Maths Virtual Communities: Developing the Teaching of Level 3 Mathematical Studies

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Autumn 2022

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Welcome

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Introduction

- I've been a teacher for 14 years, teaching in 3 schools.

- My current school is an 11-18 comprehensive.

- I've been teaching core maths for 3 years – so 1 exam sitting.

- Second in department, Key Stage 3 lead, teaching and learning across curriculum.

- I'm currently the Head of Department for Maths.

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Contents

Today's session will cover:

- the introduction to the Level 3 Core Maths qualification

- the content, scheme of work and assessment for Level 3 Mathematical Studies

- resources available to support teaching and learning

- encompassing development beyond the specification which complements students' exam preparations.

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Introduction of the Core Maths qualification

2010: Nuffield Foundation – Is the UK an outlier?

Participation in upper secondary mathematics education

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STEM learning

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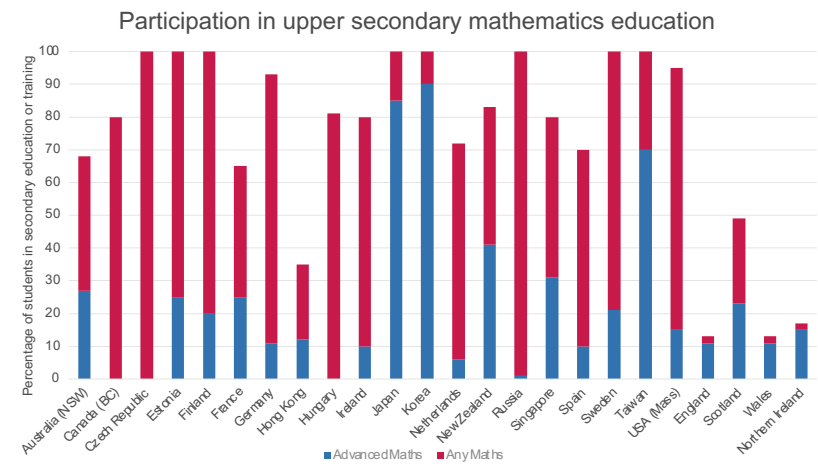
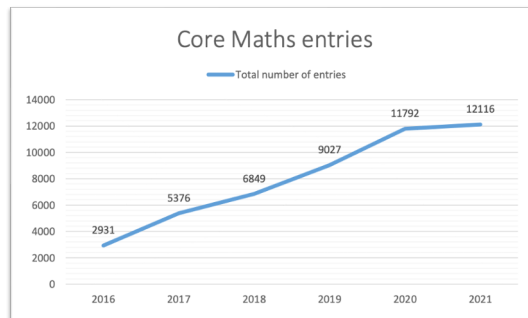# Timeline of introduction

September 2014

180 'early adopter' sixth forms and colleges offer Core Maths.

September 2015

Core Maths is available to all schools and colleges – approximately 200 more centres offer Core Maths.

June 2016

Approximately 3000 students from 200 centres take the first Core Maths exams.

Core Maths entries

— Total number of entries

Year	Entries
2016	2931
2017	5376
2018	6849
2019	9027
2020	11792
2021	12116

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AQA Level 3 Mathematical Studies content

Paper 1

• Data, estimation, personal finance.

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Where to start?

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Level 3 Mathematical Studies 1 year Route Map

Please see page 4 in Resource booklet

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Fermi Estimation

	Subject content:	Online resources:
E2.1	➢Fermi estimation - making fast, rough estimates using quantities which are either difficult or impossible to measure directly	➢How should mathematics be taught to non-mathematicians? - Tim Gower's Blog ➢Classic Fermi Questions – Mathsforum ➢Fermi Maths Problems – Kidsiiq ➢Estimation - MathsIsFun ➢How many piano tuners are there in Chicago? – TES ➢Fermi Problems - TES ➢Making estimations from limited data (Username: mei-criticalmaths Password: Critical1) ➢Fermi Estimates (Username: mei-criticalmaths Password: Critical1) ➢Horse Manure - Core Maths ➢Skin Area - Core Maths ➢Estimation, Assumptions and Predictions – Core Maths
F1.1	➢substituting numerical values into financial expressions (including bank accounts)	➢Income Tax - Nuffield Foundation ➢Savings Growth - Nuffield Foundation ➢Savings Facts and Formulae - Nuffield Foundation ➢Growth and Decay - Nuffield Foundations
F1.4	➢finding approximate solutions to problems in financial contexts	

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Sequencing of topics

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Other starting places

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Websites for topic resources produced by teachers

reflectivemaths.wordpress.com   @reflectivemaths
(New for this year – newsletter, or 'resource-letter' email)

Jon Pritchard AQA Mathematical Studies Padlet   @last_centurion

mathszest.com   @mathszest

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Any questions?

