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Denver Public School's Journey

Supporting Students with Math Learning Disabilities
NCTM 2013

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Objective

- Capacity building journey
- Collecting data on present practice
- Qualifying Students for a Math SLD
- Professional Development

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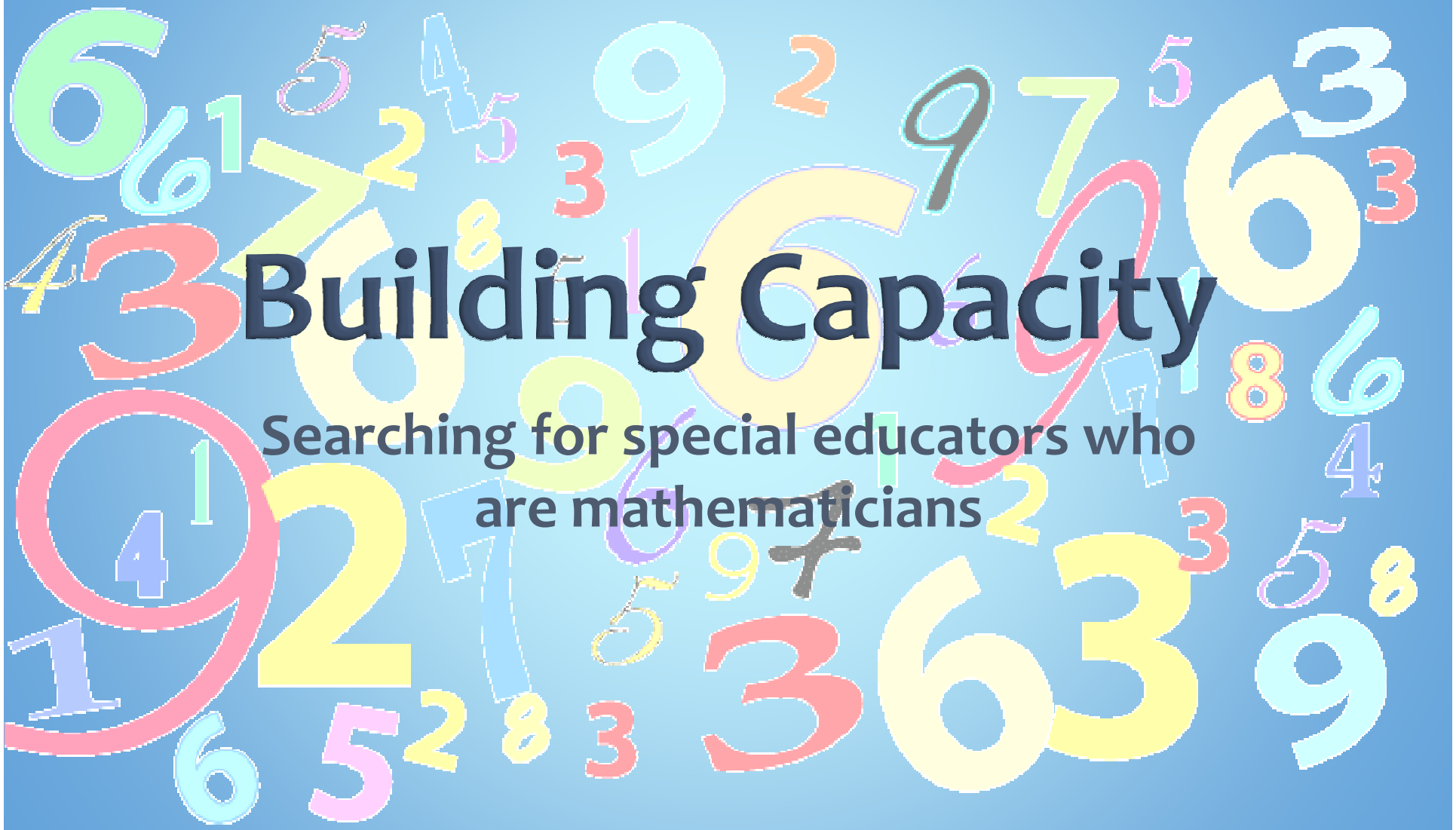

Building Capacity

Searching for special educators who are mathematicians

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dps data

84,424 Student population

155 School -41 Charter Schools

35% English Language Learners 39% Speak Spanish

9,000 Students with a Disability 10%

5,245 Teachers 477 Special Educators

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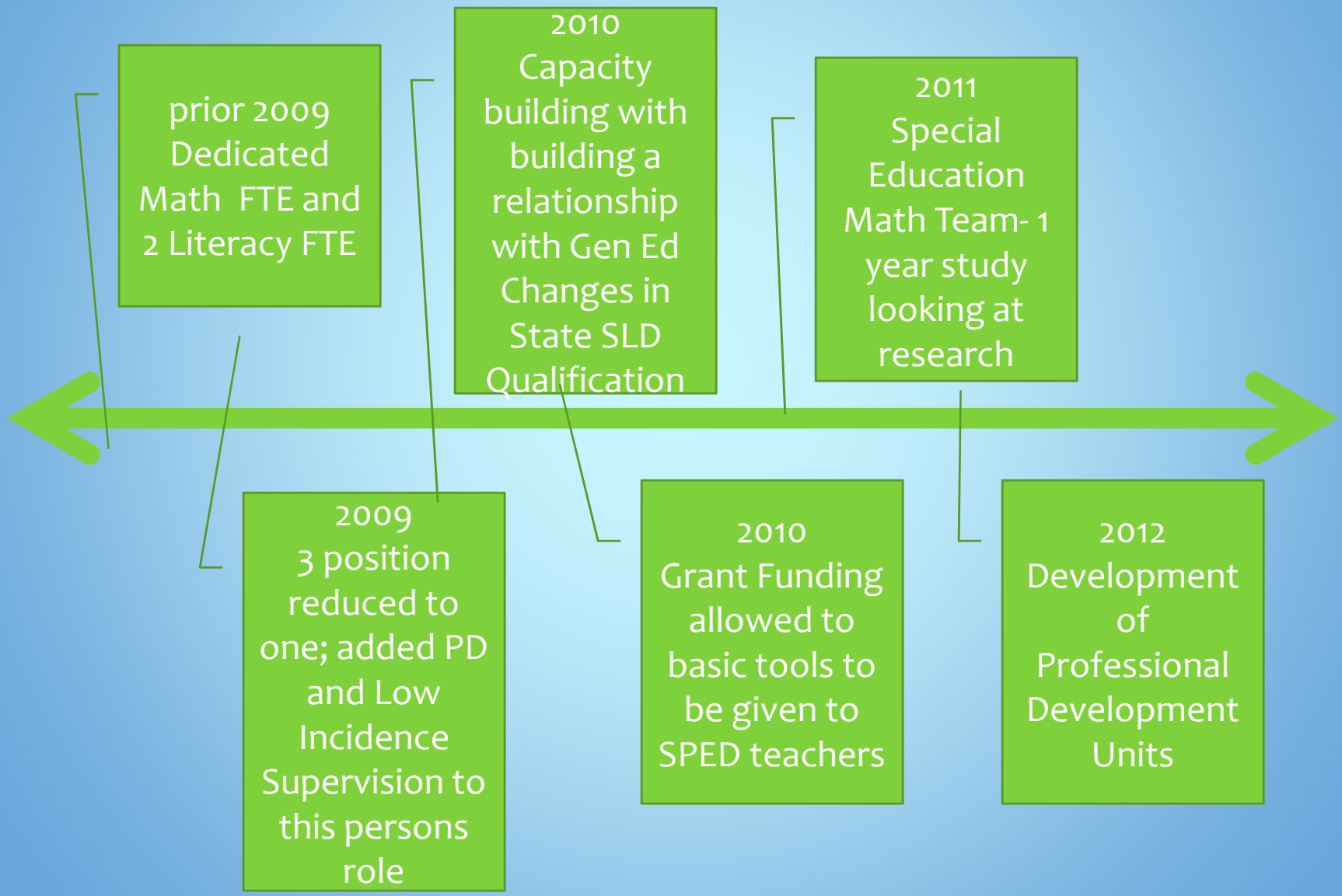
Time Line



