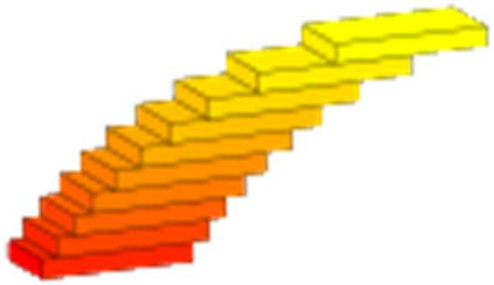
WRITING QUESTIONS: ONE YEAR IN



DR. KONSTANTINA ZERVA

SCHOOL OF MATHEMATICS

UNIVERSITY OF EDINBURGH

OUTLINE

- Assessments
- STACK Assessments in the school of mathematics
  - STACK Assessments 2017 – 18
  - STACK Assessments 2018 – 19
- Review our Assessments
  - Quiz level review
  - Question level review
  - Sanity check
- Conclusions

ASSESSMENTS

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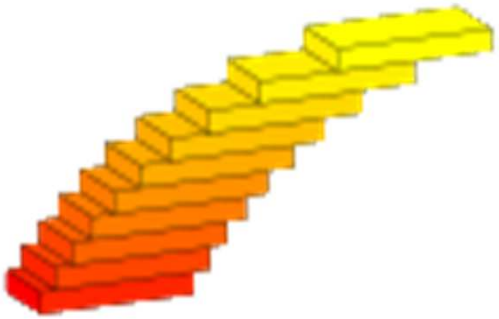
ASSESSMENTS



System for Teaching and Assessment using a Computer algebra Kernel

STACK ASSESSMENTS IN THE SCHOOL OF MATHEMATICS

➢ STACK ASSESSMENTS 2017-18

Semester 1:

- Introduction to Linear Algebra (ILA) ~ 600 students
- Mathematics for Natural Sciences 1a (MNS) ~ 150 students

Semester 2:

- Calculus and its applications (CAP) ~ 500 students
- Engineering Mathematics 1b (EM) ~ 300 students
- Mathematics for Natural Sciences 1b (MNS) ~ 150 students

STACK ASSESSMENTS IN THE SCHOOL OF MATHEMATICS

➢ STACK ASSESSMENTS 2017-18

Introduction to Linear Algebra

- 2 Reading Quizzes: 2 – 3 questions
  - 25 minutes
  - Unlimited attempts – first attempt counts
  - Immediate feedback
- 1 Skill Quiz: 4 – 7 questions
  - 1 hour
  - Unlimited attempts – first attempt counts
  - Immediate feedback
- Around 110 questions

Calculus & Applications

- 1 Reading Quiz: 4 questions
  - 30 minutes
  - 1 attempt
  - Feedback after the closing date
- 1 Skill Quiz: 10 questions
  - Unlimited time
  - 3 attempts – highest grade counts
  - Feedback after the closing date
- Around 150 questions

STACK ASSESSMENTS IN THE SCHOOL OF MATHEMATICS

➢ STACK ASSESSMENTS 2017-18

MNS 1a

- 3 Practise Quizzes: 5 questions
  - Unlimited time
  - Unlimited attempts
  - Immediate feedback
  - Score 60% to unlock the next quiz
- 1 Assessed Quiz: 7 – 10 questions
  - Unlimited time
  - 3 attempts – highest grade counts
  - Immediate feedback
- Around 240 questions

MNS 1b – EM 1b

- 3 Practise Quizzes: 3 – 5 questions
  - Unlimited time
  - Unlimited attempts
  - Immediate feedback
  - Score 60% to unlock the next quiz
- 1 Assessed Quiz: 7 – 10 questions
  - Unlimited time
  - 3 attempts – highest grade counts
  - Immediate feedback
- Around 200 questions

STACK ASSESSMENTS IN THE SCHOOL OF MATHEMATICS

➢ STACK ASSESSMENTS 2018-19

Semester 1:

