

Oakland Schools Math Trajectories Assessment Tool














The Math Trajectory Assessment Tool was created in conjunction with Oakland Schools in suburban Detroit, MI and is based upon the book by Douglas H. Clemens and Julie Sarama, *Learning and Teaching Early Math: The Learning Trajectories Approach* as well as the training offering by Dr. Chris Cain in the Teaching of Mathematics for Students with Severe and Moderate Cognitive Disabilities. This tool is intended to be a teacher friendly way to connect assessment, learning trajectories, and instruction for students whose mathematics skills are significantly impacted by their disability.

The tool can be used as a visual reference to show current student achievement, highlight next instructional steps, and provides a way to demonstrate progress over time. The trajectories chart is grouped into two broad areas: numeracy/operations and geometry/measurement/data. This lends itself to the concept of having two comprehensive math goals using overall growth rather than viewing each column as a separate math concept to be taught in isolation. Ideally, the teacher would assess the student and then color code each block on the chart to show if the skill is present, emerging, or not being addressed at this time.

Educators have multiple assessments, strategies, and supports for students who are struggling readers and now we are making progress towards having diagnostic interventions and tools readily available for mathematics as well. Often, students with disabilities are not given engaging mathematical tasks and relegated to computation practice. By better understanding how mathematics knowledge is acquired through the trajectories, teachers will be able to provide increased opportunities for rich, engaging, and relevant math lessons. The early learning trajectories showed me the potential of early math concepts and this tool is meant to support teachers in creating exciting math opportunities for all.

MANIPULATIVES

Kits were created for the initial roll out in 2016 at an approximate cost of \$150 per kit including all printables. An inventory list with vendors is available. All items fit into a 10 gallon plastic tote and can be organized with plastic tubs to keep tools visible and easily accessible. Each trajectory task page has the required manipulatives abbreviated in the first column as follows:

CUBE	Snap cubes		SQIN	Square inch tiles		RULR	Ruler
CTWR	Connected towers of 1-8 cubes		PBLC	Pattern blocks		HUND	99-0 or 0-109 "Hundreds" charts
10TR	10 Frame trains		ABLC	Attribute blocks		\$WLT	Wallet with \$20
10MG	10 Frame magnetic boards w/counters		STCK	Sticks & bundles		BLOK	Bag of wooden blocks
SDOT	Subitizing dot cards		FBAG	Feely bag with viewing window		CARD	Deck of playing cards
BEAD	100 Bead rack		ANGL	Angles		MCUP	Measuring cup set
TANG	Tangrams		10FR	10 Frame dry erase marker sheet		HORS	Small toy horses

1 Number Recognition & Subitizing		Name	Student Response	Developing	Proficiency
	Skill				
1	Show 2 groups of cubes, one has 1 and the other has 4. Ask student "Which has more?"			V	2
CUBE	Show 2 groups of cubes, one has 2 and the other has 5. Ask student "Which has more?"			P	1
2	Show 2 cubes. Ask student "How many cubes?"			V	2
CUBE	Show 3 cubes. Ask student "How many cubes?"			P	1
3	Show 3 cubes in your hand and put 5 cubes on the table. Ask student to make a group with the same as you have in your hand. (Teacher prompt: "Make a group to match mine".)			V	2
CUBE	Give the student 5 cubes, ask "Give me 2."			P	1
4	Flash a group of 2 subitizing dots, ask student, "How many?" (Look for "knowing" how many, and do not give the student time to "count" as an accommodation.)			V	2
SDOT	Flash a group of 4 subitizing dots, ask student, "How many?"			P	1
5	Flash a group of 5 subitizing dots, ask student, "How many?"			V	2
SDOT	Flash a group of 1 and 3 subitizing dots, ask student, "How many in all or altogether?"			P	1
6	Using one 10 frame with 9 showing, ask student, "How many?"			V	2
10TR	Using one 10 frame with 6 showing, ask student, "How many?"			P	1
CUBE	Using one full 10 frame and a frame with 7 showing, ask student, "How many in all?"			V	2
7	Using one full 10 frames and the 3 dot card, ask student, "How many in all?"			P	1
10TR	Using one full 10 frames and the 3 dot card, ask student, "How many in all?"			V	2
CUBE	Using three full 10 frames and the 2 dot card, ask student to say, "How many in all?"			P	1
SDOT	Using two full 10 frames and dot cards showing 3 and 4, ask student to say the total.			V	2
10TR				P	1
SDOT				O	0
Link to classroom connections - 1				TOTAL POINTS	

