CAMPBELL RIVER

School District 72

NUMERACY RESOURCES SAMPLER

MIDDLE SCHOOL AND BEYOND
(GRADE 6+)

- Instructional Resources (for Teacher Use)
- Games & Puzzles (for Student Use)
- Assessment and Reflection Resources

NUMERACY RESOURCES SAMPLER

MIDDLE SCHOOL AND BEYOND (6+)

Instructional Resources (for Teacher Use)

Masters, Games & Puzzles (for Student Use)

NUMERACY RESOURCES SAMPLER

MIDDLE SCHOOL AND BEYOND (6+)

Assessment and Reflection Resources

Numeracy Development Continuum

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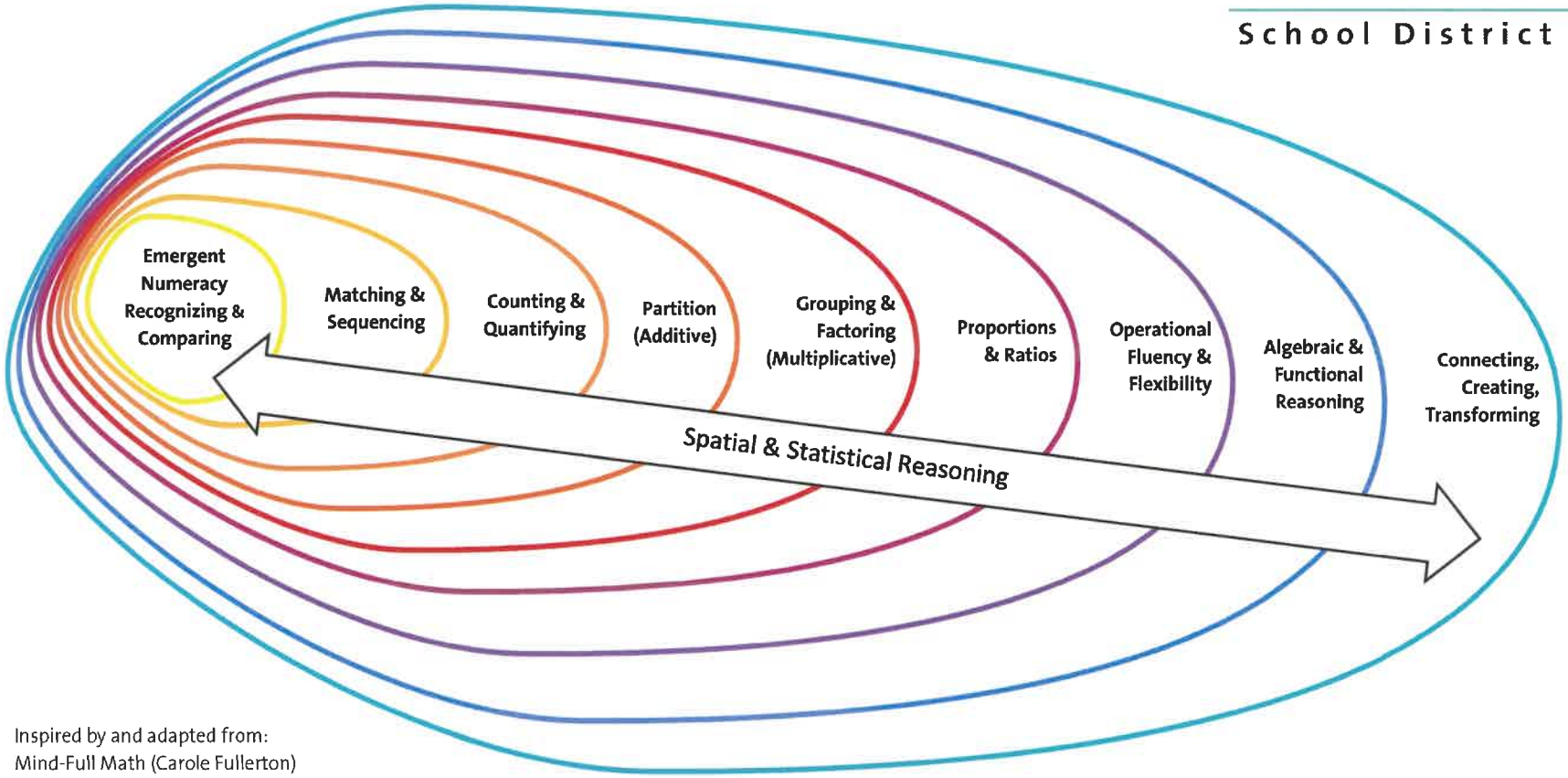
School District 72



Inspired by and adapted from:
Mind-Full Math (Carole Fullerton)
Roadmap to Proportional Relationships (Jon Orr)
Mathematical Learning Landscapes (Cathy Fosnot)
Development of Mathematical Reasoning (Pam Harris)
Student Continuum of Numeracy Development (Alex Lawson)
Teaching Elementary & Middle School Mathematics Developmentally (Van de Wall)

Development of Mathematical Reasoning

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Math in Context

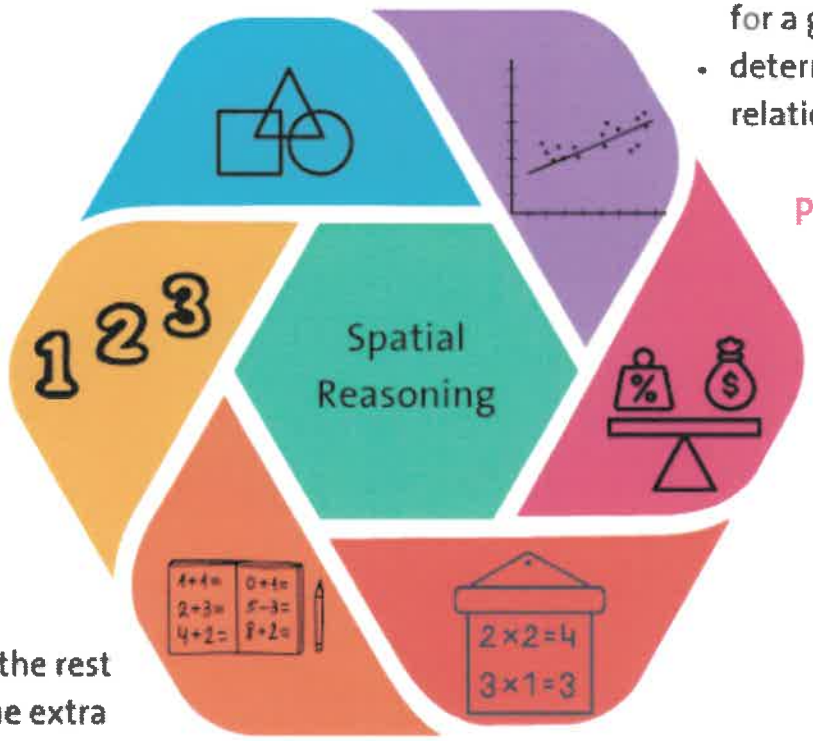
Authentic connection, rooted in place, community use, and identity

Algebraic Reasoning

- symbolic logic (words, #s & symbols)
- breaking a process into logical steps

Functional Reasoning

- determine an input/output rule
- determine a logical range of values
- consider the effect of scale factor (rate of change) on a relationship
- consider the initial value or constant for a given relationship
- determine overall trend of a relationship



Counting Strategies

- counting from 1
- counting on by 1
- counting using 1:1 equivalence (fingers, etc.)
- counting groups by counting on
- removing or distributing items 1 at a time

Proportional Reasoning

- solve proportional problems using multiplication, division, and other logical strategies
- scale up from a base ratio
- use a ratio table
- combine additive and multiplicative reasoning to create equivalent ratios

Additive Thinking

- add up to a group of 10, then add the rest
- round up and add, then remove the extra
- subtract to a group of 10, then subtract more
- round up, subtract more, then add back the extra
- skip counting
- repeated subtraction

Multiplicative Thinking

- use known multiples as benchmarks
- multiply by the next group of ten, then remove groups
- use known multiplication facts to make division statements
- multiplication & division by place value

Inspired by Pam Harris' *Development of Mathematical Reasoning*

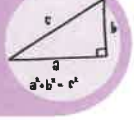
10 STRATEGIES TO estimate reasonably

01. Take aim

Use a referent or benchmark value and try it. Revise to get closer to the target.

02. Sketch It

Draw a picture that is detailed and informative

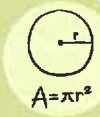


03. Compare

Compare the problem to others you have seen

04. Connect

Connect the problem to a known proportion, formula, or rule

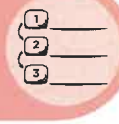


05. Overall Shape

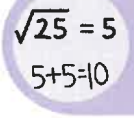
Refer to the container for clues (shape, dimensions, etc.)

