



# DPAC Math Presentation

## March 2020


# POP Quiz!

Enter what you want to calculate or know about



 Extended Keyboard

 Upload

 Examples

 Random

*Compute expert-level answers using Wolfram's breakthrough algorithms, knowledgebase and AI technology*

## Mathematics ›



Step-by-Step Solutions



Elementary Math

$x^2-1$  Algebra



Plotting & Graphics

$\int f(x) dx$  Calculus & Analysis

## Science & Technology ›



Units & Measures



Physics



Chemistry



Engineering



Computational Sciences

## Society & Culture ›



People



Arts & Media



Dates & Times



Words & Linguistics



Money & Finance

## Everyday Life ›



Personal Health



Personal Finance



Surprises



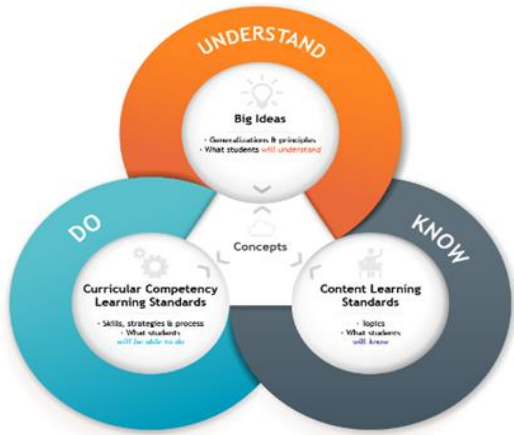
Entertainment



Household Science

# Purpose of Today

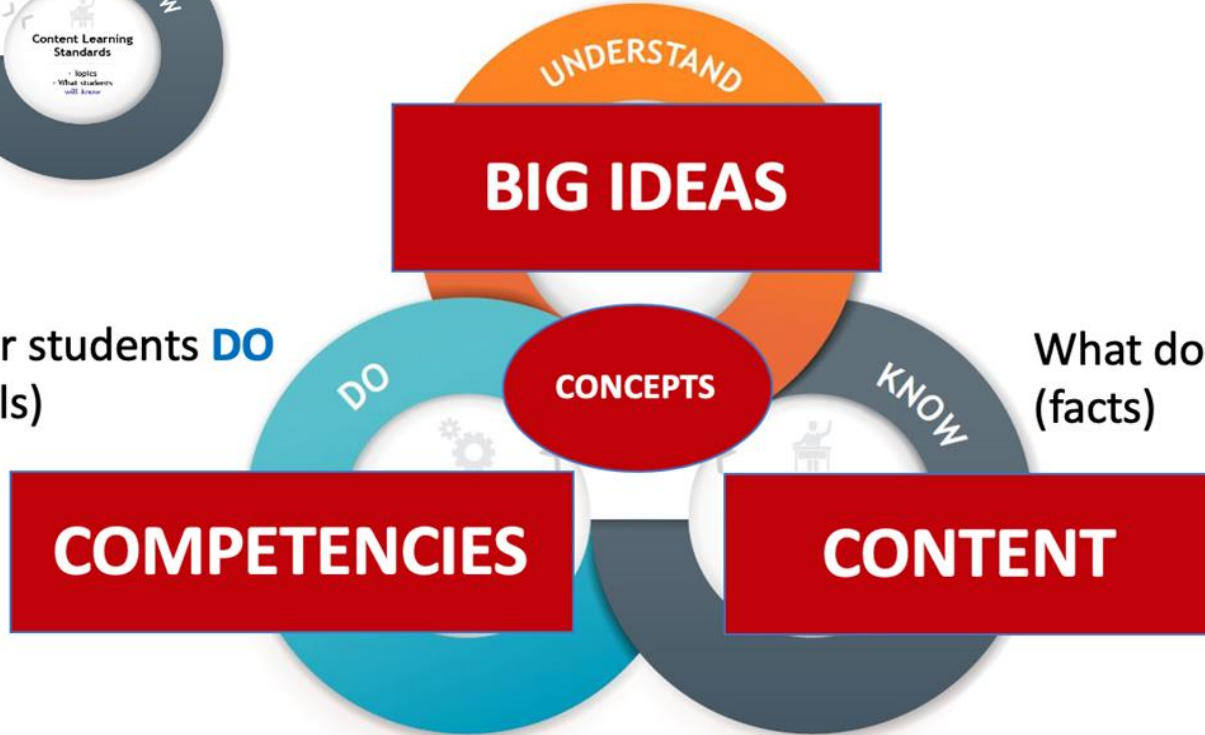
- Deepen our understanding of the Math Curriculum (Know, Do and Understand)
- Understanding the SHIFT in focus from “Traditional” math to “Numeracy”
- Experience numeracy from a student perspective
- Unpacking tensions and misconceptions
- Sharing supports and resources



