

Access to Math



for Students with
Moderate and Severe Disabilities

Who are We Talking About?

Students with...

cognitive disabilities

motor challenges

non-verbal abilities or limited language

autism

multiple disabilities

Who are We Talking About?

Students who...

- complete math tasks and algorithms, but don't know how or when to use them
- learn functional skills+
- may be stuck at matching and sorting
- make little or no progress in math
- watch, give directions, or make comments with a communication device in math class... and that's it

Where We Have Been...

...in the Last 30 Years



1. Functional math
2. Pick and choose math activities
3. Theme-driven instruction
4. Lack of appropriate, high quality materials



General Education curriculum

High quality but...

- ...too difficult even at the lowest levels

- ...too fast

- ...little differentiation

Special Education

Piece of the puzzle..

- ...some content areas

- ...single tool

- ...single intervention

What was it like to teach math for students with mild, moderate, and severe disabilities?

What can my student do?
What is useful for my student?

functional skills, sorting, counting, addition, subtraction

Where have I been?

Where am I going?

What's Wrong with All of That?

1. Limits potential
2. Increases confusion and frustration
3. Decisions based on assumptions
4. Gaps in learning
5. Altered experiences & stages of development

What I Wish I Had Known...

IEP goals \neq Curriculum

Goals: what to measure

Curriculum: guide for progression of learning

Practice is not instruction

or... "Playing Clock Bingo is not a math lesson."

Teach thinking skills and understanding + provide practice opportunities

Concept knowledge is as essential to math
as comprehension is to literacy

Expectations

&

Opportunity

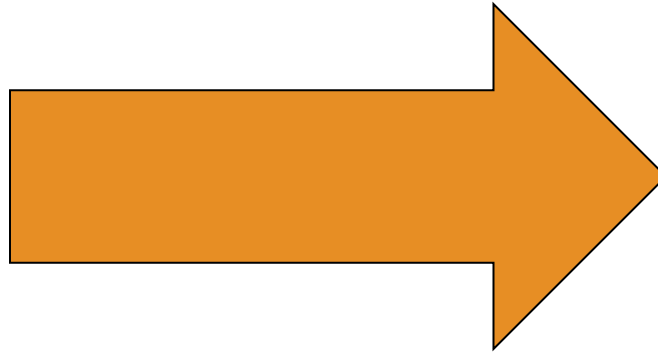
What's Been Right?

Creative

Resourceful

Hard-working

Best that could be done



Learning

Why are We Changing How We Deliver Math Instruction?

Educators raising **expectations**

=

Students have better **opportunities** to learn *math*

The only thing worse than
not being able to see...

..is being able to see
& having *no vision*

-- Helen Keller



We are on the brink...

...of something spectacular

...in math education for
students with disabilities.

Where We Need to Go

Math + Access

Good Instruction is Good Instruction

Start with the math....

How do I get my students to it?

What does that look like?

- Scope and Sequence of skills aligned to standards
- Comprehensive and Systematic: progression of learning
- Multiple hands-on math tools, methods, materials
- Differentiated tools, materials, and instruction
- Break skills down...slow the pace down

What are Some of Those Methods?

Communication

Representation

Concrete – Semi-Concrete - Abstract



Equals Math Instruction

- **Concrete** - teach with hands-on manipulatives & sensory experiences
- **Semi-concrete** – teach with representational materials to bridge concrete objects and abstract numbers
- **Abstract** – teach with numerals, signs, and symbols

Concrete



Semi-Concrete



Abstract

$$1+1=2$$

What are Some of Those Methods?

Communication

Representation

Concrete – Semi-Concrete - Abstract

Connections

Problem Solving

Teach Vocabulary

Teach math thoughtfully

What can I add to the lessons to meet individual needs and in forming meaning and challenging my students... no matter where they are?

School



LOOK FOR MATH!

What Does Differentiation Look Like for Students
with
Moderate to Severe Disabilities ?

Differentiation: How Can I....?

Talk & write about math (communication challenges)

Understand math (cognitive, LD, autism, low vision)

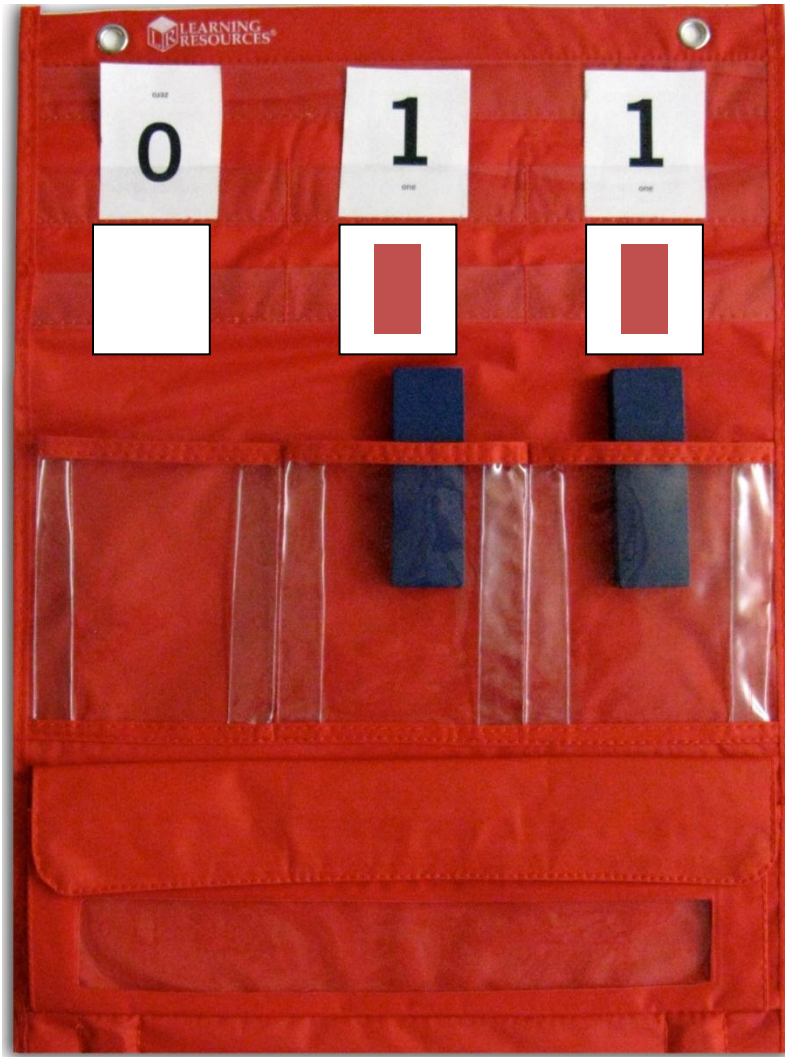
Perform a math task (motor challenges)

Be safe (throwing, mouthing materials)

Learn in the best way for me (preferred style)

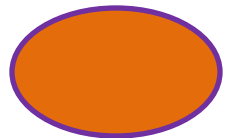
Engage in math (motivation, attention)

How Can I Talk About Math?



Provides...

- Choices (objects, pic-symbols)
- Means to communicate
 - eye gaze
 - touch
 - point
 - select with sound
- Communication device or board
 - E-Z Tech
 - Student's AAC device
 - Tactile/visual symbols



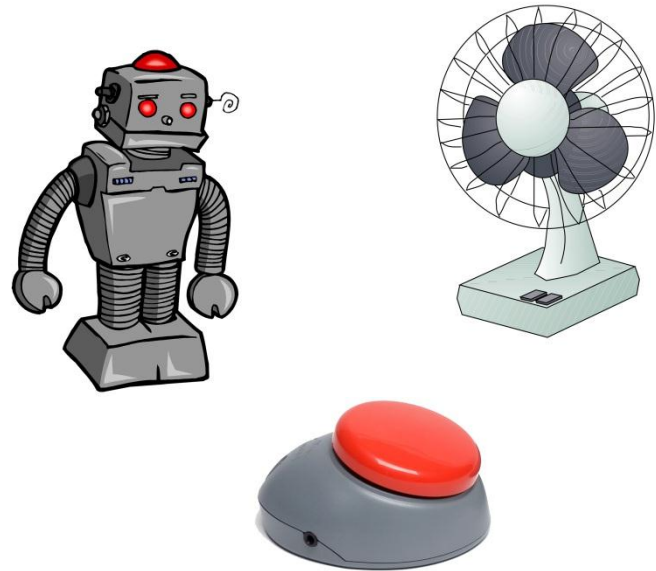
How Can I Understand?

- Touching tools



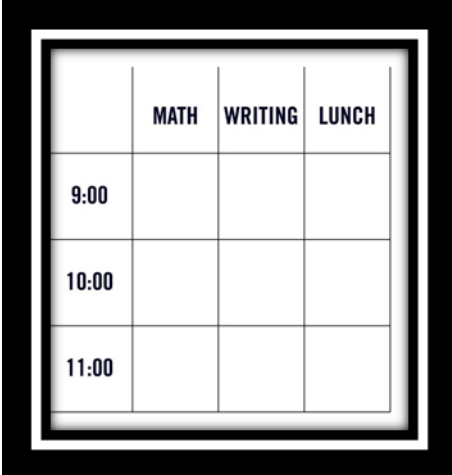
How Can I Understand?

- Touching tools
- Cause and effect



How Can I Understand?

- Touching tools
- Cause and effect
- Patterns and routine



	MATH	WRITING	LUNCH
9:00			
10:00			
11:00			

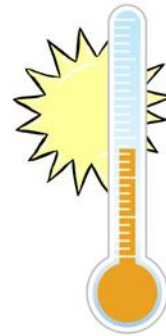
How Can I Understand?

- Touching tools
- Cause and effect
- Patterns and routine
- Interest



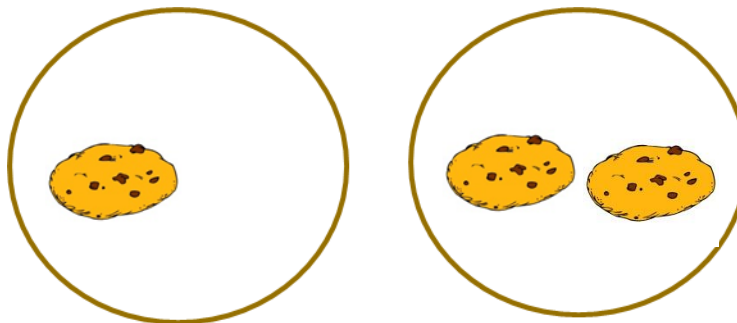
How Can I Understand?