06. Break it into Chunks

Break the problem down step by step



07. Tidy up

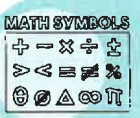


Format answers so that they are clean, clear, and easy to read

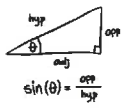
08. Organize it

Make a table or list to keep your ideas organized

09. Encode it



Use symbols and shorthand to represent ideas efficiently



10. Substitute

Make substitutions to combine or simplify elements

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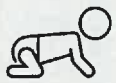
Operational Fluency Trajectory (Grade 5-7)

Operational Fluency (5-7)	 (5)	 (6)	 (7)	
Understanding Additive (+/-) Strategies	+/- 0, 1 ,2 Doubles, Making 10, Near Doubles (regroup / borrow) Add and subtract using place value	Selects and uses various additive strategies including standard algorithm	Applies additive strategies to decimals, fractions and mixed numbers	Uses additive strategies to work with decimals, fractions and percents in new contexts
Understanding Multiplicative (x / ÷) Strategies	Multiples of 2, 10, 5 Doubling/Halving, Multiples of 3, 6, 9, 4	Multiples of 7, 8, 11 Applies Multiplication algorithms	Squares, Near squares in multiplication table Uses division algorithm	Flexibly and fluently uses multiplication and division strategies to solve novel problems
Solving Recognize number families	Identify numbers as Even, Odd, x10, x5 multiples of 3, 6, 9, 4	Uses knowledge of multiples to determine common multiples	Applies common multiples to simplify and solve problems involving fractions	Solve various problems involving fractions with unlike denominators
Reasoning Proportions and part: whole relationships	Understands multiplication as grouping	Compares groups using ratios or proportions	Solves problems requiring proportional reasoning	Distinguishes between rates, ratios and proportions and uses each appropriately depending on the context
Representing Modeling Number*	Plots values on a number line	Represents / models equivalent fractions and percents	Locates points within a cartesian plane using coordinates (x,y)	Models proportional relationships using a double number line or a ratio table
Communicating Using words and symbols	Uses > < = ≈ to compare values	Uses correct notation and vocabulary for basic operations, equality, fractions, ratios, and percents	Solutions are detailed and organized, including symbols, words, and notations where needed	Accurately and cleanly communicates reasoning in various contexts. May include inequality (≠), arrows, columns, etc.

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Algebraic Reasoning (Symbolic Logic) Trajectory (Gr 7-9)

Reasoning and Analyzing: Use **reasoning and logic** to explore, analyze, and apply mathematical ideas

Understanding and Solving: Apply **multiple strategies** to solve problems in both **abstract** and contextualized situations

Communicating and Representing

Algebraic Reasoning	Emerging (7)	Developing (8)	Proficient (9)	Extending (10+)
Understanding	Substitutes values into single variable expressions	Substitutes into and evaluates expressions with more than one variable	Simplifies and evaluates expressions using exponents and polynomials	Converts concrete models into variable expressions and equations
Solving	Solves 1-step and whole number equations independently	Solves 2-step equations independently	Solves multi-step equations and isolate variables in common formulas	Writes and solves equations based on novel contexts or multi-step problems
Reasoning (Logic Strategies)	Relies on strategic guessing	Uses inverse operations and logic strategies	Uses both algebraic and concrete models to solve equations	Manipulate equations and combines multiple strategies effectively
Communicating	Encodes / identifies solution using the form: variable = ___ "Work" is shown but does not use standard notation	Shows / Identifies at least one intermediate step between the problem and the solution	Communicates multiple algebraic steps in a logical and conventional manner	Algebraic notation is complete, organized, and communicates an efficient way to solve problems May include limits, estimates, and/or non-permissible values
Representing Modeling expressions and equations	Encodes/Decodes concrete visual models of expressions	Connects equations and equivalent concrete visual models (Mobiles)	Creates visual models of linear equations (Graphing) y = ax y = ax + b	Interprets visual models of equations (intercepts, slope, interpolation, extrapolation)

- Grade 7: two-step equations with **whole-number** coefficients, constants, and solutions
- Grade 8: two-step equations with **integer** coefficients, constants, and solutions
- Grade 9: multi-step one-variable linear equations

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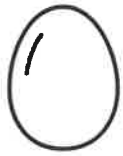
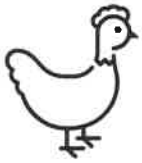
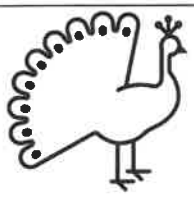
Fact Fluency Trajectory (K-9)

Name : _____

Date : _____

Fluency Stage	Addition*	Subtraction	Multiplication	Division (Factoring)
	Count On, 1 : 1, using tools	Count Back From, 1 : 1, using tools	Skip Counting, May use fingers	Guess and revise strategy Ex. Dividing a number by any number smaller than itself, chosen randomly.
	Making Ten	Think of related addition fact	Knows Benchmarks (x1, x10, x5, x2)	Strategic elimination (use a list of prime numbers 2, 3, 5, 7, ... and eliminate one at a time)
	Compensation (Regrouping) Ex. 18 + 7 = 18 + (2 + 5) = (18 +2) + 5 = 25	Take from 10 (compensation) Ex. 21-8 =21-10+2 =11+2 =13	Adds a group onto a benchmark multiple* 6 x 9 =5 x 9 +9 = 45+9	Recognizes fact families (remembers patterns in products of 2,5,10)
	Doubles and Near-Doubles	Subtract in parts (partition) Ex. 21-8 =21-1-7	Subtract a group from a benchmark multiple* 8 x 9 =8 x 10 – 8 = 80-8 = 72	Divides in parts (according to place value or benchmarks) 85 ÷ 5 = (40÷5)+ (40÷5)+ (5÷5) = 8 + 8 + 1 = 17
	Rounds one addend up and then uses subtraction 28+17 =28+20-3 =48-3	Same distance = same difference 200-18 = 199-17 (reduce both by 1) 199 - 17 182	Uses squares or other known facts Ex. 7 x 8 = 7 x 7 + 7 = 49 + 7 = 56	Thinks of related multiplication fact (connects to inverse operation) Ex. 60 ÷ 5 = 12 because 12 x 5 = 60

*Benchmark sums: 10s, doubles

*Benchmark multiples: x 1, 2, 5, 10 then 2, 4, 8 then 3, 6, 9 then 7 , 11 , 12, 13

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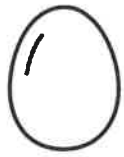
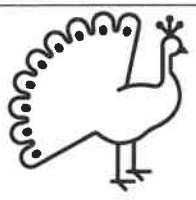
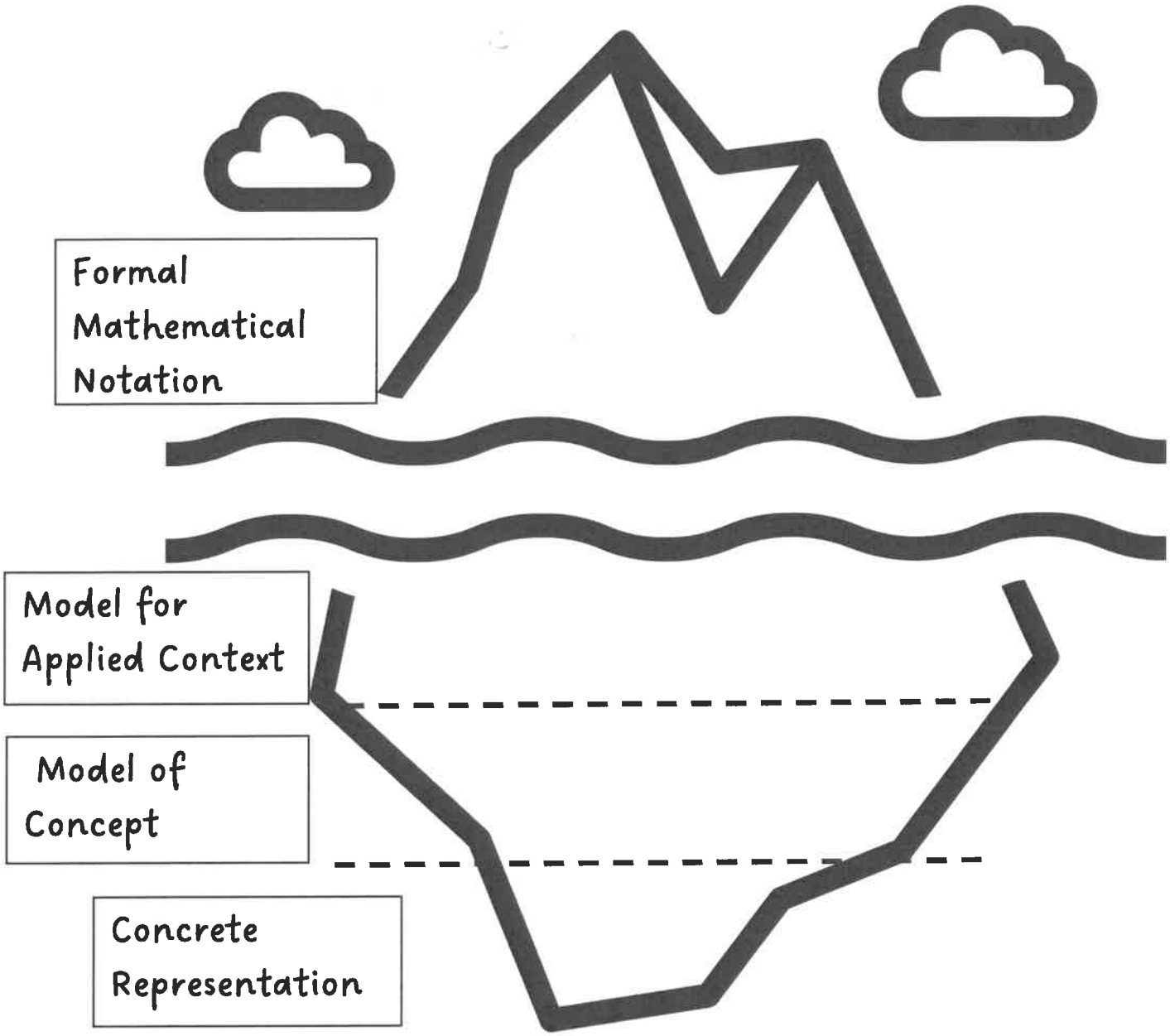
Fractions/Decimals/Percents Fluency Trajectory