ASSESSMENT CHART

MATH TRAJECTORIES PROGRESS CHART PART 1

Student Name _____ Date _____

Number Recognition & Subitizing	Counting	Composing, Ordering, Estimating	Adding & Subtracting by Counting	Arithmetic: Place Value & Multi-Digit
8 Conceptual subitizer with place value	Backward number counter Counter with place value	Benchmark estimator Composition estimator	Problem solver +/-	Composer with tens and ones
7 Conceptual subitizer to 20	Counter from N (1 more, 1 less) Counter of irregular items	Place value compare Intuitive estimator	Part-Whole - Numbers in 10	Deriver +/-
6 Conceptual subitizer to 10	Skip Counter by 2's and 10's Counts on, keeps track	Mental number line to 10 Self order to 6-	Makes group of 10 Find change +/-	Composer to 10
5 Receptual subitizer to 5 Conceptual subitizer to 5 (1)	Counter from 10 to 0 Represents number (1)	Spatial estimator-small Big Counting compare to 10	Small number - Make a group of 5	Composer to 7
4 Receptual subitizer to 4 (1)	Correspondence Cardinality - 1 dot's count (1)	Compare of dissimilar items Mental number line to 5	One more, one less to 5	Input part-whole recognizer Composer to 4 then 5
3 Maker of small collections (1-3, sometimes 4) (1)	Number reciter (2)	First Second Ordinal Counter Matching compare (1)	Nonverbal adding Nonverbal subtracting (1)	Pre-part-whole recognizer (1)
2 Names groups of 3-3 (2)	Names numbers (2)	Personal Composer (2)	Combines up to 3 (1)	Makes groups (2)
1 Recognizes more (2)	Number awareness (1)	Many-to-One Correspondence (2)	Aware of more & same (2)	Aware of whole-part (2)

Future Work

Clements and Sarama provide an alignment for the trajectories with Common Core standards. A cross walk connecting the trajectories with the Essential Elements to support teachers in writing SMART, standards-based IEP goals is in development and will be shared with teachers who have taken the assessment training. Instructional activities, web references, trade book suggestions, and teacher created materials to align with each trajectory will be posted through our MiPlace community as they are developed.

AUTHOR INFORMATION

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SCORING:

If the student is able to complete both task groups within a level, it would be marked 2 on the assessment and color coded green on the chart.

In cases where there is only one task, the student will either earn 2 points or 0 points.

If the student is able to complete one of the tasks consistently, it would be marked as a developing skill with a score of 1 and color coded yellow on the chart

PROMPTING:

If a student requires prompting to demonstrate their math abilities, that information can be recorded on the assessment by indicating the prompting level used.

V: Verbal P: Physical O: Other

ASSESSMENT CHART

Each column has eight blocks that show progress along a particular trajectory and should not be confused with a grade level or age. The chart is designed to be updated yearly in order to see the student's progress over time. It is expected that students will be at varied levels when results are compared across the trajectories. The instructional plan should not be isolated to a single column. The trajectories were designed to highlight the relationships and connections between the different strands of mathematics. Teachers can use the tool and chart to look across all areas of mathematics to determine next steps in the classroom.