- Touching tools
- Cause and effect
- Patterns and routine
- Interest
- Using tools

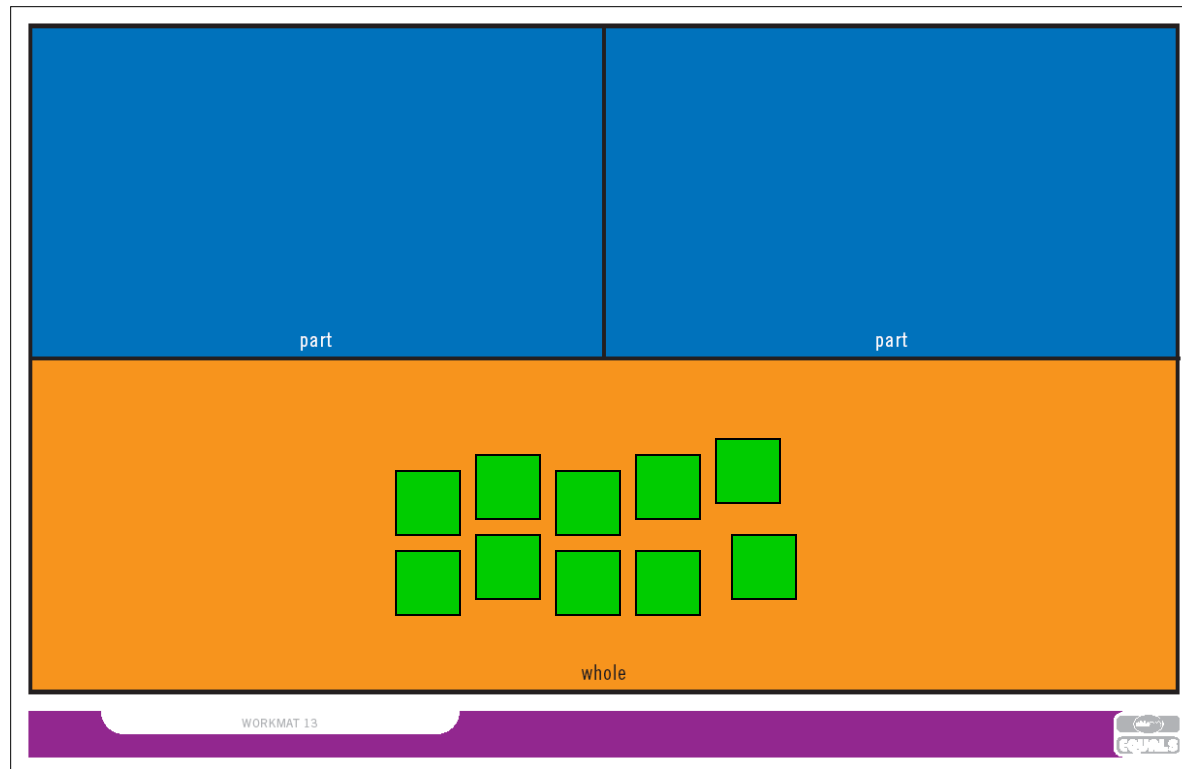


How Can I Understand?

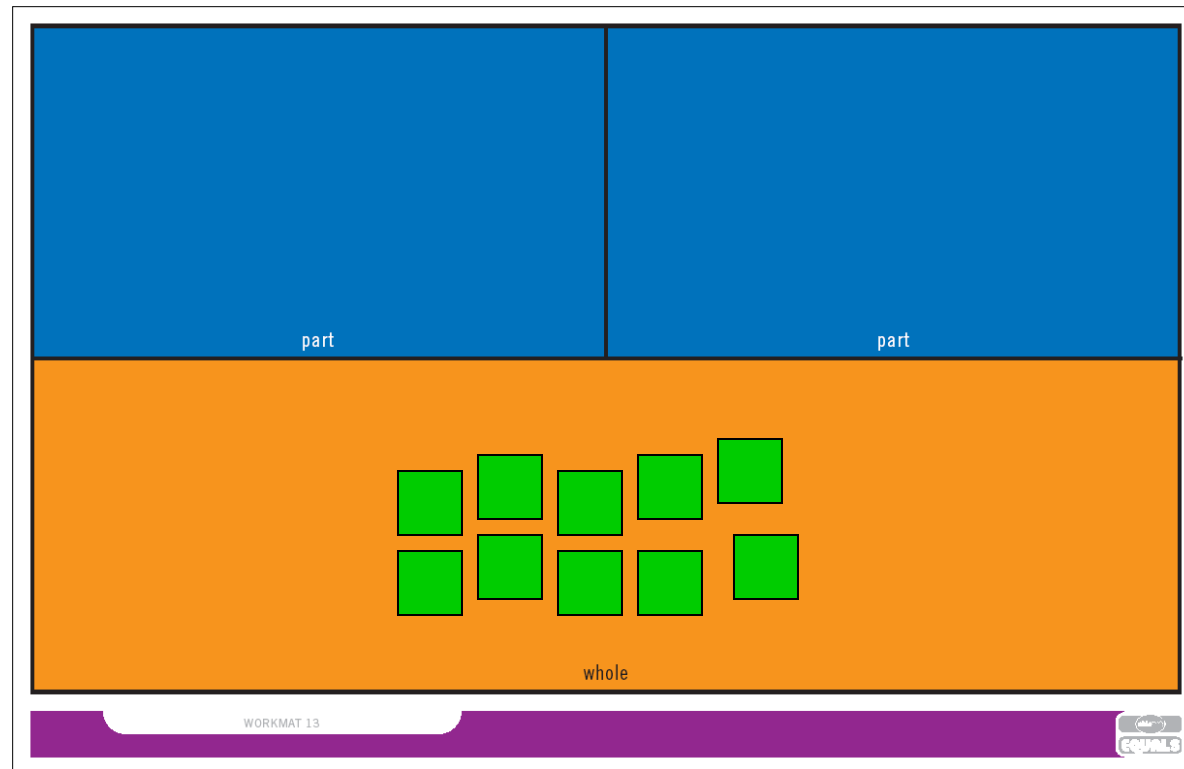
- Touching tools
- Cause and effect
- Patterns and routine
- Interest
- Using tools
- Quantity



How Can I Compose & Decompose?



How Can I Compose & Decompose?



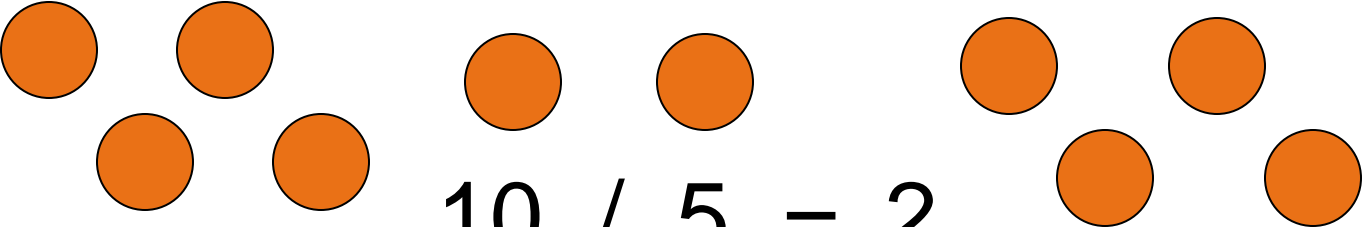
How Can I Divide?

Five groups...How Many in Each Group?

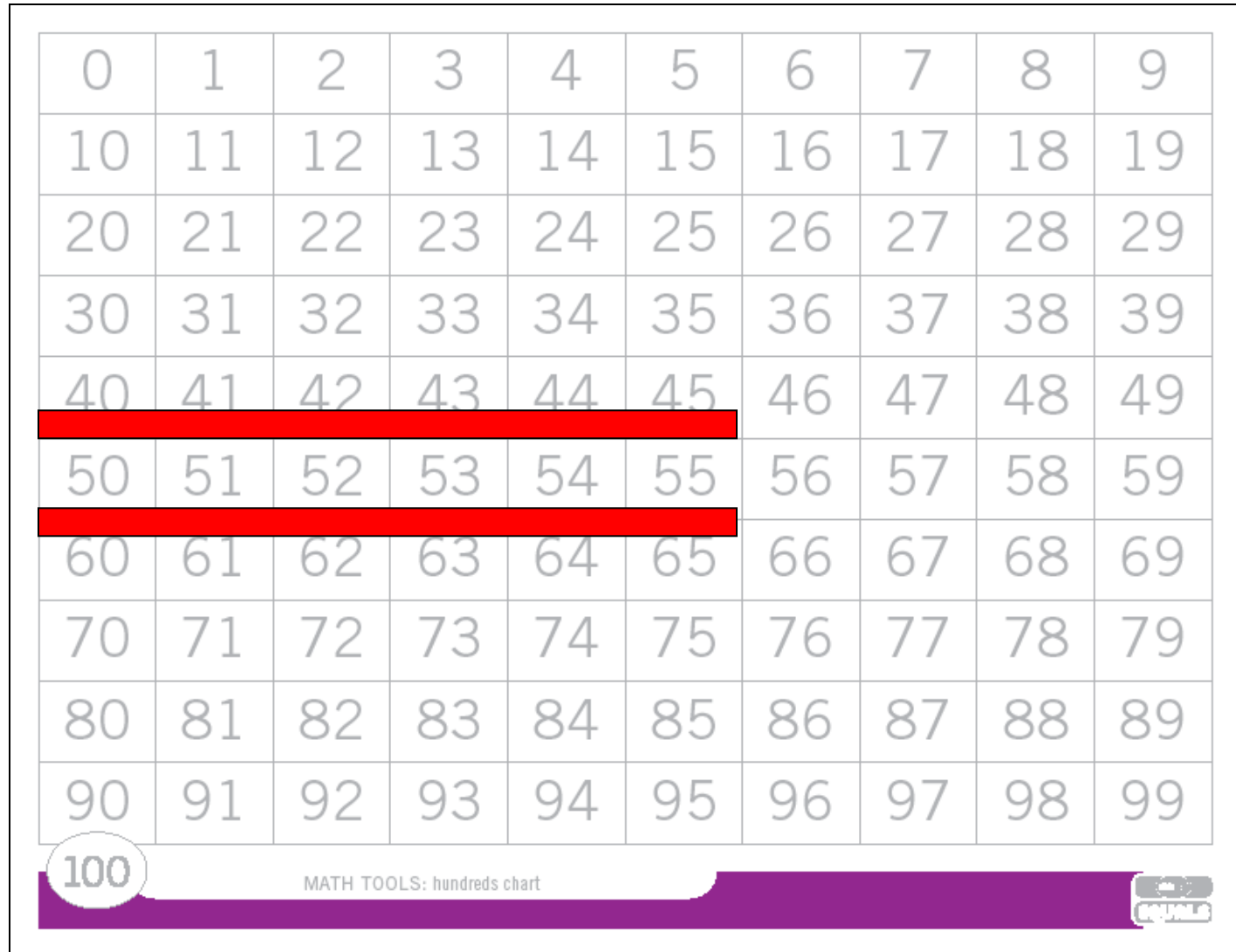
10 / 5 = 2

How Can I Divide?

