

Assessing & Developing Numeracy Competencies

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Jacob Martens SD37

Rationale

- numerate and embody mathematical habits of mind
- critically analyze information
- develop deep mathematical understanding and fluency, logical reasoning, analytical thought, and creative thinking
- use mathematics as a tool, a process, and a way to further understand the patterns and relationships within the world.

Goals

- develop a deep understanding of both factual (content) and processed-based (curricular competencies) information; each of these forms of knowledge are needed to solve complex problems
- reason mathematically using their understanding of number, pattern, spatial relationships, and analysis of data in order to problem solve
- use flexible, effective, and accurate strategies to analyze and solve increasingly complex problems
- explore how mathematics complements and includes other ways of knowing
- develop perseverance and confidence to apply mathematical thinking in various abstract and concrete contexts

Creativity & Beauty in Mathematics

“When we look at mathematics in the world and the mathematics used by mathematicians, we see a creative, visual, connected, and living subject. Yet school students often see mathematics as dead subject -- hundreds of methods and procedures to memorize that they will never use, hundreds of answers to questions that they have never asked.”

Jo Boaler

Four Stages of working on mathematics

1. Posing a question
2. Going from the real world to a mathematical model
3. Performing a calculation
4. Going from the model back to the real world, to see if the original question was answered

Conrad Wolfram

INTRODUCTION TO MATHEMATICS K TO 7

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Learning Standards

Curricular Competencies

Students are expected to be able to do the following:

Reasoning and analyzing

- ▶ Use reasoning to explore and make connections
- ▶ Estimate reasonably
- ▶ Develop mental math strategies and abilities to make sense of quantities
- ▶ Use technology to explore mathematics
- ▶ Model mathematics in contextualized experiences

Understanding and solving

Content

Students are expected to know the following:

- ◆ number concepts to 1 000 000
- ◆ decimals to thousandths
- ◆ equivalent fractions
- ◆ whole-number, fraction, and decimal benchmarks
- ◆ addition and subtraction of whole numbers to 1 000 000
- ◆ multiplication and division to

Delta SD CSL Intermediate Template

[Blank Intermediate Template](#)

Tools

Estimation Continuum & Estimation 180

<http://www.estimated180.com/day-61.html>

K-12 Developing and Assessing Numeracy Competencies

<https://deltalearns.ca/cslpilot/numeracy/>

Fluency

Fluent:

Being efficient, accurate, and flexible in your thinking

Computationally fluent:

Having efficient and accurate methods for computing

Mental Math

Consider the following:

$$18 \times 5$$

How could you solve this?

Use multiple strategies to perform mental math

Jo Boaler on Number Sense

PROBLEM SOLVING

Why Is Ascending Slowly Important When Scuba Diving?

Quick ascents can lead to decompression sickness.

During a dive, a diver's body absorbs nitrogen gas. The nitrogen gas compresses due to water pressure and slowly saturates the diver's body tissues

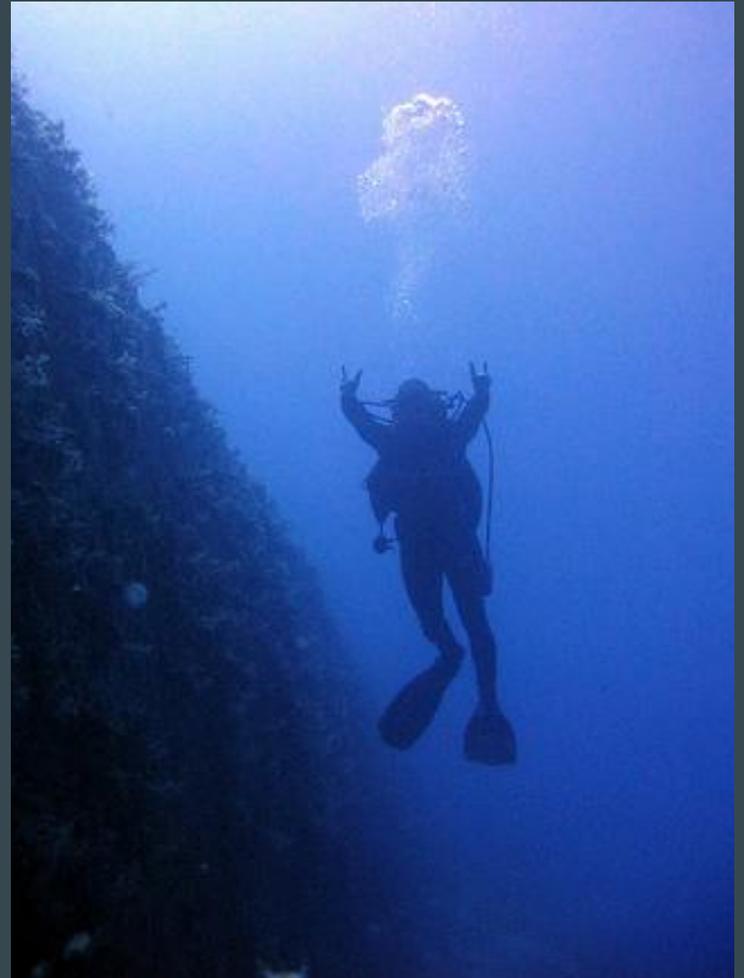
If divers ascend too quickly, the nitrogen gas in their body will expand at such a rate that they are unable to eliminate it efficiently, and the nitrogen will form small bubbles in their tissues.

Problem

Decompression sickness and can be very painful, lead to tissue death, and even be life-threatening.

Divers should ascend no faster than 10 meters per minute.

If a diver is 30 meters underwater, how long will it take to ascend to the surface?



Safety Stops and Deep Stops

In addition to slow ascents, scuba diving training organizations also recommend making a safety stop at 5 meters for 3-5 minutes. A safety stop allows a diver's body to eliminate additional nitrogen from the body before his final ascent.

When making deep dives (say 30 meters or deeper) studies have also shown that a diver who makes a deep stop (about halfway to the surface) as well as a safety stop will have significantly less nitrogen in his body upon surfacing than a diver who does not.

Considering this new information, how long will it take the diver to safely ascend the 30 meters to the surface?

The Final Ascent Should Be the Slowest

The greatest pressure change is near the surface. The more shallow a diver is, the more rapidly the surrounding pressure changes as he ascends.

A diver should ascend most slowly from his safety stop to the surface, even more slowly than 10 meters per a minute

Nitrogen in a diver's body will expand most quickly during the final ascent, and allowing his body additional time to eliminate this nitrogen will further reduce the diver's risk of decompression sickness.

Considering this new information, how long should it take the diver to safely ascend the 30 meters to the surface?