2 Counting

Name _____

	Skill	Student Response	Prompting	Achievement
1 CUBE	Ask student "Tell me a number." Any number word is acceptable. (<i>Alt.: Use a choice board with letters and numbers or AAC device</i>)		V	2
	Ask student "How many cubes would you like?" (Look for any number word <u>not</u> some, all, or more.)		P	1
2 CUBE	Ask student to count to 5 or to count their fingers. (Look for at least 2 number words, <u>order is not important!</u>) As an alternate, ask student, "How old are you? Or "Tell me some numbers you know."		V	2
	Ask student to count a group of 6 cubes in a straight line, not connected, as you point to each one. (Look for at least 3 number words, <u>order is not important</u>)		P	1
3 CUBE	Ask student to count to 10. (Ask student if they can go higher? Look for 5 number words, not all have to be in order.)		O	0
	Ask student to count a group of 6 cubes displayed in a straight line, encouraging the student to point or touch each one. (Look for 1:1 correspondence.) Actual sequence or final count may be wrong, but student should say a number word for each object.		V	2
4 CUBE	Show a row of 4 cubes, ask student, "How many?" Student will count with 1:1 correspondence and <u>MUST repeat the total as a final answer.</u> (Look for cardinality)		P	1
	Ask student, "What number comes after 2?" (Student must get both right to earn one point)		O	0
5 CUBE ppper	Given 7 or more cubes, ask student to "Give me 5 cubes."		V	2
	Ask student to write or represent the numbers 1-10. Ask student to count a group of 9 objects that are not organized in any way. <u>MUST repeat the total as a final answer.</u> (Look for cardinality) (Both tasks required to earn one point)		P	1
6 \$WLT HUND	Ask student to count from 10 to 0 with the teacher removing blocks as they count down. (Look for ZERO)		O	0
	Ask student to skip count to 100 by 10's. Ask student to count to 20 by 2's.		V	2
7 CTWR	Ask student using finger models, "How many is 2 more than 3? Let's count on..." (Look for the student to count on from 4. If they are counting from 1 every time, the student is not proficient.)		P	1
	Flash 2 dollars in the wallet and give three to the student. Ask student, "You have \$2 in your wallet and here are 3 more dollars, "How many do you have altogether?" (Look for the student to count on or use fingers for 2)		O	0
8 HUND BEAD	Ask student, "What is one more than 56? What is one less?" Next ask, "What is one more than 80? What is one less than 80?"		V	2
	Offer a hundreds chart, sticks & bundles, or a bead rack, ask student to, "Start with 23 add 30. How many in all?" Then, "Add 2 more. How many do you have now?" Ask student to count backward from 20 to 0. Ask student to count backwards from 54 and stop them at 37. (Look for what happens at decade numbers)		P	1
Link to classroom connections - 2		TOTAL POINTS		