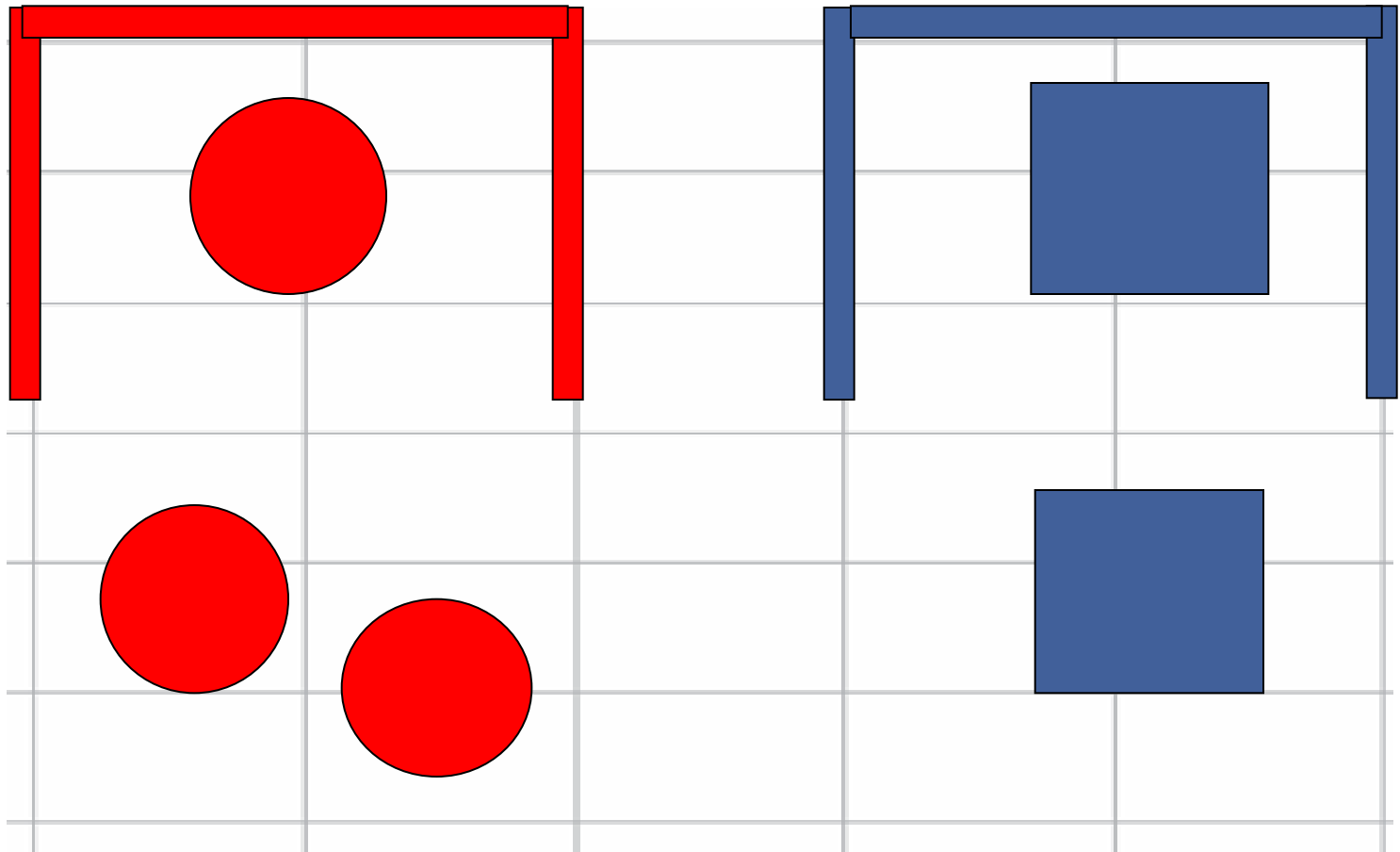
Five in each group...How Many Groups?


$$10 \div 5 = 2$$

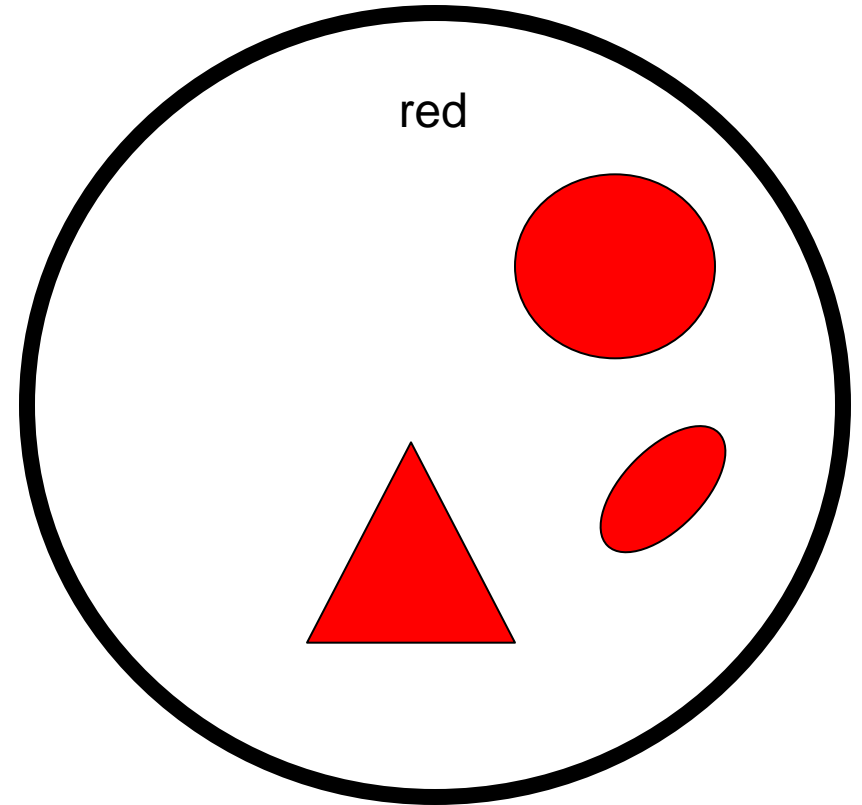
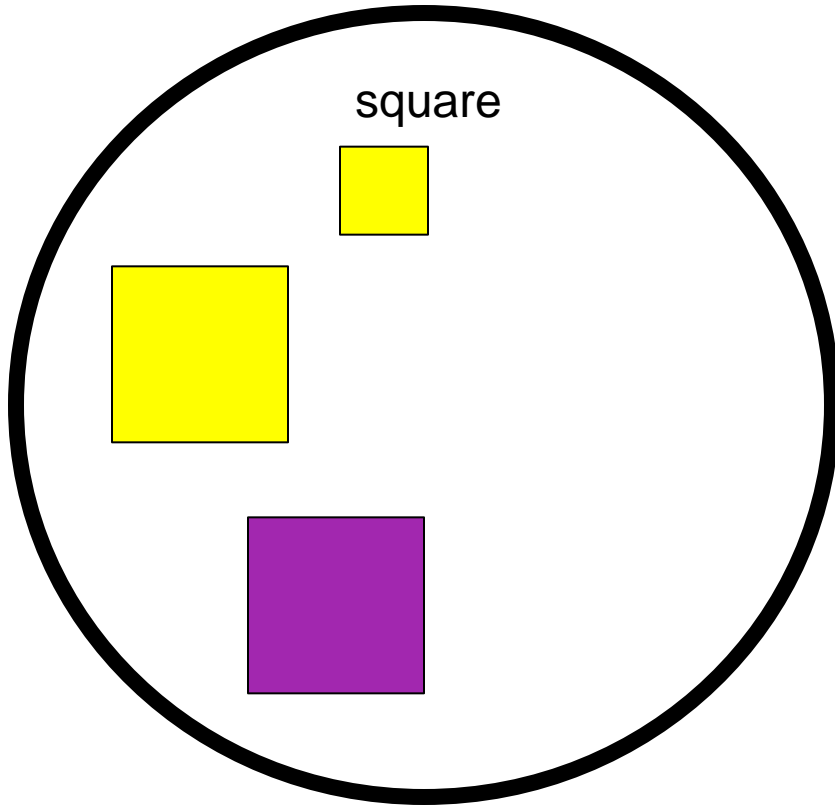
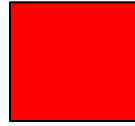
How Can I Find a Number?



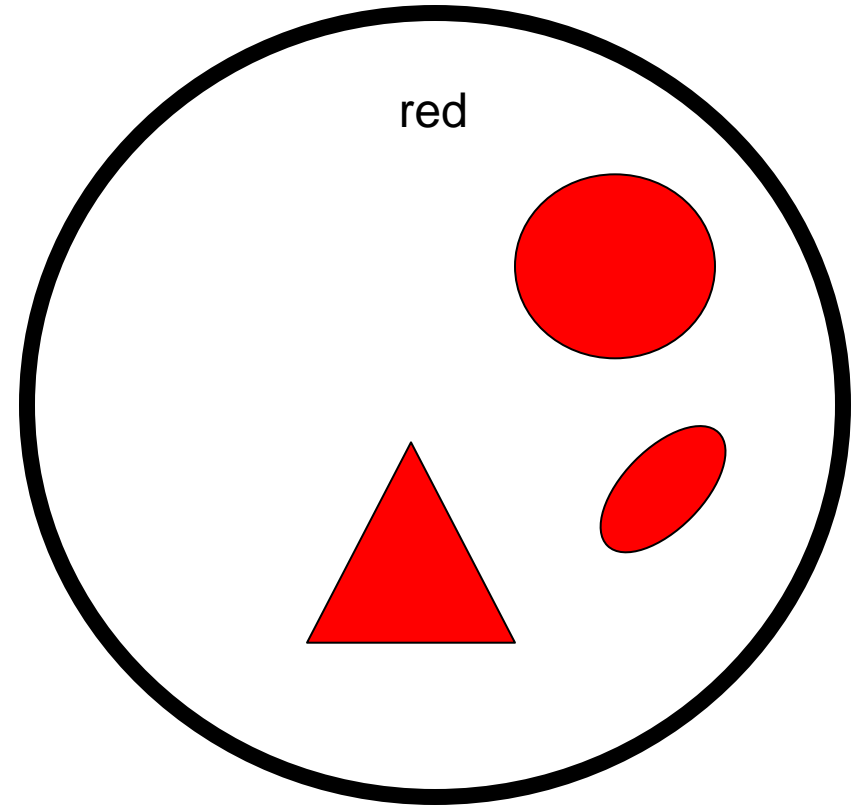
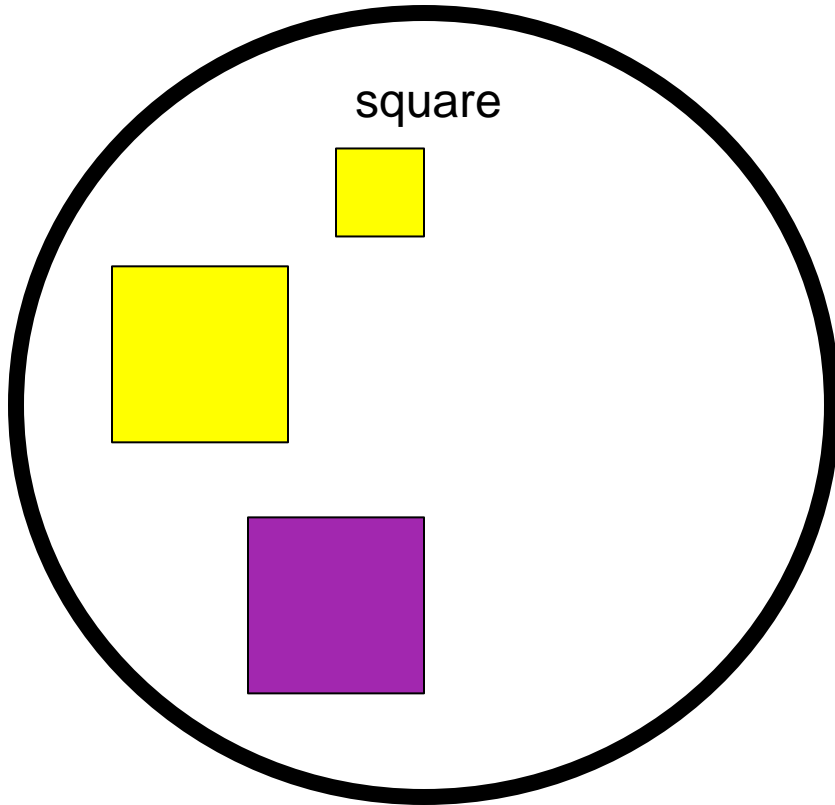
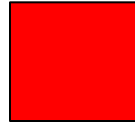
How Can I Sort?



