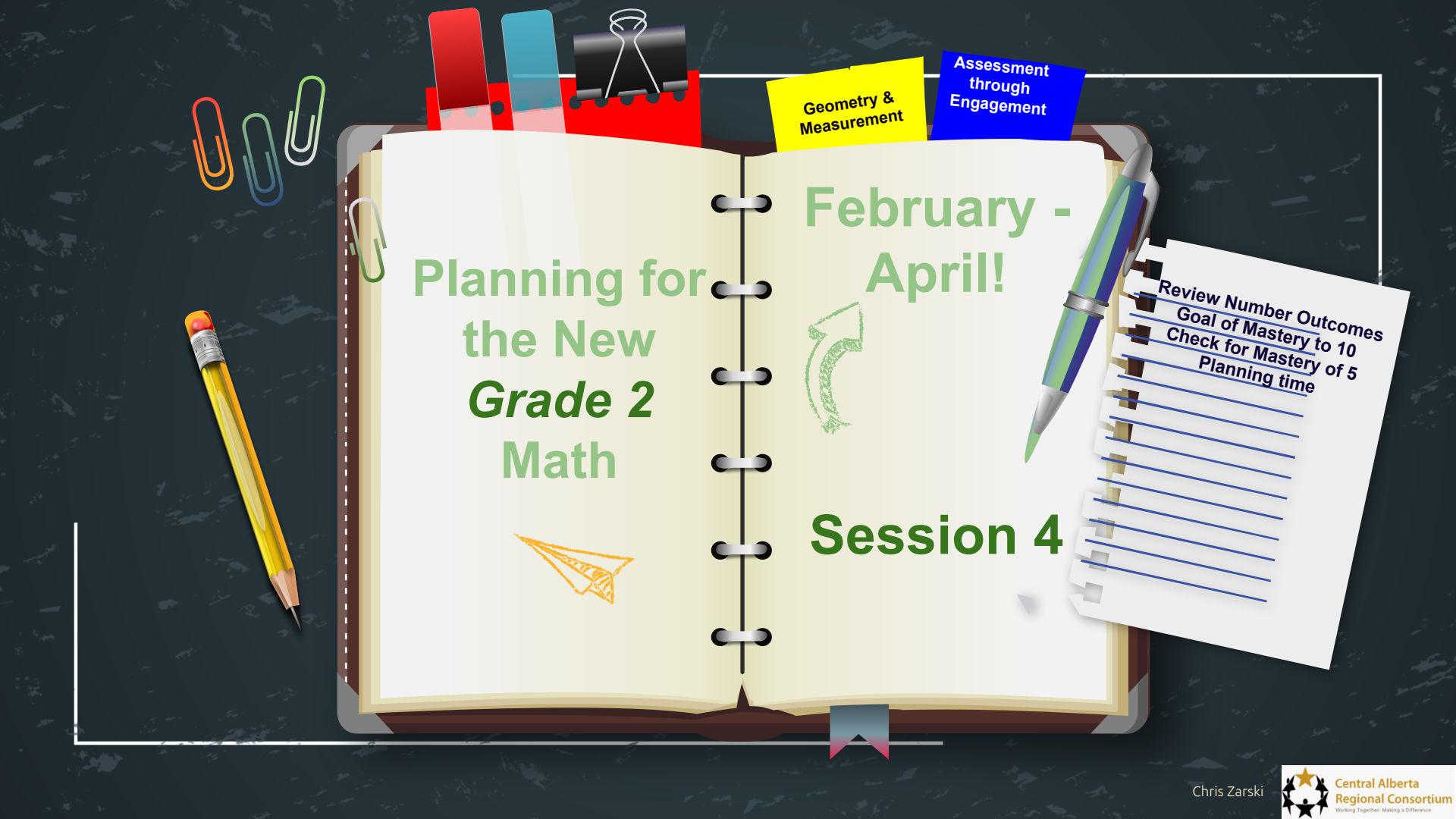


Chris Zarski

Central Alberta Regional Consortium
Working Together: Making a Difference

In the spirit of reconciliation, we want to acknowledge that this gathering is taking place on traditional lands across the province of Alberta, home to many diverse First Nations, Métis and Inuit peoples. We acknowledge that this land is a traditional meeting ground giving voice to its original peoples and the story of creation of this country in a way that history may have forgotten.

February

2N1.1 Students analyze quantity to 1000. (100- 500)

- There are infinitely many natural numbers.
- Every digit in a natural number has a value based on its place.
- Each natural number is associated with exactly one point on the number line.

2N1.2 Students analyze quantity to 1000.(100 working to 1000)

- A quantity can be interpreted as a composition of groups.

2N1.3 Students analyze quantity to 1000.

- All natural numbers are either even or odd.

2N1.4 Students analyze quantity to 1000.

- A quantity can be estimated when an exact count is not needed.

2N1.5 Students analyze quantity to 1000.

- Inequality is an imbalance between two quantities.

2N2.1 Students investigate addition and subtraction within 100. (start regrouping)

- A sum can be composed in multiple ways.

2N3.1 Students interpret part whole relationships using unit fractions.

- Fractions can represent part-to-whole relationships.
- One whole can be interpreted as a number of unit fractions.

Place Value and Addition - Money (the visual of Place Value)

February

2P1.2 Students explain and analyze patterns in a variety of contexts.

- A pattern core can vary in complexity.

2T1.2 Students relate duration to time.

- Duration is quantified by measurement. (calendar related)

1M1.1 Students relate length to the understanding of size.

- Length is quantified by measurement.
- Length is measured with equal-sized units that themselves have length.
- The number of units required to measure a length is inversely related to the size of the unit.

1M1.2 Students relate length to the understanding of size

- Length can be estimated when a measuring tool is not available.

2G1.1 Students analyze and explain geometric attributes of shape.

- Shapes are defined according to geometric attributes.
- A shape can be visualized as a composition of other shapes.

Background to Measurement

March	April
Number: Quantity is measured with numbers that enable counting, labelling, com	
2N1.3 Students analyze quantity to 1000 (500 on). • All natural numbers are either even or odd. 2N1.4 Students analyze quantity to 1000. • A quantity can be estimated when an exact count is not needed. 2N2.1 Students investigate addition and subtraction within 100. • A sum can be composed in multiple ways. 2N2.2 Students investigate addition and subtraction within 100. • Addition and subtraction can represent the sum or difference of countable quantities or measurable lengths.(with and without regrouping)	2N1.3 Students analyze quantity to 1000.(500 on). • All natural numbers are either even or odd. 2N1.4 Students analyze quantity to 1000. • A quantity can be estimated when an exact count is not needed. 2N2.1 Students investigate addition and subtraction within 100. • A sum can be composed in multiple ways. 2N2.2 Students investigate addition and subtraction within 100. • Addition and subtraction can represent the sum or difference of countable quantities or measurable lengths. .
Patterns: Awareness of patterns supports problem solving in various situations.	

Money
Counters
Number line

Money
Cuisenaire Rods
Base 10 blocks
symbolic

March	April	
Time: Duration is described and quantified with time.		
2T1.2 Students relate duration to time. • Duration is quantified by measurement. (clock related)	2T1.2 Students relate duration to time. • Duration is quantified by measurement. (clock related)	
Geometry: Shapes are defined by geometric attributes.		
2G1.1 Students analyze and explain geometric attributes of shape. • Shapes are defined according to geometric attributes. • A shape can be visualized as a composition of other shapes. 2G1.2 Students analyze and explain geometric attributes of shape. • Geometric attributes do not change when a shape is translated, rotated, or reflected.	2G1.1 Students analyze and explain geometric attributes of shape. • Shapes are defined according to geometric attributes. • A shape can be visualized as a composition of other shapes. 2G1.2 Students analyze and explain geometric attributes of shape. • Geometric attributes do not change when a shape is translated, rotated, or reflected..	
Measurement: Attributes such as length, area, volume, and angle are quantified by measurement.		
2M1.2 Students communicate length using units. • Length can be estimated when a measuring tool is not available.	2M1.2 Students communicate length using units. • Length can be estimated when a measuring tool is not available.	