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Survey and Walk Through

- Special education teachers didn't have a copy of the core curriculum
- Special education teachers had hand me downs from the first version of the core curriculum
- Special Education Teachers didn't have any manipulatives
- Only a handful of special education teachers had a back ground in mathematics
- Same course but teachers were on vastly different places in the curriculum
- Abundance of evidence of teaching math misconceptions
- "Slower and Louder" was the prevailing intervention
- No evidence of "CRA" practices in the classroom

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Tools we bought

RTI

General Education did a two year study to identify interventions

1) Computation based program that supported the 10 frame concept (k-2)
2) Conceptual based math intervention that supported the core curriculum
3) Blended learning options for schools to use

Special Education

Through Grant Funding

1) Computation based program that supported the 10 frame concept (k-5)
2) Conceptual based math intervention that supported the core curriculum (supported)
3) Blended learning options for schools to use (supported)
4) Manipulative K-12 and Center Programs
5) Specific tools for center based teachers who work with significant needs
6) Writing modified curriculums of the core curriculums
7) Pre-algebra and pre-geometry program

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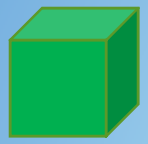
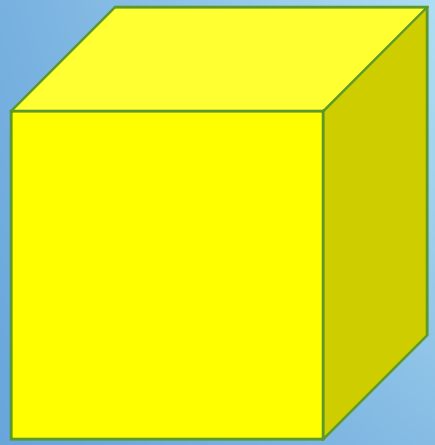
Algeblocks Key



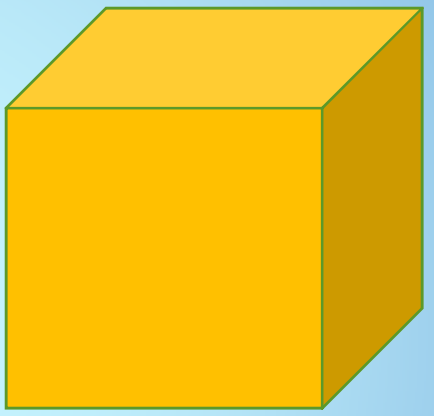
1 sq unit

X

Y



x^2



Y^2

XY

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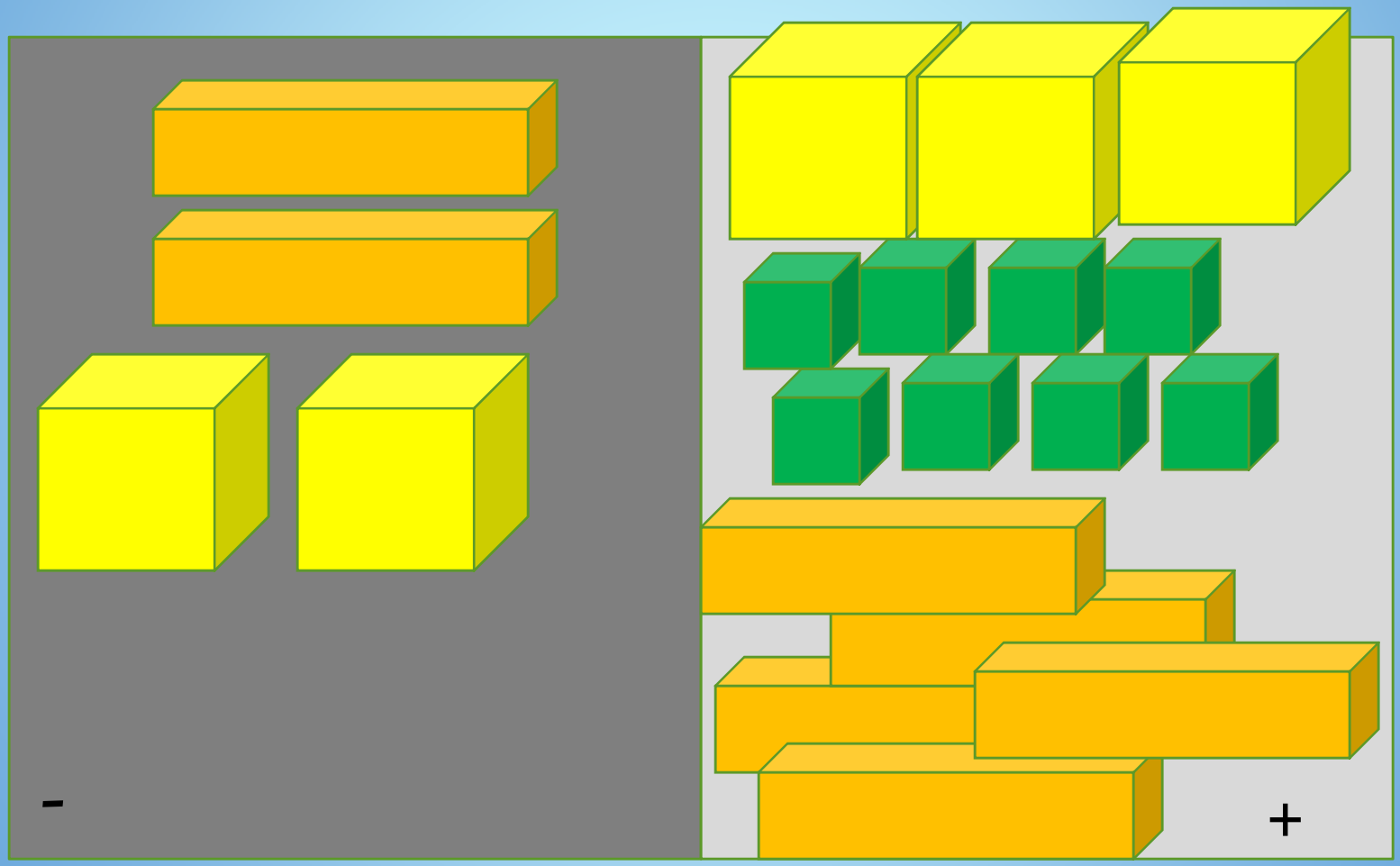
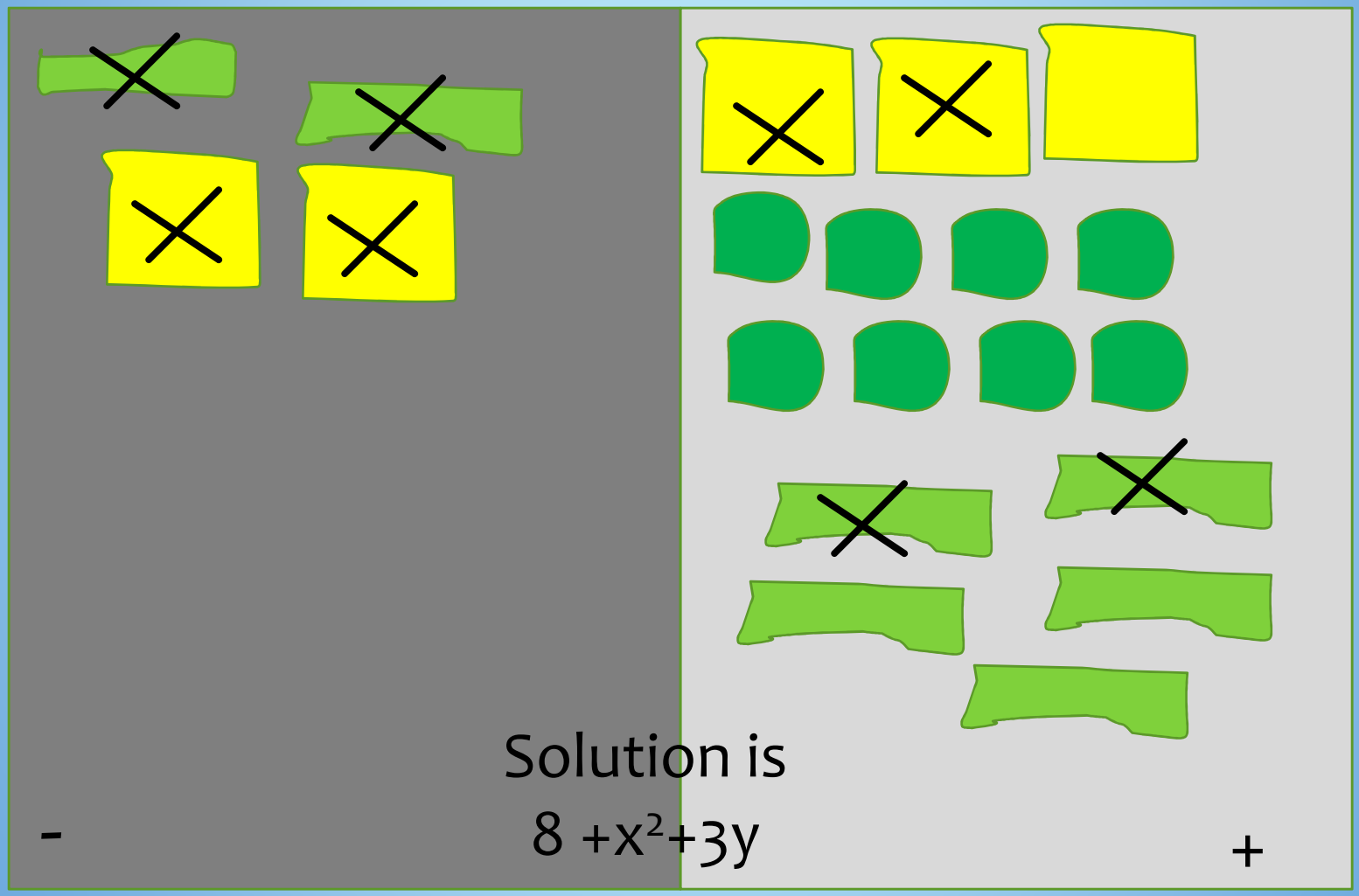
$3x^2 - 2y + 8 - 2x^2 + 5y$

