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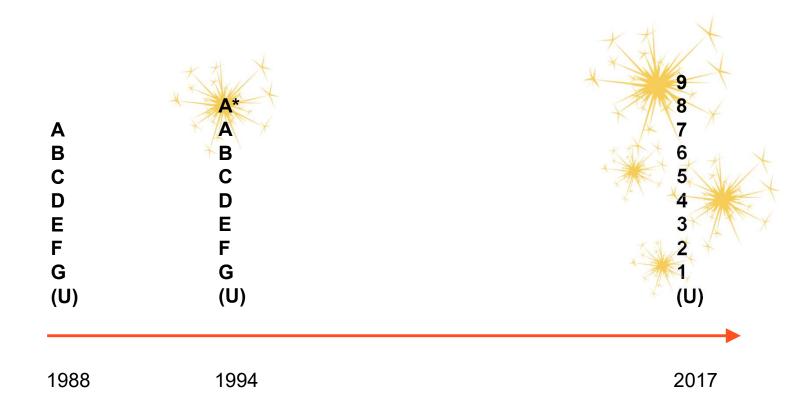# A Shiny new way to interpret GCSE grades

Using Rasch to give meaning to the GCSE 9-1 scale

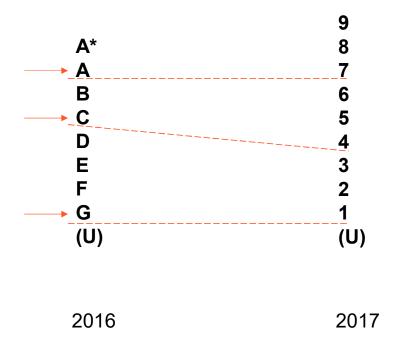**J Williamson & M Carroll | 21 March 2019**

Section One

Motivations

GCSE grades

A
B
C
D
E
F
G
(U)

A*
A
B
C
D
E
F
G
(U)

9
8
7
6
5
4
3
2
1
(U)

1988

1994

2017

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GCSE grades

	9
A*	8
→ A	7
B	6
→ C	5
D	4
E	3
F	2
→ G	1
(U)	(U)
2016	2017

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GCSE grades

New grading structure	Current grading structure
9	
8	A*
	A
	B
	C
	D
	E
	F
	G
	U

GCSEs in England are changing: new 9 t...
À regarder plus tard   Partager

PLUS DE VIDÉOS

00:00:01

9 things to know about the new GCSE grades

1. GCSEs in England are being reformed and will be graded with a new scale from 9 to 1, with 9 being the highest grade.

2. New GCSE content will be more challenging.

3. Fewer grade 9s will be awarded than A*s.

4. English language, English literature and maths were the first to be graded from 9 to 1 in 2017.

5. Another 20 subjects will have 9 to 1 grading in 2018, with most others following in 2019. During this transition, students will receive a mixture of letter and number grades.

6. The new grades are being brought in to signal that GCSEs have been reformed and to better differentiate between students of different abilities.

7. In the first year each new GCSE subject is introduced, broadly the same proportion of students will get a grade 4 or above as would have got a grade C or above in the old system.

8. These changes are only happening in England. Wales and Northern Ireland are not introducing the new 9 to 1 grading scale as part of their changes to GCSEs.

9. You can see how the 9 to 1 grades compare with the A* to G scale in our GCSE grading postcard.

GCSE 9 to 1
a brief guide for

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What are GCSE grades supposed to mean?

- Many people would like to know a given grade "looks like" – teachers, parents, students, the public.

Grade 5
- demonstrate mostly accurate and appropriate knowledge, understanding and application of geographical information and issues
- demonstrate clear understanding of interactions and interrelationships between people and the environment and between geographical phenomena
- construct coherent arguments to draw conclusions supported by evidence
- use a range of geographical skills and techniques accurately, showing understanding of their purpose

Ofqual (2017)

Grade 8
- demonstrate relevant and comprehensive knowledge, understanding and application of geographical information and issues
- demonstrate perceptive understanding of complex interactions and interrelationships between people and the environment and between geographical phenomena
- construct sustained and convincing arguments to draw well-evidenced conclusions
- use and evaluate a wide range of geographical skills and techniques effectively

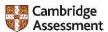# How useful?