Attributes and *Properties* of Shapes

Transformations

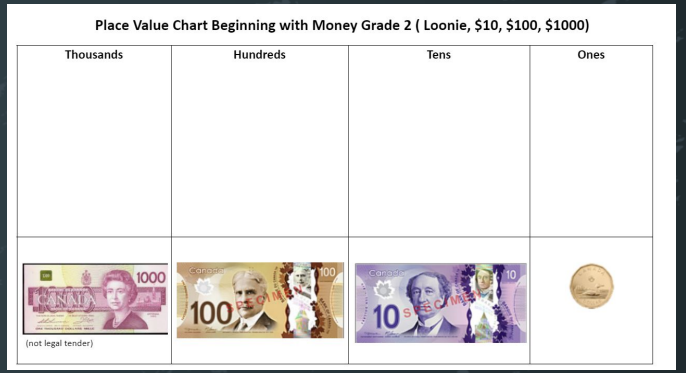
March	April
Statistics: The science of collecting, analyzing, visualizing and interpreting data can info	
	2ST1.1 Students relate data to a variety of representations. • Data can be collected to answer questions.

How can quantity contribute to a sense of number?

2N 1.1 Students analyze quantity to 1000.

Knowledge	Understanding	Skills & Procedures
Any number of objects in a set can be represented by a natural number. The values of the places in a four-digit natural number are thousands, hundreds, tens, and ones. Places that have no value within a given number use zero as a placeholder. The number line is a spatial representation of quantity.	There are infinitely many natural numbers. Every digit in a natural number has a value based on its place. Each natural number is associated with exactly one point on the number line.	Represent quantities using words and natural numbers. Identify the digits representing thousands, hundreds, tens, and ones based on place in a natural number. Relate a number, including zero, to its position on the number line.

Practice Converting and Trading with the Money Mat Thousand, Hundred, Tens, Ones



Place Value Visually

2N 1.2 Students analyze quantity to 1000.

Knowledge	Understanding	Skills & Procedures
A quantity can be skip counted in various ways according to context. Quantities of money can be skip counted in amounts that are represented by coins and bills (denominations).	A quantity can be interpreted as a composition of groups.	Decompose quantities into groups of 100s, 10s, and 1s. Count within 1000, forward and backward by 1s, starting at any number. Skip count by 20s, 25s, or 50s, starting at 0. Skip count by 2s and 10s, starting at any number. Determine the value of a collection of coins or bills of the same denomination by skip counting.

Combine with a place value questions

The Number Game

$20, quarters, $50 or 50 cents

Use for place value as well.

2N 1.3 Students analyze quantity to 1000.

Knowledge	Understanding	Skills & Procedures
An even quantity will have no remainder when partitioned into two equal groups or groups of two. An odd quantity will have a remainder of one when partitioned into two equal groups or groups of two.	All natural numbers are either even or odd.	Model even and odd quantities by sharing and grouping. Describe a quantity as even or odd. Partition a set of objects by sharing or grouping, with or without remainders.

2N 1.4 Students analyze quantity to 1000.

Knowledge	Understanding	Skills & Procedures
A benchmark is a known quantity to which another quantity can be compared.	A quantity can be estimated when an exact count is not needed.	Estimate quantities using benchmarks.

Introduction into Odd/Even and Fractions Grade 2

Establish Benchmarks that are easy to access - human body parts!

K5 Worksheet Support

2N 1.5 Students analyze quantity to 1000.		
Knowledge	Understanding	Skills & Procedures
Words that can describe a comparison between two unequal quantities include not equal greater than less than The less than sign, <, and the greater than sign, >, are used to indicate inequality between two quantities. Equalityand inequality can be modelled using a balance.	Inequality is an imbalance between two quantities.	Model equality and inequality between two quantities, including with a balance. Compare and order natural numbers. Describe a quantity as less than, greater than, or equal to another quantity.

Use numbers from the Number Line Activity, < and > symbols from the Math Kit

How can addition and subtraction be interpreted?		
2N2.1 Students investigate addition and subtraction within 100.		
Knowledge	Understanding	Skills & Procedures
The order in which more than two numbers are added does not affect the sum (associative property).	A sum can be composed in multiple ways.	Visualize 100 as a composition of multiples of 10 in various ways. Compose a sum in multiple ways, including with more than two addends.

Money
Cuisenaire Rods
Blocks
Base 10
K5 Resources to translate into money (possibly)

2N2.2 Students investigate addition and subtraction within 100.		
Knowledge	Understanding	Skills & Procedures
Familiar addition and subtraction number facts facilitate addition and subtraction strategies. Addition and subtraction strategies for two-digit numbers include making multiples of ten and using doubles.	Addition and subtraction can represent the sum or difference of countable quantities or measurable lengths.	Recall and apply addition number facts, with addends to 10, and related subtraction number facts. Investigate strategies for addition and subtraction of two-digit numbers. Add and subtract numbers within 100. Verify a sum or difference using inverse operations. Determine a missing quantity in a sum or difference, within 100, in a variety of ways. Solve problems using addition and subtraction of countable quantities or measurable lengths.

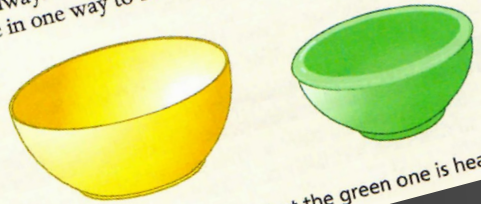
Continue with the money design for Place Value so students can physically see what they are adding and regrouping.

Measurement is the process of assigning a qualitative or quantitative description of size to an object based on a particular attribute. It is always a comparison of the size of one object with another, so the same object can be described using different measurements. Therefore, knowledge of the size of certain benchmarks assists in measuring.

Looking at Some of the Measurement Principles

MEASUREMENT PRINCIPLE 1

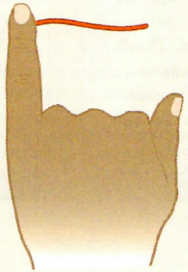
Different measurement attributes of the same object are not always related, so it is possible for an object that is large in one way to be small in another.



"The yellow bowl is bigger, but the green one is heavier."

MEASUREMENT PRINCIPLE 4

Familiarity with certain measurement referents helps you estimate.



"My finger is 1 cm wide, so this string must be 1, 2, 3, 4, 5 cm long."

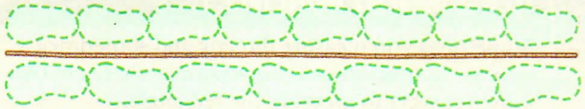
MEASUREMENT PRINCIPLE 6

In order to measure, a series of uniform units must be used, or a single unit must be used repeatedly.

"When you measure, you have to use the same tool again and again."

MEASUREMENT PRINCIPLE 7

The unit chosen for a measurement affects the value of the measurement; a bigger unit results in a smaller number of units. (This makes a measurement without a unit meaningless.)



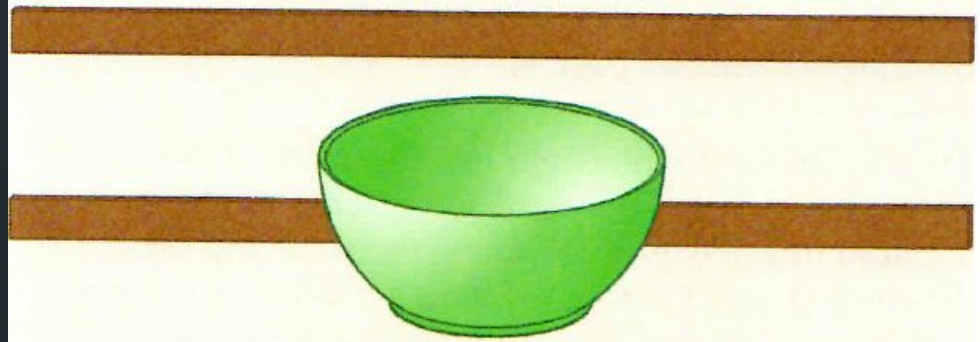
"Our rope is the length of eight of John's shoes, but only seven of Ani's shoes because Ani's shoes are bigger."

Small, M.(2017). *Making math meaningful*. Nelson Education Ltd. p.467-468

Common Errors and Misconceptions

Not Allowing for Hidden Parts

Some students at the definition/comparison stage may think that when one length is partly hidden and another is not, the item they can see more of must be longer. For example, some students may think the first stick shown here is longer because they can see all of it. In fact, both lengths are the same.



Small, M.(2017). *Making math meaningful*. Nelson Education Ltd. p.483

Comparing Lengths That Do Not Align

Some students at the definition/comparison stage may try to compare lengths without aligning the objects first. These students will often think that length is determined by where an object ends, rather than by the distance from start to end. For example, a student may believe that the lower stick shown here is longer because it sticks out farther.