concrete



$3x^2 - 2y + 8 - 2x^2 + 5y$ representational



$3x^2 - 2y + 8 - 2x^2 + 5y$

abstract

$3x^2 - 2x^2 = x^2$

$-2y + 5y = 3y$

8

$8 + x^2 + 3y$

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Qualification for SLD

Shifting from a discrepancy between IQ and Performance to Response to Intervention

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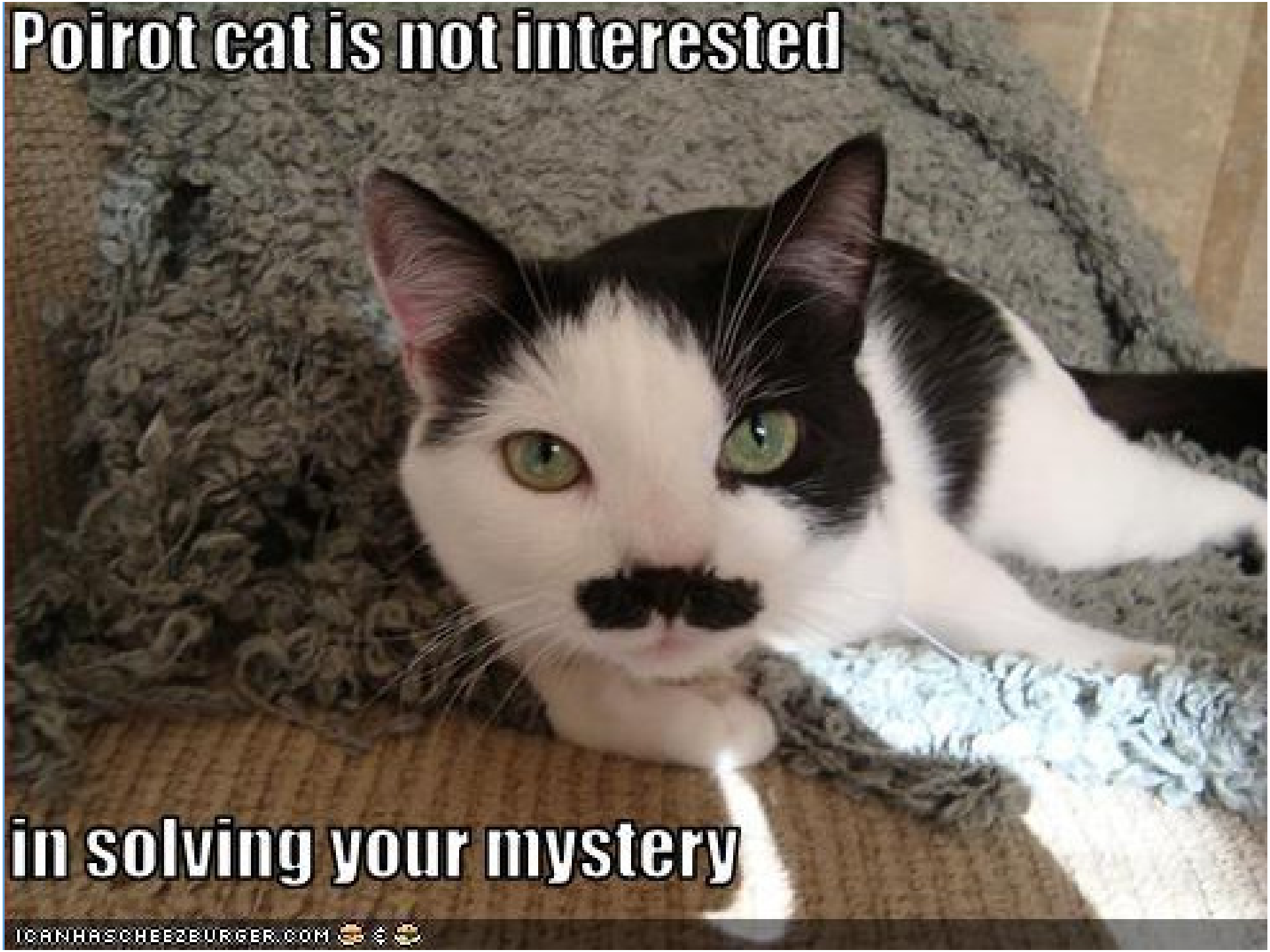
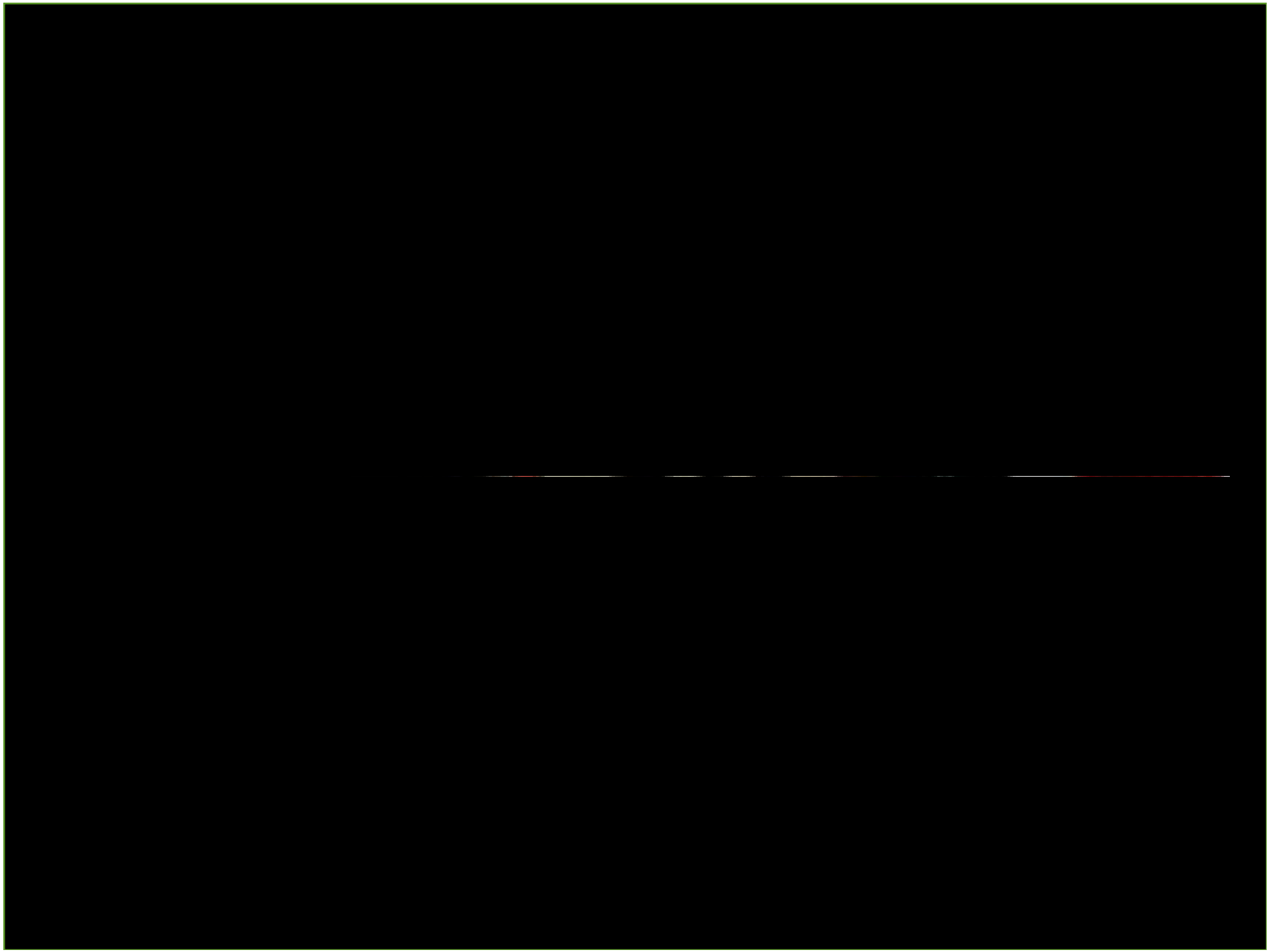
Solving a Mystery!