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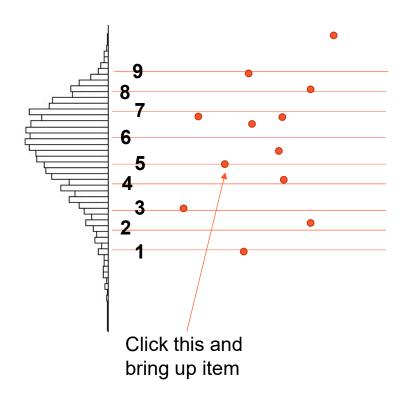
What are GCSE grades supposed to mean?

- Grade descriptors for GCSE are *necessarily* limited by the nature of GCSE assessment:
    - isn't truly criterion-referenced (and never has been)
    - is compensatory
    - has grades awarded using comparable outcomes

- Descriptions in terms of empirical evidence about what candidates can *do* is recognized as useful (Cadwallader, 2014; Greatorex, 2005)
    - Particularly true before teachers (or others) have accumulated their own experiences of new grading system
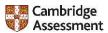
Role for Rasch?

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The idea

9
8
7
6
5
4
3
2
1

Can we produce a prototype?

Is it a helpful way to understand what 9-1 grades mean?

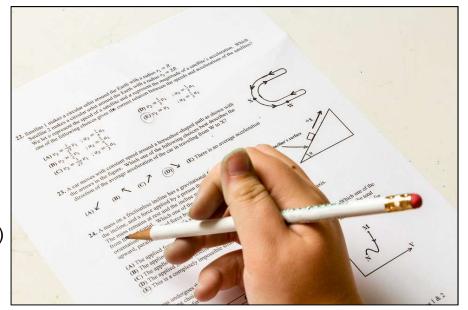Click this and bring up item

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Section Two

Analysis and development

Data and modelling

- Anonymised, item-level GCSE results data from OCR
  - One of four exam boards offering GCSEs in England

- Two specifications, June 2018 exams
  - Chosen for large entries (>15k), high % of low-tariff items

  - **Geography**
    - 3 papers, taken by all candidates
      - 23, 23, 17 items
      - 70, 70, 60 total marks

  - **Mathematics**
    - Tiered: 3 Foundation papers (1-5), 3 Higher papers (4-9)
      - Foundation 48-49 items, Higher 34-36 items
        - 100 marks each
    - Common items link tiers to put on same scale
      - 6-10 common items per paper (19-27% of paper's marks)

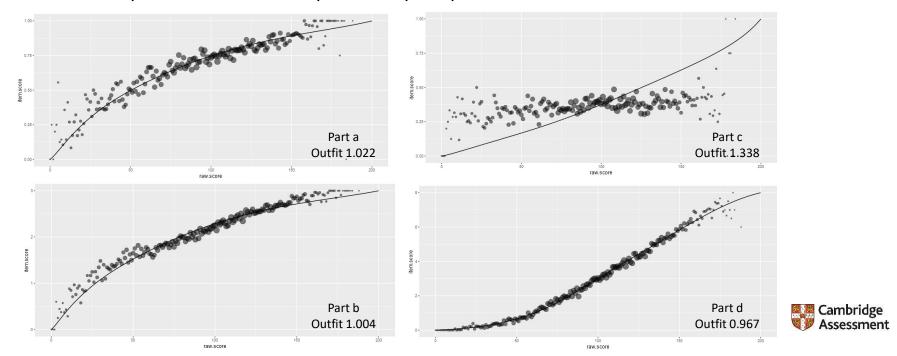- Fit Partial Credit Models in R using "mirt" package