4 Addition & Subtraction

Name _____

	Skill	Student Response	Prompting	Achievement
1 CUBE	Show 5 cubes and 1 cube, ask student to choose the group which has more .		V	2
	Give 4 cubes to the student and the teacher has none. Ask student to give " some " cubes to you, so it is fair.		P O	1 0
2 CUBE SDOT	Show the 1, 2, and 3 dot cards as answer choices. Say to the student, "I am giving you <u>1 cube</u> and now I am giving you <u>1 more cube</u> . Give me the dot card that matches how many cubes you have in all."		V	2
	<u>Give</u> the student 2 cubes and then 1 more cube. Ask student, "How many in all or total ?" (Dot cards as answer choices are allowed as well as verbal or AAC responses.)		P O	1 0
3 CUBE	Put 2 cubes on the desk with 3 off to the side. Ask student, "Can you add one more to my group?"		V	2
	Put 4 cubes on the desk and ask the student, "Can you take away or subtract two cubes from my group?"		P O	1 0
4 \$WLT	Tell the student they have \$2 dollars to start and you will give them \$1 for doing a classroom job. Ask student, "How many dollars do you have now or in all ?" Student is allowed to use the money as a counting model.		V	2
	Give the student \$5 and let them "buy" a desired object or treat for \$1. Ask student "How much money do you have now or left over ?" Student is allowed to use dollar bills as models.		P O	1 0
5 10FR CUBE \$WLT	Show 3 cubes in a 10 frame or 3 fingers, ask student " How many more to make a group of 5?"		V	2
	Give \$5 but explain that they actually need \$8. Ask student, " How many more dollars do you need?"		P O	1 0
6 \$WLT	Show 7 cubes in a 10 frame or 7 fingers, ask student "How many more to make a group of 10?"		V	2
	Show \$2 and the closed wallet, explain that you put some more money in their wallet as a surprise. Now they have \$6 altogether. Ask student, "How may dollar bills did I put in your wallet?"		P O	1 0
7 CUBE 10FR	Give a 10 frame trains and 20 cubes (10 light, 10 dark) Ask student, "Show two ways of making a ten ."		V	2
	Ask student to add $5 + 5 + 2$ (Look for finger use, doubles, or "make 10" as a strategy. All strategies are GOOD) Ask student to add $8 + 7$ and explain their thinking with with NO model. (Teacher prompt: tell me how this sounds in your head. Both problems can be written down for the student, but they need to solve in their head!)		P O	1 0
8 CUBE 10FR	Ask student to add $20+16$ using 10 frame trains, hundreds chart, or sticks & bundles, or a bead rack. Ask student to subtract $18 - 7$. (No regrouping required)		V	2
	Ask student to add $23 + 17$ (exchanging the ones for a ten) using 10 frame trains, or a hundreds chart, or sticks & bundles, or a bead rack. Ask student to subtract $34 - 16$ using manipulatives. (Requires regrouping)		P O	1 0
Link to classroom connections - 4		TOTAL POINTS		

MATH TRAJECTORIES PROGRESS CHART PART 1

Student Name

Date

	Number Recognition & Subitizing	Counting	Comparing, Ordering, Estimating	Adding & Subtracting by Counting	Arithmetic- Place Value & Multi Digit
8	Conceptual subitizer with place value	Backward number counter Counter with place value	Benchmarks estimator Composition estimator	Problem solver +/-	Composer with tens and ones Multi-digit +/-
7	Conceptual subitizer to 20	Counter from N (1 more, 1 less) Counter of imagined items	Place value comparer Intuitive estimator	Part-Whole + Numbers-in- 10	Deriver +/-
6	Conceptual subitizer to 10	Skip Counter by 2's and 10's Counts on, keeps track	Mental number line to 10 Serial orderer to 6+	Make a group of 10 Find change +/-	Composer to 10
5	Perceptual subitizer to 5 Conceptual subitizer to 5 (1)	Counter (From 10 to 0) Represents numbers (1)	Spatial estimator-small/big Counting comparer to 10	Small number + Make a group of 5	Composer to 7
4	Perceptual subitizer to 4 (1)	Corresponder Cardinality - totals count (1)	Comparer of dissimilar items Mental number line to 5	One more, one less to 5	Inexact part-whole recognizer Composer to 4 then 5
3	Maker of small collections (1-3, sometimes 4) (1)	Number reciter (2)	First-Second Ordinal Counter Matching comparer (1)	Nonverbal adding Nonverbal subtracting (1)	Pre-part-whole recognizer
2	Names groups of 1- 3 (2)	Names numbers (2)	Perceptual Comparer (2)	Combines up to 3 (1)	Makes groups (1)
1	Recognizes more (2)	Number awareness (2)	Many-to-One Corresponder (2)	Aware of more & some (2)	Aware of whole/part (1)