A sailor goes into a restaurant. His hands are tanned except for where a watch and wedding ring once belonged. He orders albatross, eats one bite which reminds him of something. He goes outside and kills himself.


Poirot cat is not interested
in solving your mystery
ICANHASCHEEZBURGER.COM



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SLD Definition

Specific Learning Disability means a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in the imperfect ability to listen, think, speak, read, write, spell or do mathematical calculations.

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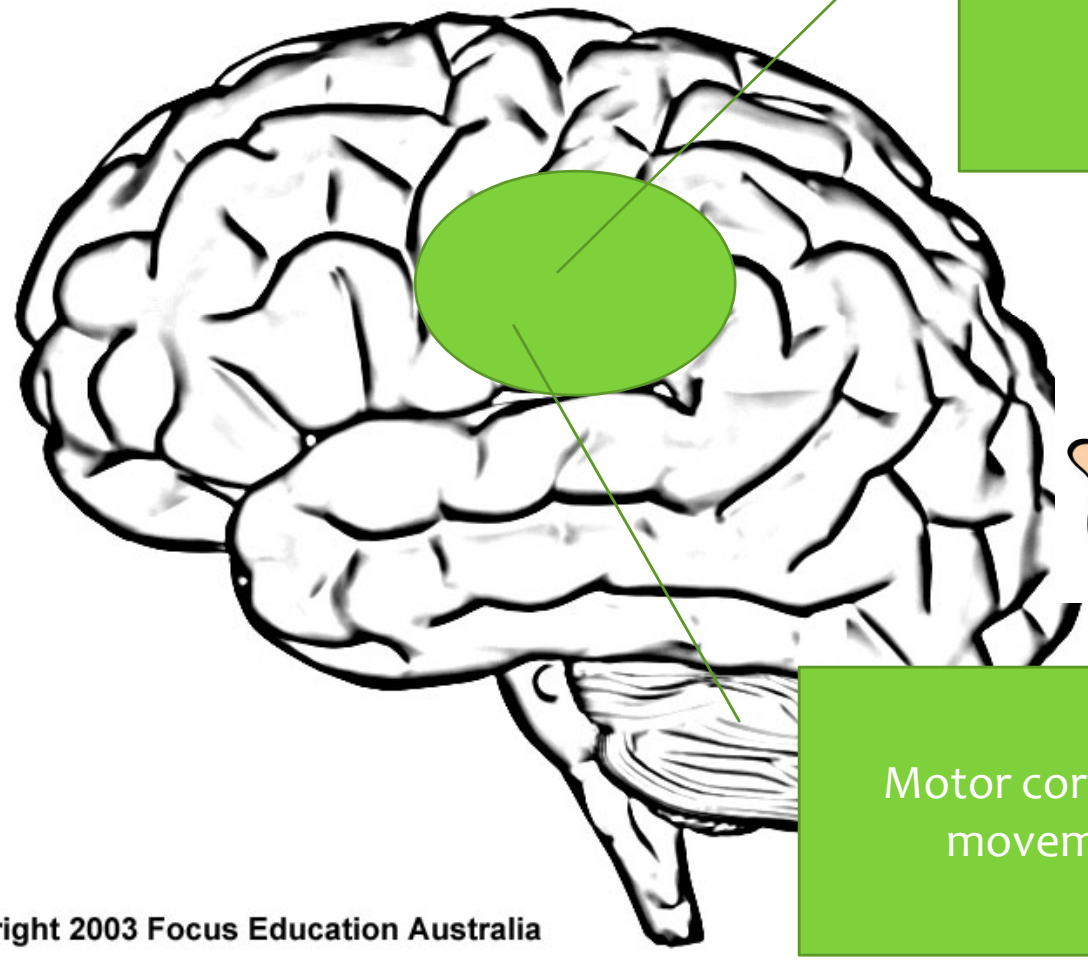
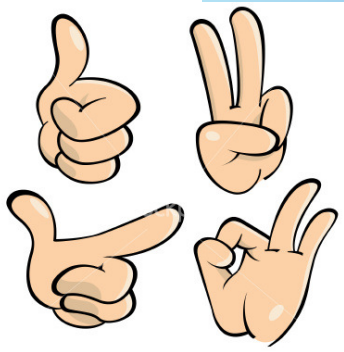
Numerosity