Name : _____

Date : _____

Fluency Stage	Addition	Subtraction	Multiplication	Division
	Adds fractions with common denominators Adds decimals to one place (no carrying)	Subtracts fractions with common denominators	Multiplies benchmark fractions by a whole number	Divides fractions to simplify (2, 3, 5, 10)
	Adds fractions up to and over 1, same denominator. Uses a bar or pie models	Subtracts fractions up to and over 1, with same denominator. Uses bar or pie models	Uses multiplication facts to create equivalent fractions Uses array or grid models to represent multiplication	Reduces fractions using strategic elimination (use a list of prime numbers 2, 3, 5, 7, ... and eliminate one at a time) Divides a whole number by a decimal value.
	Adds mixed numbers and decimals by grouping whole and fractional parts	Subtracts mixed numbers and decimals by grouping whole and fractional parts	Uses multiplication to create common denominators when needed	Recognizes and converts decimals and fractions as two ways of showing the same value. (A fraction is a division, and a decimal is a division by a power of 10)
	Adds fractions with unlike denominators Adds decimals accurately	Subtracts fractions with unlike denominators Subtracts decimals accurately	Multiplies fractions Multiplies decimal values accurately	Divides fractions by a whole number and vice versa Divides a fraction by another fraction
	Fluently converts values to fractions, decimals and percents to add them efficiently	Uses subtraction to solve problems including decimals, fractions and percentages (ie. tax, sale price)	Uses a ratio table (proportional reasoning) to solve rate and ratio problems.	Uses and solves proportions (equates 2 fractions to find an unknown value)


Formal
Mathematical
Notation
Model for
Applied Context
Model of
Concept
Concrete
Representation

Mathematical Discourse Protocol: "Notice & Wonder"

For all "Notice & Wonder" tasks, start with the following sentences:

1. I see...
    a. A drawing / an image
    b. A graph
    c. A painting
    d. A video / a scenario
2. These are ...
    a. Numbers / Calculations
    b. Geometry
    c. Statistics / Probability
    d. Logical Consequences
3. I wonder... (A question, or several, that you ask yourself while looking at the provocation)
    a. What's missing?
    b. Is that true? Always? What are the exceptions?
    c. What about...
    d. Why is it...
    e. How...
4. Let me summarize...
    a. In words (in general, plus, minus, equal, same, double, ...)
    b. In symbols (an equation, variables, a formula)
    c. With the help of a model (graph)
    d. With a similar analogy or scenario

3 ACT MATH TIP SHEET

HOW TO RUN A 3 ACT TASK WITHOUT A HITCH

DURING ACT 1

SPARK CURIOSITY

What caught your eye about the 3 act math task you've found? What made you think it would be useful for your classroom? Often times, we can be tricked into thinking kids will enjoy a problem because it is from the real world, it is relevant, or because there is a video they can watch. These are all misconceptions. Think about how the problem might make a student **curious** to engage and solve the problem.

CREATE ANTICIPATION BY WITHHOLDING INFORMATION

Be sure to It avoid giving students all of the information for the task upfront. When first exploring 3 act math tasks, it is easy to miss the fact that the first video, act 1, typically gives little information about the question we are asking or any measured quantities. Much like a well written movie script, the filmmaker is intentionally giving just enough information to capture the attention of the audience and will build the storyline slowly to keep that attention. During a 3 act math task, we want to build this **anticipation** in our students by **withholding information**.

NOTICE AND WONDER

Once we have built **anticipation** through the **withholding of information**, we can now **empower student voice** by asking them what they **notice** and what they **wonder** about the image or video clip. Be sure to leave this questioning open as asking for them to pay attention to only things related to mathematics may shut down some students, especially those who may not feel confident enough in their thinking.

making MATH MOMENTS that MATTER

TAPINTOTEENMINDS

MRORR ISAGEEK.COM

DURING ACT 2

PROMOTE STUDENT THINKING

A common misconception is that students need to understand the steps, formulas, and procedures before they can have any success when attempting to solve a 3 act math task. The most effective way to implement a 3 act math task or any other type of curious problem is to **promote student thinking** without explicitly pre-teaching the concept. If a lesson is taught before students have had an opportunity to solve a problem using their prior knowledge and through the inquiry process, this can immediately shut down some students who do not feel confident with the newly presented ideas. Pre-teaching can often lead teachers to feel as though 3 act math tasks "aren't working" for their students and may result in abandoning this problem type before they've experienced the benefits.

FUEL SENSE MAKING

Plan with intentionality to **fuel sense making** as you help push student thinking in the direction of the new learning. Making use of the 5 Practices for Orchestrating Productive Discussions as you **anticipate**, **monitor**, **select**, **sequence**, and **connect** the mathematical ideas you have planned with intentionality will be extremely important to maximize student learning. Selected specific students to share out their useful mathematical models and strategies prior to you sharing additional models and strategies you would like to highlight through direct instruction.

DURING ACT 3

THE BIG REVEAL

Just like a great Hollywood movie, Act 3 is the conclusion of the storyline. In math class, this is where we share what really happened in the real world. It's great to have a video or image for this portion, but not always a requirement.

PURPOSEFUL PRACTICE

Plan an opportunity for **purposeful practice**. It is a huge bonus If you can make this portion connected to the context/story to build on the 3 act math task, but is not a requirement.

I Have, You Need

PH

AN INSTRUCTIONAL ROUTINE TO BUILD PARTNERS OF 10, 100, 1000

Play Often

Set expectation and rules of the game:

- Establish a target number.
- Say, *"For a total of 100, I have 92, you need...".*
- Give brief think time. Then cue students to respond, "8".
- Play several rounds at a time, gradually choosing more challenging numbers.
- Alternate between choral response, popcorn response, down the line response, and partner play. Keep it moving, keep students anticipating with positive energy. After playing a few times, talk strategy.

Talk Strategy

Ask students:

How do you know? What do you think about as you figure out each partner?

Occasionally choose a number like 73, then immediately choose it's additive partner, 27, for the next round. Ask students if they notice a relationship between the two numbers. Help students realize they could find the difference up to 100, but also subtract back from 100.

When using the target 100, do students deal with the ones first? Do students deal with the tens first? Over time, gradually help students develop the 90-10 strategy, where they fill in the total to 90 and then the ones to 10.

Purposefully Choose Numbers to Help Students Grow

When choosing numbers for the "I Have" part, consider these principles:

- Choose accessible increments before choosing more challenging relationships—ie. work with multiples of 10 before moving to multiples of 5, use multiples of 10 and 5 before using whole numbers, use whole numbers before using rational numbers (fractions and decimals).
- Choose numbers in the top half of the range before using numbers in the bottom half of the range.
- Choose numbers closer to an anchor or benchmark number before using numbers that are more adrift from the anchors.

Diligently work to adjust to your students. If the problems seem easy, gradually give harder numbers. If they seem difficult, back up to easier numbers. Try to just reach the zone of proximal development.

Generally, play to total of 5, then 10, then 20, then 100. By the end of 2nd grade, total 100 by 5s. By the end of 3rd grade, total 100 by 1s and total 1,000 by 100s and 10s. If your students are older, back up to what they need and build them up.

Kindergarten and 1st:

Play with fingers (one hand or two), five-frame cards, ten-frame cards, double ten-frame cards, or number racks, or verbal numbers. As students get used to the game, as you show the card, say the number shown and record the partner as students say it.

1st and 2nd:

Play with double ten-frame cards, number racks. As students get used to the game, as you show the card, say the number shown and record the partner as students say it. Alternate between physical representations and verbally saying the numbers.

3rd to 12th:

Play with dollar amounts, coin combinations, fractions and decimals for a total of 1, portions of time for a total of 60 minutes. As they study geometry and angles, play to benchmarks like 90, 180, 360.

Would you like to teach more complex ways of thinking and reasoning? Join us on #MathStratChat!

Learning Through Mistakes in Math: "My Favourite No!" Routine

The "My Favourite No!" routine is a simple yet powerful routine that helps students analyze mistakes. In general, the teacher gives students a problem to solve and students complete this problem on an index card or a small piece of paper. The teacher then collects the solutions and makes two piles, correct (yes pile) and incorrect (no pile). From the "no" pile, he/she chooses a favourite incorrect "no" answer, usually the "favourite" has some things correct and at least one common error. The teacher then facilitates a collaborative conversation regarding this problem, to help uncover and learn from the mistake. More than one "favourite no!" can be presented if the topic is multi-layered or solving the problem requires combining several skills. The demonstration, shared by The Teaching Channel, takes place in a middle school classroom with Leah Alala as the facilitator. However, this formative assessment strategy could be used at any grade level.

Watch a demo of "My Favourite No!": My Favourite No (a math assessment technique) on Vimeo

Steps for Implementing the "Favourite No" Routine

1. After teaching and engaging students in a concept, the teacher poses a question/problem for students to answer on an index card. This could be done as an exit ticket at the end of a day or even at the start of a lesson.

