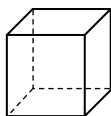
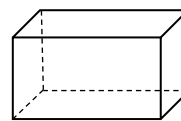
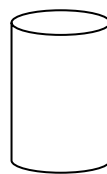
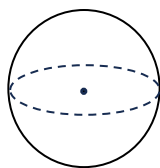
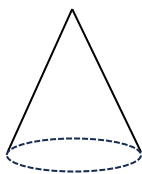
THE ULTIMATE REVISION GUIDE

FOUNDATION

3 QUESTIONS ON EVERY TOPIC

AT EVERY LEVEL

ALL EXAM-STYLE QUESTIONS



EMU Maths

Essential Maths Unlocked



This revision guide belongs to

HOW TO USE THIS REVISION GUIDE

*The following is guidance only – use the guide as you wish.

For context, every topic consists of three questions.

Q1 = easy. Q2 = medium difficulty. Q3 = challenging.

- a) In the RAG (red, amber, green) grid on the next few pages, start with topic number 1.

If you are 100% confident with this topic, mark it as green, attempt Q3 and move to the next topic. For each topic you mark as green on the RAG grid, attempt Q3.

As soon as you reach a topic that you mark amber or red, go to the relevant page and attempt all questions (Q1, Q2 and Q3).

Check your answers at the back of the book. To see full working out, go to

website link available in paper copy of book

- b) **Before you start answering questions, look through the first few pages as they contain past paper trackers, grade boundaries from previous years, handy formulae and more!**

NUMBER				
1	Place value and writing numbers			
2	Number cards			
3	Basic conversions			
4	Ordering numbers			
5	Arithmetic and inequality signs			
6	BIDMAS			
7	Types of number			
8	Error intervals & reciprocals			
9	Directed number (add and subtract)			
10	Using a calculator			
11	Rounding			
12	Estimation			
13	Multiplying integers			
14	Multiplying decimals			
15	Dividing integers			
16	Dividing decimals			
17	Standard form and ordinary numbers			
18	Standard form (with operations)			
19	Standard form using a calculator			
20	Standard form (worded questions)			
21	Prime factorisation			
22	Factors and multiples			
23	HCF and LCM			
24	Fractions (shaded shapes)			
25	Simplifying fractions and equivalent fractions			
26	Fractions (add/subtract)			
27	Fractions (multiply/divide)			
28	Fractions of amounts			
29	Percentages			
30	Percentages and fractions (worded questions)			

NUMBER				
31	Reverse percentages			
32	Percentage change			
33	Simple interest			
34	Compound interest			
35	Money problems			
36	Worded problems			
37	Function machines			
38	Following a rule			
ALGEBRA				
39	Writing expressions			
40	Substitution			
41	Linear sequences			
42	Sequences (miscellaneous)			
43	Fibonacci sequences			
44	Simplifying indices			
45	Index laws			
46	Expanding single brackets			
47	Expanding two sets of single brackets			
48	Expanding double brackets			
49	Factorising single brackets			
50	Factorising quadratics			
51	Solving quadratics			
52	Solving linear equations			
53	Forming and solving equations (from words)			
54	Forming and solving equations (one shape)			
55	Forming and solving equations (two shapes)			
56	Simultaneous equations			
57	Solving linear inequalities			
58	Inequalities and number lines			
59	Changing the subject			
60	Drawing linear graphs			

ALGEBRA				
61	Plotting quadratic graphs			
62	Features of quadratic graphs			
63	Plotting cubic and reciprocal graphs			
64	Recognising graphs			
65	Sketching graphs			
66	Distance-time graphs			
67	Midpoint			
68	Coordinates			
69	Gradient of a line			
70	Parallel and perpendicular lines			
71	Equation of a straight line			
72	Equation of a line (given one point)			
73	Equation of a line (given two points)			
74	Timetables			
75	Recipes			
76	Best buys			
77	Exchange rates			
78	Conversion graphs			
RATIO & PROPORTION				
79	Simplifying ratios			
80	Ratios (form $n:l$ or $l:n$)			
81	Ratios and fractions			
82	Sharing into and within ratios			
83	Ratios (problem solving)			
84	Ratios (problem solving with fractions and percentages)			
85	Ratios (changing ratios)			
86	Ratios (combining ratios)			
87	Proportion			
88	Force, pressure, area			
89	Distance, speed, time			
90	Mass, density, volume			