Activation in the brain during arithmetic
Parietal lobe





Motor cortex involved with movement of fingers

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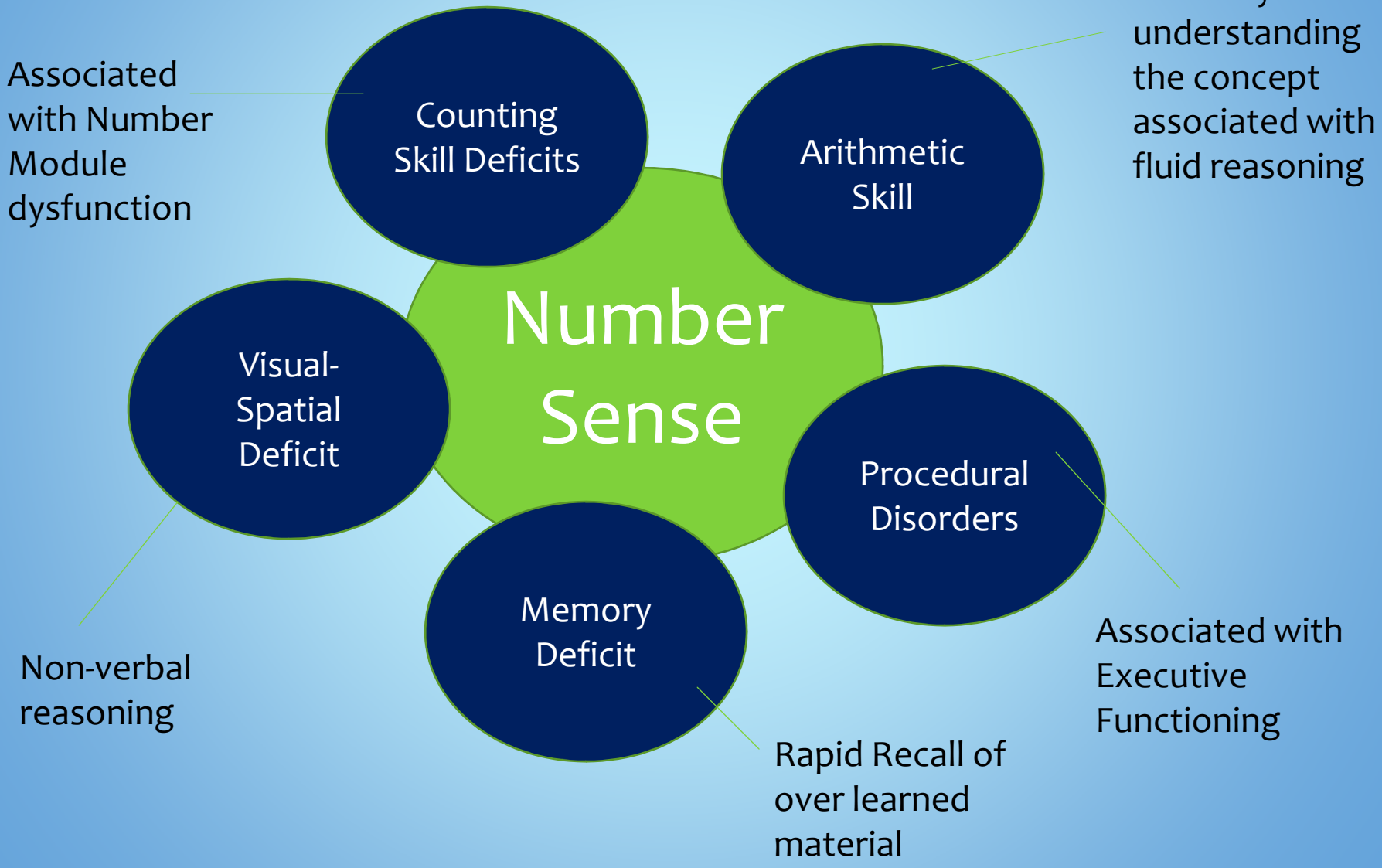
Types of Math Disorders



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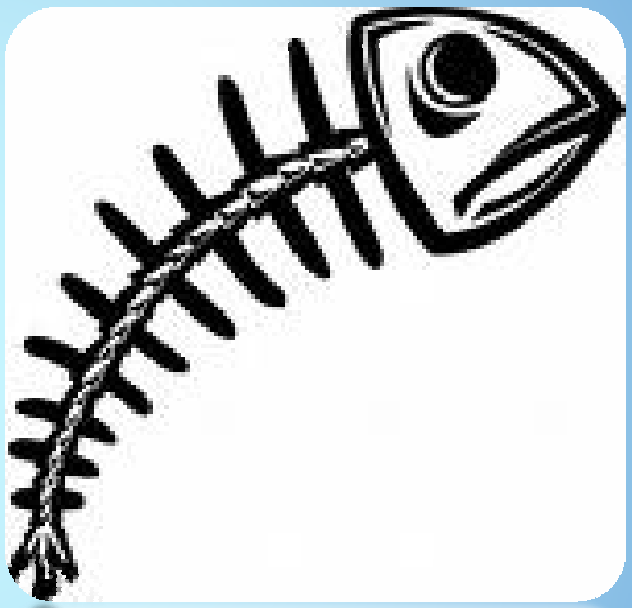

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Fishbone diagram is used when….

… a team needs to study a problem/issue to determine the root cause.

… a team wants to study all the possible reasons why a process is beginning to have difficulties, problems, or breakdowns.

… a team needs to identify areas for data collection.

… a team wants to study why a process is not performing properly or producing the designed results.

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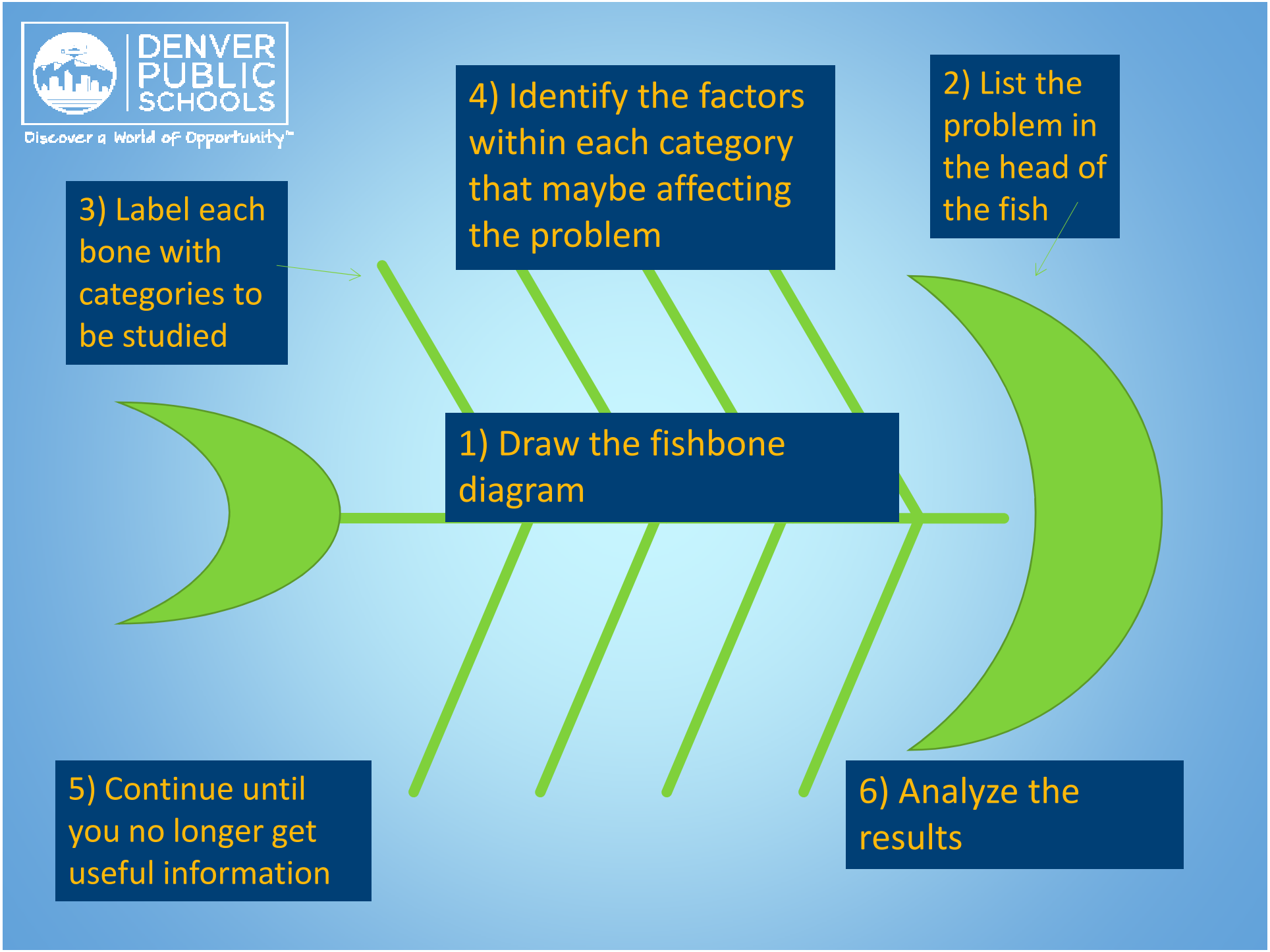