Small, M.(2017). *Making math meaningful*. Nelson Education Ltd. p.483

Measuring Curved and Zigzag Lengths

Some students at the definition/comparison stage may not take curves or zigzags into account when deciding which of two lengths is longer. For example, a student may believe the green piece of yarn is longer because it extends farther from left to right.

"The green yarn must be longer. It sticks out more."

Small, M.(2017). *Making math meaningful.* Nelson Education Ltd. p.483

Problems with Iteration

When students first begin to measure lengths by moving a single nonstandard unit along the distance, they may find it difficult to keep track of where one iteration of a unit ends and the next one begins. This results in gaps or overlap between units and, therefore, incorrect measurement.

Small, M.(2017). *Making math meaningful*. Nelson Education Ltd. p.484

Ruler Placement

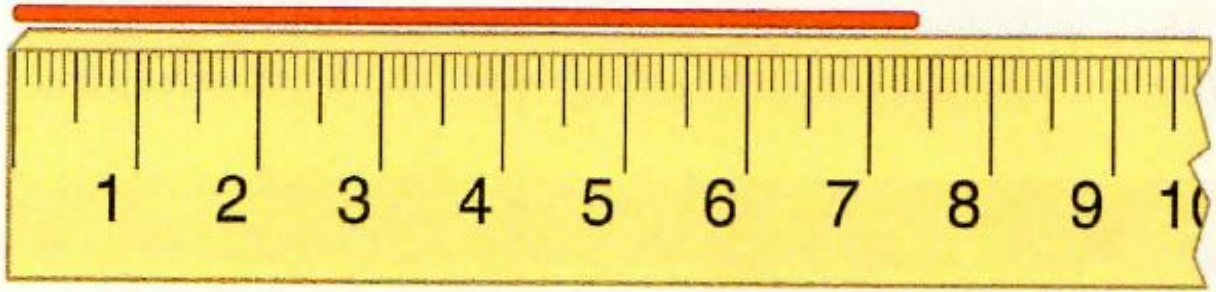
When students first learn to use a centimetre ruler, some will mistakenly begin measuring from points other than the 0-cm mark without subtracting the initial value. Beginning partway along the ruler can indicate that the student has not yet learned that the measurement represents the whole length of the object, from where it begins to where it ends, rather than just the endpoint. Beginning from the 1-cm mark may indicate that the student does not realize that the scale on the ruler actually begins at 0 cm, or simply that the student assumes you always start at 1. This problem often occurs if the 0-cm end is not labelled. As well, students sometimes begin from the opposite end of the ruler, rather than from 0.

"The pen is 16 cm long."

Small, M.(2017). *Making math meaningful.* Nelson Education Ltd. p.484

Describing Any Part of a Unit as a Half

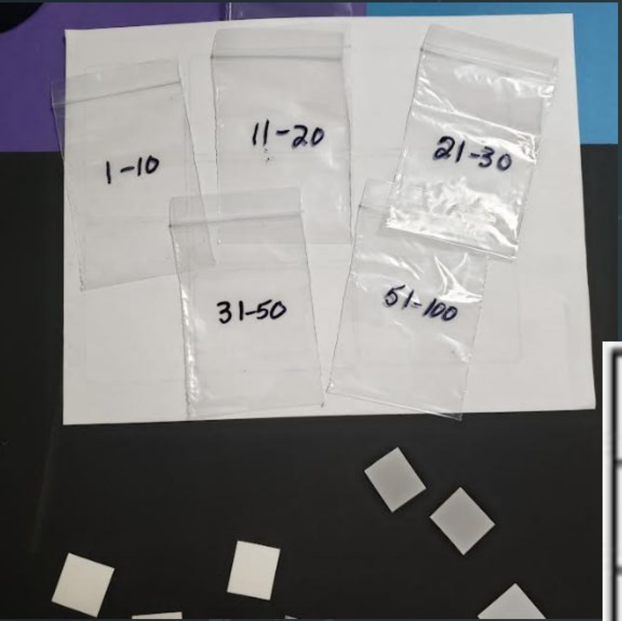
Some students have trouble reporting measurements that fall between two units on a ruler. For example, they might report both measurements below as "7 and a half centimetres" because they use the term "half" in an informal way to include anything that is not whole.



Small, M.(2017). *Making math meaningful*. Nelson Education Ltd. p.484

Let’s Look at Some Activities

Use with numbers for addition, before and after, comparative language ; money, groups of objects

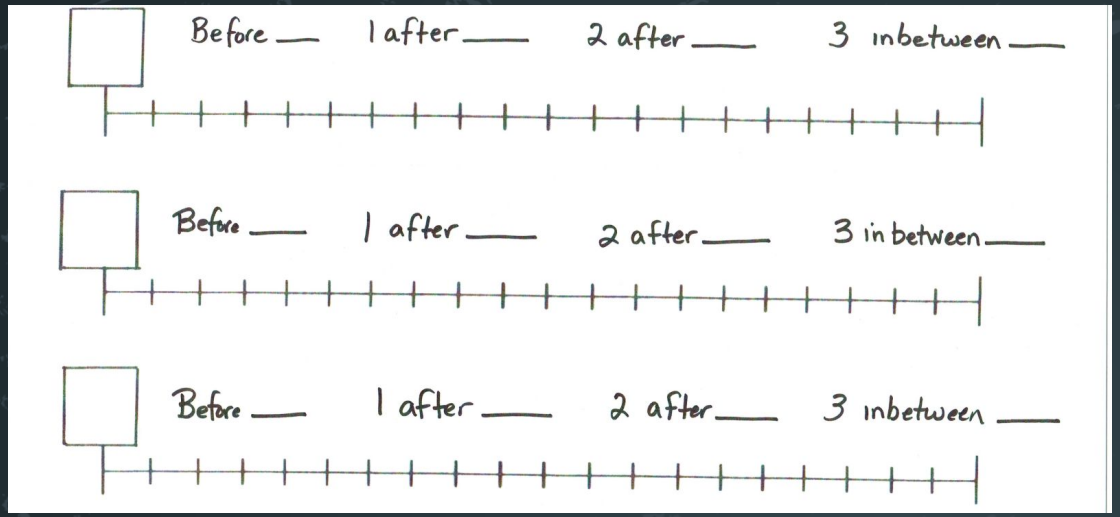


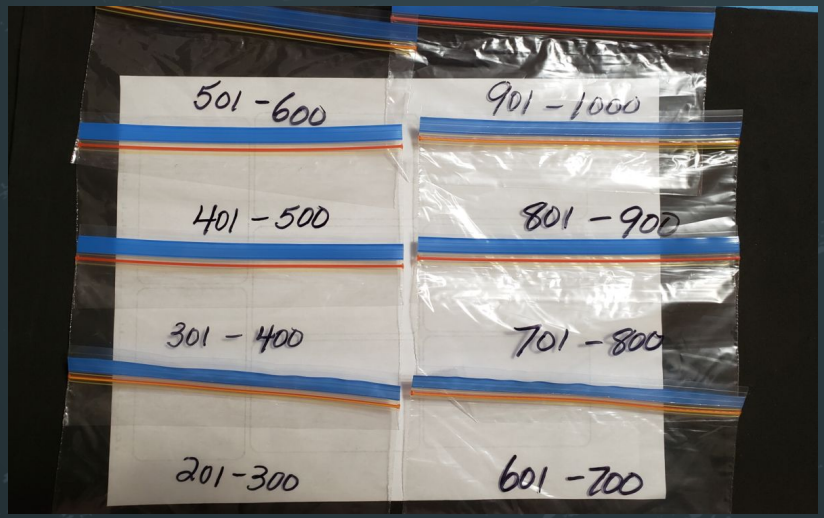
1	2	3	4	5	6	7	8	9	10

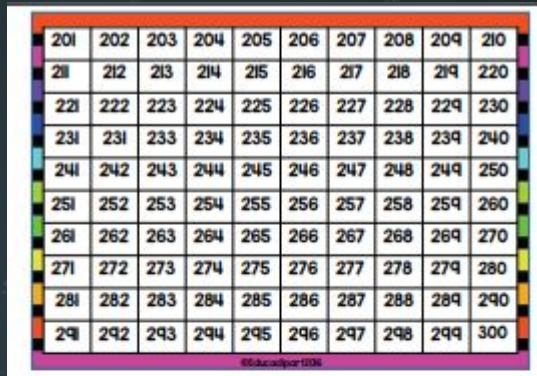
1	2	3	4	5	6	7	8	9	10

1	2	3	4	5	6	7	8	9	10

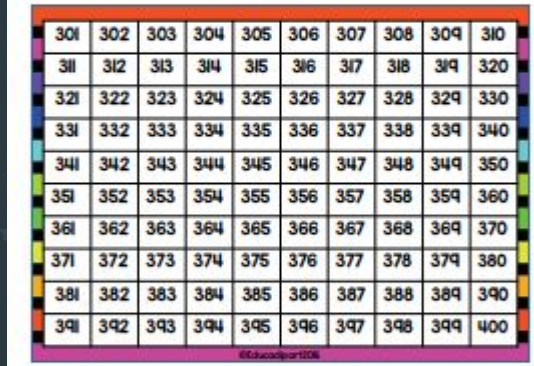
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50