RATIO & PROPORTION				
91	Time			
GEOMETRY & MEASURE				
92	3D shapes			
93	Polygons (basic)			
94	Lines of symmetry and rotational order			
95	Measuring angles & types of angles			
96	Basic angle rules			
97	Angles in triangles			
98	Angles in quadrilaterals			
99	Angles in parallel lines			
100	Angles in regular polygons			
101	Angles in irregular polygons			
102	Drawing transformations			
103	Describing transformations			
104	Congruent shapes			
105	Similar shapes			
106	Area and perimeter			
107	Volume of prisms			
108	Surface area of prisms			
109	Area (proof)			
110	Parts of a circle			
111	Area of a circle			
112	Circumference of a circle			
113	Arc lengths and area of sectors			
114	Pythagoras' theorem			
115	Trigonometry			
116	Exact values			
117	Plans and elevations			
118	Converting between units			
119	Scale diagrams			
120	Constructing triangles			
121	Constructing bisectors			

<u>GEOMETRY & MEASURE</u>				
I22	Bearings			
I23	Loci			
I24	Adding and subtracting vectors			
I25	Describing and drawing vectors			
<u>PROBABILITY</u>				
I26	Probability (words)			
I27	Probability scales			
I28	Probability in tables			
I29	Probability tree diagrams			
I30	Probability (mixture)			
I31	Frequency trees			
I32	Two-way tables			
I33	Listing outcomes and sample space diagrams			
I34	Venn diagrams			
<u>STATISTICS</u>				
I35	Tally charts and pictograms			
I36	Vertical lines charts			
I37	Bar charts			
I38	Line graphs			
I39	Frequency polygons			
I40	Scatter graphs			
I41	Stem and leaf diagrams			
I42	Pie charts			
I43	Spot the mistakes (charts & graphs)			
I44	Frequency tables (ungrouped)			
I45	Averages and range			
I46	Averages from tables, charts and graphs			
I47	Combined mean			
I48	Averages from tables			

A) THINGS TO NOTE

- a) The following revision guide has been produced in line with the Edexcel (Pearson) GCSE Maths syllabus.

Due to content overlap, content in the following revision guide also pertains significantly to the following exam boards: AQA, OCR and Edexcel IGCSE.

- b) All diagrams in the revision guide are not accurately drawn.

- c) Answers to all questions are at the back of the book. **Worked solutions can be accessed via the following weblink:** [website link available in paper copy of book](#)

- d) It is recommended that you use a pencil on the RAG grid so that you can edit as you improve.

B) GRADE BOUNDARIES (Foundation Tier Edexcel entries only)

Year	Maximum mark	Grade 5	Grade 4	Grade 3	Grade 2	Grade 1
June 2017	240	158	122	90	58	26
November 2017	240	145	113	83	53	23

June 2018	240	169	136	101	66	31
November 2018	240	167	132	96	61	26

June 2019	240	184	149	111	73	36
November 2019	240	166	142	104	67	30

November 2020	240	165	136	99	63	27
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November 2021	240	166	134	100	66	32
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June 2022	240	173	135	100	66	32
November 2022	240	173	135	100	66	32

June 2023	240	182	147	109	71	33
November 2023	240	175	140	104	68	33

June 2024	240	175	142	103	65	27
November 2024	240	174	141	103	66	29

June 2025	240	175	144	105	67	29
November 2025	240	174	143	105	67	29

June 2026	240					
November 2026	240					

June 2027	240					
November 2027	240					

June 2028	240					
November 2028	240					

C) EXAM DATES

PAPER 1	PAPER 2	PAPER 3
Day: _____	Day: _____	Day: _____
Date: _____	Date: _____	Date: _____

D) FORMULAE SHEET (OFFICIAL)

*The below formulae are on the Foundation Tier formulae sheet for those sitting the Edexcel GCSE exams.

Area, volume and perimeter

$$\text{Area of a trapezium} = \frac{1}{2}(a + b)h$$

$$\text{Volume of a prism} = \text{area of cross section} \times \text{length}$$

$$\text{Circumference of a circle } 2\pi r = \pi d$$

$$\text{Area of a circle} = \pi r^2$$

Pythagoras' Theorem and Trigonometry

$$a^2 + b^2 = c^2$$

$$\sin A = \frac{a}{c} \quad \cos A = \frac{b}{c} \quad \tan A = \frac{a}{b}$$

Compound interest

Where P = the principal amount, r = the interest rate, n = the number of times that the interest is compounded

$$\text{Total accrued} = P \left(1 + \frac{r}{100} \right)^n$$

Probability

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$P(A \text{ and } B) = P(A \text{ given } B) P(B)$$

E) HANDY THINGS TO KNOW (NOT OFFICIAL)

*The below are not on the official formulae sheet but are nonetheless useful to know.