What do our students **UNDERSTAND**  
(conceptual understanding)

What can our students **DO**  
(skills)

What do our students **KNOW**  
(facts)



# Learning how to drive



# Driving: Know - Do - Understand

## **KNOW** (facts)

Rules, signs, signals, vocabulary, etc



## **DO** (skills)

Accelerate, brake, steer, park, turn, etc



## **UNDERSTAND** (conceptual understanding)

How to share the road, decision making, road patterns, how to adjust for weather, etc



## BIG IDEAS

## Understand

**Number** represents, describes, and compares the quantities of ratios, rates, and percents.

Computational **fluency** and flexibility extend to operations with fractions.

**Discrete linear relationships** can be represented in many connected ways and used to identify and make generalizations.

The relationship between surface area and volume of **3D objects** can be used to describe, measure, and compare spatial relationships.

Analyzing **data** by determining averages is one way to make sense of large data sets and enables us to compare and interpret.

## Do

## Learning Standards

## Know

Curricular Competencies	Content
<p><i>Students are expected to do the following:</i></p> <p><b>Reasoning and analyzing</b></p> <ul style="list-style-type: none"> <li>Use <b>logic and patterns</b> to solve puzzles and play games</li> <li>Use <b>reasoning and logic</b> to explore, analyze, and apply mathematical ideas</li> <li><b>Estimate reasonably</b></li> <li>Demonstrate and <b>apply</b> mental math strategies</li> <li>Use tools or technology to explore and create patterns and relationships, and test conjectures</li> <li><b>Model</b> mathematics in contextualized experiences</li> </ul> <p><b>Understanding and solving</b></p> <ul style="list-style-type: none"> <li>Apply <b>multiple strategies</b> to solve problems in both abstract and contextualized situations</li> <li>Develop, demonstrate, and apply mathematical understanding through play, inquiry, and problem solving</li> <li>Visualize to explore mathematical concepts</li> <li>Engage in problem-solving experiences that are <b>connected</b> to place, story, cultural practices, and perspectives relevant to local First Peoples communities, the local community, and other cultures</li> </ul> <p><b>Communicating and representing</b></p> <ul style="list-style-type: none"> <li>Use mathematical vocabulary and language to contribute to mathematical discussions</li> <li><b>Explain and justify</b> mathematical ideas and decisions</li> </ul>	<p><i>Students are expected to know the following:</i></p> <ul style="list-style-type: none"> <li><b>perfect squares and cubes</b></li> <li><b>square and cube roots</b></li> <li><b>percents</b> less than 1 and greater than 100 (decimal and fractional percents)</li> <li>numerical <b>proportional reasoning</b> (rates, ratio, proportions, and percent)</li> <li>operations with <b>fractions</b> (addition, subtraction, multiplication, division, and order of operations)</li> <li><b>discrete linear relations</b> (extended to larger numbers, limited to integers)</li> <li><b>expressions</b>- writing and evaluating using substitution</li> <li><b>two-step equations</b> with integer coefficients, constants, and solutions</li> <li><b>surface area and volume</b> of regular solids, including triangular and other right prisms and cylinders</li> <li><b>Pythagorean theorem</b></li> <li>construction, views, and nets of <b>3D objects</b></li> <li><b>central tendency</b></li> <li><b>theoretical probability</b> with two independent events</li> <li><b>financial literacy</b> — best buys</li> </ul>