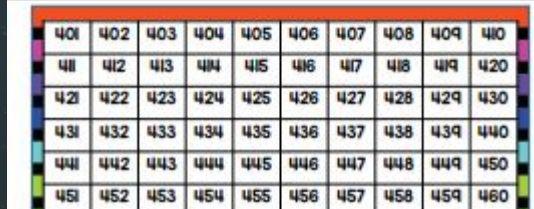




201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230
231	231	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290
291	292	293	294	295	296	297	298	299	300

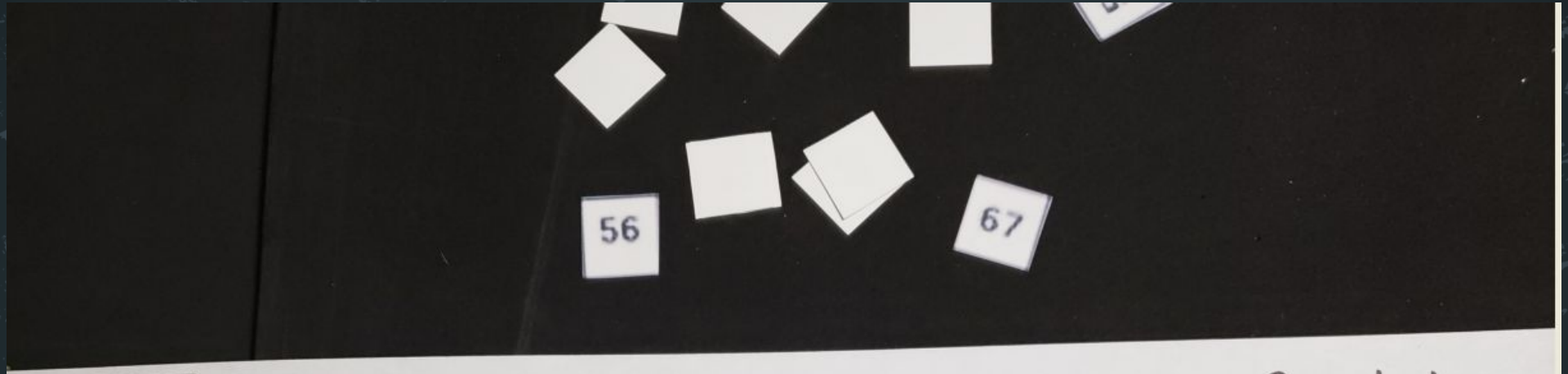


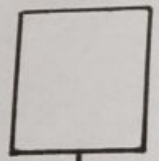
301	302	303	304	305	306	307	308	309	310
311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330
331	332	333	334	335	336	337	338	339	340
341	342	343	344	345	346	347	348	349	350
351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370
371	372	373	374	375	376	377	378	379	380
381	382	383	384	385	386	387	388	389	390
391	392	393	394	395	396	397	398	399	400



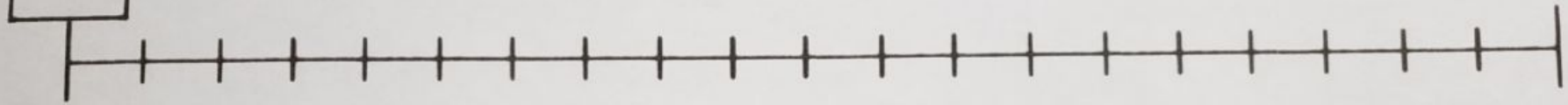
401	402	403	404	405	406	407	408	409	410
411	412	413	414	415	416	417	418	419	420
421	422	423	424	425	426	427	428	429	430
431	432	433	434	435	436	437	438	439	440
441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460

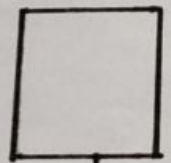
Number Cards



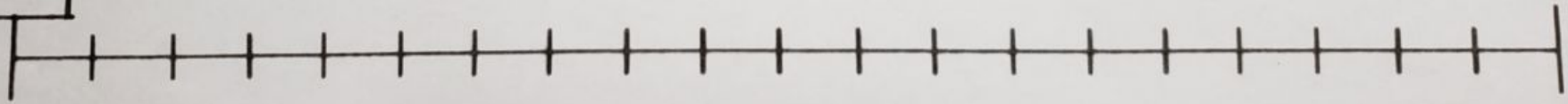


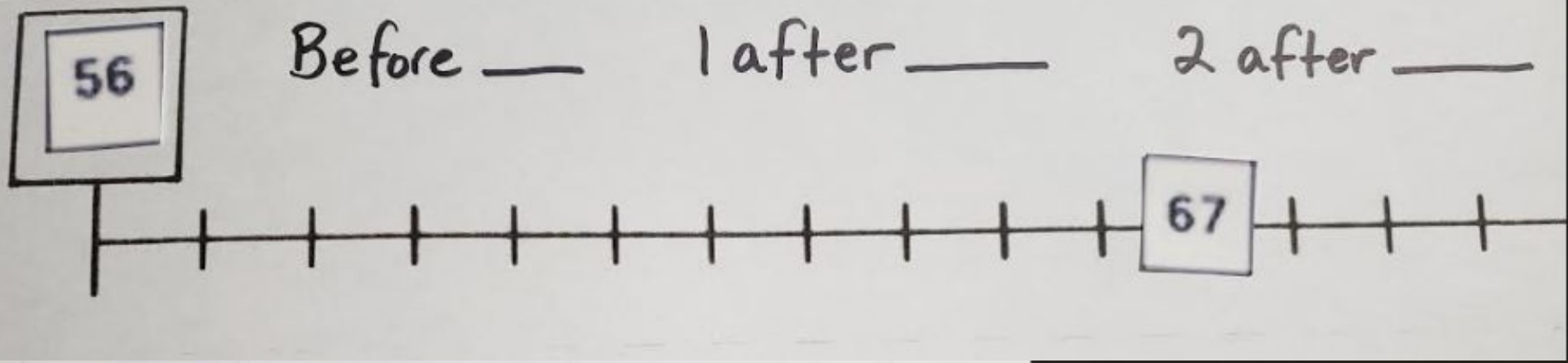
Before ___ 1 after ___ 2 after ___ 3 in between

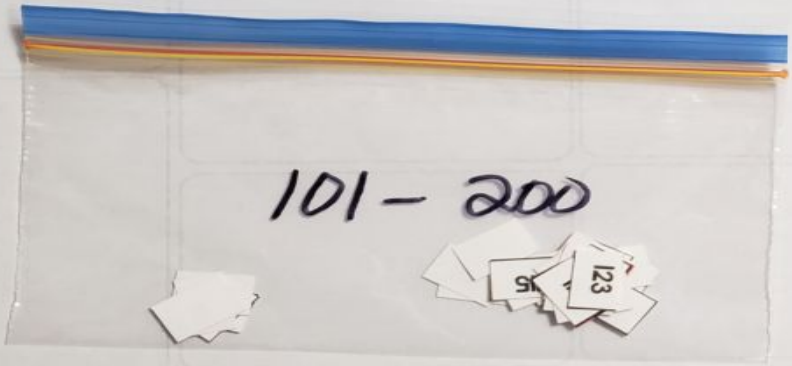




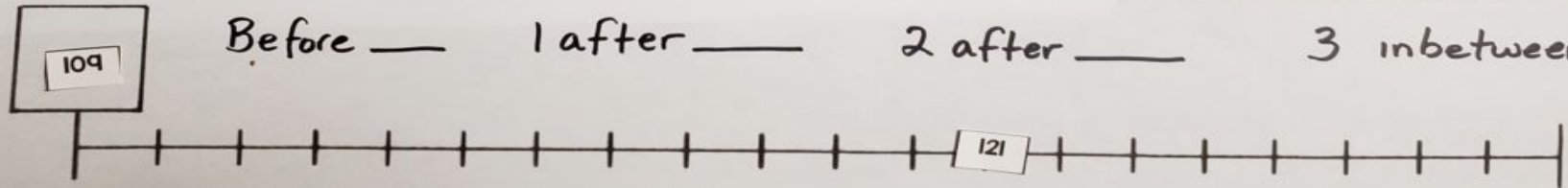
Before ___ 1 after ___ 2 after ___ 3 in between