QCA P1		Strands of the Numeracy Strategy				Key levels of experience • Encounter • Awareness • Response
1. Pupils show reflex responses, they encounter a range of people, objects and materials in everyday7 2. Begin to show sensory awareness and focus briefly, with intermittent responses, e.g. brief gasp, or surprise at onset/close of interactions. EQUALS Level 1 • Reflexive reactions – Sensory awareness and responses.		Counting and recognising numbers The number system	Adding and subtracting Calculations	Solving problems Handling data	Measures, shape and space	
Teaching Focus Sensory Development Including Attention and Perception	Interpretation that describes the strand appropriately for PLD pupils	Learn to tolerate and enjoy stimulation. Use sight, touch, hearing or smell to encounter one or a number of objects or events. Extend glances and combine or coordinate with reflexive movements to improve coordination of attention. Feel sequential touching, and have assistance with rhythmic clapping of hands or movement of limbs.	Encounter and be aware of increasing and decreasing stimuli/quantity: Light – brightness, flash frequency and rhythm, start, end, darkness. Sound – volume, timbre, rhythm. Quantity – sequence or increase/decrease of objects. Weight and volume – increase/decrease. Touch – rhythmic pressure motion. Movement – frequency of stops and starts.	Encounter and respond to stimuli, begin to show response to different aspects of a stimulating event. Be encouraged to focus on main or particular features of a stimulus. Experience sequential events. See/experience objects being hidden and revealed. Have anticipation, surprise, pleasure or disappointment modelled. Visually track the movement of single objects. Glance between objects.	Encounter, be aware and respond to spaces, shapes, and time patterns. Hear associated language including intonation that emphasises description of size, frequency, etc. Encounter long and short periods of stimulus. Hear commentary or be assisted to feel changes during travel or movement, e.g. round corners or through doors in wheelchair.	P1. Practical examples • Light and sound sequences may be used as stimuli for direct teaching. For example, an adult makes sound patterns by tapping or scratching rhythmically on a resonance board and watching for responses from the child laying on it, accompanying the patterns with language related to sequence. At earliest levels (P1.i) the child may show reflex response, even tolerance may be a significant achievement. Later (P 1.ii) the child will extend the level of awareness and begin to show an attentive response, perhaps showing some anticipation of the sequence continuing, or some desire for repeat. • Haptic perception of weight, volume, shape etc. through touch or the development of the notion of 'Oneness' depends upon learning to hold items. To avoid tactile defensive responses items can be presented by stroking them along the child's arm towards the palm. Items like meditation chime balls create an additional attention stimulus that may encourage the child to look or listen towards what they are grasping. Language should describe the sequence of events, or the nature of one object then another. Later levels may include giving and taking. • Child may enjoy inclusion in social interaction between adults and peers, e.g. as they respond to changes and sequences of a game, hearing the intonation of turn taking language of gaining and losing. Awareness of the differentiated learning taking place will allow staff to promote appropriate inclusion.
	Active Physical Development	Experience reaching towards and brief touch of single objects. Begin to combine reflexive movements to develop purposeful touch. Begin to extend glances at single objects and test with touch, eyes, nose and mouth. Have large and small movements, rhythmic movement of limbs and manipulation of fingers modelled physically.	Be helped to reach and touch and grasp objects, with single, both or alternate hands, experience assisted hand-to-hand transfer. Have objects taken from them and given to them. Experience finger manipulation and body part touching, associated with vocalisations about increasing and decreasing sequences.	Experience physical responses to their actions, e.g. give in response to their reach. Activities that encourage increasing control, extension and combination of reflex actions, e.g. modelling combined sweeping and grasping, or reaching and picking up, and placing items. Be assisted to pick up different objects and explore the nature of their different properties.	Extend grasping by modelling, feeling and holding of shapes and solids. Move or be moved in and through spaces of different kinds, e.g. open, narrow, low, etc. Experience people's responses to seeking and finding things. Remarks about things in usual places. Feel stretching and curling of body, limbs and digits.	
Sharing and Communicating		Learn to respond and make sensory contact and eye contact with adult. Be encouraged to maintain focus on single objects. Hear language, with intonation that emphasises quantities, beginning and end of sequences, etc. See or feel gestures associated with quantities, including pointing, rhythm and counting sounds.	Be aware of comings and goings. Experience language intonation and gestures, associated with changes involving increasing and decreasing, or gaining and losing, having something or having nothing.	Encounter, be aware of or respond to communications in response to their own actions. Hear comments that • Draw attention to objects and events • Encourage or indicate sharing • Describe and question – Do you like? Do you want? • Praise anticipation, response, waiting.		