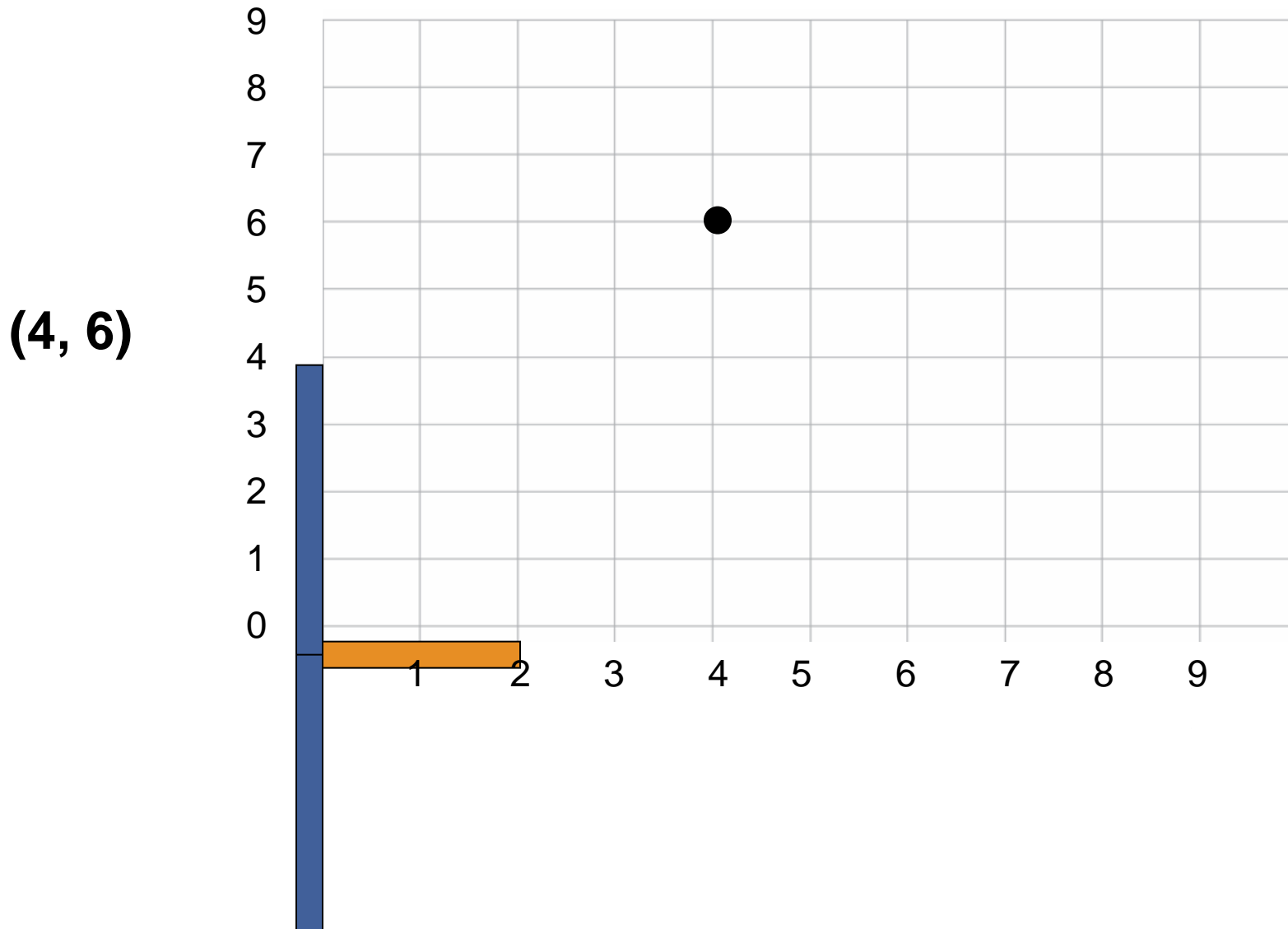
How Can I Sort with a Venn Diagram?



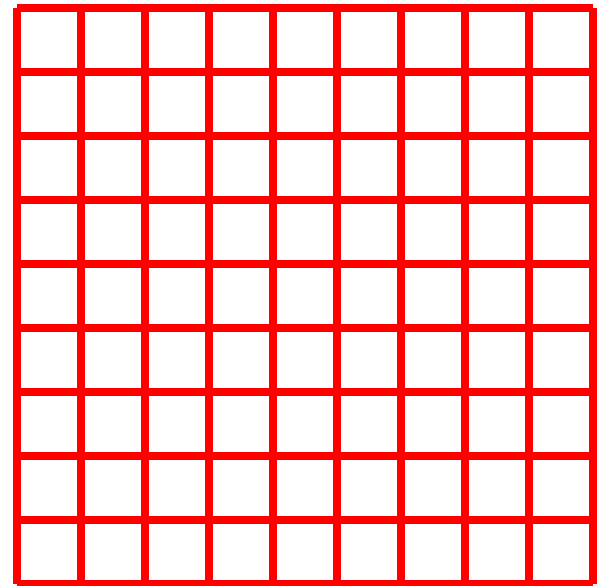
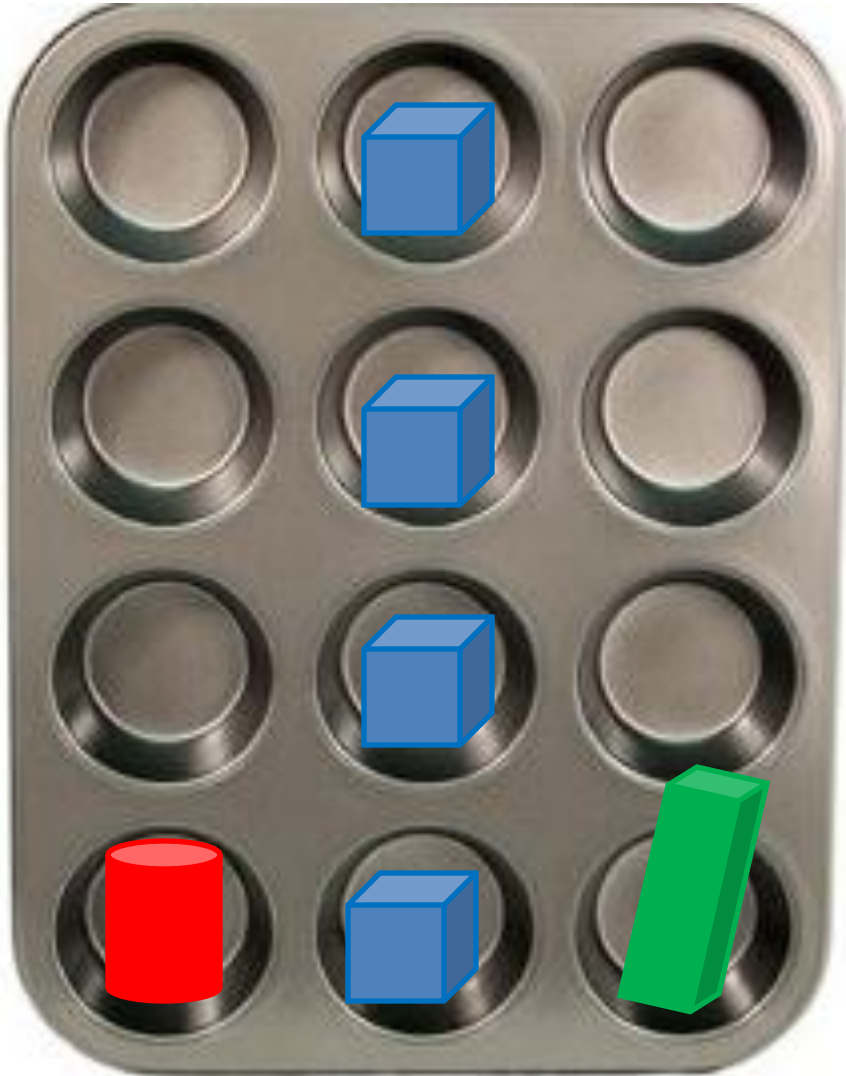
How Can I Sort with a Venn Diagram?



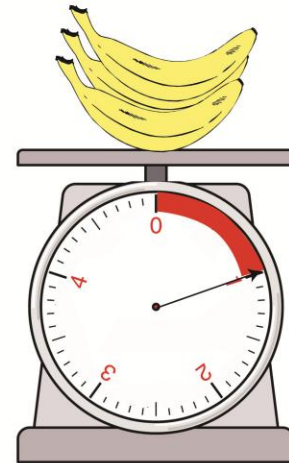
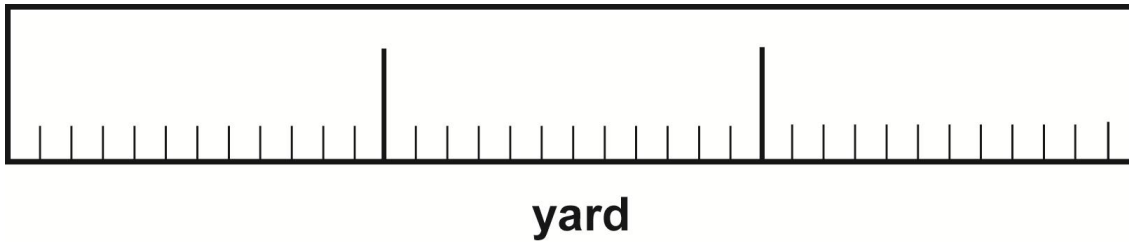
How Can I Graph Coordinates?



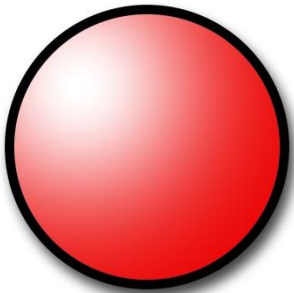
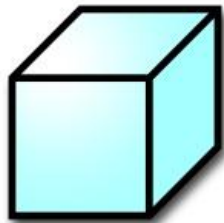
How Can I Make a Graph I Can Touch?



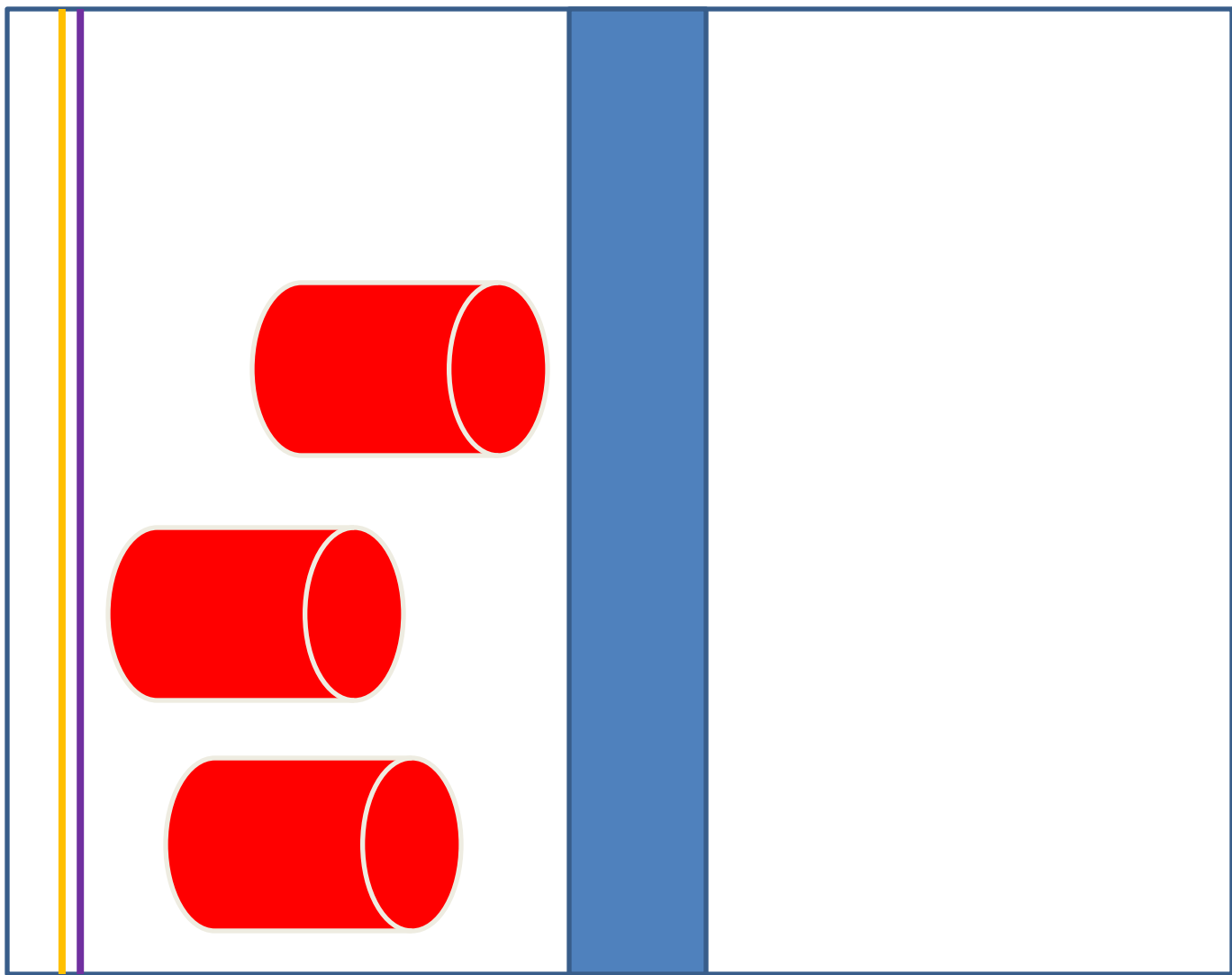
How Can I Learn the System of Numbers?