- Engineering Mathematics 1a (EM 1a) ~ 300 students
- Several Variable Calculus and Differential Equations (SVCDE) ~ 200 students
- Mathematics for Physics (Mphys) ~ 200 students
- Fundamentals of Algebra and Calculus (FAC) ~ 110 students – **Pure Online course**

STACK ASSESSMENTS IN THE SCHOOL OF MATHEMATICS

➢ STACK ASSESSMENTS 2018-19

Engineering Mathematics 1b

- 3 Practise Quizzes: 3 – 5 questions
  - Unlimited time
  - Unlimited attempts
  - Immediate feedback
  - Score 60% to unlock the next quiz
- 1 Assessed Quiz: 7 – 10 questions
  - Unlimited time
  - 3 attempts – highest grade counts
  - Immediate feedback
- Around 200 questions

SVCDE

- 1 Practise Quiz: 5 – 12 questions
  - Unlimited time
  - Unlimited attempts
  - Immediate feedback
  - Score 50% to unlock the Assessed Quiz
- 1 Assessed Quiz: 5 – 10 questions
  - Unlimited time
  - 1 attempt
  - Feedback after the closing date
- Around 180 questions

STACK ASSESSMENTS IN THE SCHOOL OF MATHEMATICS

➢ STACK ASSESSMENTS 2018-19

Mathematics for Physics

- 1 Assessed Quiz/ 2 weeks: 4 – 5 questions
  - 30 minutes
  - Unlimited attempts – first counts
  - Feedback after the closing date

FAC

- Pure online course
- George Kinnear talk

REVIEW OUR ASSESSMENTS

- What happens before the beginning of the semester?
- What happens on a weekly basis during the semester?
- What happens after the semester is over?

REVIEW OUR ASSESSMENTS

Disadvantage of online assessment: lack of feedback loop for the teacher!

Active steps need to be taken to review what students have done

Things to consider:

- How many quizzes do the students have every week?
- What is the purpose of each of them?
- How much time would you like the students to spend dealing with each quiz?