2. The teacher collects the cards and makes two piles: Correct and Incorrect (Yes and No Piles).

3. The teacher then chooses an incorrect answer that is their "Favourite No". The choice is very intentional based on common errors from the group and known common misconceptions relating to the concept.

4. The teacher then **rewrites** the problem and posts it on the document camera or whiteboard. (This maintains the anonymity of the student so that the focus is on the solution rather than whose answer it is.)

5. Students analyze the problem and the teacher asks: "What is done correctly?" It is important to focus on what is done right first! One strategy for engaging students is to ask them to do a pair/share regarding what is done correctly before sharing out as a group.

6. Then, the group discusses the error made and learns through this mistake. The teacher used accurate vocabulary to paraphrase student ideas and precise notation to annotate and/or edit the solution.

IMPORTANT NOTE: Students should expect the teacher to be the facilitator of this conversation rather than a "sage on the stage". More learning will occur if the conversation is student-centered, and student driven.

Math Questions to Promote Thinking

Why do you think that?

What were you thinking here?

Can you paraphrase their thinking? Can anyone?

How do you know this is right? Is it right? Are you sure? What makes you so sure?

Can you find a time or place where this won't work?

Did anyone get the same answer in a different way?

Did anyone get a different answer? How did you get your answer?

What do you think helped you decide how to get your answer?

Tell us what you were thinking.

What would happen if...

Is there a pattern? What is it? Why not?

What decisions can you make from this pattern?

What is the same, or different, about your two ways of doing this?

What do you think will happen next? How do you know? Are you Sure?

Can you prove it?

Can you change something to make it come out differently? What? Why do you think that works?

Will it be the same if we use different numbers? Why or why not?

Does it make sense to you? Why or why not?

What would seem more reasonable? Why?

How can you check it to see for yourself?

What do you think that you should do next? Why?

Can you make a model or drawing to show what it means?

Find someone and see if you can work it out together. Explain it to them.

Will what you did always work that way? What makes you think that?

Do you see a pattern? What is it? How could you make it easier to see?

How could you have done this more quickly?

What other numbers would work?

Are there some numbers for which that will not work? How do you know?

Write a new problem that is different in some ways but the same in others.

What is the largest number that will work? The smallest?

Do you want to change your answer? Why do you want to change your answer?

How does this relate to...?

Have you seen a problem like this before?

Tell or write a story that uses this kind of mathematics?

What would you measure it with? Why?

How do you think a carpenter (or other profession) would use this?

Use these materials to show me how you solved this problem. Do you think other materials would work better?

Name: _____

Human Maths Bingo

Directions: Look for a classmate who matches a description in one of the boxes and get them to write their name in it. When all your boxes are signed, yell out BINGO!

Find someone:

Whose birthday is in the **4.1 + 1.9** month?	Who has **√4** brothers?	Who has visited **>2** countries?	Whose number of immediate family members is **divisible by 2?**
Whose last name begins with the **15th to 18th letter** of the alphabet?	Whose height in cm is a **multiple of 4?**	Who lives **<1000m** from school?	Who has been to the movies in the last **45 ÷ 9** weeks?
Whose birthday date contains the answer to **3^2**?	Who goes to bed before **20:30?**	Who has more than **$1\frac{1}{4} + \frac{3}{4} + \frac{6}{8} + \frac{1}{4}$** pets at home?	Who can name at least **18 ÷ 6** countries starting with the letter 'A'?

These charts may be useful for students to reference during Esti-Mystery experiences.

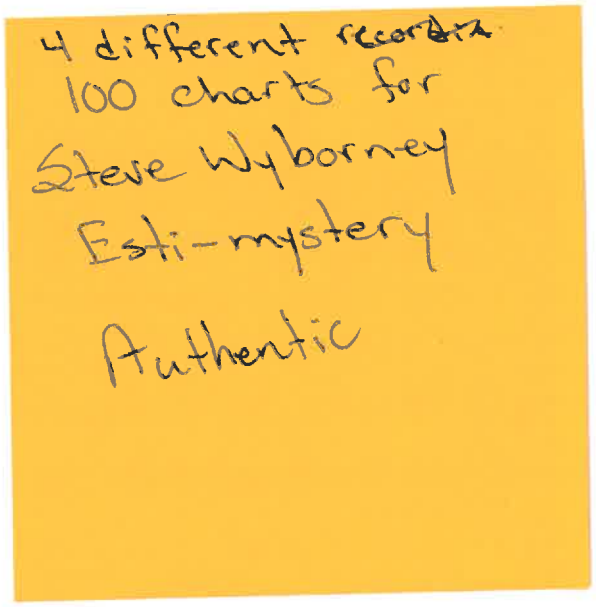


Chart 1

Chart 1 is a standard 100 chart.

Chart 2

Chart 2 is an inverted 100 chart.

Chart 3

Chart 3 is a standard 100 chart. The prime numbers (from 2-97) are underlined.

Chart 4

Chart 4 is an inverted hundreds chart. The prime numbers (from 2-97) are underlined.

Chart 1

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
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Chart 2

91	92	93	94	95	96	97	98	99	100
81	82	83	84	85	86	87	88	89	90
71	72	73	74	75	76	77	78	79	80
61	62	63	64	65	66	67	68	69	70
51	52	53	54	55	56	57	58	59	60
41	42	43	44	45	46	47	48	49	50
31	32	33	34	35	36	37	38	39	40
21	22	23	24	25	26	27	28	29	30
11	12	13	14	15	16	17	18	19	20
1	2	3	4	5	6	7	8	9	10

Chart 3

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
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Prime Numbers from 2-97

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67,

71, 73, 79, 83, 89, 97

Chart 4

91	92	93	94	95	96	97	98	99	100
81	82	83	84	85	86	87	88	89	90
71	72	73	74	75	76	77	78	79	80
61	62	63	64	65	66	67	68	69	70
51	52	53	54	55	56	57	58	59	60
41	42	43	44	45	46	47	48	49	50
31	32	33	34	35	36	37	38	39	40
21	22	23	24	25	26	27	28	29	30
11	12	13	14	15	16	17	18	19	20
1	2	3	4	5	6	7	8	9	10

Prime Numbers from 2-97

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67,

71, 73, 79, 83, 89, 97

6 X 6 Number Grid

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

7 x 7 Number Grid

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

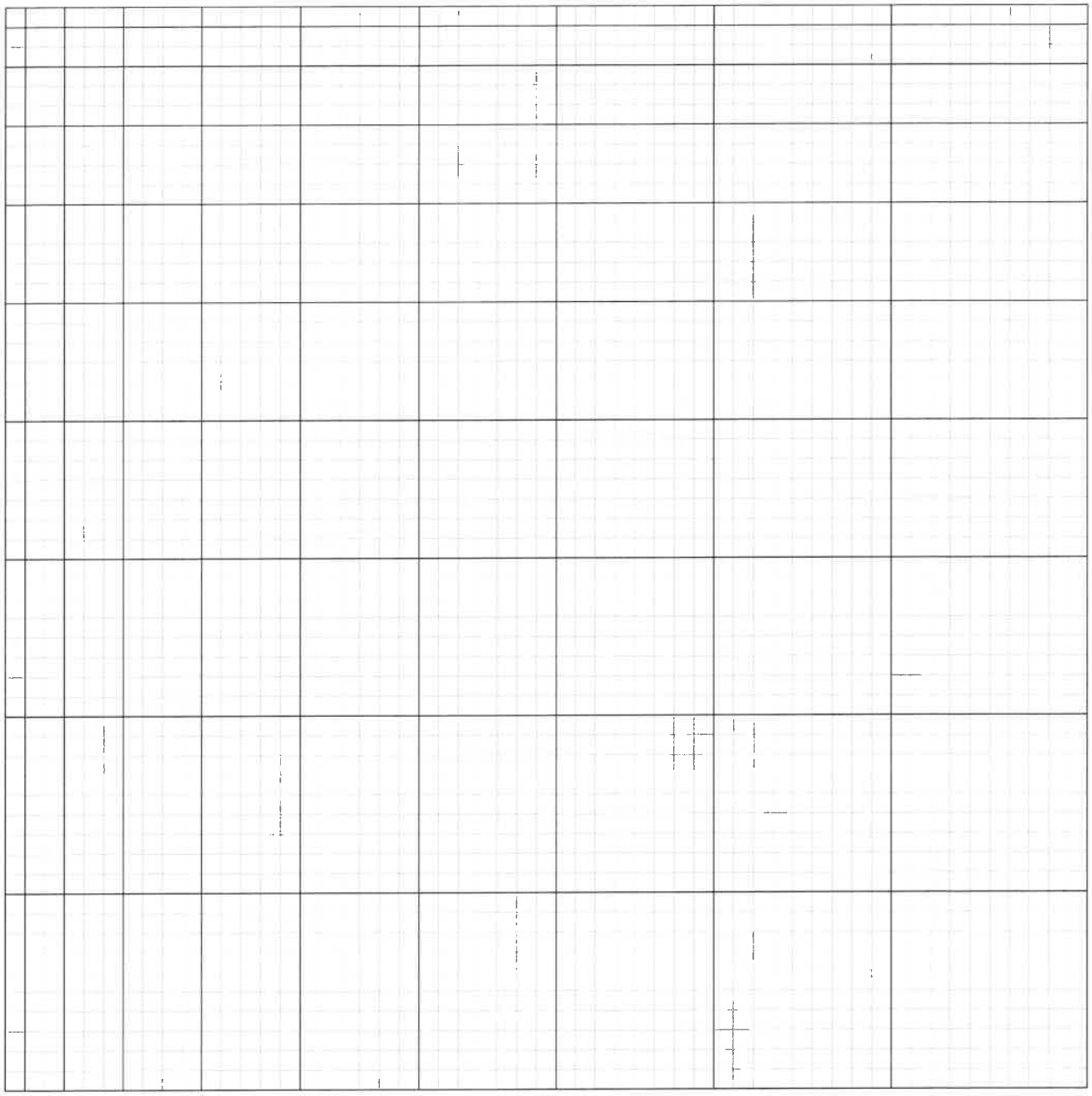
10 x 6 Grid

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	51	52	53	54
55	56	57	58	59	60