How Can I Find Shapes Around Me?



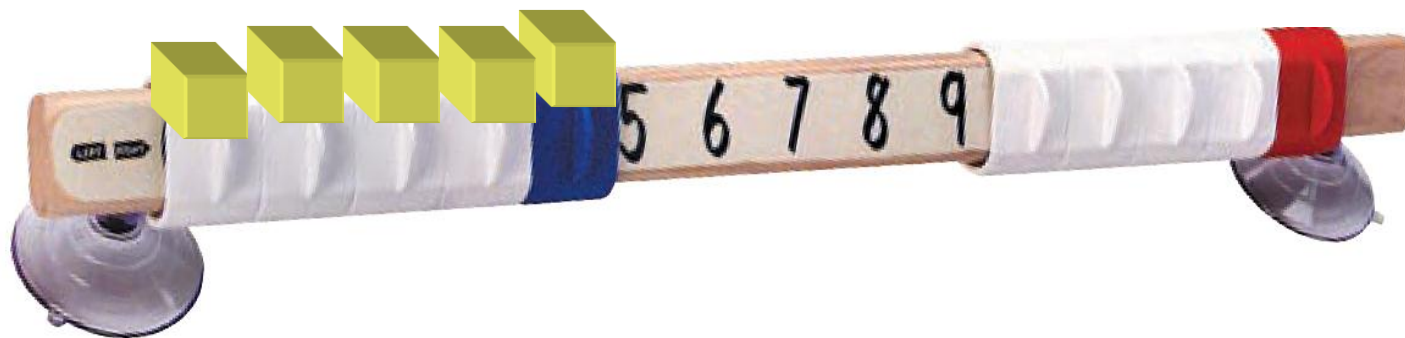
How Can I Use Manipulatives to Count?



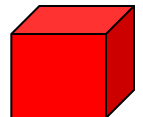
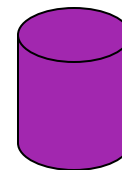
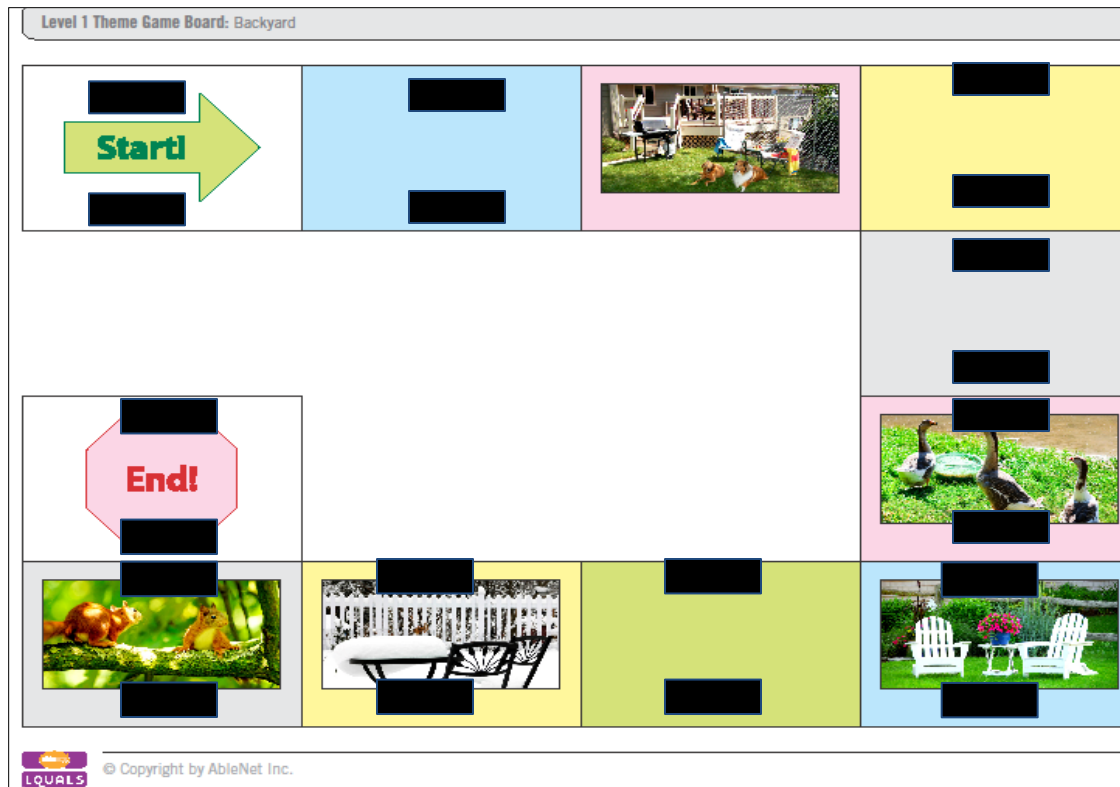
How Can I Use Manipulatives to Count?



How Can I Use Manipulatives to Add?



How Can I Play a Game?



How Can I Manage Fraction Manipulatives?

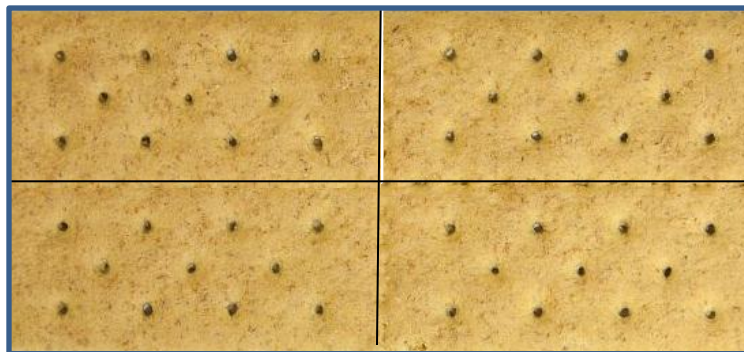


How Can I Understand Ratio in Fractions?

part



whole



1



4

How Can I Show What I Know?

What do I know about rectangles?



Geometry

7

Show line, angle, and vertex. Point to vertex. Ask, "What is this?"

Adaptation

Say, "Show the line." Move counting window over choices until s

8

Note: Student assessment page is only for item 7.

Show student response booklet. Say, "Show the rectangle. Draw it

Adaptation

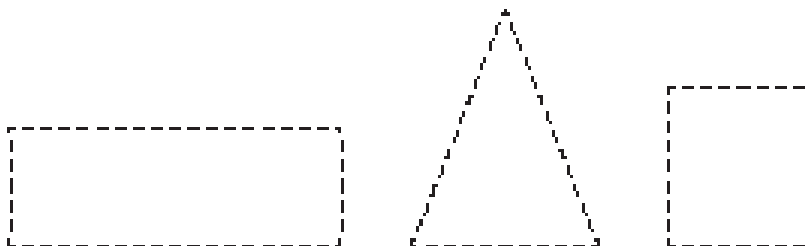
Show long Ang-legs, short Ang-legs, and insect in pocket chart. Sa
one side at a time. Repeat 3 more times.

54

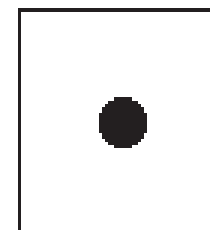
Geometry Directions 7, 8

GEOMETRY

Item 8



Item 7



Item 12



Item 23

0

1

2

3

4

Geometry

7

Show line, angle, and vertex. Point to vertex. Ask, "What is this?"

Adaptation

Say, "Show the line." Move counting window over choices until student indicates an answer.

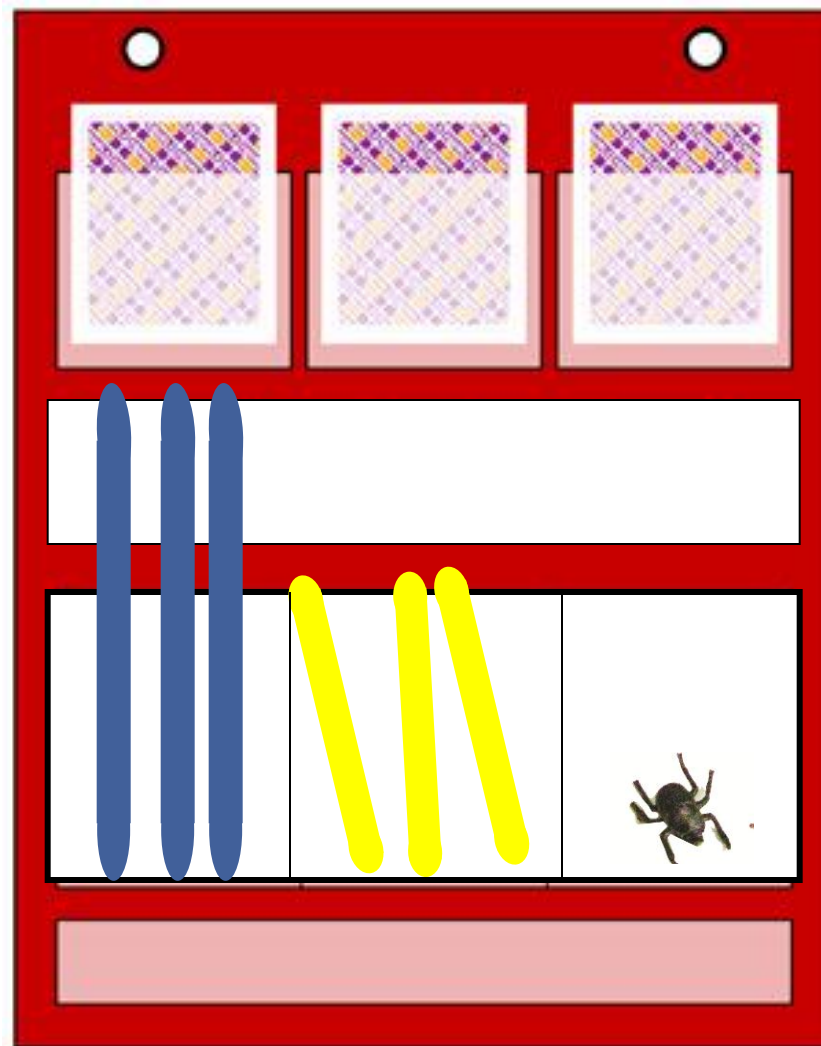
8

Note: Student assessment page is only for item 7.

