

Understanding Mathematics Achievement in South Africa

The achievement tests in the 2011 Trends in International Mathematics and Science Study (TIMSS) were designed to assess the thinking processes that learners engage in when solving mathematics problems. The hierarchy of cognitive processes included three domains: knowledge, applying and reasoning. We examine these three cognitive domains and provide examples of questions that assess each domain. Although the overall achievement was low, with an average score of 352 across the three domains, South African learners surprisingly fared relatively better in questions that required reasoning.

Applying

Ability to apply knowledge and conceptual understanding to answer questions or solve problems



Average achievement score

336

Example question:

Bush height (cm)	Shadow length (cm)
20	16
40	32
60	48
80	64

The table above shows the shadow lengths of four bushes of different heights at 10 a.m. What is the shadow length at 10 a.m. of a bush that has a height of 50 centimeters?

- A 36 cm
- B 38 cm
- C 40 cm
- D 42 cm

52% of SA learners answered this question correctly

International average: 60%

Knowing

Ability to demonstrate knowledge of mathematics facts, concepts and procedures



Average achievement score

352

Example question:

$$42.65 + 5.748 =$$

Answer:

63% of SA learners answered this question correctly

International average: 72%

Reasoning

Goes beyond routine problems to encompass unfamiliar situations, complex contexts and multiple problems



Average achievement score

363

Example question:

The results of a long jump competition were reported as follows:

	Average Length
Team A	3,6 m
Team B	4,8 m

There were the same number of students in each team. Which statement about the competition MUST be true?

- A Each student in team B jumped farther than any student in team A
- B After every student in team A jumped, there was a student in team B who jumped farther
- C As a group, team B jumped farther than team A
- D Some students in team A jumped farther than some students in team B

44% of SA learners answered this question correctly

International average: 58%