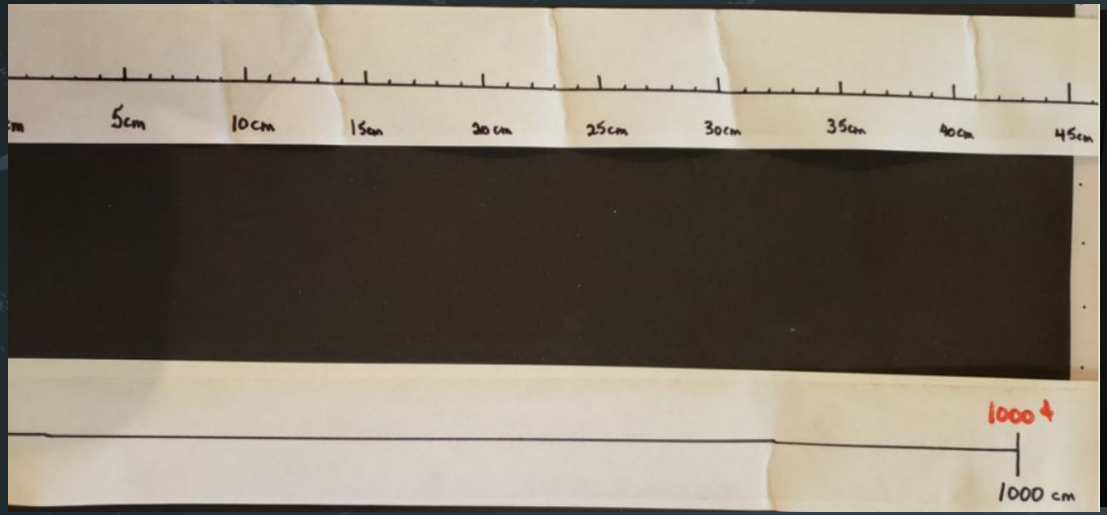


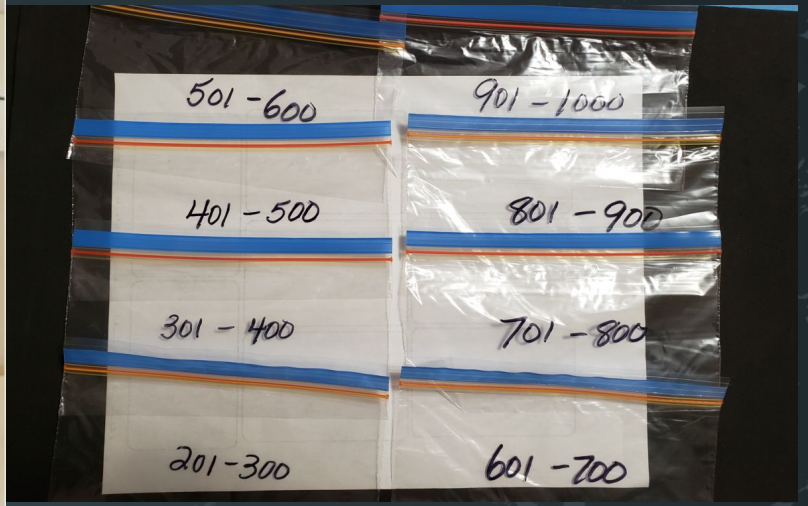

56
Before ___
1 after ___
2 after ___
67

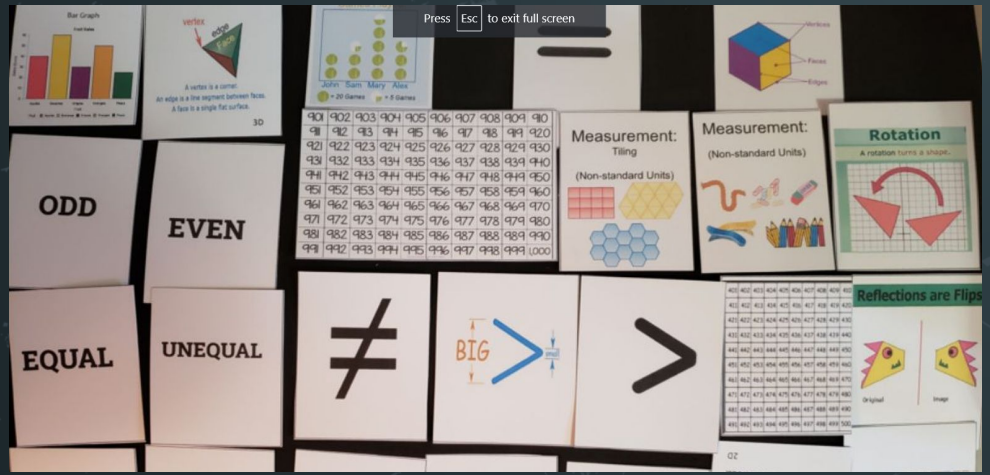

101 – 200

109 < 121


109
Before ___
1 after ___
2 after ___
3 inbetween ___
121


5cm
10cm
15cm
20cm
25cm
30cm
35cm
40cm
45cm
1000 cm


501 - 600
901 - 1000
401 - 500
801 - 900
301 - 400
701 - 800
201 - 300
601 - 700


Press Esc to exit full screen
ODD
EVEN
EQUAL
UNEQUAL
Measurement:
Tiling
(Non-standard Units)
Measurement:
(Non-standard Units)
Rotation
A rotation turns a shape.
Reflections are Flips
BIG


0cm
Reflections are Flips

Geometry

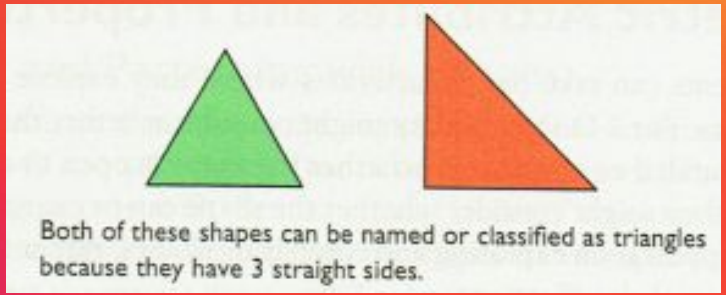
“Geometry is one, but not the only, aspect of mathematics where visualization is important. Whiteley (2004) speaks about visual reasoning as “seeing to think.” Because visualization is such an obvious aspect of geometry, using geometric thinking as one tool to improve visual reasoning makes sense.” (Small, 2017, p.394)

Small, M.(2017). *Making math meaningful.* Nelson Education Ltd. p.394

Identifying and Classifying Shapes

Identifying and Classifying Shapes

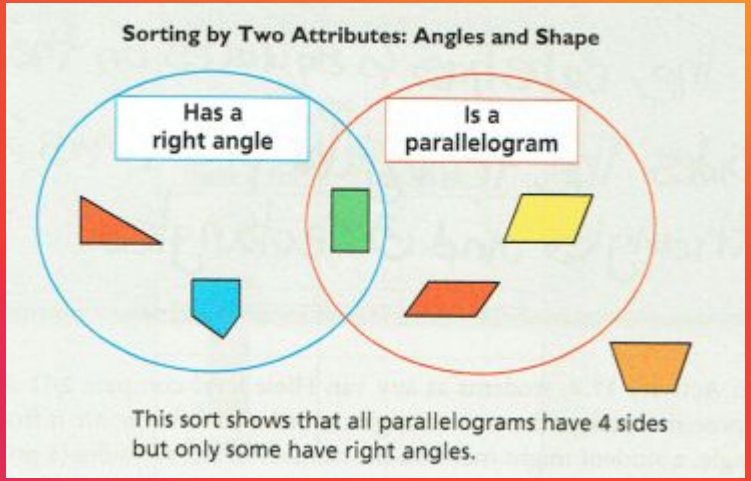
- Start with just “knowing” its a ‘ball’ - sphere; ‘box’ ; ‘triangle’
- As they develop and consider more geometric properties their classifications become more refined - ‘red isosceles triangle’