Show student response booklet. Say, "Show the rectangle. Draw it."

Adaptation

Show long Ang-legs, short Ang-legs, and insect in pocket chart. Say, "Make a rectangle." Student chooses one side at a time. Repeat 3 more times.



How Can I Focus on My Learning?



How Can I Focus on My Learning?



Action Dictionary



say

express in words or picture symbols. A means of verbal expression allows students to answer a question, make a comment, state an idea, ask a survey question, estimate or predict. Other actions: ask, discuss, talk, tell, repeat, give ideas, imitate, state, report, announce, speak, name, respond, describe

EXAMPLE 1 The student activates the LITTLEmack or BIGmack communicator to say something.



INSTRUCTOR: The instructor records a single message into the LITTLEmack or BIGmack communicator. The instructor may provide a choice of picture symbols so student can choose what is recorded.

STUDENT: The student activates the LITTLEmack or BIGmack communicator to say a single message.

EXAMPLE 2 The student activates the Step-by-Step communicator to say a series of messages or ask a series of questions.



INSTRUCTOR: The instructor records a sequence of messages or questions on the Step-by-Step communicator.

STUDENT: The student activates the Step-by-Step communicator multiple times to say a series of messages or steps, or to ask a series of questions for a survey.

EXAMPLE 3 The student chooses the message to say with the SuperTalker, iTalk2 or Talking Brix.



INSTRUCTOR: The instructor fastens different picture symbols and records corresponding messages on the SuperTalker or iTalk2 or on two or more Talking Brix. For errorless learning, the instructor interprets the student's choice to frame it within context.

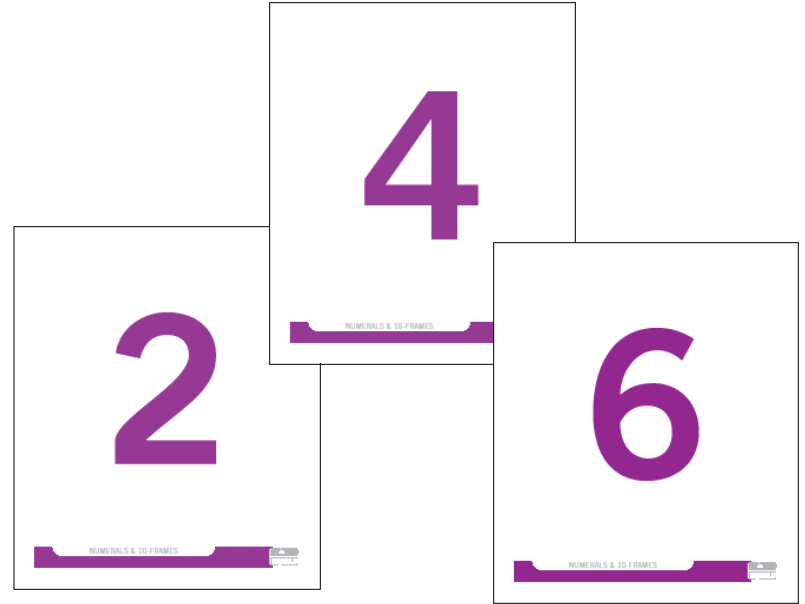
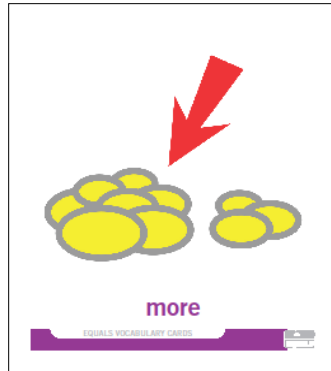
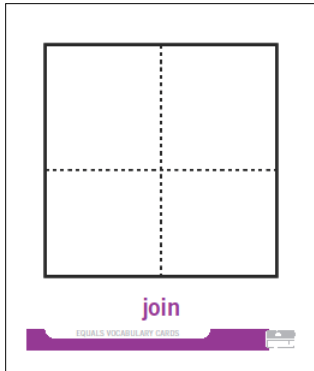
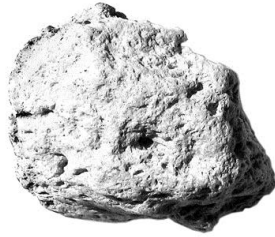
STUDENT: The student chooses and activates his/her choice of message by using the picture symbols.

EXAMPLE 4 The student indicates a choice of picture symbols or objects to say something.



INSTRUCTOR: The instructor places three picture symbol or object choices near the student. For errorless learning, the instructor interprets the student's choice to frame it within context.

STUDENT: The student eye gazes to, touches, or takes a picture symbol or object to communicate. The student may make a choice whether or not objects or pic-symbols are presented as choices or are simply available.



I joined sets.

More!

Action Dictionary



count

Name, recite or indicate numbers in order so as to identify number of units.
Counting can take place across all subject areas and activities during the day.
Other actions: sweep, slide, skip count.

EXAMPLE 1 The student sweeps objects to count.



INSTRUCTOR: The instructor places objects on counting tray. The instructor counts aloud as student sweeps.

STUDENT: The student sweeps each object as the instructor counts, and stops at the appropriate amount to indicate the number of units.

EXAMPLE 2 The student slides objects or tabs on the MathLine to count.



INSTRUCTOR: The instructor fastens objects to MathLine with rough-side hook and loop material on tab and soft-side on object (placed so numeral on MathLine is visible.) The instructor counts aloud as student slides and points to total as needed. For skip counting, group tabs with tape.

STUDENT: The student moves objects or tabs to the left on MathLine to count as instructor counts aloud. The student slides the tabs and finds the total on the MathLine.

EXAMPLE 3 The student counts using a Step-by-Step communicator.



INSTRUCTOR: The instructor records each number on each step in sequence on the Step-By-Step communicator. The instructor moves or points to each item as student counts. For errorless counting, record a silent step or "stop" after the last number required.

STUDENT: The student activates the Step-by-Step as instructor moves or points, and stops at the appropriate time.
Errorless counting: Student activates and stops when reaches silent step or "stop".

EXAMPLE 4 The student uses a calculator to count.



INSTRUCTOR: The instructor enters $1 + 1 =$ in calculator. For skip counting by tens, enter $10 + 10 =$, for fives enters $5 + 5 =$ and twos enters $2 + 2 =$. The instructor or student says the numbers aloud.

STUDENT: The student presses $=$ sign for each number (or group of numbers, if skip counting), as student or instructor says the numbers aloud.



Classroom Videos

Shift: More Hats

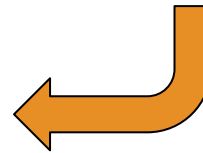
1. I am a math teacher.

- Math comes first
- Comprehensive & Systematic: progression of learning
- Teach math seriously and thoughtfully.



2. I am a special educator.

- Access for all
- Active learning
- Higher expectations



EQUALS DLP Project

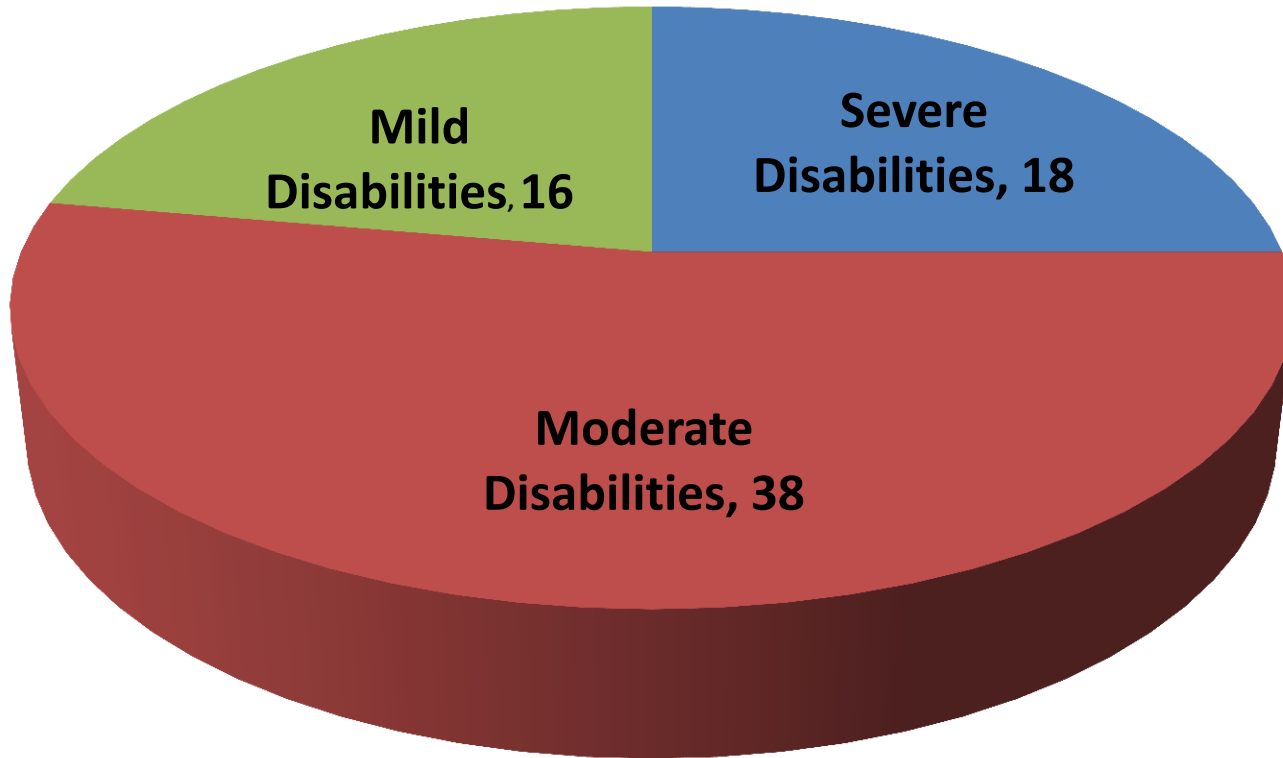
Research
Slides

Equals Study

A year-long test of the effectiveness of the Equals curriculum was conducted (2011-2012)