Most learning activities will include a variety of elements of focus

Figure 13.7 Mathematical activities in focus at P1

QCA P2		Strands of the Numeracy Strategy				Key levels of experience
1. Make responsive actions using trial/error, show reactions to familiar people and objects. Explore with help, e.g. reaching/holding objects, turning towards. 2. Engage with others, communicate with sound/gesture. Recognise familiar people, events and objects. Remember responses, join cooperative exploration. EQUALS Level 2 • Deliberate reactions – Track and handle objects, interest in object permanence, main events.		Counting and recognising numbers	Adding and subtracting Calculations	Solving problems Handling data	Measures, shape and space	<ul style="list-style-type: none"> • Response • Engagement • Participation
Interpretation that describes the strand appropriately for PLD pupils	The number system Appreciating quantity. <i>Noticing, itemising, identifying, matching.</i>	Appreciating and anticipating changes that create increase and decrease. <i>Collecting, separating, Precursors to calculating.</i>	Active responses – making things happen. Organising responses, things and information. <i>Comparing and remembering, Precursors to recording.</i>	Appreciating and manipulating space, shape and time patterns.	Examining objects of different shape, size and length. React to spaces or shapes and show preferences about them. Show engagement in response to long and short time patterns or tactile experiences. Engage in attention to changing weights and pressure. Anticipate movements and destinations.	• The child attends as items are placed into and tipped out of containers, or may be helped and encouraged to do it themselves. For this kind of activity choose boxes that make interesting sounds that add an attention grabbing dimension, the sound of objects being dropped in can also be associated with sequence or counting words. • Children can be encouraged to scan a series of objects and hear associated language, for example, creating a sequence of sounds from a row of drums or tins, or pointing at a series of objects or people with a torch. Anticipating turns and hearing sequence or number words. • Holding and examining objects that have been linked together, for example, a pair of washing-up brushes, or three marbles in a Persil bag, in this way children experience the handling of more than one item at once, yet the group remains stable.
	Maintain interest and attention to sensory input relating to quantities. Look from one object/sound or light source to another. Show interest in difference between one and two items. Use visually directed reaching, or reach to sound of an object. Begin to use reach and point actions.	Engage in attention to changes of increase and decrease. Maintain attention and respond, showing awareness that change is occurring. Cultivate interest in object permanence. Feel objects that have been hidden as they watch. Encourage visualisations. Be offered alternatives between one and two items, and encouraged to realise which is more. Substituting – encounter and show interest in small group patterns	Respond to stimuli and show an interest and desire to participate in changing, continuing or stopping events. Discern between different stimuli and signal like/dislike. Focus on specific features and maintain interest, cooperative exploration, repeat responses. Track visual sequences or arrays of objects.	Respond to adult's comments about spaces, shapes, length, weight, time, etc. and maintain attention to events. Initiate communication with expression gesture, sound or pre-verbal vocalisation, expressing responses to spaces, shapes, etc. Hear language intonation and see or feel gestures associated with spaces, shapes, length, weight, time, etc.		
Active Physical Development	Apply more complex schema to the process of exploring objects, e.g. shaking, stroking and poking. Point, reach for, touch objects. Hold single items. Eye point from one object to another. Be assisted to experience hand transference or holding more than one object. Be encouraged to make sounds to accompany rhythmic limb or finger manipulations.	Gain and discard objects. Be encouraged to uncover objects that they have seen being hidden. Collect items together, on lap or table. Put items into and take them out of containers or bags. Touch objects in turn. Touch fingers or body parts in turn.	Be assisted to actively participate in controlling and changing quantities or events. Holding, giving, moving, pushing, pulling. Use a two-handed scoop to pick up. Picking up and putting down. Be encouraged to control the placement, or position of items, or to choose to place things in different containers. Single switch control.	Move or be moved in and out of spaces. Reach and hold or otherwise engage in tactile experiences of shape, length and weight. Be assisted to make large exploratory movements feeling objects/ space. Notice things not in their usual place. Participate in response to instructions about stretching, curling, or reaching with body, limbs or digits.	Respond to adult's comments about spaces, shapes, length, weight, time, etc. and maintain attention to events. Initiate communication with expression gesture, sound or pre-verbal vocalisation, expressing responses to spaces, shapes, etc. Hear language intonation and see or feel gestures associated with spaces, shapes, length, weight, time, etc.	
Sharing and Communicating	Experience models of turn taking while attending to objects and quantities. Show or give objects to adults, be encouraged to alternate focus between objects. Hear language, intonation and see or feel gestures associated with quantities, including rhythm and counting sounds – have their own responses responded to.	Share responses to comings/goings and events, express an interest in frequency, increases and decreases. Express a desire for more or less. Show satisfaction and dissatisfaction, via facial expression, gesture, sound or pre-verbal vocalisation. Hear language, intonation and see or feel gestures associated with increase and decrease.	Respond to adult's comments and then maintain attention to events. Initiate communication about changes using expression, gesture, sound or pre-verbal vocalisation. Make a response to immediate instructions. Seek recurrence of events. Hear and attend to language intonation, see or feel gestures associated with making things change.	Respond to adult's comments about spaces, shapes, length, weight, time, etc. and maintain attention to events. Initiate communication with expression gesture, sound or pre-verbal vocalisation, expressing responses to spaces, shapes, etc. Hear language intonation and see or feel gestures associated with spaces, shapes, length, weight, time, etc.		