LAWS OF INDICES

LAW	EXAMPLE
$y^a \times y^b = y^{a+b}$	$2^2 \times 2^3 = 2^5$
$y^a \div y^b = y^{a-b}$	$2^2 \div 2^3 = 2^{-1}$
$(y^a)^b = y^{a \times b}$	$(2^2)^3 = 2^6$
$(xy)^a = x^a y^a$	$(2a^2b)^3 = 2^3 \times (a^2)^3 \times b^3 = 8a^6b^3$
$y^{-a} = \frac{1}{y^a}$	$2^{-5} = \frac{1}{2^5} = \frac{1}{32}$
$y^0 = 1$	$2^0 = 1$

EXACT VALUES

	0°	30°	45°	60°	90°
sinθ	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cosθ	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tanθ	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	undefined

F) REVISION TRACKER (PAST PAPERS)

Month	Year	Paper	Mark out of 80	Grade		Topics to revise
May/June	2017	Paper 1			Marks away from desired grade:	
May/June	2017	Paper 2				
May/June	2017	Paper 3				
November	2017	Paper 1			Marks away from desired grade:	
November	2017	Paper 2				
November	2017	Paper 3				

May/June	2018	Paper 1			Marks away from desired grade:	
May/June	2018	Paper 2				
May/June	2018	Paper 3				
November	2018	Paper 1			Marks away from desired grade:	
November	2018	Paper 2				
November	2018	Paper 3				

May/June	2019	Paper 1			Marks away from desired grade:	
May/June	2019	Paper 2				
May/June	2019	Paper 3				
November	2019	Paper 1			Marks away from desired grade:	
November	2019	Paper 2				
November	2019	Paper 3				

Month	Year	Paper	Mark out of 80	Grade		Topics to revise
November	2020	Paper 1			Marks away from desired grade:	
November	2020	Paper 2				
November	2020	Paper 3				

November	2021	Paper 1			Marks away from desired grade:	
November	2021	Paper 2				
November	2021	Paper 3				

May/June	2022	Paper 1			Marks away from desired grade:	
May/June	2022	Paper 2				
May/June	2022	Paper 3				
November	2022	Paper 1			Marks away from desired grade:	
November	2022	Paper 2				
November	2022	Paper 3				

May/June	2023	Paper 1			Marks away from desired grade:	
May/June	2023	Paper 2				
May/June	2023	Paper 3				
November	2023	Paper 1			Marks away from desired grade:	
November	2023	Paper 2				
November	2023	Paper 3				

Month	Year	Paper	Mark out of 80	Grade		Topics to revise
May/June	2024	Paper 1			Marks away from desired grade:	
May/June	2024	Paper 2				
May/June	2024	Paper 3				
November	2024	Paper 1			Marks away from desired grade:	
November	2024	Paper 2				
November	2024	Paper 3				

May/June	2025	Paper 1			Marks away from desired grade:	
May/June	2025	Paper 2				
May/June	2025	Paper 3				
November	2025	Paper 1			Marks away from desired grade:	
November	2025	Paper 2				
November	2025	Paper 3				

May/June	2026	Paper 1			Marks away from desired grade:	
May/June	2026	Paper 2				
May/June	2026	Paper 3				
November	2026	Paper 1			Marks away from desired grade:	
November	2026	Paper 2				
November	2026	Paper 3				

Month	Year	Paper	Mark out of 80	Grade		Topics to revise
		Paper 1			Marks away from desired grade:	
		Paper 2				
		Paper 3				

		Paper 1			Marks away from desired grade:	
		Paper 2				
		Paper 3				

		Paper 1			Marks away from desired grade:	
		Paper 2				
		Paper 3				

		Paper 1			Marks away from desired grade:	
		Paper 2				
		Paper 3				

		Paper 1			Marks away from desired grade:	
		Paper 2				
		Paper 3				

G) MOCK EXAMS TRACKER

MOCK 1

Paper	Mark out of 80	Topics to revise
Paper 1		
Paper 2		
Paper 3		
Final grade:		
Marks away from desired grade:		

MOCK 2

Paper	Mark out of 80	Topics to revise
Paper 1		
Paper 2		
Paper 3		
Final grade:		
Marks away from desired grade:		

STANDARD FORM AND ORDINARY NUMBERS (17)

1 (a) Write 90000 in standard form



.....

(1)

(b) Write 813 000 in standard form



.....

(1)

(a) Write 0.0005 in standard form



.....

(1)

(d) Write 0.00247 in standard form



.....

(1)

(e) Write 1.8×10^{-3} as an ordinary number



.....

(1)

(f) Write 5.409×10^{-2} as an ordinary number



.....

(1)

(g) Write 2×10^7 as an ordinary number



.....

(1)

(h) Write 6.3×10^4 as an ordinary number



.....