12 x 5 grid

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
51	52	53	54	55
56	57	58	59	60

1	2	3	4	5	6	7	8	9	10
2	**4**	6	8	10	12	14	16	18	20
3	6	**9**	12	15	18	21	24	27	30
4	8	12	**16**	20	24	28	32	36	40
5	10	15	20	**25**	30	35	40	45	50
6	12	18	24	30	**36**	42	48	54	60
7	14	21	28	35	42	**49**	56	63	70
8	16	24	32	40	48	56	**64**	72	80
9	18	27	36	45	54	63	72	**81**	90
10	20	30	40	50	60	70	80	90	**100**



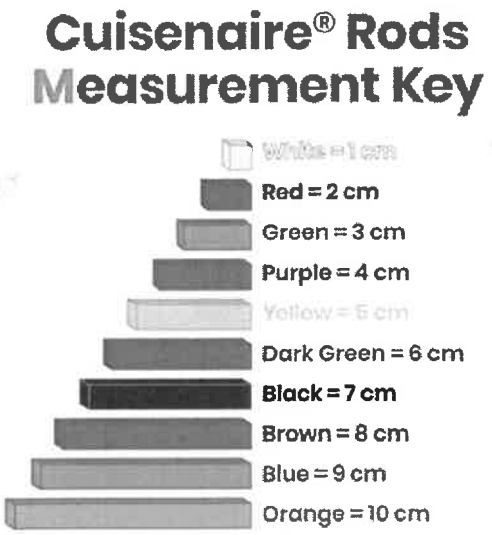
Which One Would You Prefer?

Are these all sandwiches? Why or why not?

Cuisenaire Rods

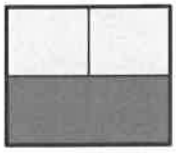
- Cuisenaire rods can help When visualizing base-10 and Metric measurement.

They can also be used to Compare whole numbers and model fractions



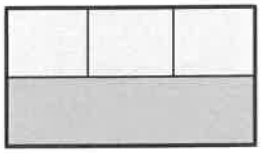
Using Cuisenaire Rods

- Model a fraction relationship where one object is exactly ½ of another.



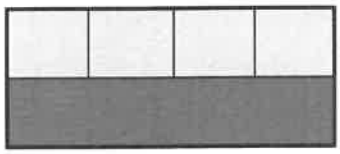
Using Cuisenaire Rods

- Model a fraction relationship where one object is exactly 1/3 of another.



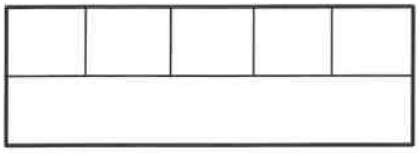
Using Cuisenaire Rods

- Model a fraction relationship where one part is exactly ¼ of another.



Using Cuisenaire Rods

- Model a fraction relationship where one part is exactly 1/5 of another(meaning 5 of one colour = 1 of another colour.



Using Cuisenaire Rods

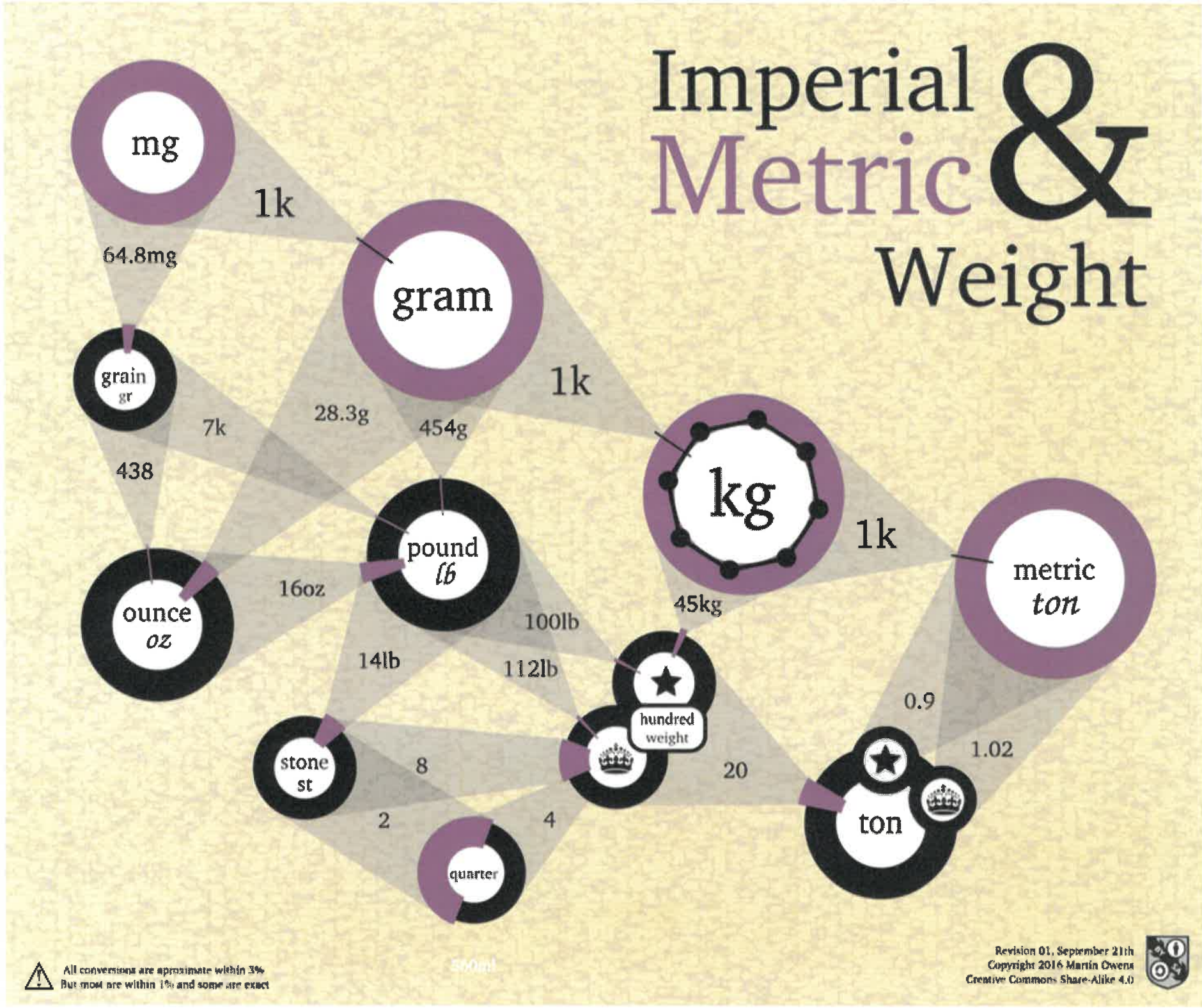
- Model a fraction relationship where one part is exactly 2/3 of another