Most learning activities will include a variety of elements of focus

Figure 13.8 Mathematical activities in focus at P2

QCA P3		Strands of the Numeracy Strategy			Key levels of experience	
1. They participate in exploring, showing anticipation and appropriate responses to familiar people, activities and routines.		Solving problems Handling data			• Participation	
2. They have become involved, actively explore and manipulate objects, remember and apply potential solutions. They communicate choices, likes and dislikes using sounds, tones and/or gestures as they move towards gaining skills that will support understanding.		Active responses – making things happen. Organising responses, things and information. <i>Comparing and remembering. Precursors to recording.</i>			• Involvement	
EQUALS Level 3 • Varied deliberate reactions – Imitate gestures and activities, recognise cause and effect/explore associate properties. Anticipate events.		Express desire to change stimuli/event or objects. Anticipate and respond to instructions, e.g. wait 1, 2, 3, now. Use own personal sounds, intonations, and gestures to indicate direct events. Anticipate and express consequences of change. Direct a sequence of events. Take items and place in organised ways.			• Understanding	
Strand description		Measures, shape and space				
• Reception numbers • Y1 onwards		Appreciating and anticipating changes that create increase and decrease. <i>Collecting, separating. Precursors to calculating.</i>				
Interpretation that describes the strand appropriately for PLD pupils		Associate objects of similar shapes together – equate to representation. Anticipate and respond appropriately to spaces changes, patterns of time and to changes in position, size, etc. Discern odd one out, etc. Make choices about them and show preferences. Make decisions about direction and movement. Make large exploratory movements feeling objects/space.				
Teaching Focus		Participate and experiment with changing positions of objects. Anticipate effects of changes of shape and size. Explore bringing shapes together and creating sequences of shapes, objects or sounds – vocal or instrumental. Choose spaces to move or be in. Experiment with changing body position, posture, movement, direction, speed, rhythm, etc.				
Sensory Development Including Attention and Perception		Actively instigate changes to objects and collections, events, etc. Create effect by moving/positioning objects. Experience various schema as appropriate, e.g. vertical/horizontal, circular, trajectory, enclosure, rotation, etc. Anticipate effects – change of place, increase or depletion, etc. Integrate picking and placing schema to place items next to each other. Combine objects appropriately. Point to marks – make marks.				
Active Physical Development		Express desire to change stimuli/event or objects. Anticipate and respond to instructions, e.g. wait 1, 2, 3, now. Use own personal sounds, intonations, and gestures to indicate direct events. Anticipate and express consequences of change. Direct a sequence of events. Take items and place in organised ways.				
Sharing and Communicating		Offer and accept items. Showing items to gain attention or giving items to prompt actions. Use own personal sounds, symbols or gestures to name objects, events or numbers. Itemise using sequences of sounds. Use intonation to mark beginning/end. Ask for items that are out of sight. Use deferral/imitation – copying the actions of a person who is not present.				