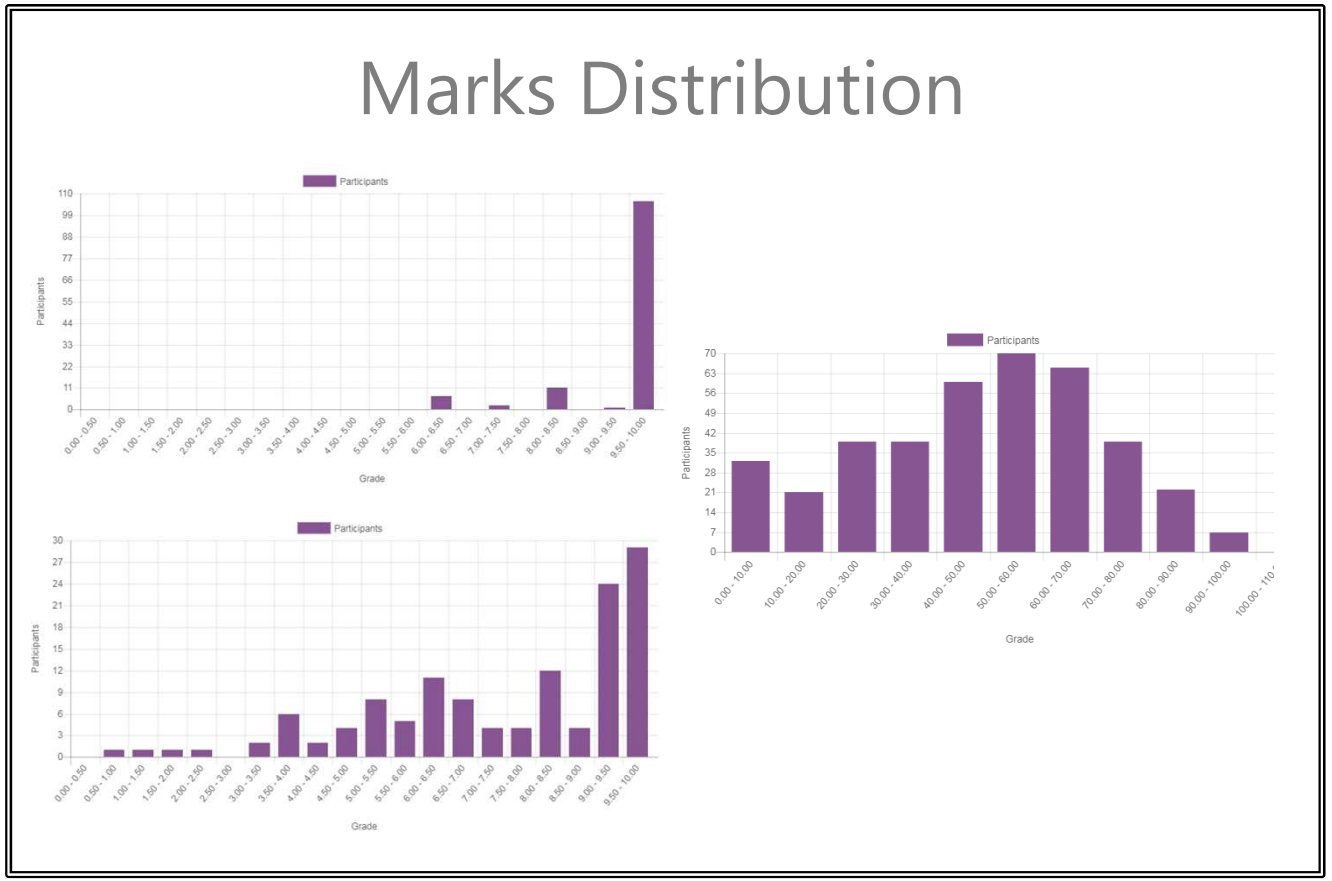
REVIEW OUR ASSESSMENTS

Advantage of e-Assessment: we have all the data stored.

- ✓ Marks
- ✓ Time
- ✓ Attempts

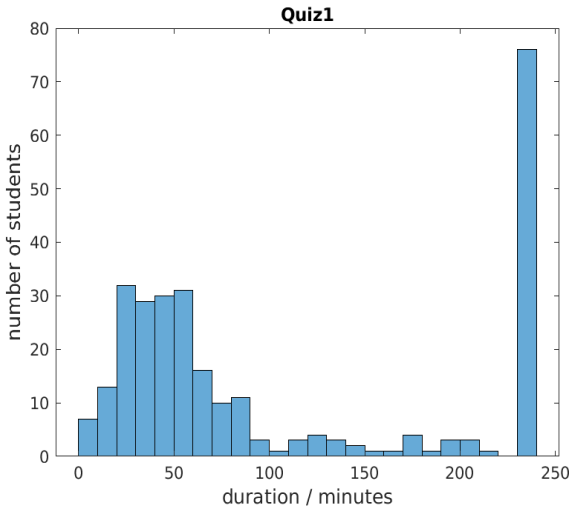
- Quiz level review
- Question level review
- Sanity Check

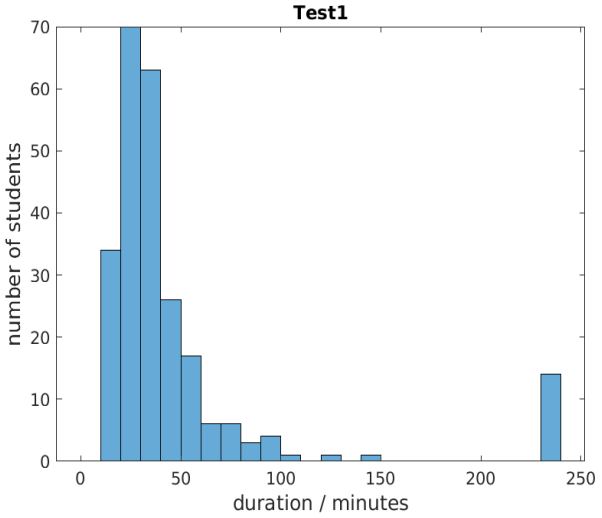
REVIEW OUR ASSESSMENTS – QUIZ LEVEL REVIEW



