



higher education  
& training

Department:  
Higher Education and Training  
REPUBLIC OF SOUTH AFRICA



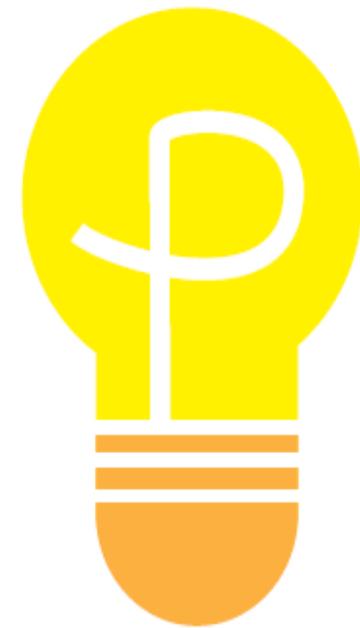
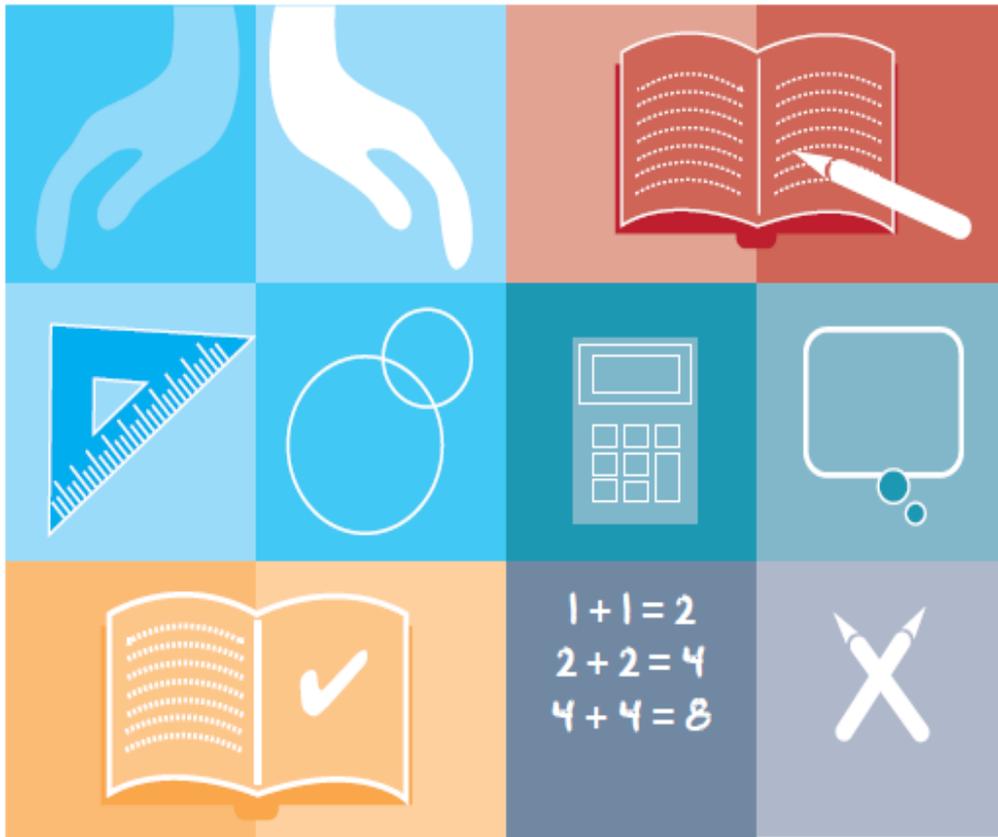
Co-funded by the  
European Union

# Knowledge and Practice Standards for Mathematics in Initial Teacher Education

17<sup>th</sup> of April 2019



# Assessment workstream



PrimTEd

1. **Advocate** for HEI participation in in common assessment approaches;
2. Encourage **collaboration about teacher assessment** approaches to teacher competence in relation to the teaching of mathematics and language/literacy;
3. Develop **common written test assessments** (with a related assessment framework and reporting framework), for:
  - Language/literacy (English)
  - Mathematics;
4. **Publish and share the findings** emerging from the results of the common assessments through participating in:

# Maths test design & administration

Content domains	Weighting
Whole number and operations	24%
Rational numbers and operations	38%
Patterns, functions and algebra	16%
Geometry	8%
Measurement	14%

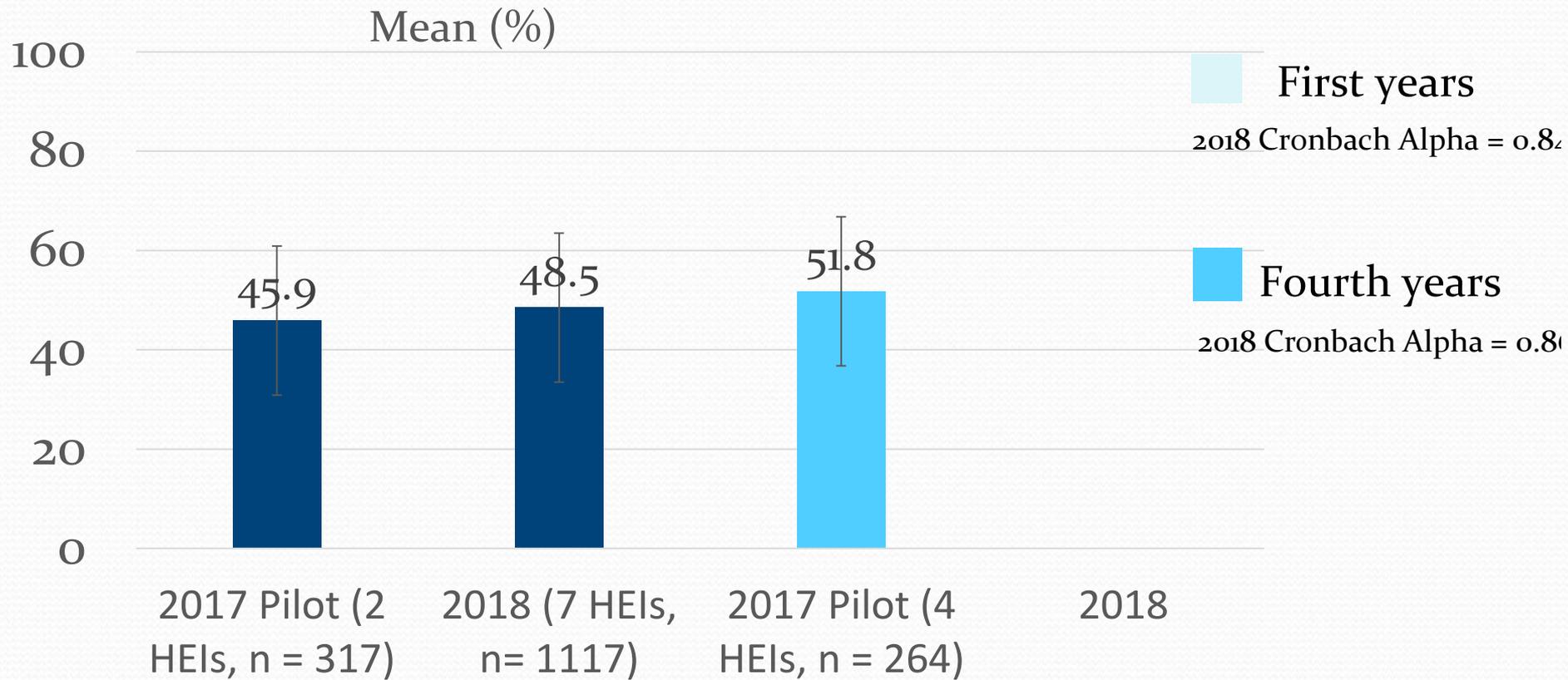
The test was out of 50 marks.

Items were classified according to a mathematics content domain, cognitive demand and or pedagogy category.