# Goals of the Mathematics Curriculum

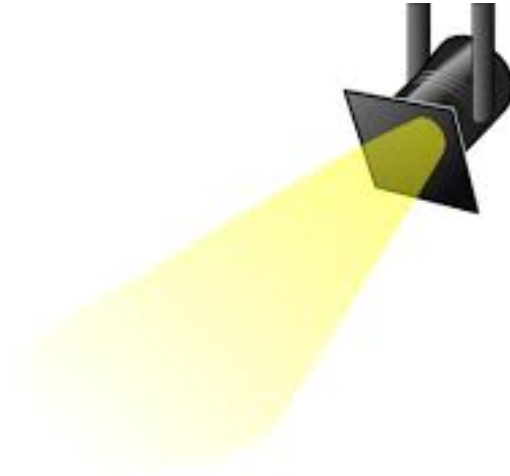
- develop a deep understanding of both **factual (Content)** and **processed-based** (Curricular Competencies) information, needed to solve complex problems
- **reason mathematically, using their understanding of number, pattern, and spatial relationships and analyzing data in order to solve problems**
- become financially literate, which supports and underpins sound financial decision making
- use flexible, effective, and personalized strategies to analyze and **solve increasingly complex problems in situational contexts**
- explore the connections between mathematics and other ways of knowing, such as First Peoples knowledge and other worldviews
- develop the perseverance and confidence to apply mathematical thinking in various abstract and concrete contexts
- view and navigate their world with a mathematical perspective
- **develop a capacity for abstract thinking, which includes the critical thinking skills necessary for understanding global issues in society**

# Defining Numeracy

## **Numeracy**

Numeracy is the ability to interpret information within a given situation, apply mathematical understanding to solve an identified problem, and to analyze and communicate a solution.

# Traditional Math



**Know**

**Understand**

**Do**

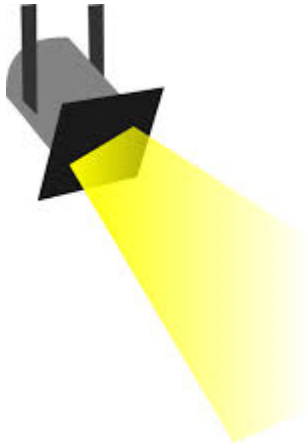
# What the Experts Say - The Why

“There’s an enormous difference between memorizing a few key facts and having an authentic grasp of the material...The emphasis on memorizing trivia, names, facts and formulas must stop. It’s poor use of precious educational time.” from Brain-Based Learning, by Eric Jensen

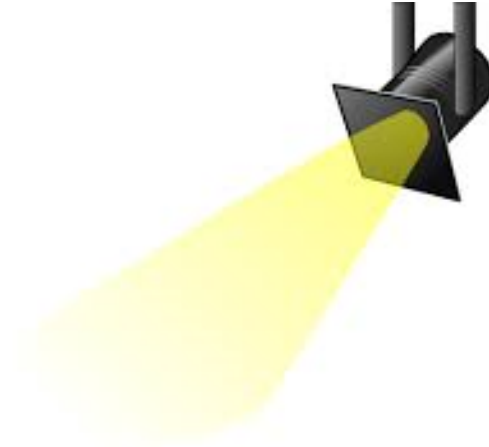
“The bottom line is that research has shown that things our brain does not understand are more likely to be forgotten. It is part of our makeup.”-John Marshall, Phi Delta Kappan

“When we simply learn the rules, they can be easily forgotten- or misused.”  
– John Van de Walle