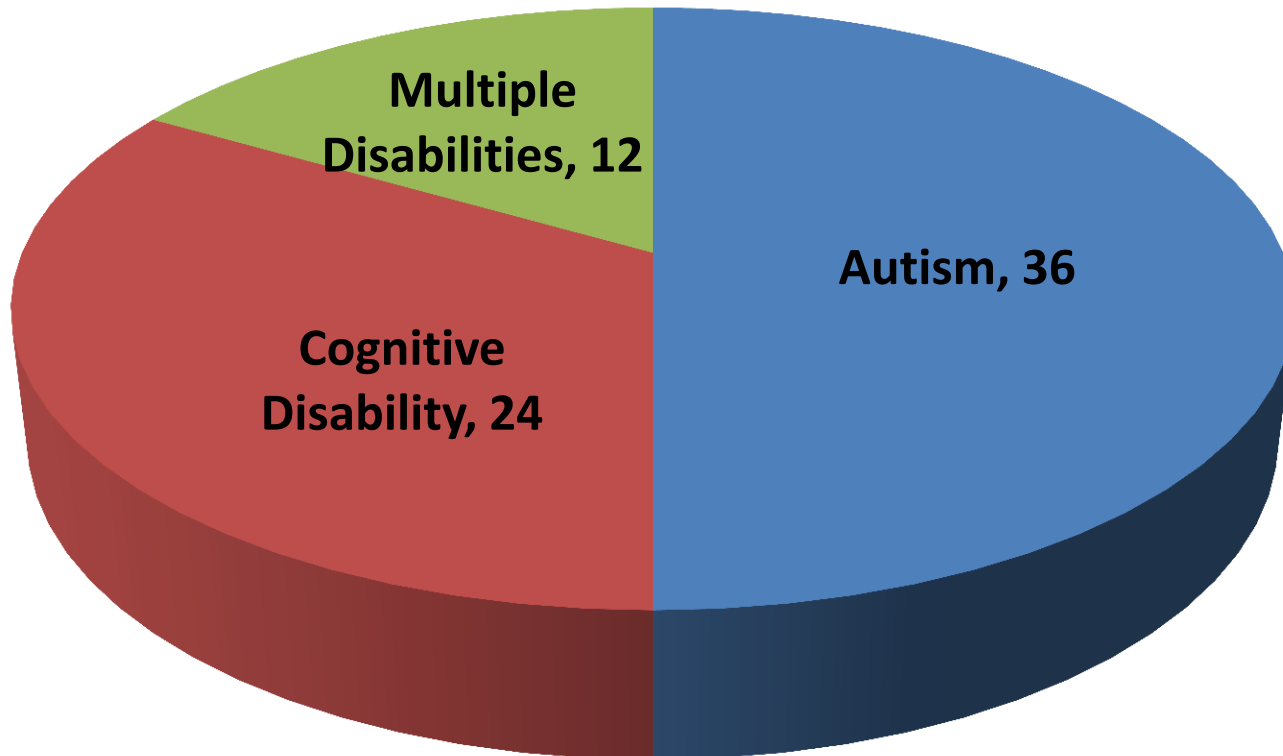
- 72 students with disabilities
- Grades K-8; ages 5-14
- Daily Equals instruction
- Small group (3-8) 40 min. sessions
- 21 participating teachers

EQUALS RESEARCH



Students by Instructional Level

EQUALS RESEARCH



Students by Disability Category

Equals Study

Data collection using Equals Assessment

- Pre-testing in September
- Post-testing in April
- Test administered
 - by trained assessors
 - unaffiliated with students they assessed

Teachers also given survey

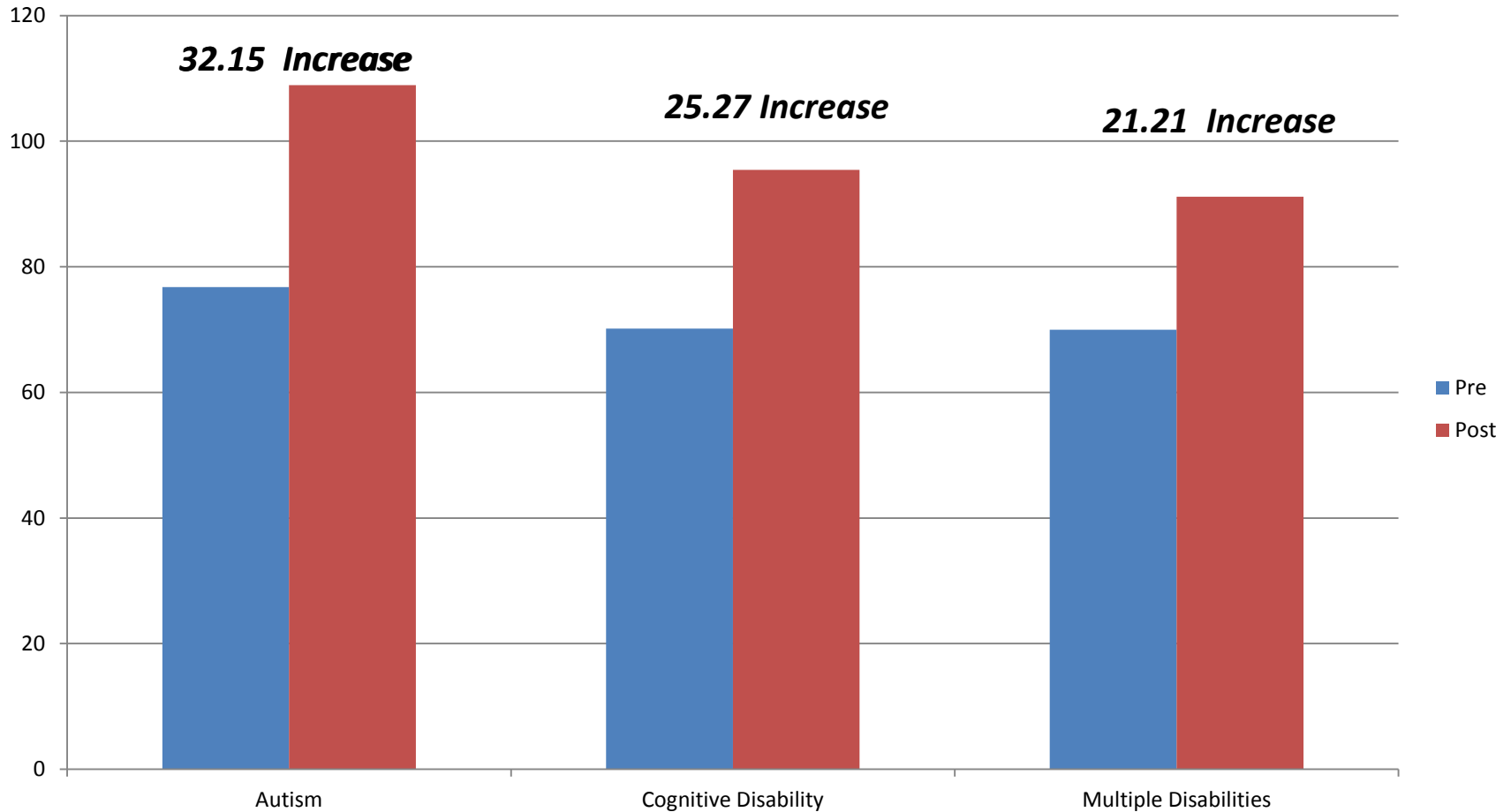
- 12 question Likert survey
- Rate the effectiveness and ease of use of the Equals curriculum
- Comments collected

Analysis

Progress = raw score April – raw score Sept.

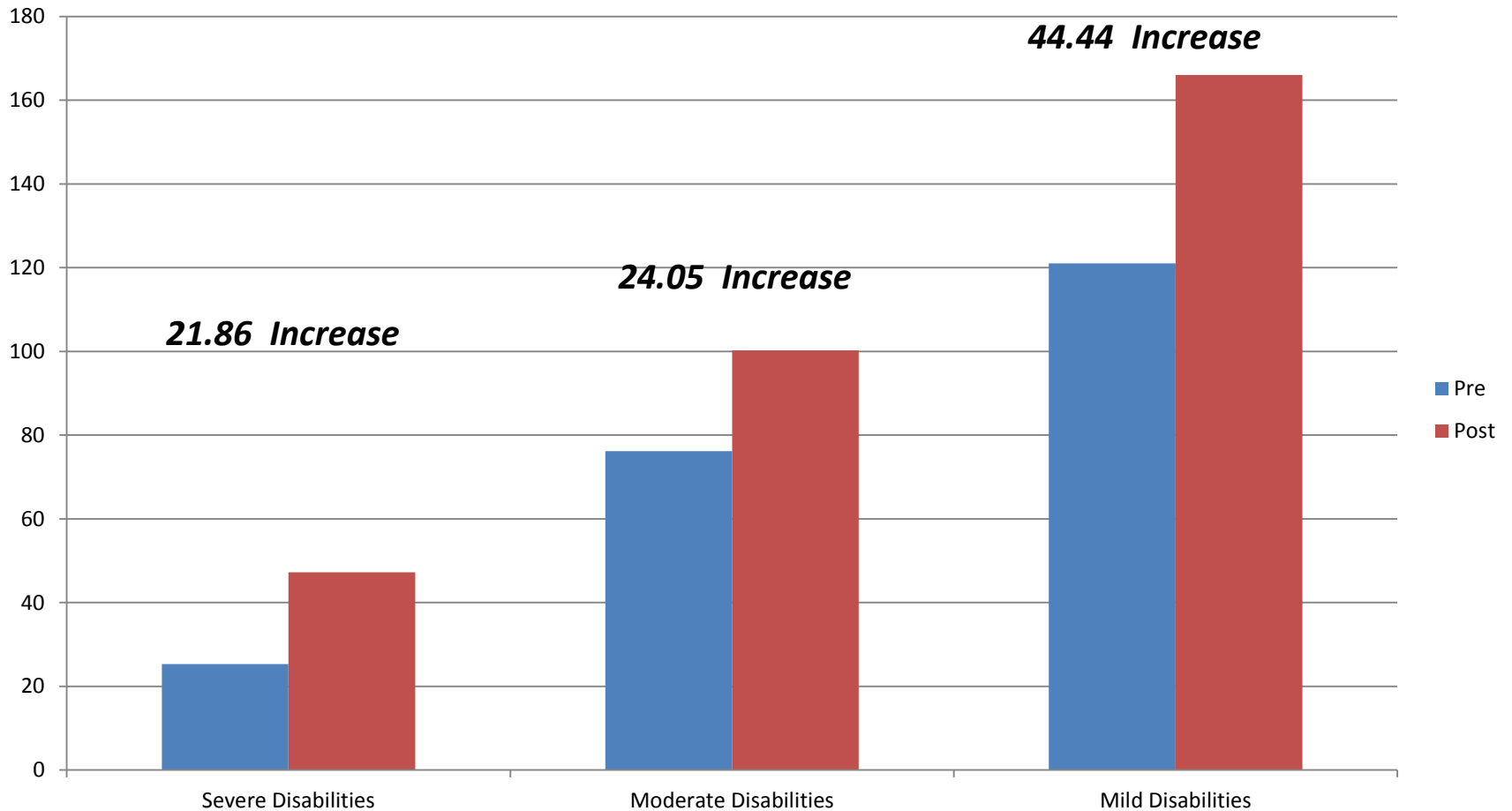
- Every one of the 72 students demonstrated progress
- No student regressed
- Taken altogether students gains averaged 38%