(1)

(Total for Question 1 is 8 marks)

2 Write these numbers in order of size.

Start with the largest number.

$$2.941 \times 10^3$$

$$294.1$$

$$29\,410 \times 10^{-4}$$

$$0.002\,941 \times 10^7$$



(Total for Question 2 is 2 marks)

3 Write these numbers in order of size.

Start with the smallest number.

$$8.51 \times 10^4$$

$$85.1 \times 10^{-3}$$

$$851 \times 10^3$$

$$0.000\,851$$

$$8510$$



(Total for Question 3 is 2 marks)

STANDARD FORM (WITH OPERATIONS) (18)

- 1 (a) Work out $(6 \times 10^5) \times (3 \times 10^{-8})$

Give your answer in standard form.



.....
(2)

- (b) Work out $(3 \times 10^4) \times (12.2 \times 10^{-6})$

Give your answer in standard form.



.....
(2)

(Total for Question 1 is 4 marks)

- 2 (a) Work out $2.6 \times 10^3 + 4.7 \times 10^4$

Give your answer in standard form.



.....
(3)

(b) Work out $9.2 \times 10^{-4} - 4.7 \times 10^{-5}$

Give your answer in standard form.



.....
(3)

(Total for Question 2 is 6 marks)

3 (a) Find the value of $(5 \times 10^3)^2$

Give your answer in standard form.



.....
(2)

(b) Find the value of $4 \times 10^3 \div 16 \times 10^8$

Give your answer in standard form.



.....
(3)

(Total for Question 3 is 5 marks)

ANSWERS

BEFORE YOU MARK YOUR WORK...

a) Answers for all questions are below

b) **Answers with working out** for each question can be accessed via the following link website link available in paper copy of book

c) Look out for the following below: **oe** means or equivalent, and **SWO** means see working out via the above weblink

PLACE VALUE AND WRITING NUMBERS (1)

- 1a) 8205
 b) 904,124
 c) 300,950,002
 2a) 500 (five hundreds)
 b) 8000 (eight thousands)
 3a) 0.02 (two hundredths)
 b) 0.007 (seven thousandths)

NUMBER CARDS (2)

- 1) 875
 2) 12,598
 3) $39 + 47$. Or $37 + 49$.

BASIC CONVERSIONS (3)

- 1a) 70%
 b) $\frac{45}{100}$ or $\frac{9}{20}$
 c) 20%
 d) 0.09
 e) 0.36
 f) $\frac{50}{100}$ or $\frac{1}{2}$
 g) 0.6
 2a) 400 cm
 b) 2.8 m
 c) 350 mm
 d) 9 kg
 e) 6.4 litres
 3) 1600 millilitres

ORDERING NUMBERS (4)

- 1) -4, -2, 0, 1, 5, 8
 2a) 0.308, 0.38, 3.08, 3.8
 b) 0.04, 0.389, 0.4, 0.405, 0.45
 3a) 30%, $\frac{1}{4}$, 0.2

- b) $\frac{3}{12}$, $\frac{5}{18}$, $\frac{4}{9}$, $\frac{2}{3}$, $\frac{3}{4}$
 c) $\frac{1}{3}$, $\frac{2}{4}$, $\frac{7}{12}$, $\frac{3}{5}$, $\frac{15}{20}$

ARITHMETIC AND INEQUALITY SIGNS (5)

- 1a) 172
 b) 61,328
 c) 46,908
 2a) 30
 b) 67.5
 3) <
 >
 >
 >
 <
 >
 =

BIDMAS (6)

- 1a) 4
 b) 8
 c) $9 \times (2 + 4) = 54$
 d) $40 \div (2 + 6) - 5 = 0$
 2) Brianna should have done the multiplication before the subtraction.
 $1 \times 3 = 3$. $10 - 3 = 7$.

3a) 32

- b) 7
 c) 47
 d) 6
 e) 5

TYPES OF NUMBER (7)

- 1a) 25
 b) 17
 c) 3.8
 d) 7
 2a) 36 or 49
 b) 2401
 c) 27
 3a) 1 or 27
 b) 4
 c) Any four from: 11, 13, 17, 19 and 23
 d) 5 and 31. Or 7 and 29.
 Or 13 and 23 or 17 and 19.
 e) E.g. 532. (Odd, odd, even).

ERROR INTERVALS & RECIPROCAL (8)

- 1a) $24.5 \leq p < 25.5$
 b) $2.55 \leq x < 2.65$
 c) $6.75 \leq m < 6.85$
 2) $5.4 \leq B < 5.5$
 3a) $\frac{1}{4}$ or 0.25
 b) $-\frac{5}{3}$
 c) $\frac{40}{17}$