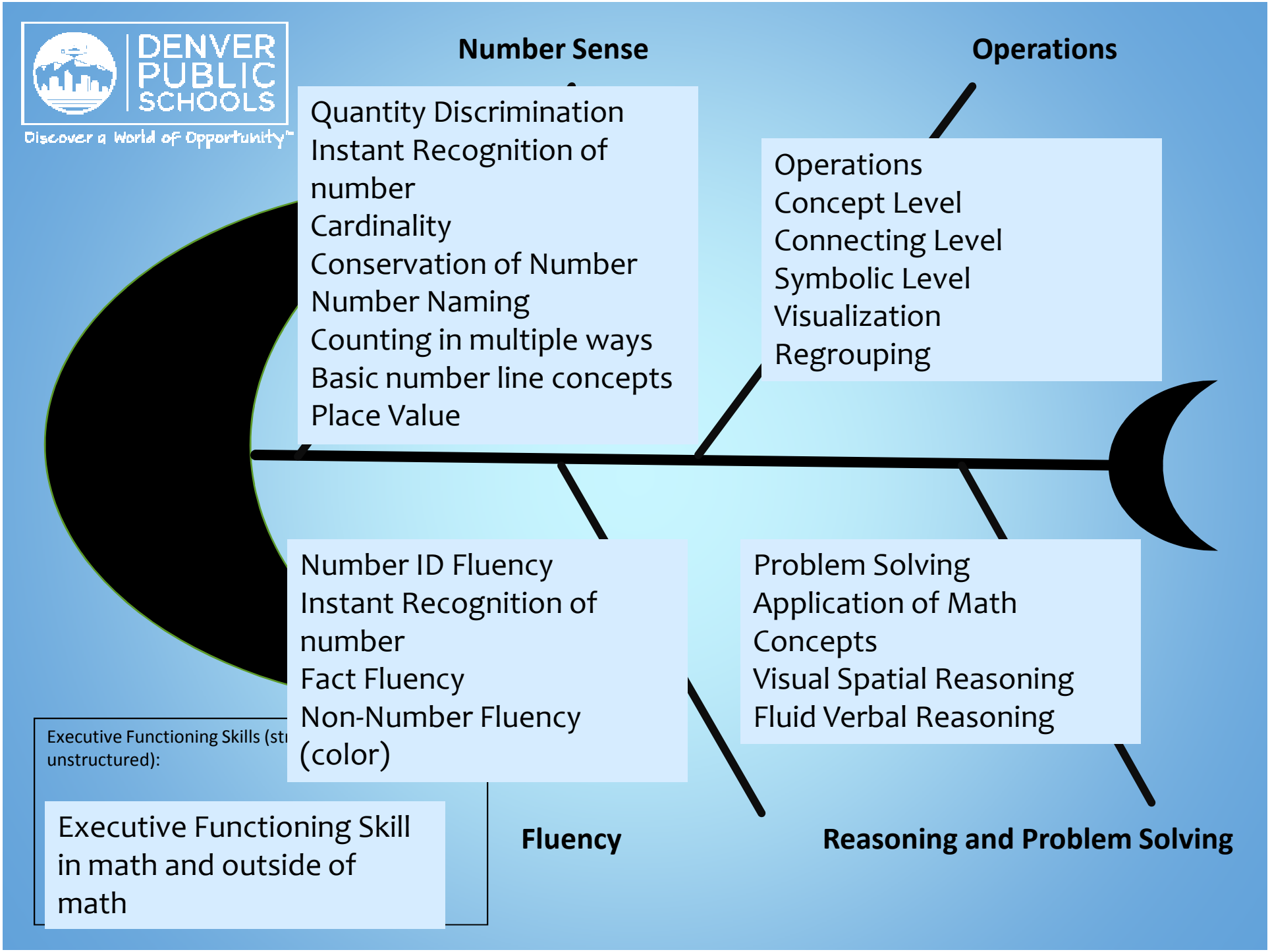
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Number Sense
Quantity Discrimination
Instant Recognition of number
Cardinality
Conservation of Number
Number Naming
Counting in multiple ways
Basic number line concepts
Place Value
Operations
Operations
Concept Level
Connecting Level
Symbolic Level
Visualization
Regrouping
Number ID Fluency
Instant Recognition of number
Fact Fluency
Non-Number Fluency (color)
Problem Solving
Application of Math Concepts
Visual Spatial Reasoning
Fluid Verbal Reasoning
Executive Functioning Skills (st
unstructured):
Executive Functioning Skill in math and outside of math
Fluency
Reasoning and Problem Solving