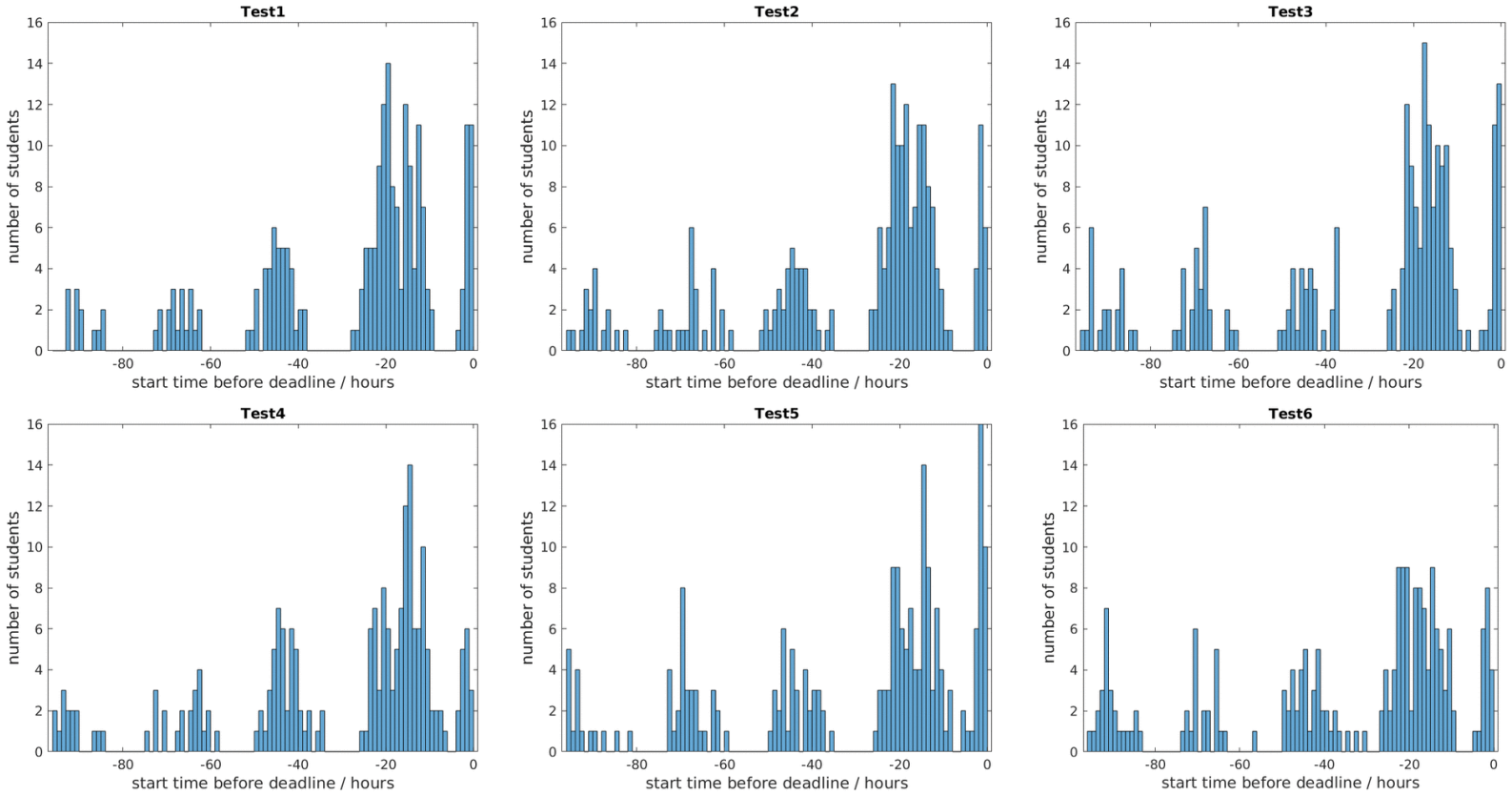
REVIEW OUR ASSESSMENTS – QUIZ LEVEL REVIEW

Time Distribution





REVIEW OUR ASSESSMENTS – QUIZ LEVEL REVIEW



REVIEW OUR ASSESSMENTS – QUESTION LEVEL REVIEW

Are all random versions equal?