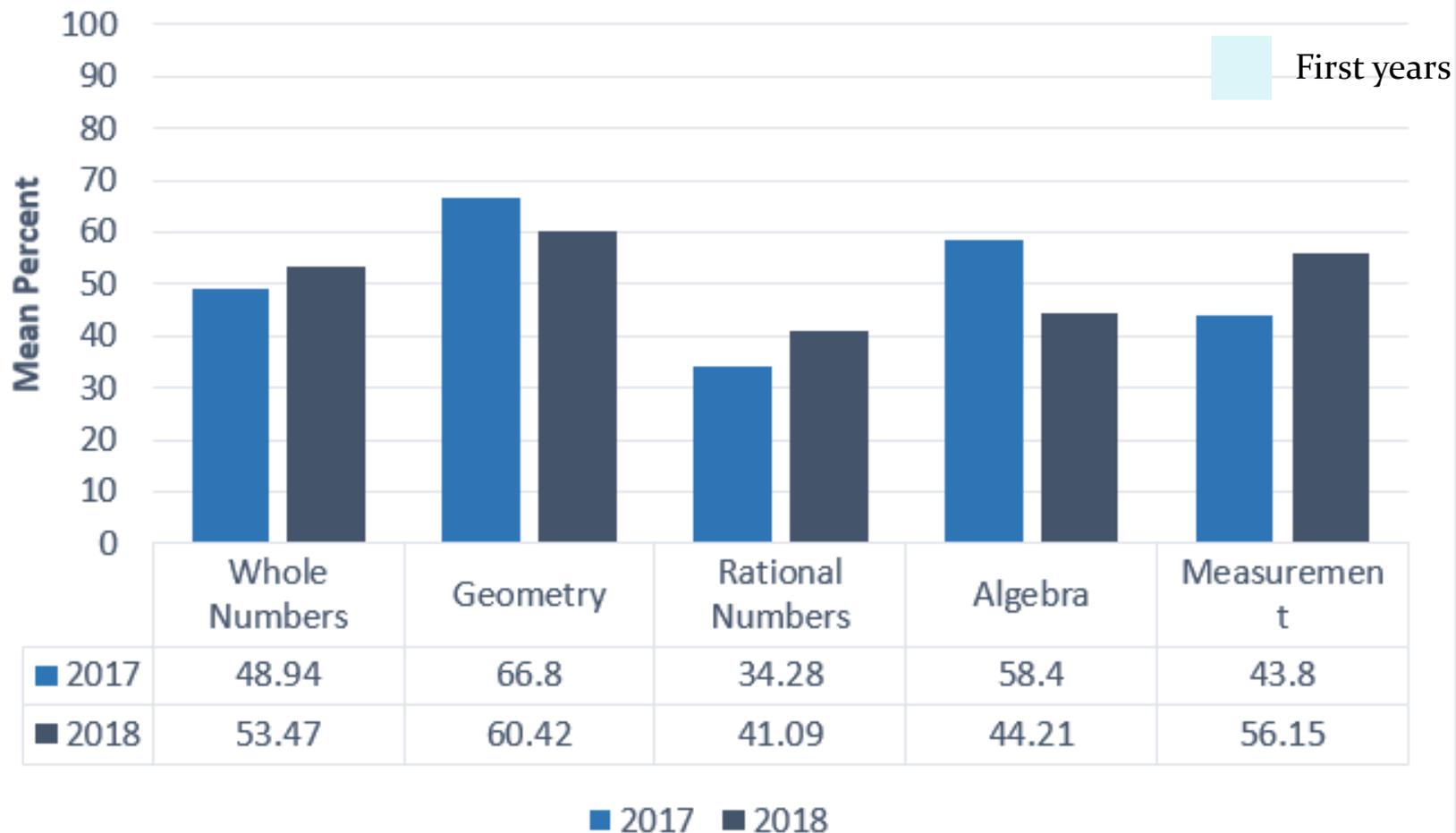
Online, randomized appearance, feedback and marking