Small, M.(2017). *Making math meaningful*. Nelson Education Ltd. p.397

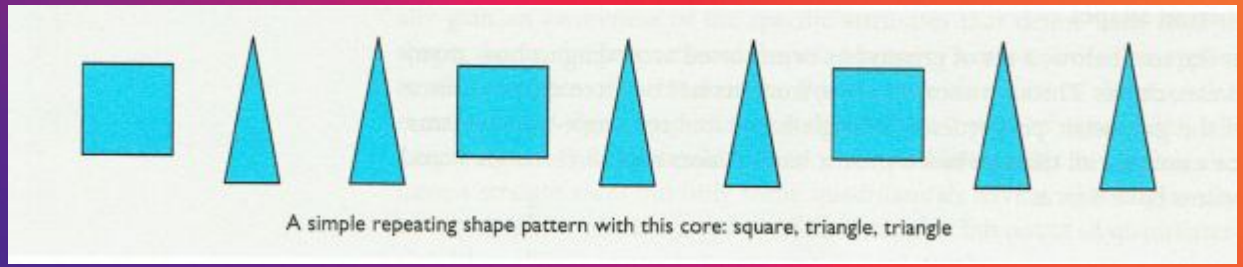
Venn diagram offers us the higher order thinking.

Students begin to learn specific attributes of shapes and then recognize that different shapes may have common attributes.



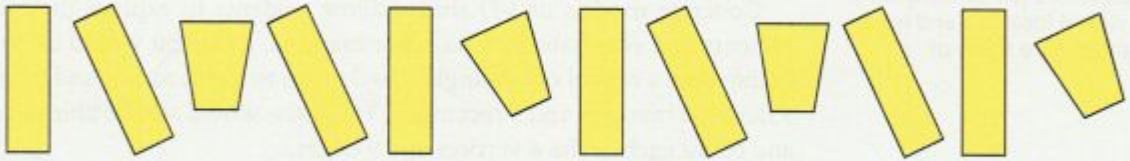
Small, M.(2017). *Making math meaningful.* Nelson Education Ltd. p.400

Attributes can also be reflected in patterns



A simple repeating shape pattern with this core: square, triangle, triangle

In this pattern, not only do the shapes change, but the orientation of the shapes changes as well.



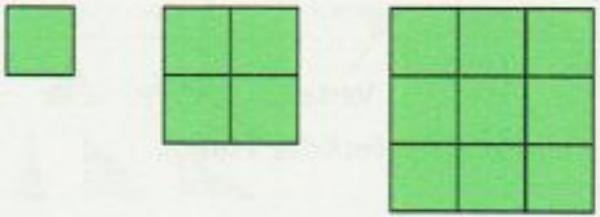
Pattern rule 1: rectangle, rectangle, trapezoid, ...

Pattern rule 2: vertical, turned, ...

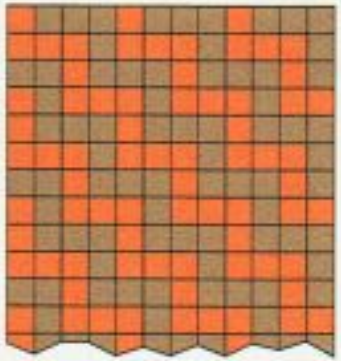
Small, M.(2017). *Making math meaningful.* Nelson Education Ltd. p.400-401

Growing and Multi-Directional Patterns

In this growing pattern, both the length and the width of the square increase by 1 square each time.



Patterns are visible in rows, columns, and diagonals on this grid.



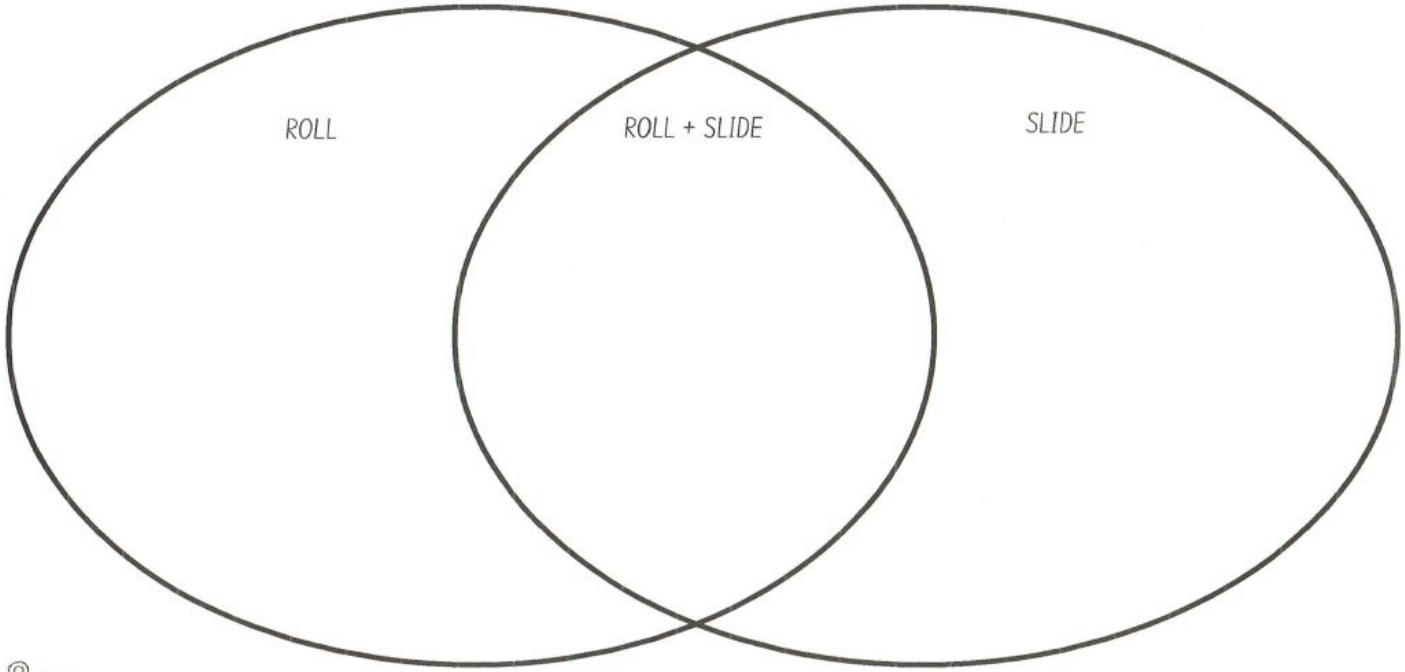
Small, M.(2017). *Making math meaningful*. Nelson Education Ltd. p.401

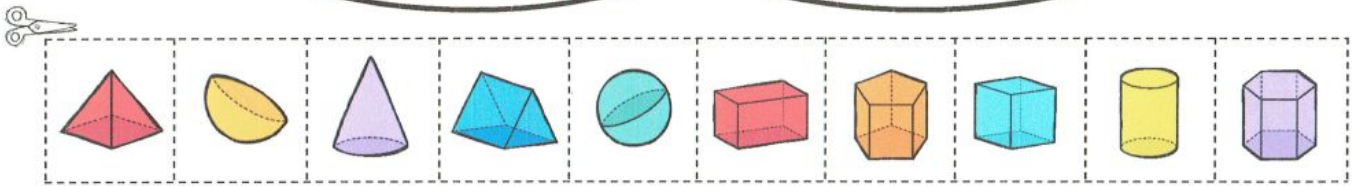
Alberta Mathematics K-6 Scope and Sequence - Geometry
** changes are highlighted in yellow