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Estimation

How many piano tuners are there in Chicago?

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Maths of the back of an envelope

- 'Back of an envelope maths' is an important and valuable life skill.

- It is a tool that people in business use for quickly checking the viability of a new project.

- Engineers use it to check if a proposed solution is likely to work.

- Commentators on statistics use it to help make sense of the myriad numbers that are thrown out by politicians, 'expert' pundits and marketers.

- It's the maths you might use every day to ensure you're not getting ripped off by a so-called 'deal' that turns out to be anything but.

- Book recommendation: Maths on the Back of an Envelope: Clever Ways to (Roughly) Calculate Anything – Rob Eastaway.

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Developing estimation

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Any questions?

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Statistical analysis: From GCSE to Core Maths

GCSE Maths Papers 2019

%	Personal	Occupational	Societal	Scientific	Maths
AQA F	29	5	1	2	63
AQA H	23	6	0	1	70

Core Maths Papers 2019

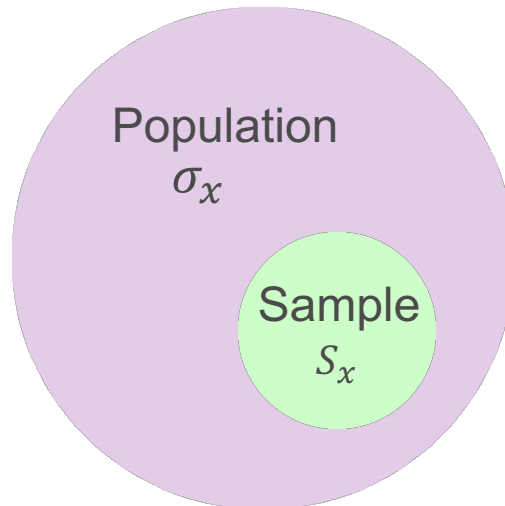| %	Personal	Occupational	Societal	Scientific	Context not specified
AQA A	34	38	9	15	3
AQA B	34	38	17	12	0
AQA C	34	16	9	37	4

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Data as a starting point

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Sources of data for the whole cycle

- Sampling
- Representation
- Analysis
- Critical analysis

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Introducing Standard Deviation

Population
σ_x

Sample
S_x

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Any questions?

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Personal finance

A teacher on UPS 1 works 3 days a week.
She decides to go up to 4 days a week.
Her gross pay will increase by 33.3%.

Using 2018-19 Income Tax and
National Insurance tables.

What will happen to her net pay?

	0.6 FTE	0.8 FTE	% increase
£36646	21987.60	29316.80	33.3%
Taxable	10137.60	17466.80	
Tax @ 20%	(2027.52)	(3493.36)	
N.I. on:	13563.60	20892.80	
NI @ 12%	(1627.63)	(2507.14)	
Net pay	18332.45	23316.30	27%

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Calculating Tax and NI on higher bands

Tax:

• Salary
• Subtract PA
• 20% of lower band
• 40% of remaining

National Insurance:

• Salary
• Subtract higher band
• 2% of remaining
• Find difference between bands
• 12% of the difference

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Financial maths in the news

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Any questions?

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Normal distribution – 1, 2 and 3 standard deviations

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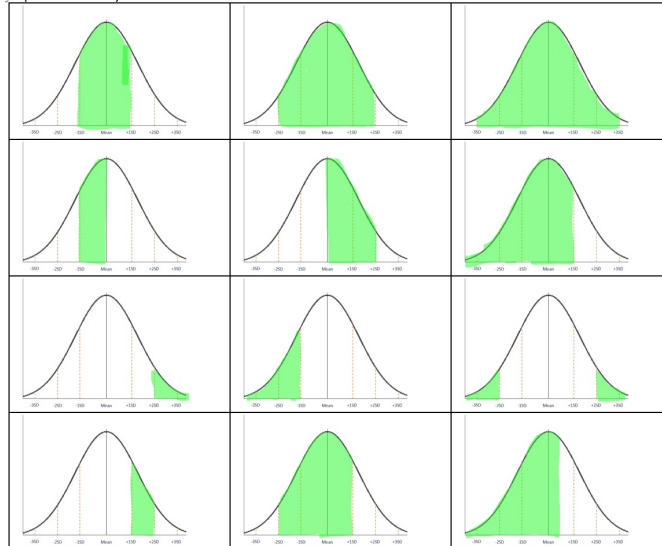
Normal distribution z values

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Confidence intervals

Population

$$\mu \pm z\left(\frac{\sigma}{\sqrt{n}}\right)$$

Sample
μ

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Any questions?