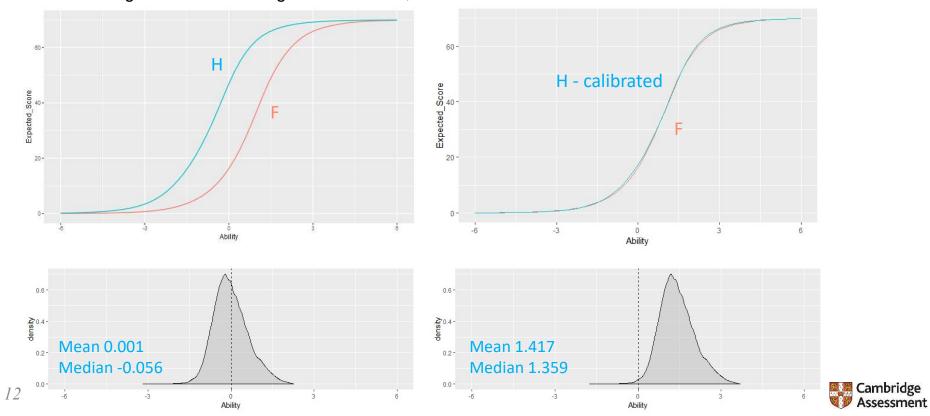Cambridge Assessment

Item fit

- Infit/outfit generally good
  - A few show outfit > 1.5: ~6% items in Maths, only 1 item in Geography
    - Only 1 maths item with infit > 1.5
    - **Only polytomous items**
- Also look at empirical curves – example of a 4-part question

Part a
Outfit 1.022

Part c
Outfit 1.338

Part b
Outfit 1.004

Part d
Outfit 0.967

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Tiered exams

- Maths is tiered – need to put on same scale
  - Stocking-Lord method using common items, calibrate H → F