	K	1	2	3	4	5	6
Learning Outcomes	**KG1 Children investigate shape.**	**1G1 Students interpret shape in two and three dimensions.**	**2G1 Students analyze and explain geometric attributes of shape.**	**3G1 Students relate geometric properties to shape.**	**4G1 Students analyze and explain geometric properties.**	**5G1 Students investigate symmetry as a geometric property.**	**6G1 Students analyze shapes through symmetry and congruence.**
Geometric Characteristics and Relationships	**KG1.1** 2D and 3D shapes found in nature - circles, -triangles -cubes -cylinders Terms-flat, curved, straight and round	**1G1.1** 2D shapes -squares, -circles, -rectangles, -triangles 3D shapes -cubes -prisms, - cylinders, -spheres, -pyramids, -cones Line of symmetry	**2G1.1** Geometric attributes, -sides -vertices -faces or surfaces Sort according to 2 attributes Create a picture or design with shapes from verbal instructions or memory **2G1.2** Investigate Translations, Rotations and Reflections	**3G1.1** Geometric Properties Perpendicular, Parallel, Equal Right angles Polygons -triangles -quadrilaterals -pentagons -hexagons -octagons Regular and Irregular polygons **3G1.2** Transformations of polygons Translations Reflections, Rotations	**4G1.1** Angle relationships supplementary and complementary Quadrilaterals Triangles-classification by sides and angles **4G1.2** Compare shapes that are close approximations	**5G1.1** 2D and 3D shapes have Reflection Symmetry Order of Rotational Symmetry in 2D shapes Central Symmetry **5G1.2** Regular polygons-Reflection and Rotational Symmetry	**6G1.1** Symmetry and Congruency Two transformations Reflection and Rotation Symmetry Symmetry in Tessellations **6G1.2** Symmetry and Congruency of Shapes

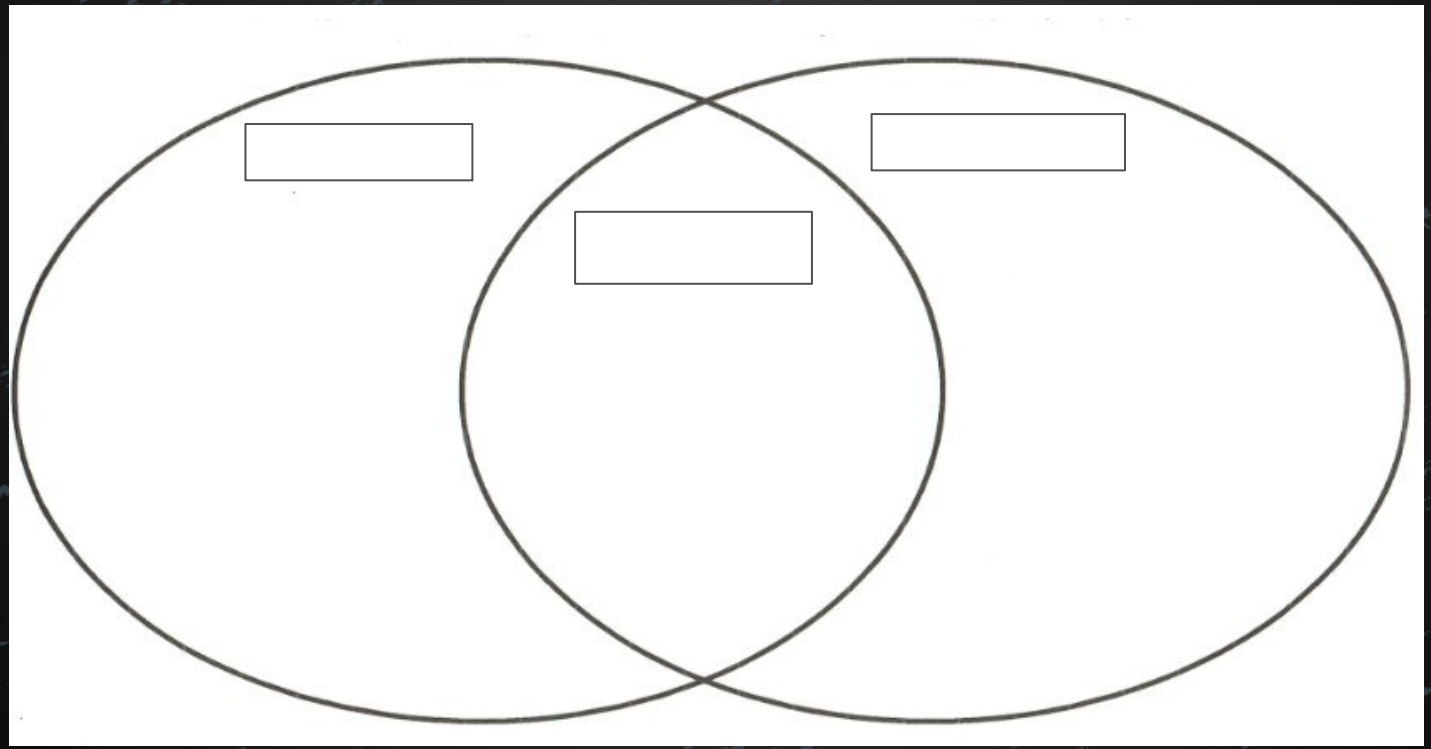
EXPLORING 3D OBJECTS

Using the 3D objects provided, can you find out which 3D objects roll, slide or roll and slide down a ramp? Record your findings.





Resort Your Cards - what attribute rule will you use?



Transformations
Students investigate slides, reflections and rotations and what effect they have on the properties of shapes.

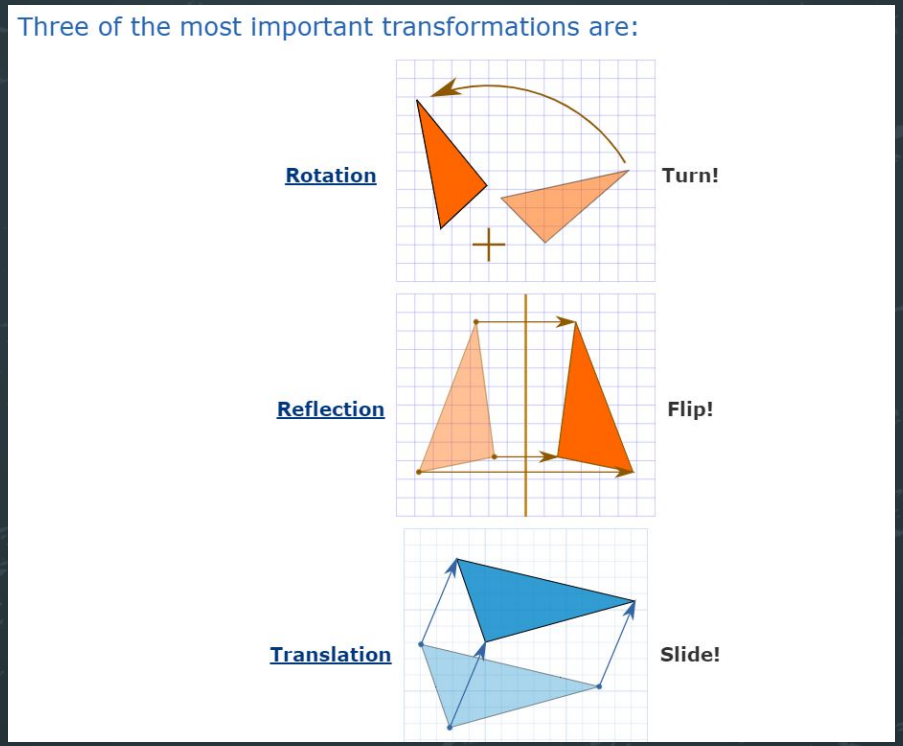
1 cm grid paper
Shapes that can be manipulated.

Transformations of slides (translation), flips (reflection) and turns (rotations) do NOT affect the size or shape. Reflections and Rotations do affect the orientation.