Using Cuisenaire Rods

- Model a fraction relationship where one part is exactly ¾ of another

Using Cuisenaire Rods

- Model a fraction relationship where one part is exactly 2/5 of another


Imperial & Metric Weight
mg
1k
64.8mg
gram
grain
gr
7k
28.3g
454g
1k
438
kg
1k
metric
ton
pound
lb
16oz
45kg
ounce
oz
100lb
14lb
112lb
hundred
weight
0.9
1.02
stone
st
8
20
2
4
ton
quarter
All conversions are approximate within 3%
But most are within 1% and some are exact
Revision 01, September 21th
Copyright 2016 Martin Owens
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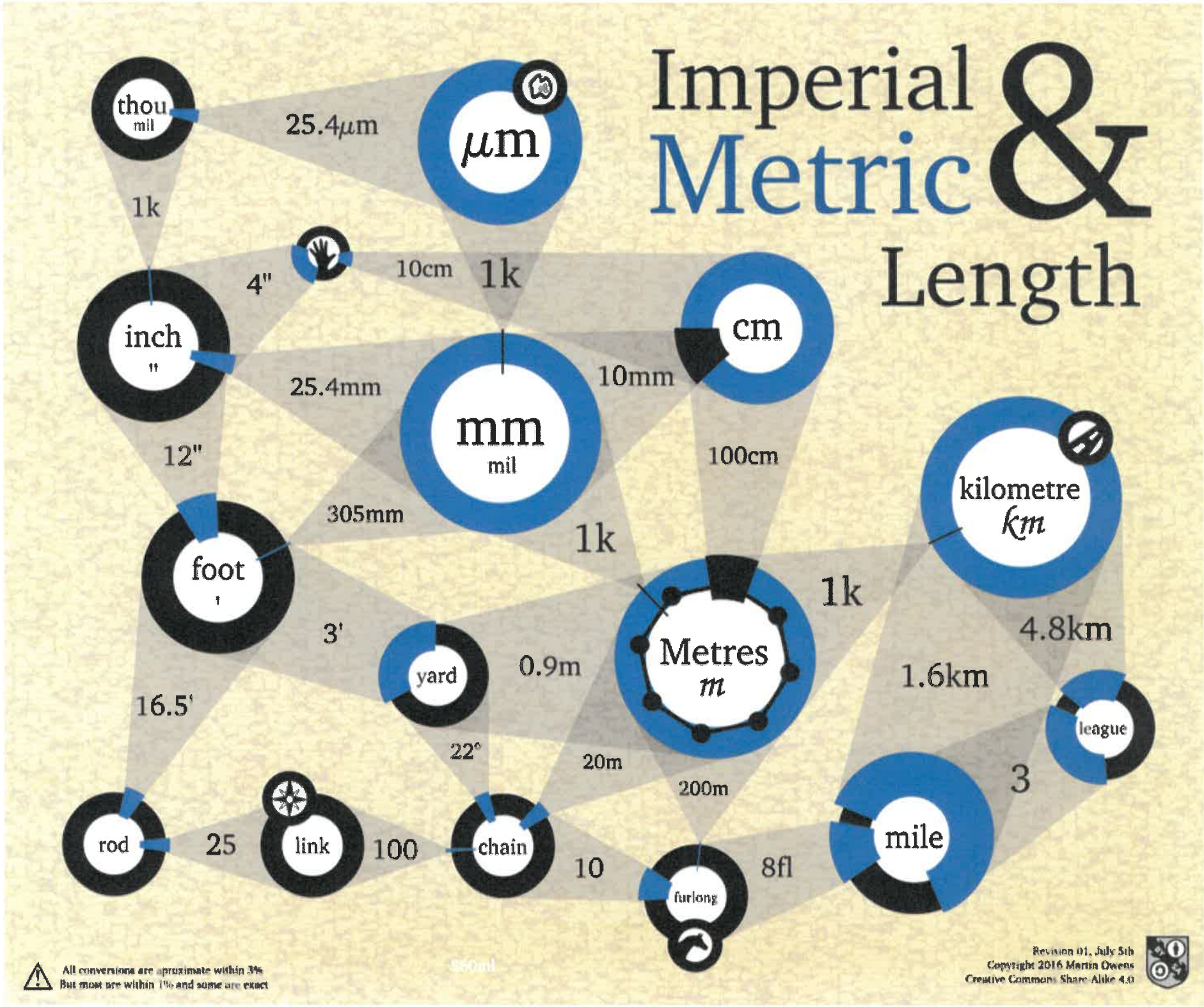
Imperial & Metric Length
thou
mil
25.4μm
μm
1k
4"
10cm
1k
inch
"
cm
25.4mm
mm
mil
10mm
12"
100cm
kilometre
km
305mm
1k
foot
'
1k
1k
4.8km
3'
yard
0.9m
Metres
m
1.6km
league
16.5'
22°
20m
200m
3
rod
25
link
100
chain
10
furlong
8fl
mile
All conversions are approximate within 3%
But most are within 1% and some are exact
Revision 01, July 5th
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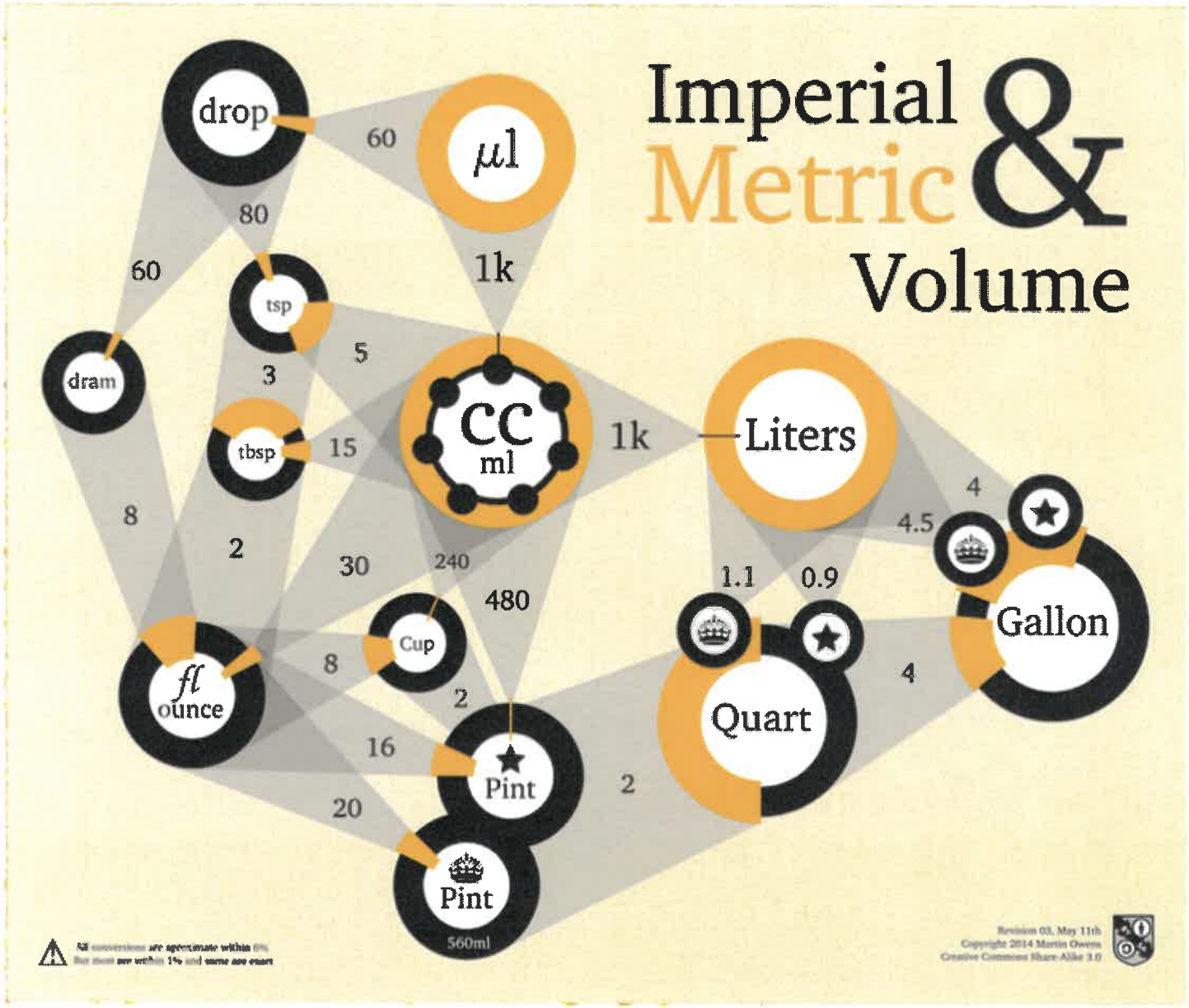
Imperial & Metric Volume
drop
60
µl
80
60
1k
tsp
5
dram
3
CC
ml
1k
Liters
tbsp
15
8
2
30
240
480
4
4.5
1.1
0.9
Cup
8
2
Gallon
4
fl
ounce
16
Pint
2
Quart
20
Pint
560ml
All conversions are approximate within 6%
But most are within 1% and some are exact
Revision 03, May 11th
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Numeracy Thinking Paper Name: _____

(Story Problems and Problem of the Week)

What do you know? What details are given in the story or problem description? (ex. Use numbers, words, and/or pictures)	What strategies will you use to organize the information you know AND the information you can figure out? ☐ make a list ☐ make a table ☐ use symbols or shapes ☐ make a visual model
What operations or steps did you do? Write numbers and signs to show the steps you used. ① ② ③	What is your final answer? (In words) How did you check if you were right? ☐ work backwards ☐ try a different strategy and get the same answer ☐ check with a peer ☐ use an answer key ☐ _____

Water, Water Everywhere Thinking Task

You are in charge of a water conservation awareness campaign for our school. You have surveyed the following 12 students and have determined that they brush their teeth as listed below. Use this information to estimate the water that could be conserved if they changed their water usage habits.

All students currently leave the water running at high flow for the entire time they brush their teeth.

Water usage flow rates:

- Off - 0 cups/sec.
- Low - 1 cup/10 sec.
- High - 3 cups/10 sec.

Student name:	Frequency of brushing:	Duration of Brushing:
Johnny	2 times/day	40 sec.
Suzie	after every meal	1 minute
Joanna	3 times/day	2 minutes
George	1 time/day	30 sec.
Polly	after every time she eats	1 minute 30 sec.
Heather	2 times/day	1 minute 20 sec.
Catherine	1 time/day	2 minutes
Billy	Once every other day	195 seconds
Lana	3 times/day	35 seconds
Shane	every morning	50 seconds
Uma	twice	1 minute 10 sec.
Bob	5 times/day	70 seconds

THE CLASS PET

Your class wants a class pet. Look at the details of those available and design a budget for each pet. Remember you must take care of all their needs and some of their wants (extras) so that the pet will be healthy and happy. Based on your work, the PAC will decide how much money they will give your class. Show all the work you've done to make your decision. Then answer the question, " Which pet do you think the PAC will agree to give you the money for?" and explain why.