Q#	Question name	Attempts	Facility index	Standard deviation	Random guess score	Intended weight	Effective weight	Discrimination index	Discriminative efficiency
1	L1.1 Q3c Fractional powers	104	86.54%	34.30%	0.00%	10.00%	11.20%	43.54%	61.01%
1.1	Variant 1 of L1.1 Q3c Fractional powers	13	76.92%	43.85%	0.00%	10.00%		63.36%	81.27%
1.2	Variant 2 of L1.1 Q3c Fractional powers	10	70.00%	48.30%	0.00%	10.00%		0.93%	1.23%
1.3	Variant 3 of L1.1 Q3c Fractional powers	6	83.33%	40.82%	0.00%	10.00%		18.58%	23.40%
1.4	Variant 4 of L1.1 Q3c Fractional powers	9	88.89%	33.33%	0.00%	10.00%		78.22%	100.00%
1.5	Variant 5 of L1.1 Q3c Fractional powers	13	84.62%	37.55%	0.00%	10.00%		51.28%	65.56%
1.6	Variant 6 of L1.1 Q3c Fractional powers	12	91.67%	28.87%	0.00%	10.00%		-12.29%	-20.67%
1.7	Variant 7 of L1.1 Q3c Fractional powers	9	88.89%	33.33%	0.00%	10.00%		92.86%	100.00%
1.8	Variant 8 of L1.1 Q3c Fractional powers	17	94.12%	24.25%	0.00%	10.00%		30.14%	87.22%
1.9	Variant 9 of L1.1 Q3c Fractional powers	9	88.89%	33.33%	0.00%	10.00%		19.32%	36.51%

4	L1.1 Q3b Fraction simplification	142	100.00%	0.00%	0.00%	20.00%	0.00%
4.1	Variant 1 of L1.1 Q3b Fraction simplification	21	100.00%	0.00%	0.00%	20.00%	
4.2	Variant 2 of L1.1 Q3b Fraction simplification	12	100.00%	0.00%	0.00%	20.00%	
4.3	Variant 3 of L1.1 Q3b Fraction simplification	10	100.00%	0.00%	0.00%	20.00%	
4.4	Variant 4 of L1.1 Q3b Fraction simplification	16	100.00%	0.00%	0.00%	20.00%	
4.5	Variant 5 of L1.1 Q3b Fraction simplification	8	100.00%	0.00%	0.00%	20.00%	
4.6	Variant 6 of L1.1 Q3b Fraction simplification	18	100.00%	0.00%	0.00%	20.00%	
4.7	Variant 7 of L1.1 Q3b Fraction simplification	18	100.00%	0.00%	0.00%	20.00%	
4.8	Variant 8 of L1.1 Q3b Fraction simplification	19	100.00%	0.00%	0.00%	20.00%	
4.9	Variant 9 of L1.1 Q3b Fraction simplification	20	100.00%	0.00%	0.00%	20.00%	

Simplify the algebraic expression: $z^3 \times z^{-9}$.

Simplify the algebraic expression: $z^{17} \times z^{-10}$.

REVIEW OUR ASSESSMENTS – SANITY CHECK

- Fix any questions known to be broken (e.g. random numbers which don't operate correctly)
- Check that all the questions have test cases for each PRT. The minimum is to provide test cases for the correct and wrong answer.
- Check that each question has sufficient deployed variants.
- Check that all questions have worked solutions.

CONCLUSIONS

Review Guide

- Quiz Review
  - General distribution of marks – different shape depending on the purpose of the assessment
  - Time distribution
- Questions review
  - Do all questions have the same effective weight?
  - Do all random versions have the same difficulty?
- Sanity check

Thank you for attending!