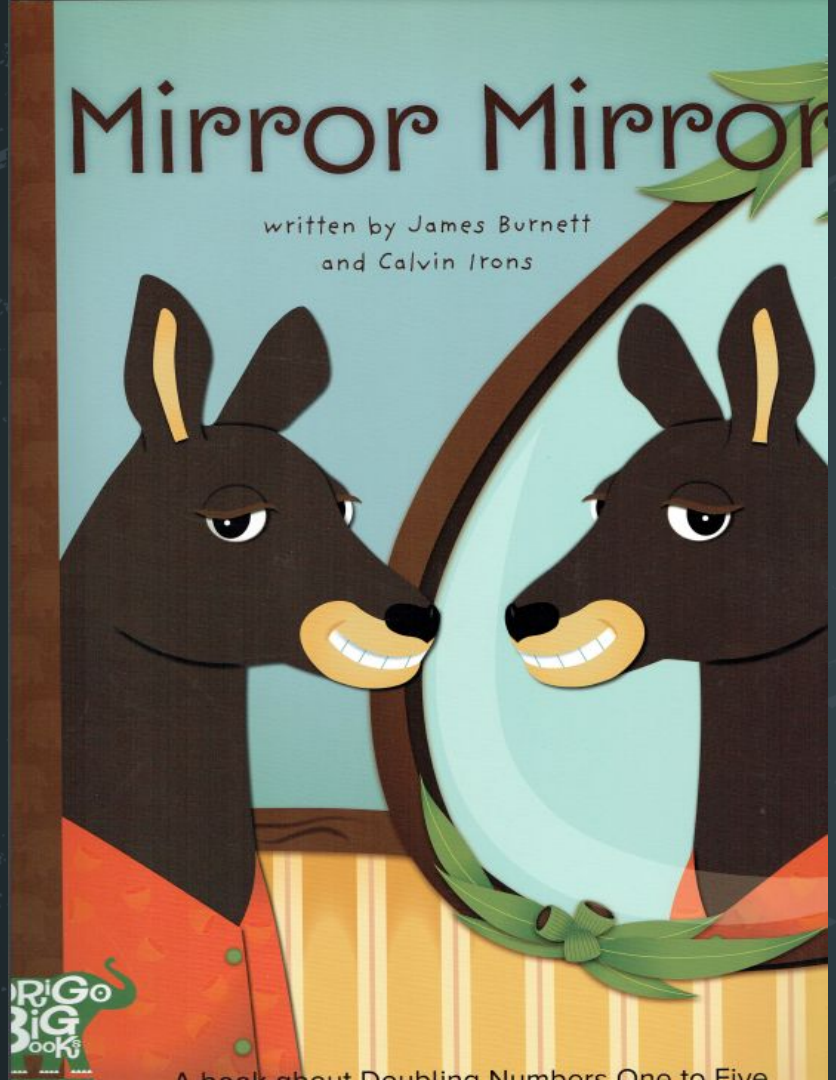
Small, M.(2017). *Making math meaningful.* Nelson Education Ltd. p.394

Line of Symmetry leads so well into Reflections (mirror images)

Investigate:



mathisfun.com



A book about doubling numbers 1 - 5 but is based on reflection so it would be a great Math Talk opportunity.

Origo Big Book


CRAFTER'S SQUARE
foam stickers
autocollants en mousse
WARNING:
CHOKING HAZARD - Small parts.
Not for children under 3 yrs.
AVERTISSEMENT:
DANGER D'ÉTOUFFEMENT - Petites pièces.
Ne convient pas aux enfants de moins de 3 ans.

Possible Assessment

Sample Transformation Assessment

Identify whether each picture is a Reflection (mirror), Translation (slide) or Rotation (turn)

Teachers Note: You could deepen the learning by selecting only a few diagrams and asking students to explain their thinking.This could be treated as summative whereas a simple identification of the diagram could be formative assessment.

a)

a_____

b)

Resources

K-5 Learning

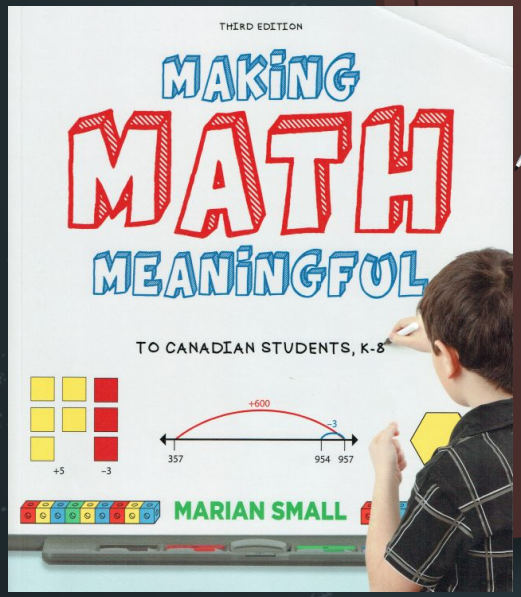
Contains Math, Literacy, SCience etc but resources sheets are concise.

https://www.k5learning.com/free-math-worksheets

Transformations

Cube for Teachers

https://docs.google.com/spreadsheets/d/e/2PACX-1vTUeTpCyz5W1ULjnEcM2fkWQQZeHl91pFDAyOlTmn_Ch8uuB2jwumFxZ5FcoPMpBbOce9-oKIKgPMr9/pubhtml#



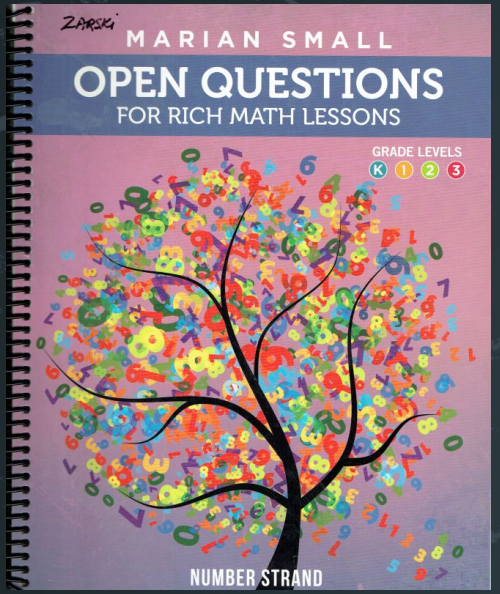
Assessment Project

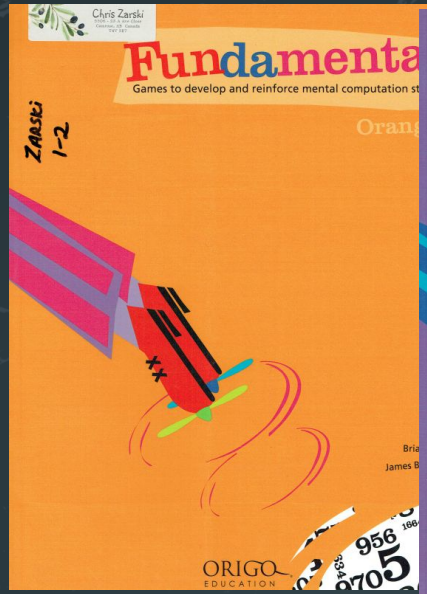
My Math Path

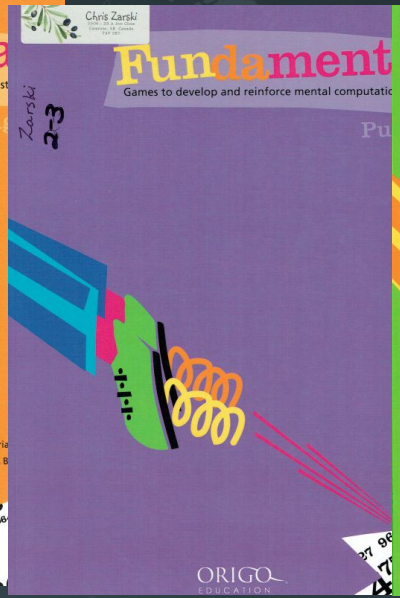
FUNdamentals (Origo)

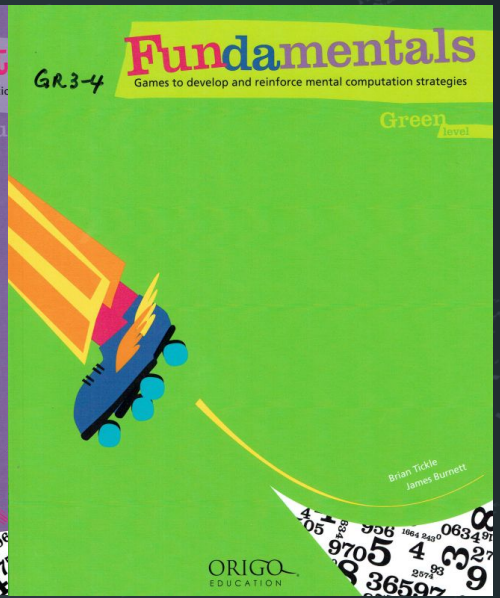
Open Questions (Competencies)

Next slide please!









Rubicon

Origo

Any questions?