	Hamster  **$ 11.95**	**Beta Fish**  **$5.00**	Hermit Crab  **$ 7.49** (includes the shell it wears only)
Needs:			
	Food: $4.50/ pkg (Your class will need 6 packages each year)	Food: $2.00 / container (Your class will need 5 containers a year)	Food: $ 5.00 / box (Your class must will need 10 packages)
	Basic Cage: $20.00	Aquarium: $25.00	Habitat $ 11.99
	Bedding: $9.00/ bag (Your class will need 3 bags each year)	Water Treatment: $5.00/ bottle (You will need 2 bottles)	Shells Stage 1: $3.00/1 Stage 2: $ 5.99/ 2 Stage 3: $ $7.00/ 1
		Living Plants: $10	Deodorant $ 10.00
		Pebbles: $3.00	Spray bottle: $2.00
Extras:			
	Exercise ball:$9.95	Plastic Plants: $3.50	Toys: $10.00
	Treats $ 6.50		Shells: (refer to above costs)
	Vitamins $4.50	Posts: $5.00	
	Deluxe Cage: $39.50	Castle: $10.00	
	Deluxe Chlorophyll Bedding: $1.00 extra/ bag	Pirate Ship: $17.50	
	Chew toys (for teeth) $6.00	Coloured Pebbles: $5.00	
	Hideaway: $6.50	Large Rocks: $0.50, $1.50, $4.00	
Important Info:			
	It is not possible to have two hamsters in one cage, they will fight each other.	It is not possible to have two beta fish in one cage, they will fight each other.	The hermit crab will need at least 2 shells at all stages of its growth. It grows in three stages.

Million Dollar Mission

One day, you are working on your wonderful Math problems when a mysterious billionaire walks into class. He says he has a job for you but doesn't really explain the details. He might have mumbled "dangerous" but it wasn't clear.

He will need your help for 30 days and you'll need a passport.

You will have a choice of have you are paid:

1. One cent on the first day, 2 on the second day, 4 on the third day and he'll continue to double your salary each day....or

2. Exactly 1 000 000.00$ (A million!!!)

What is the better choice?

Complete a table like this :

Option #1		
Day	**Daily earnings**	**Total Earnings($)**
1	0.01	0.01
2	0.02	0.03
3	0.04	0.07
⋮	⋮	⋮

Kayak Expedition

Ethan went on a 6 km kayak expedition on the Fraser River last week. The trip was divided into 3 legs that were each 2 km long.

The first leg left at 2h30 and ended at 3h10.

The second leg traveled the fastest current. Ethan was able to paddle twice as fast as on the first leg.

Ethan completed the third leg at the same pace as the first leg.

What are the different speeds for each leg of the expedition? (In kilometres per hour)

At what time did Ethan finish the trip?

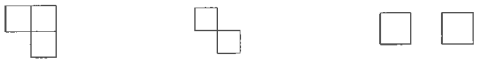
BUILDING A GARDEN

Your class is going to build a garden to grow plants to sell. The garden will be made up of planter boxes and paving stones to walk on. The garden must be wheel chair accessible so the paving stones are wide enough for wheel chairs. In order for the garden to grow well it must be weeded and watered regularly. To make sure that you can do this there are a few design rules to follow:

1. You must be able to walk beside each planter box on at least one side. This way you can take care of the plants in that box.

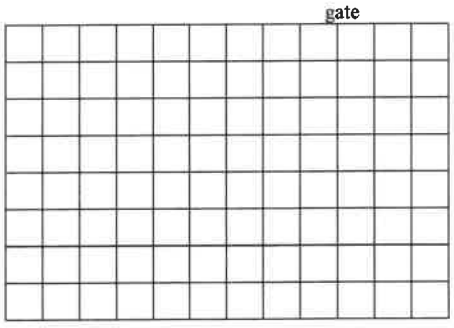
2. You are not allowed to step over any planter boxes. This is bad for the plants.

3. Paving stones must be connected along at least one side so that the path is wide enough for wheel chairs.



4. There must be a fence around the garden to keep animals out. The fence must have a gate. You can position the gate anywhere you want.

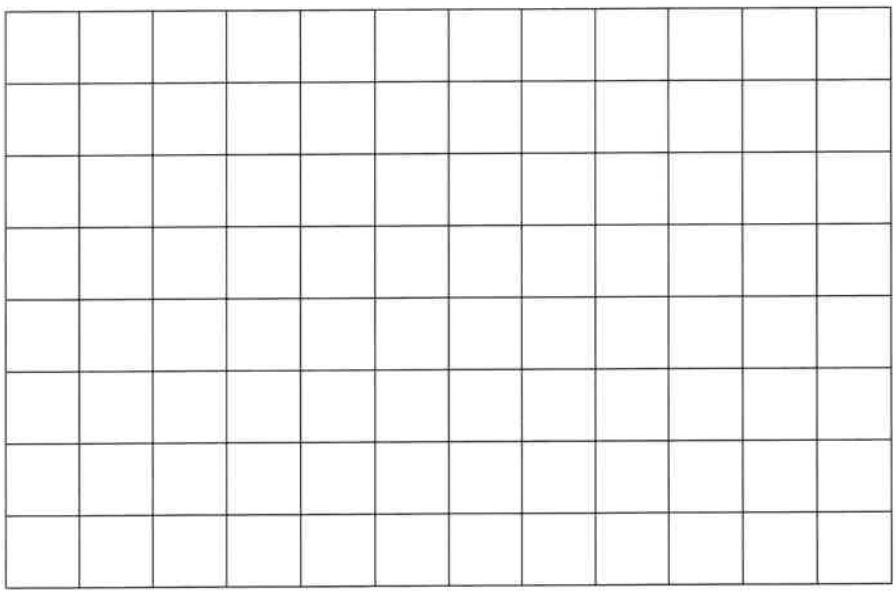
Last year's class designed the following garden with 46 planter boxes:

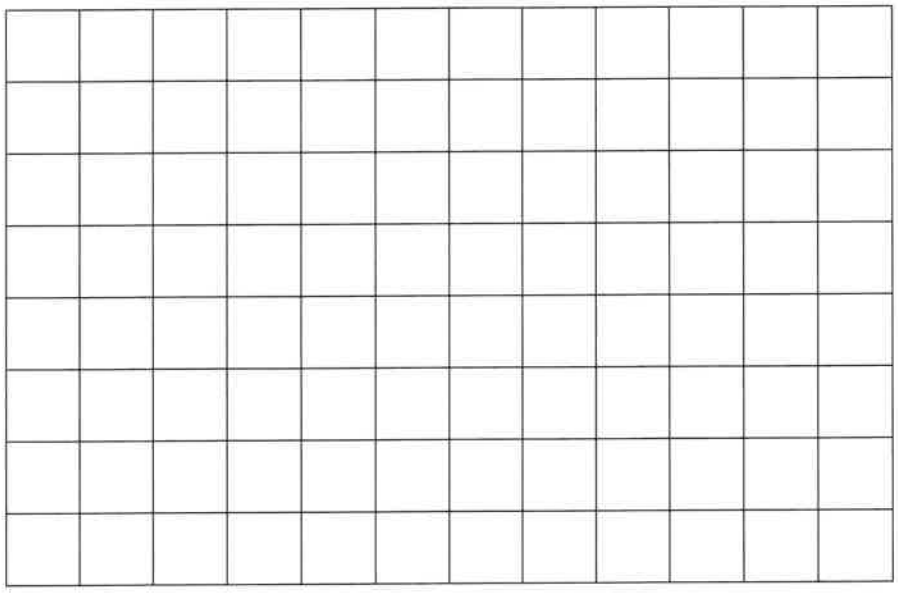


(shaded squares are planter boxes, white squares are paving stones.)

Your task is to design the best garden. When you have finished you must explain why your design is the best.

Building a Garden-work grids





Notice & Wonder: Data Visualization **Name:** _____

Provocation #1a

Complete the following sentences:

I see...