<b>Topic</b> <b>Cognitive demand</b>	<b>Rational number, low cognitive demand</b>	<b>Rational number, high cognitive demand</b>
<b>Example question</b>	0,7 is a decimal fraction. Write 0,7 as a common fraction.	A farmer's cost for milk production is R3,12 for each litre. What are his production costs for 2,5 litres of milk? The calculation you need, to get the correct answer is:  A. $3,12 \times 2,5$ B. $3,12 - 2,5$ C. $2,5 \div 3,12$ D. $3,12 \div 2,5$

# Maths results (2017-2018)



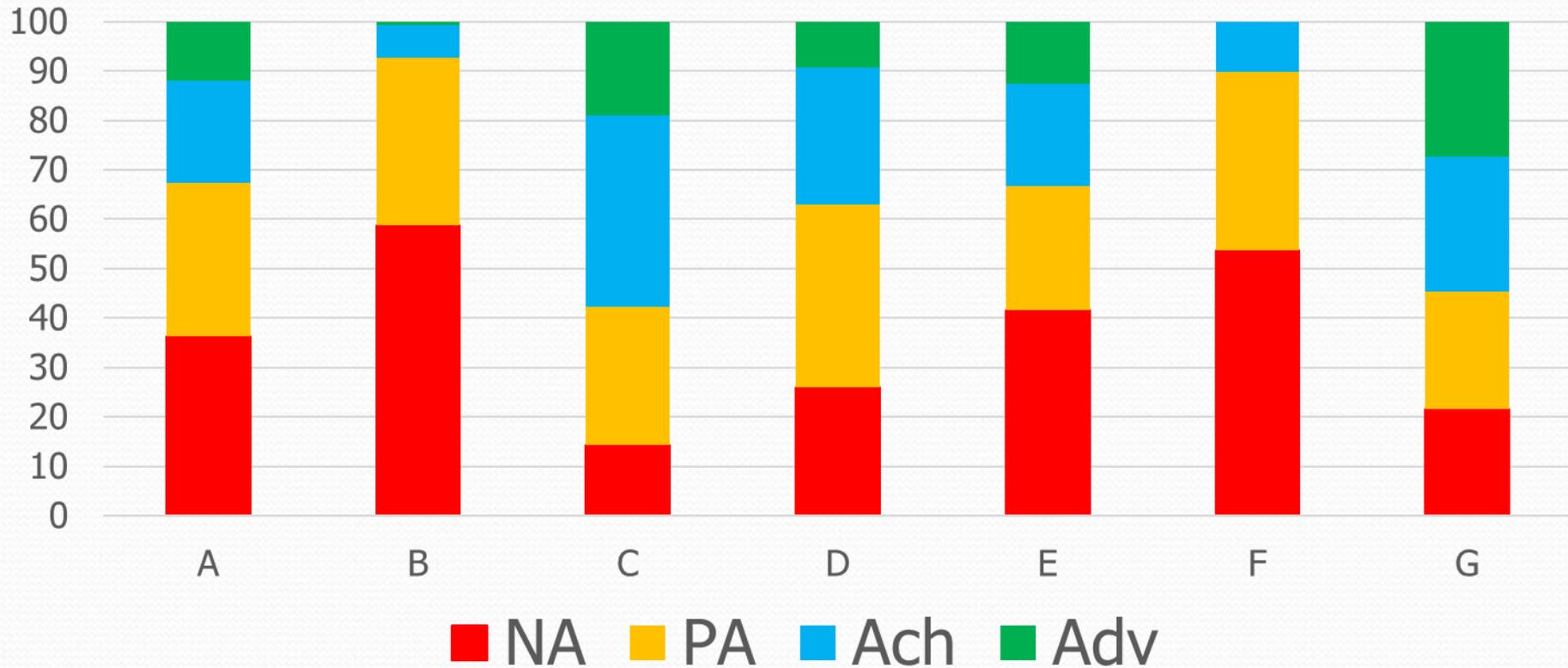
## Relative Performance by Topic in the years 2017 and 2018