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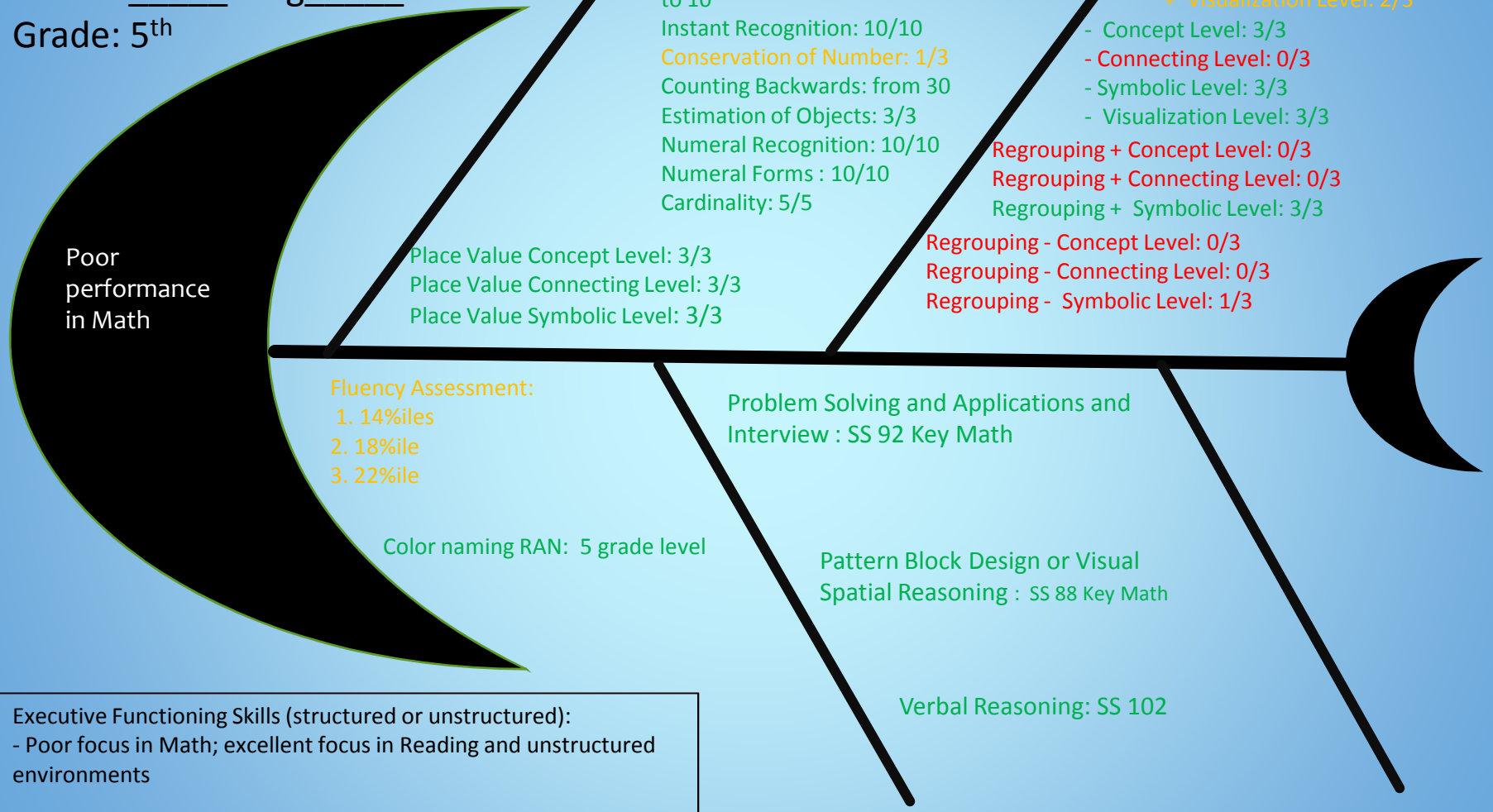
Name: _____Greg_____

Grade: 5th



Executive Functioning Skills (structured or unstructured):
- Poor focus in Math; excellent focus in Reading and unstructured environments

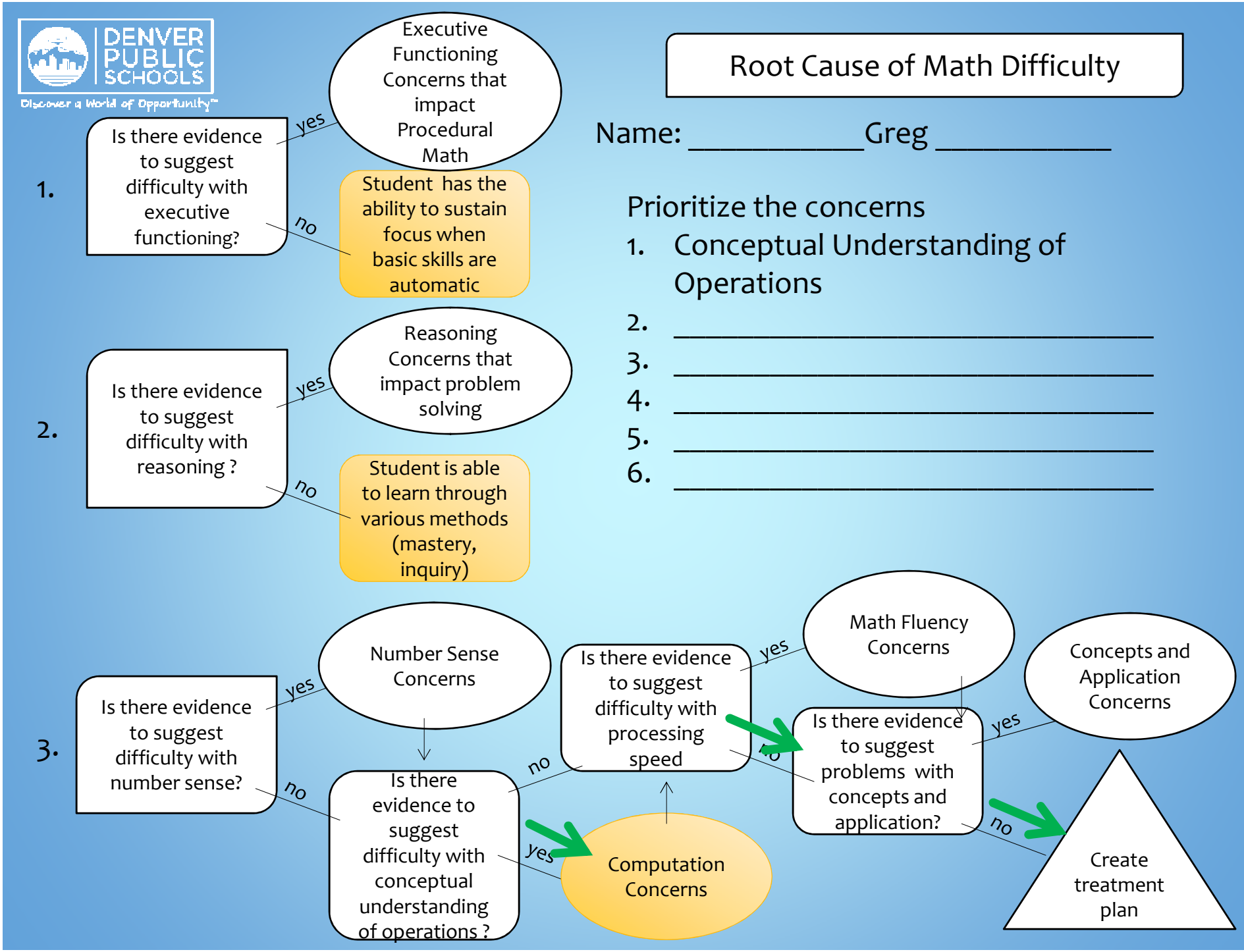
Other:
-Older sibling have no issues with math; parents didn't report any history of math difficulty