EQUALS RESEARCH



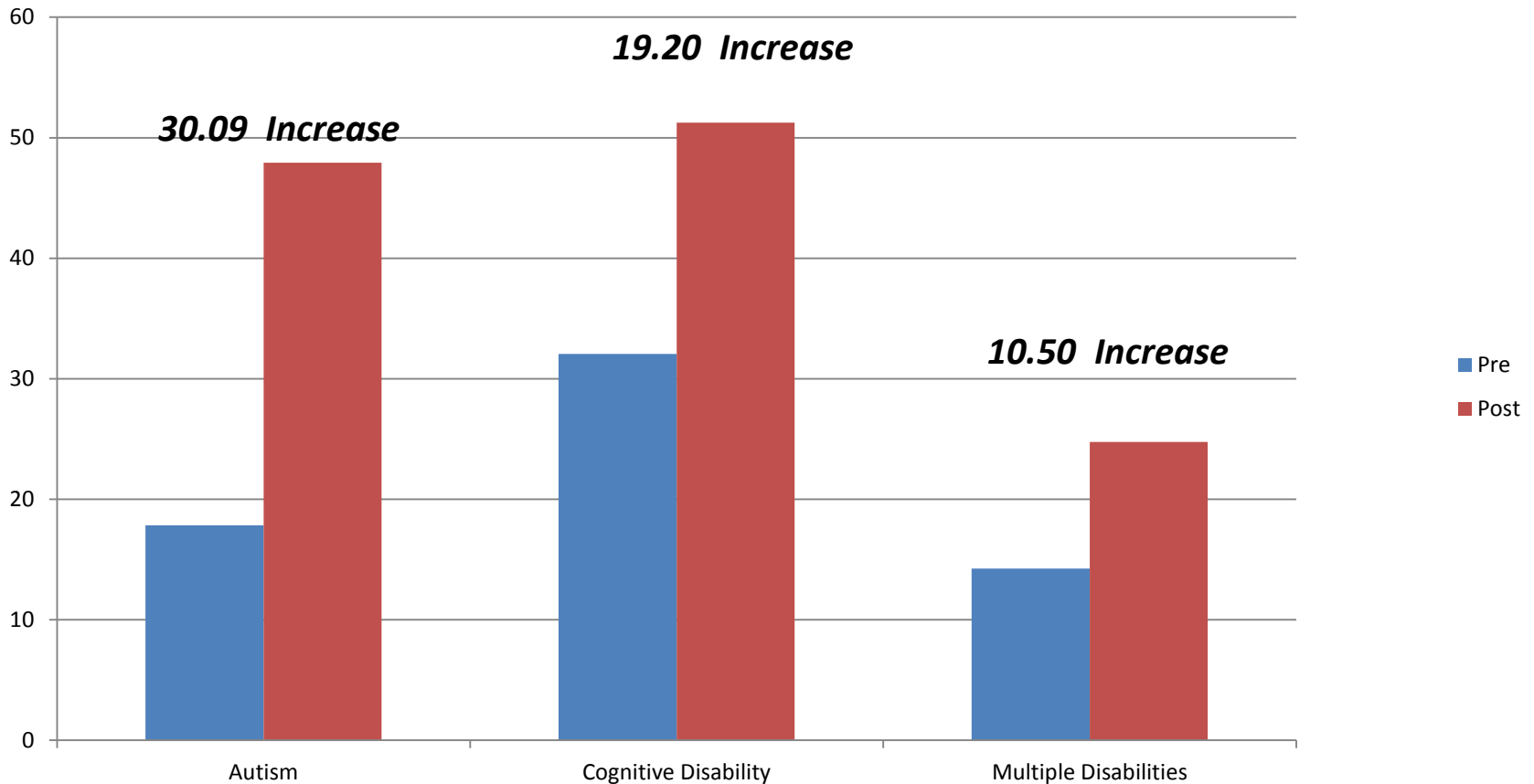
Pre and Post Assessment Results By Disability Category

EQUALS RESEARCH



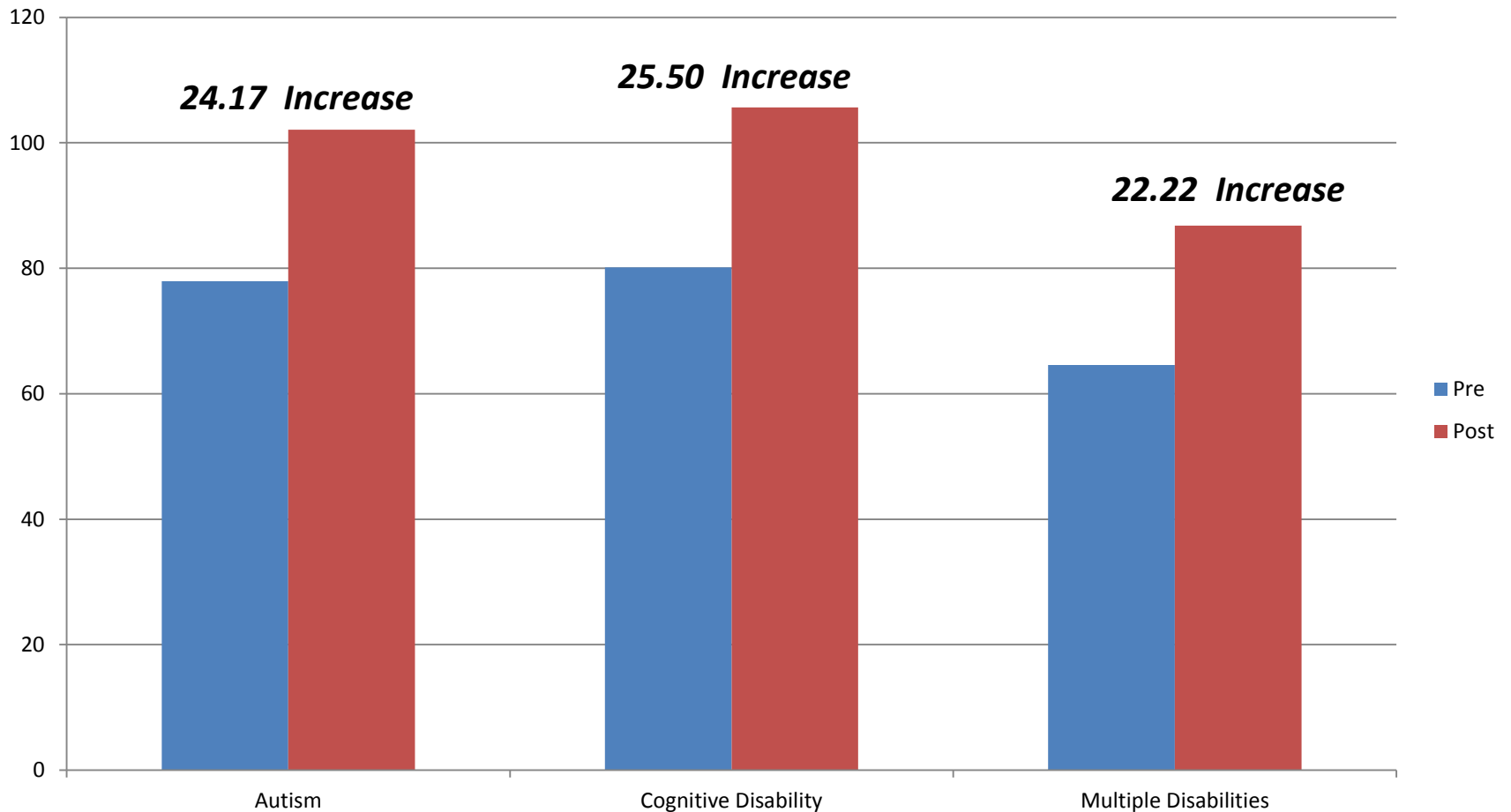
Pre and Post Assessment Results By Instructional Level

EQUALS RESEARCH



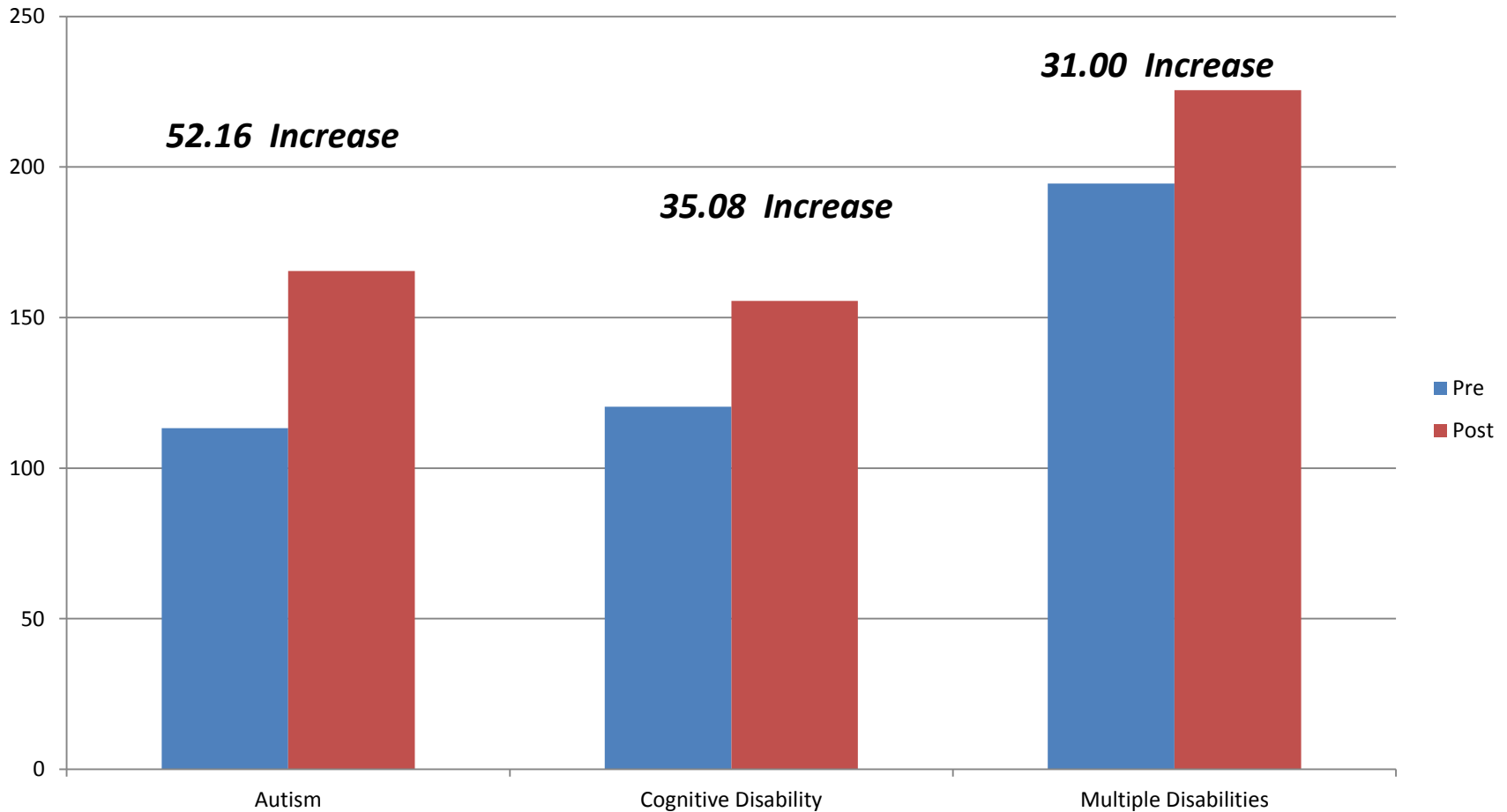
Level 1 Students – Severe Disabilities
Pre & Post Assessment Results By Disability Category

EQUALS RESEARCH



Level 2 Students – Moderate Disabilities
Pre & Post Assessment Results By Disability Category

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Level 3 Students – Mild Disabilities
Pre & Post Assessment Results By Disability Category

Equals Research Analysis of Teacher Surveys

No.	Question	Mean	Median
1.	How effective is the lesson layout with regards to lesson planning?	4.33	4
2.	How effective is the lesson layout with regards to execution of the lesson?	4.00	4
3.	How effective is the curriculum organization?	4.38	4
4.	How effective is the curriculum content/ skills taught with regards to student growth?	4.52	5
5.	How effective is the spiraling curriculum (continually building upon skills in later lessons) to our students?	4.62	5
6.	How effective has the Equals program been at increasing student knowledge of a variety of math concepts?	4.57	5
7.	How effective has the planning and implementation of lessons in a group setting been in contrast to previous practice (individual lessons for each student)?	4.33	4
8.	How effective are the skill drill worksheets?	3.76	4
9.	How effective are the problem solving worksheets?	3.33	3
10.	How effective are the chapter assessments?	4.04	4
11.	How effective are the manipulatives in conjunction with the lesson?	4.48	5
12.	How effective is the students' placement test in correctly assessing students for placement?	4.39	4

EQUALS RESEARCH



Questions

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Equals Math

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