# Shift to “new math” - Numeracy and Application

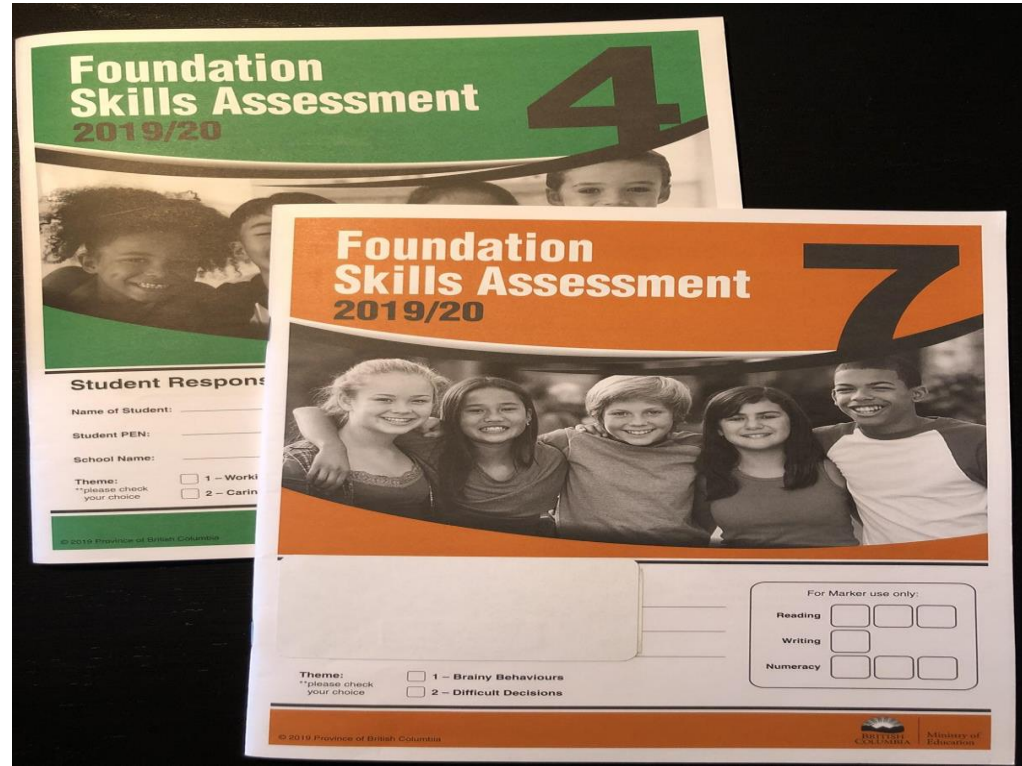


**Know**  
**Understand**



**Do**

# FSA Questions

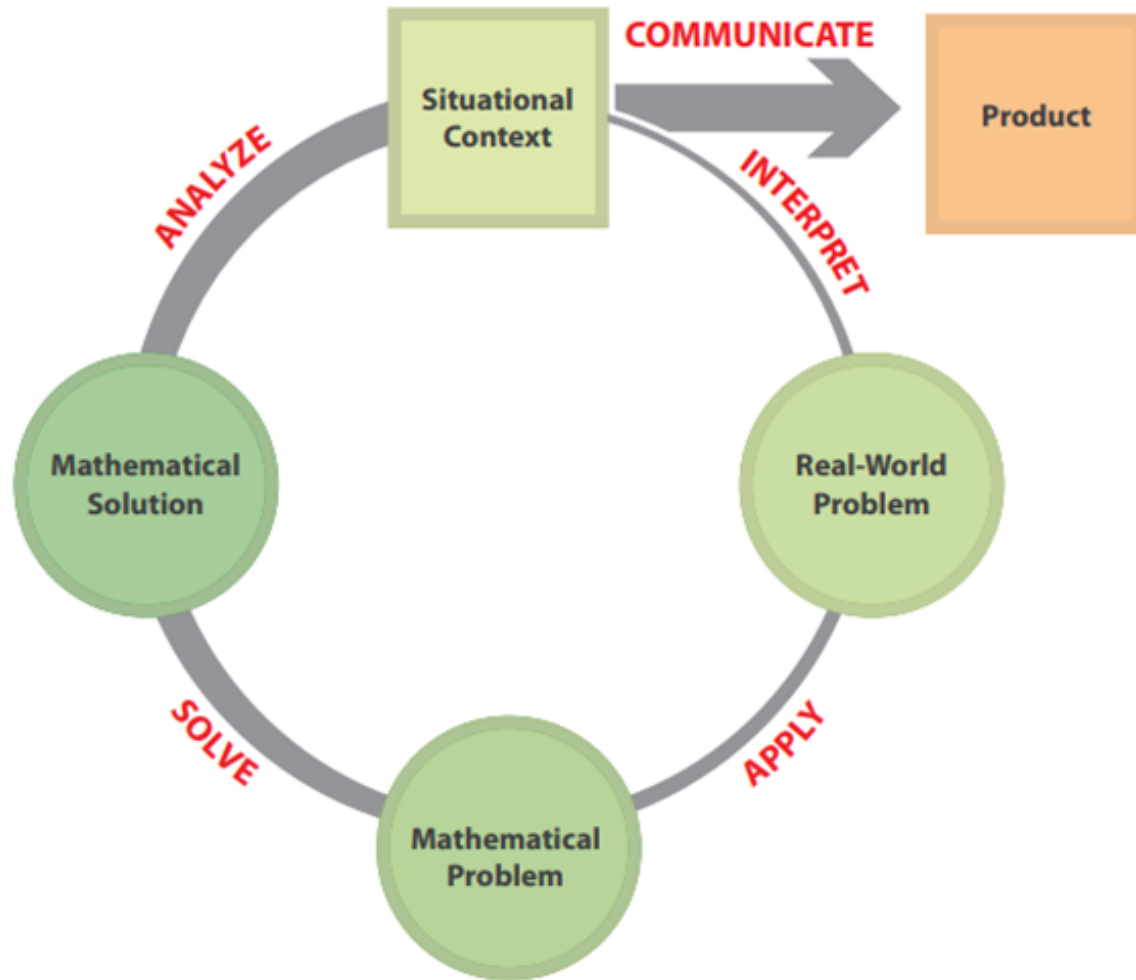


## FSA Numeracy Scoring Rubric

	1	2	3	4
Snapshot	<p><i>Student demonstrates limited ability to view the situation mathematically. Approach or representation is ineffective. Reasoning or evidence is absent.</i></p>	<p><i>Student demonstrates basic ability to view the situation mathematically. Approach or representation is difficult to follow. Reasoning or evidence is lacking to some degree.</i></p>	<p><i>Student demonstrates proficient ability to view the situation mathematically. Approach or representation is sensible and generally can be followed. Reasoning or evidence contains minor inconsistencies.</i></p>	<p><i>Student demonstrates advanced ability to view the situation mathematically. Approach or representation is effective and is easily followed. Reasoning and evidence is clear and well presented.</i></p>
	<p><b>NR</b> No response (answer page is blank)</p>	<p><b>0</b> Information is simply recopied from the problem; work is not relevant to the problem; response contains very inappropriate language; or all work is erased or crossed out.</p>		

What skills/knowledge did you need to answer the FSA questions?