Root Cause of Math Difficulty

Name: _____Greg _____

Prioritize the concerns

1. Conceptual Understanding of Operations
2. _____
3. _____
4. _____
5. _____
6. _____



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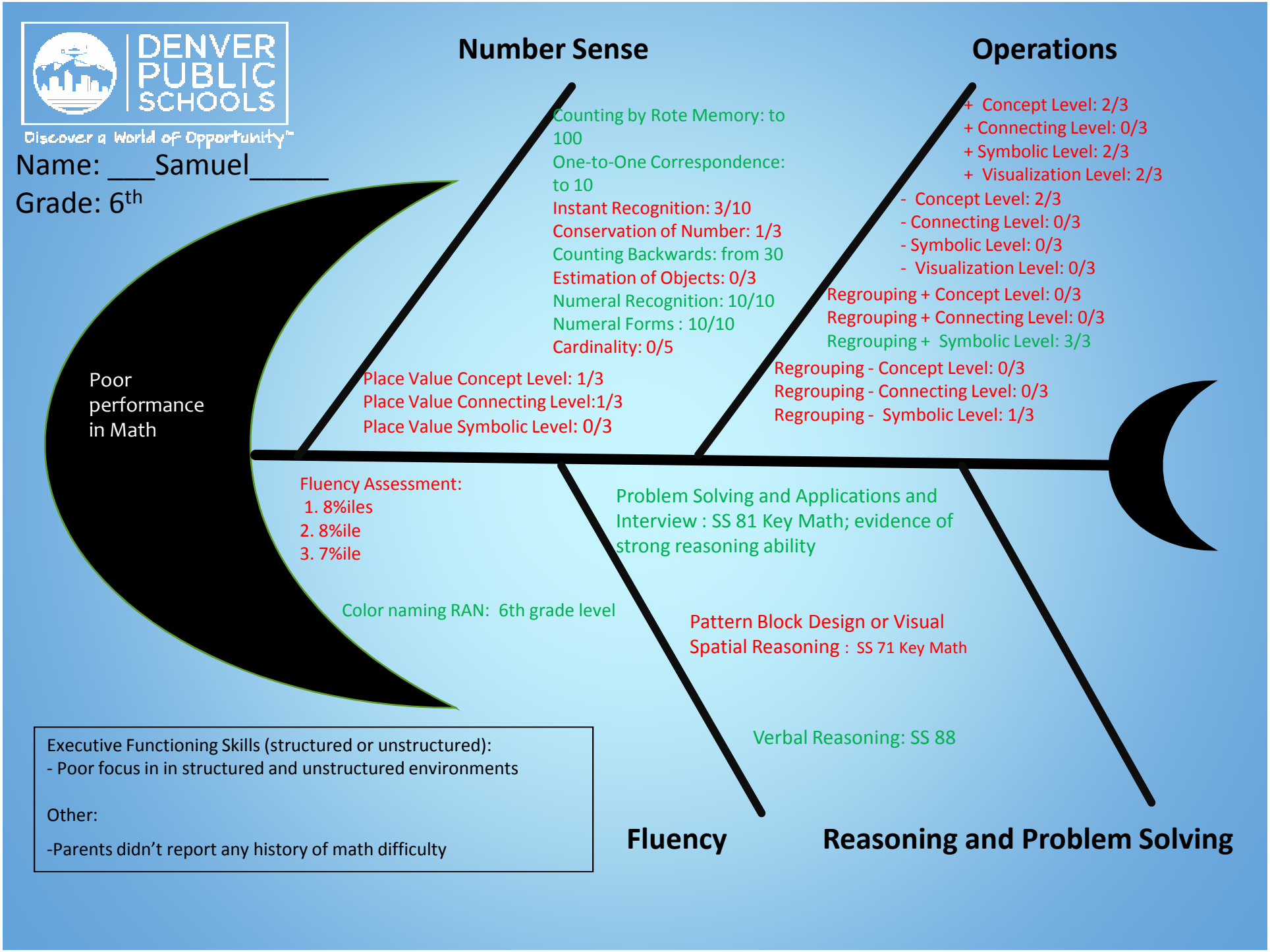
Treatment Plan for Greg

Direct Instruction	Accommodations and Modifications of the Core Curriculum	Home to School Connections
Recommendations: instruction of the conceptual understanding of operations using a CRA approach; continue to build visualization concepts through 10 frame computation exercises	**Areas of Concern:** Lacks operational conceptual understanding	Home Engagement: ❑High X Medium ❑ Low ❑None
Goals : Increase understanding of operational concepts	**Accommodations:** Allow use of computing devices when doing problem solving tasks; make sure CRA approach is used in introducing new concepts	Meaningful Homework **Tasks:** allow use of manipulative to solve basic computation problems; homework that follows a CRA approach.
Plan: 15 minutes of supplement during math instruction by the special education teacher; use Origo and Hands on Standards Materials	**Modifications:** No modifications needed at this time	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Name: ___Samuel_____
Grade: 6th
Poor performance in Math
Number Sense
Counting by Rote Memory: to 100
One-to-One Correspondence: to 10
Instant Recognition: 3/10
Conservation of Number: 1/3
Counting Backwards: from 30
Estimation of Objects: 0/3
Numeral Recognition: 10/10
Numeral Forms : 10/10
Cardinality: 0/5
Place Value Concept Level: 1/3
Place Value Connecting Level:1/3
Place Value Symbolic Level: 0/3
Operations
+ Concept Level: 2/3
+ Connecting Level: 0/3
+ Symbolic Level: 2/3
+ Visualization Level: 2/3
- Concept Level: 2/3
- Connecting Level: 0/3
- Symbolic Level: 0/3
- Visualization Level: 0/3
Regrouping + Concept Level: 0/3
Regrouping + Connecting Level: 0/3
Regrouping + Symbolic Level: 3/3
Regrouping - Concept Level: 0/3
Regrouping - Connecting Level: 0/3
Regrouping - Symbolic Level: 1/3
Fluency Assessment:
1. 8%iles
2. 8%ile
3. 7%ile
Color naming RAN: 6th grade level
Problem Solving and Applications and Interview : SS 81 Key Math; evidence of strong reasoning ability
Pattern Block Design or Visual Spatial Reasoning : SS 71 Key Math
Verbal Reasoning: SS 88
Fluency
Reasoning and Problem Solving
Executive Functioning Skills (structured or unstructured):
- Poor focus in in structured and unstructured environments
Other:
-Parents didn't report any history of math difficulty

Root Causes of Math Difficulty

Name: _____Sam _____

Prioritize the concerns

1. Executive Functioning
2. Number Sense
3. Operations
4. Visual Spatial Reasoning
5. _____
6. _____

1. Is there evidence to suggest difficulty with executive functioning?
   - yes → Executive Functioning Concerns that impact Procedural Math
   - no → Student has the ability to sustain focus when basic skills are automatic

2. Is there evidence to suggest difficulty with reasoning ?
   - yes → Reasoning Concerns that impact problem solving
   - no → Student is able to learn through various methods (mastery, inquiry)

3. Is there evidence to suggest difficulty with number sense?
   - yes → Number Sense Concerns
   - no → Is there evidence to suggest difficulty with conceptual understanding of operations ?
     - yes → Computation Concerns
     - no → Is there evidence to suggest difficulty with processing speed
       - yes → Math Fluency Concerns
       - no → Is there evidence to suggest problems with concepts and application?
         - yes → Concepts and Application Concerns
         - no → Create treatment plan

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Treatment Plan for Sam

Direct Instruction	Accommodations and Modifications of the Core Curriculum	Home to School Connections
Recommendations: provide structured environment; teach metacogntiion skills related to executive functioning skills ; develop instant recognition of number at the conceptual level; develop cardinality; instruction on the conceptual level of operations; develop visual spatial skills	**Areas of Concern:** Lacks operational conceptual understanding; poor executive functioning; poor number sense;	Home Engagement: ❑High X Medium ❑ Low ❑None
Goals : Increase instant recognition of number and cardinality; Increase understanding of operational concepts; increase visual spatial reasoning skills	**Accommodations:** Allow use of computing devices when doing problem solving tasks; make sure CRA approach is used in introducing new concepts; allow manipulative; extra time to complete tasks; distraction free environment to complete work	**Meaningful Homework Tasks:** allow use of manipulative to solve basic computation problems; homework that follows a CRA approach; games to develop number sense and computational understanding
Plan: 30 min outside the general education classroom; daily subitizing and counting skills and games; Use Origo and Hands on Standards materials; puzzle work	**Modifications:** No modifications needed at this time	

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Professional Development

Special educators as mathematicians

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PDU structure

$ for

Assessment PDU

SDI in Math PDU

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Where to find this PPT and Questions