Strand description		Counting and recognising numbers The number system				
• Reception numbers • Y1 onwards		Adding and subtracting Calculations				
Interpretation that describes the strand appropriately for PLD pupils		Appreciating and anticipating changes that create increase and decrease. <i>Collecting, separating. Precursors to calculating.</i>				
Teaching Focus		Recognise connections between stimuli/objects/events. Engage in close attention to changing quantities and anticipate changes. Discriminate (by subdividing) between small groups (1 to 4), recognising more/less, choose group with most. Maintain interest in quantities after they have been hidden. Appreciate when there are still more hidden items yet to be revealed.				
Sensory Development Including Attention and Perception		Gather collections and separate groups of items. Experience incremental itemisation of objects, or on a physical number line/string. Participate with adult itemising objects. Make sound or rhythm to itemise up and down – include nothing left. Tally objects/events using fingers and adult number names. Make sounds and gestures to symbolise none, one, and more, here and gone.				
Active Physical Development		Offer and accept items. Showing items to gain attention or giving items to prompt actions. Use own personal sounds, symbols or gestures to name objects, events or numbers. Itemise using sequences of sounds. Use intonation to mark beginning/end. Ask for items that are out of sight. Use deferral/imitation – copying the actions of a person who is not present.				
Sharing and Communicating		Initiate and take turns communicating about quantities, imitating gestures and sounds. Respond to object or event names appropriately. Appreciate meaning of 'objects of reference'. Ask for items that are not in sight – by any means of communication. Coordinate sound making with rhythmic gestures/pointing. Appreciate adult use of number names during the itemising process, and in the description of quantity.				
<p>P3. Practical examples</p> <ul style="list-style-type: none"> Collecting items together – this can occur as part of a game played with a group, for example collecting the items they knock over with a swinging ball, or collecting tokens you give them if they manage to score by landing a ball rolled down a piece of plastic drain pipe into a bucket. A line of five small drawers each labelled with a number 1 to 5 can be used in many ways, for example as a number line for putting items in sequentially. This equipment plays on children's natural fascination with drawers, finding out what's inside, putting things in and taking things out. They provide useful concrete experiences of object permanence, visualisation, itemisation, partitioning, and sequential increase/decrease of quantity. Though some aspects of experience that occur with line drawers such as number names, numeral recognition, name order, naming quantities, addition etc. may be beyond the child's present abilities, they are still valuable incidental experiences. Use a row of big mac speaking switches, with one, two and three programmed on them, for choice making or prediction activities, for example roll big dice, choose the mac with the same pattern, or choose the mac that will say how many sweets are on the table. Adult support will differentiate the task to promote appropriate success, although it should be recognised that failing or scoring nothing is a valuable learning experience. 						

Figure 13.9 Mathematical activities in focus at P3