H

F

Mean 0.001
Median -0.056

H - calibrated
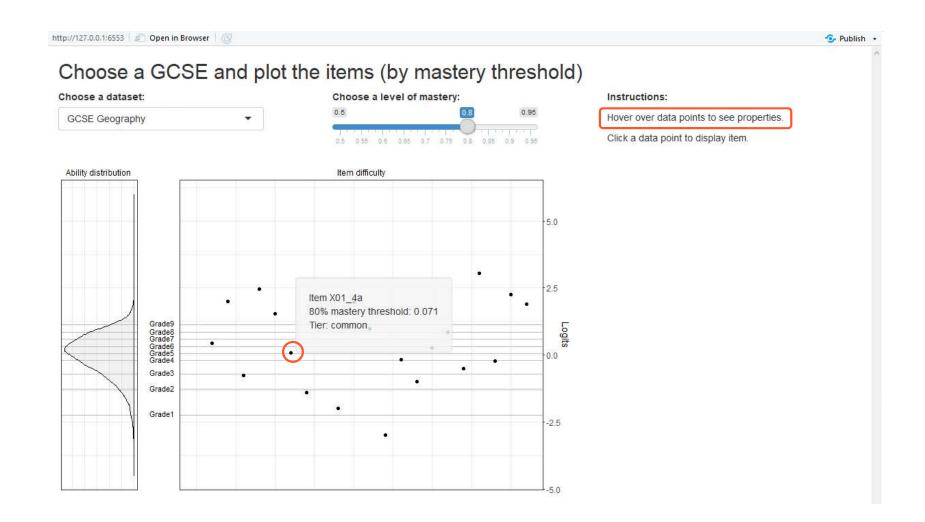
F

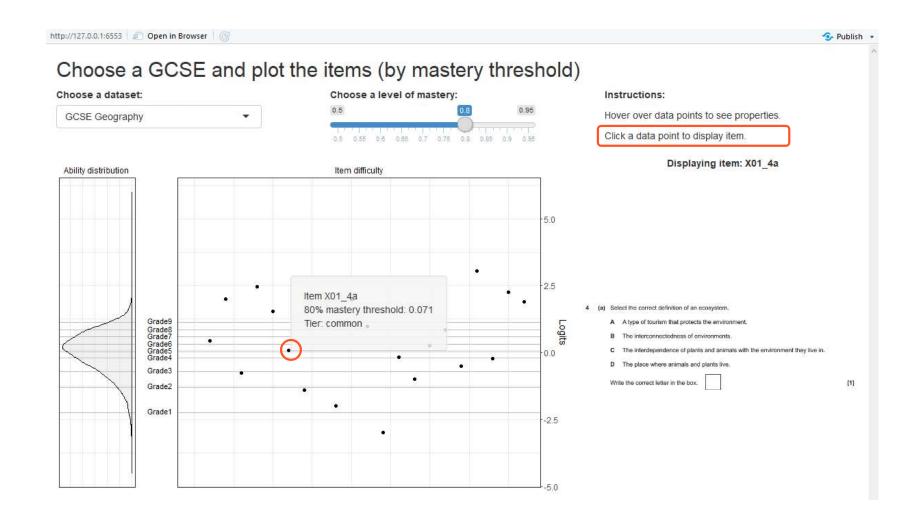Mean 1.417
Median 1.359

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Wright maps

- Extract EAP person ability estimates, item difficulties

- Consider one mark items only
  - Easier to interpret BUT does not represent full construct
  - 21 Geography, 53 Maths F, 19 Maths H

- Which items do candidates at each grade have an X% chance of getting right?
  - What item threshold to plot? What can we use to indicate mastery?
    - Start with 80%
  - Find grade boundaries on logit scale, plot on Wright map

- Make it interactive using 'shiny' R package
  - Flexible mastery threshold
  - Link Wright map to image of item content

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Section Three

The app

Section Four

Discussion

What does grade 5 in Geography mean?

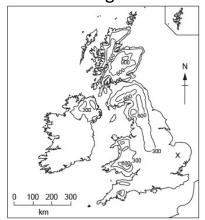**To achieve grade 5 candidates will be able to:**

- demonstrate mostly accurate and appropriate knowledge, understanding and application of geographical information and issues

- demonstrate clear understanding of interactions and interrelationships between people and the environment and between geographical phenomena

- construct coherent arguments to draw conclusions supported by evidence

- use a range of geographical skills and techniques accurately, showing understanding of their purpose

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What does grade 5 in Geography mean?

A candidate obtaining grade 5 has:

A 50% chance of answering this item correctly

(b) Using **Fig. 3**, suggest which type of natural landscape is likely to be found at X.

.... **[1]**

And an 80% chance of answering this item correctly

4   (a) Select the correct definition of an ecosystem.

   A   A type of tourism that protects the environment.

   B   The interconnectedness of environments.

   C   The interdependence of plants and animals with the environment they live in.

   D   The place where animals and plants live.

   Write the correct letter in the box. ☐   **[1]**

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Discussion points

- Is this tool helpful?

- Would it be useful to display further information?

- What scale to present?
  - Logits?
  - Or grades? Note implied linearity of 9-1 vs. A*-G…

- How could we deal with polytomous items in the Wright map?
  - What would mastery mean?

- Could this be opened up to end users without analytical background?
  - Do they need to understand the underlying Rasch modelling?

- What are the potential concerns about the approach?

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References

Baird, J.-A., Cresswell, M., & Newton, P. (2010). Would the real gold standard please step forward? *Research Papers in Education, 15*(2), 213-229.

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Cadwallader, S. (2014). *Developing grade descriptions for the new GCSEs: Considerations and challenges*. Manchester: AQA Centre for Education Research and Practice.

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Ofqual. (2017, 6 September 2017). Grade descriptors for GCSEs graded 9 to 1.   Retrieved from https://www.gov.uk/government/publications/grade-descriptors-for-gcses-graded-9-to-1

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