## Marking Rubric (Constructed Response)

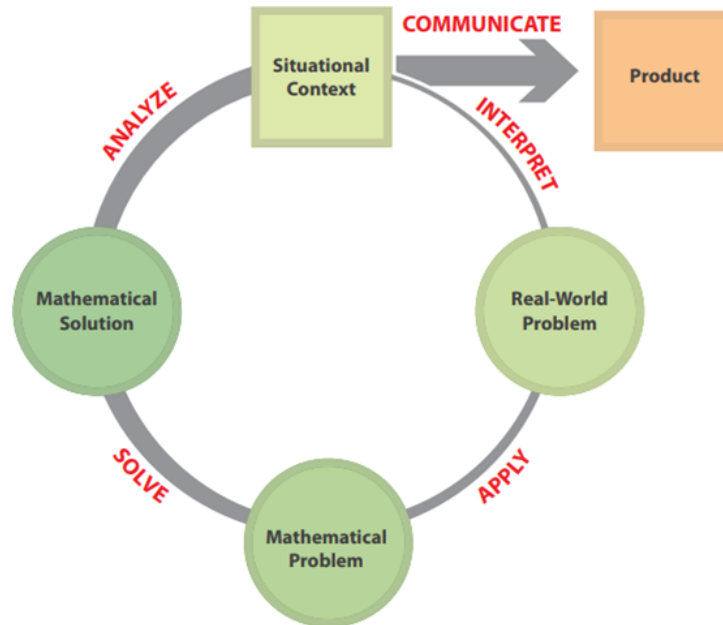
### Snapshot

4	Student demonstrates an extensive understanding of the situation. The approach is effective and comprehensive. The solution is supported by relevant evidence, and any errors are minor and do not hinder the solution's reasonableness within context. The reasoning is clearly communicated and addresses all critical and pertinent aspects of the problem.
3	Student demonstrates a strong understanding of the situation. The approach is sensible. The solution addresses all critical aspects of the problem; minor mathematical errors may exist. The reasoning is clearly communicated and references most pertinent aspects of the problem.
2	Student demonstrates a basic understanding of the situation. The approach may be unclear and/or incomplete but is on the right track. The solution may contain mathematical errors. The reasoning may be unclear but aligns with certain critical aspects of the problem.
1	Student demonstrates a limited understanding of the situation. The approach is ineffective or leaves out critical aspects needed to resolve the problem. The solution may contain fundamental mathematical errors. The reasoning is missing or irrelevant.
0*	Student work described by one of the following statements: <ul style="list-style-type: none"><li>• <i>Information simply recopied from the problem.</i></li><li>• <i>Diagrams or calculations are unrelated to the problem.</i></li><li>• <i>Any answer without supporting work.</i></li><li>• <i>Response does not address the purpose of the task.</i></li><li>• <i>Inappropriate response (contains profanity, inappropriate diagram or language).</i></li><li>• <i>All work is erased or crossed out.</i></li></ul>
NR	No response (answer sheet is blank)

\* Any zero score must include rationale and be approved by the section head.

# Grade 10 Numeracy Questions

What skills/knowledge did you need to answer the question?



# Scenarios

What skills would be needed to solve each problem?

- 1) A civil engineer leads the team in charge of designing and building a new bridge.
- 2) A CFO collects and analyzes the data necessary to make predictions about next quarter's earnings.
- 3) A researcher leads a peer reviewed study to test the efficacy of a new treatment.

# Skills Required for the Future

1. Data Literacy
2. Critical Thinking
3. Tech Savviness
4. Adaptability and Flexibility
5. Creativity
6. Emotional Intelligence (EQ)
7. Cultural Intelligence and Diversity
8. Leadership Skills
9. Judgment and Complex Decision Making
10. Collaboration
11. Self Management Skills (self-motivation, prioritization/time management, **stress management**)

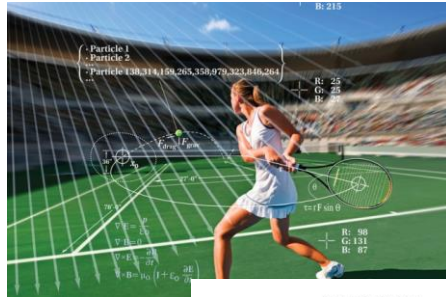
# Tensions and Misconceptions

support pathways  
testing failure  
post secondary  
rigor stress success resilience inflation tutors

# Create a positive attitude/mindset about math



# Make math a part of everyday life



## SUDOKU

LEVEL: COMPLICATED					ANSWER												
		3	6	7		2	5	8	3	6	4	7	1	9	2		
1		6		8		3	4	7	2	9	3	1	6	5	8		
		9	1		6		4	1	9	6	2	8	5	7	4	3	
2		5	3		9	8	1	8	3	9	1	5	6	2	7	4	
	2			6			1	7	6	1	7	8	2	4	5	3	9
3		7			2	3		5	2	4	5	3	7	9	8	6	1
									9	2	8	5	6	3	4	1	7
									7	5	1	4	9	2	3	8	6
									3	6	4	7	1	8	9	2	5



# Support your child's math studies



$$\begin{array}{r} 47 \\ + 29 \\ \hline 76 \end{array}$$

$$\begin{array}{r} 47 \\ + 29 \\ \hline 60 \\ 216 \\ \hline 76 \end{array}$$

# Ask prompting questions when your child needs help

- Why did you...?
- What can you do next?
- Do you see any patterns?
- Does the answer make sense?
- Can you try again?
- How do you know?