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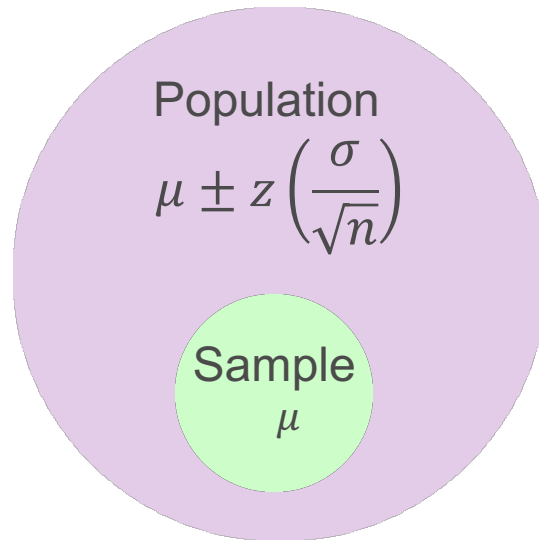
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Correlation and regression: Moving on from GCSE

Additional content:

- Mean Point
- Dependent and Independent
- Extrapolation and Interpolation
- Gradient and y-intercept in context
- Use some of the data sets

Using a data set – context is key:

- Calculate the PMCC
- Comment on the result
- Find the regression equation
- What do the values mean?
- Make predictions
- Reliability
- What more do you want to know?

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Any questions?

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Critical analysis

"There are three kinds of lies: lies, damned lies and statistics".

Benjamin Disraeli

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Considerations for critical analysis

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Any questions?

Balancing revision

- Knowledge retrieval
- Key Skills

Core Maths Key Skills

Stratified Sampling:

	Year 7	Year 8	Year 9	Total
Male	31	29	25	85
Female	39	40	43	122
Total	70	69	68	207

A sample of 35 students is required.
How many Year 7 females are required for the sample?

Why is stratified sampling a good approach?
Describe the key elements of selecting a stratified sample.

Discrete Data (rounded to take only certain values)

The following times were recorded, in minutes, for how long it took some 20-30 year olds to travel to work:

16	15	30	14	7	11
23	4	29	11	9	

What is the median time?
What is the interquartile range of times?
Draw a box plot for the data.

Normal Distribution and Confidence Intervals

ND Curve and features		% without tables	Tables
		Within 1 sd ≈ _____ %	More than half
		Within 2 sd ≈ _____ %	Less than half
		Within 3 sd ≈ _____ %	

Standardising Formula	In between Probabilities	Given probability or %
$z =$		

Sample Error	Confidence Interval	CI z values
	$CI =$	90%: z = (look up_____)
		95%: z = (look up_____)
		99%: z = (look up_____)

Resources

Take advantage of our extra resources in the 'Plan', 'Teach' and 'Assess' sections of our website.

AQA Certificate Level 3 Mathematical Studies
1350

Find all the information, support and resources you need to deliver our specification.

Teaching from: September 2014
Exams from: June 2016
QAN code: 601/4945/0

| Specification | Planning resources | Teaching resources | Assessment resources | Key dates |

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Event materials

The electronic materials from this event will be available to download shortly. If you aren't able to download them at this time, they will be made available to you in the customer portal of our online booking system.

Once we receive notification that you have attended the course, you will be sent a certificate of attendance email. When you receive the email, please log in to your account and the materials will be available on the 'my resources' tab on the welcome screen.
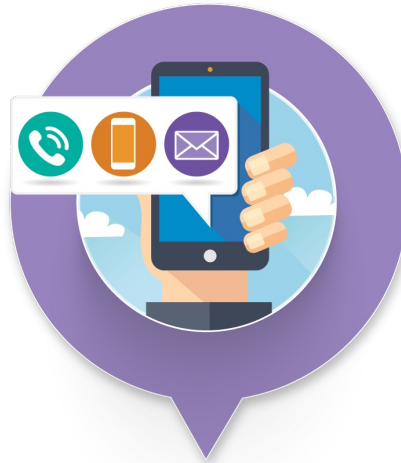
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Get in touch

Our friendly team will be happy to support you between 8am and 5pm, Monday to Friday.

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Realising potential

Thank you

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