	<b>Partly Achieved</b>	<b>Achieved</b>	<b>Advanced</b>
	Student mostly shows evidence of 'procedural fluency' as opposed to 'conceptual understanding	Student shows evidence of using 'procedural fluency' and some evidence of conceptual	Student functions at 'procedural fluency', 'conceptual understanding', 'adaptive reasoning' and 'strategic competence'

	Partly Achieved	Achieved	Advanced
	<p>Student can:</p> <p>do <b>simple straightforward operations</b> (+, - &amp; x) that involve whole numbers;</p> <p>identify whole numbers on a number line;</p> <p>identify <b>regular geometric shapes</b>;</p> <p>calculate <b>area &amp; perimeter of rectangles using numbers</b>, not symbols;</p> <p><b>solve problems of one-variable</b>: time/money.</p>	<p>Student can:</p> <p>operate equally well with <b>symbols &amp; numbers</b>;</p> <p>make reasonable <b>estimations of spatial dimensions &amp; have 'good sense' of proportion</b>;</p> <p>express <b>decimals as comm. fractions</b> &amp; vice versa and do estimations that involve both;</p> <p>solve <b>complex problems that involve more than one variable</b>, e.g. money &amp; mass;</p> <p><b>support their viewpoints with valid reasons.</b></p>	<p>Student ' &amp; can use <b>operations to support reasoning</b>,</p> <p><b>organise &amp; arrange both numbers, variables &amp; functions</b> in logical order to solve problems;</p> <p>work efficiently with a wide spectrum of real numbers;</p> <p>'visualise' &amp; operate <b>complex spatial transformations</b> to solve problems;</p> <p><b>support their viewpoints with valid reasons</b>; analyse learners' work and show awareness of common learner errors.</p>

# Math Reporting: Performance Levels by Institution



# Mathematical knowledge for teaching

Primary teachers must have deep knowledge of:

(1) the **mathematical topics at the primary school level** that includes a robust understanding of why particular concepts and procedures within each topic **make sense** mathematically;

(2) the **future use and further development** of this content in previous and subsequent grade levels;

(3) **appropriate representations, suitable classroom contexts, alternate approaches** and methods (such as might be used by children in solving problems);

(4) **interconnections and interdependence** among the content and topics, as well as how a new concept can be built upon other existing ideas; and

(5) **when the mathematical ideas are developmentally appropriate** for children to learn.

(Hart 2010)

# Mathematical process for teaching

Teachers (and learners) must have the capacity to **think mathematically**, and not just be able to reproduce symbolic forms, such as execution of calculations by learned algorithms  
Adapted from (Devlin, 2012; Katz, 2014).

Today – the primary agreed expectation is the capacity to **draw on mathematical tools to deal with new and potentially problematic situations**, rather than merely the capacity to reproduce procedures learnt in relatively stable contexts very similar to those in which they were taught.

(Unesco, 2012)

# Mathematical topics

## Mathematical thinking

These topics include the five topics as described in CAPS:

- Numbers, relations and operations;
- Patterns, functions and algebra,
- Measurement,
- Shape and space (geometry) and
- Data handling

Number sense

Geometry and  
measurement



# MATHEMATICS for ITE

Mathematical thinking

Geometry and  
measurement

Number sense

# MATHEMATICS for ITE

Knowledge and practice standards

## Mathematical thinking

1. Developing mathematical insight
2. Represent and use mathematics
3. Develop mathematical productions
4. Reason and reflect

## Geometry and measurement

5. Foundational knowledge
6. Properties
7. Transformations
8. Measurement

## Number sense

9. Pre- number
10. Number systems and number theory
11. Additive relations with whole numbers
12. Multiplicative reasoning with whole numbers
13. Rational numbers
14. Integers
15. Common fractions and proportional reasoning
16. Early algebraic reasoning

# PrimTEd: Maths

## Project leader and deputy leader

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## Not yet involved (6 HEIs)

DUT

CUT

VUT

Sol Plaatjies

NMMU

University of Venda