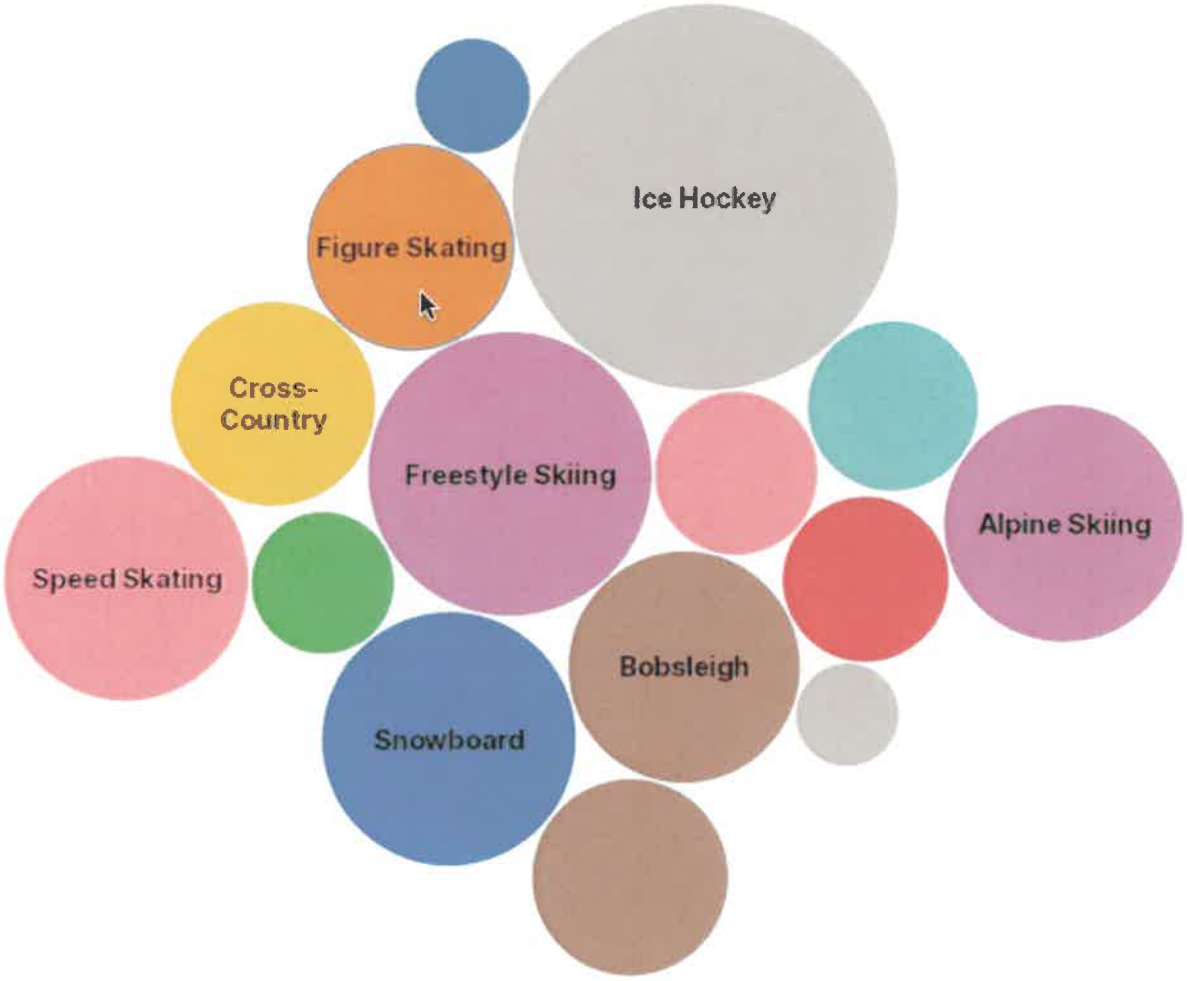
These are...

I wonder...

Let me summarize...

Provocation # 1b

Name: _____



I can assume that...

If there are 1000 athletes in total...

Another way to display this data is...

It would be better if...

Teacher Note:

Let students look at the chart and make inferences about the data before revealing the facts.

The first data visualization shows the bubble chart for the number of athletes sent to the 2022 Winter Olympics by various countries.

Questions to Pose:

What might this graph be showing?

Which countries appear to have approximately the same value?

Can the countries be ranked without the precise data values?

The second bubble chart shows the number of athletes by sport (for the 2022 Winter Olympics).

Questions to Pose:

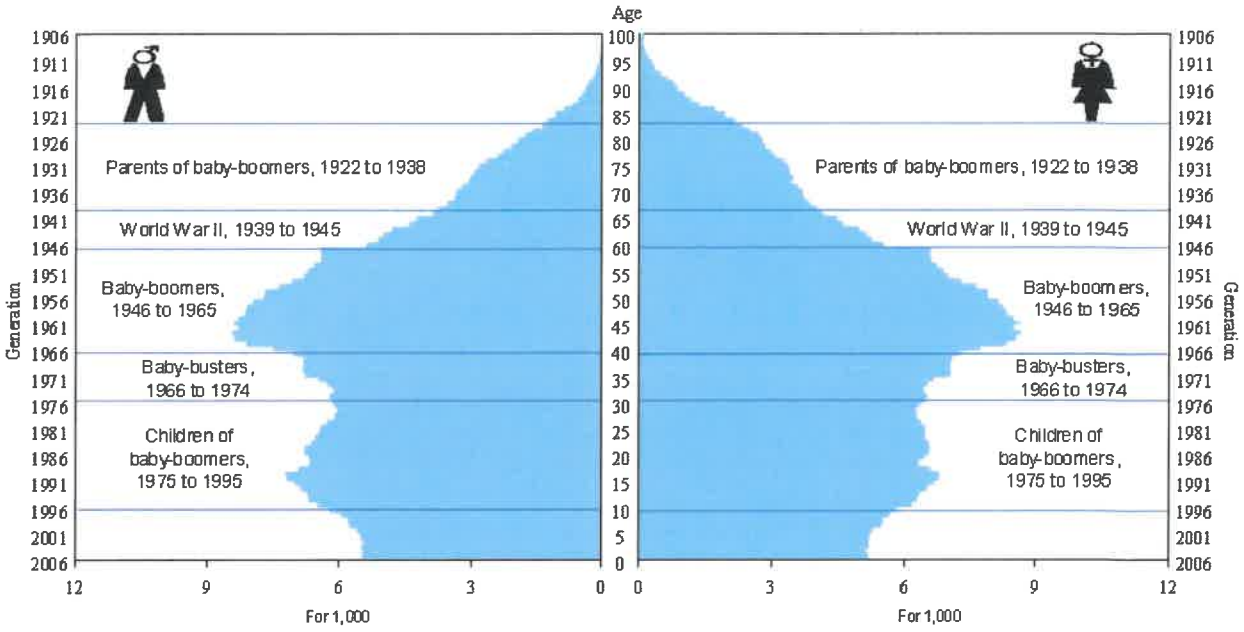
What do all the sports have in common?

What kinds of sports are not shown?

What other sports could be added as labels?

Why does it make sense that hockey has the largest bubble?

Provocation No.2



Complete the following sentences:

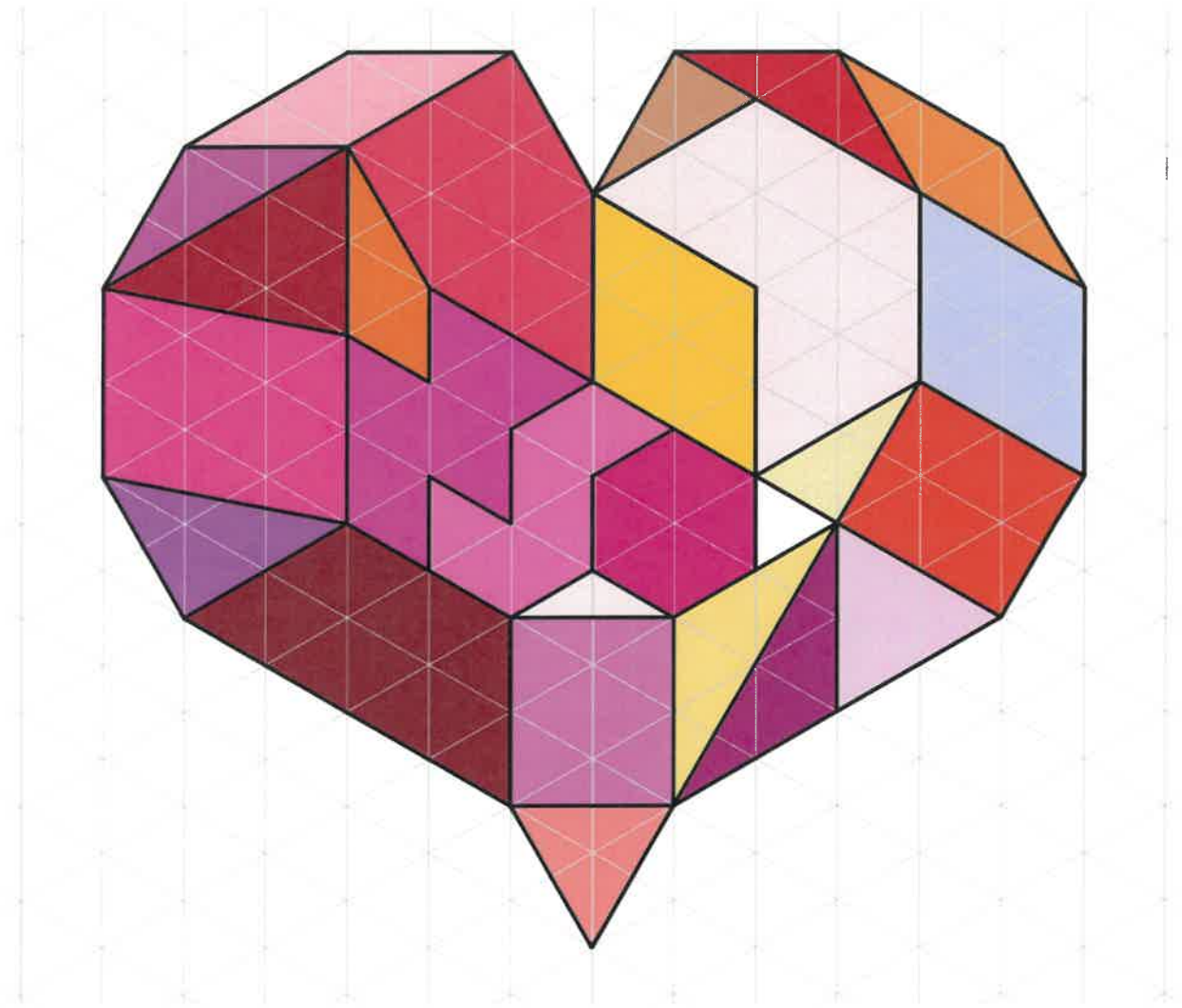
I see....

These are ...

I wonder...

Let me summarize...

Provocation No.3



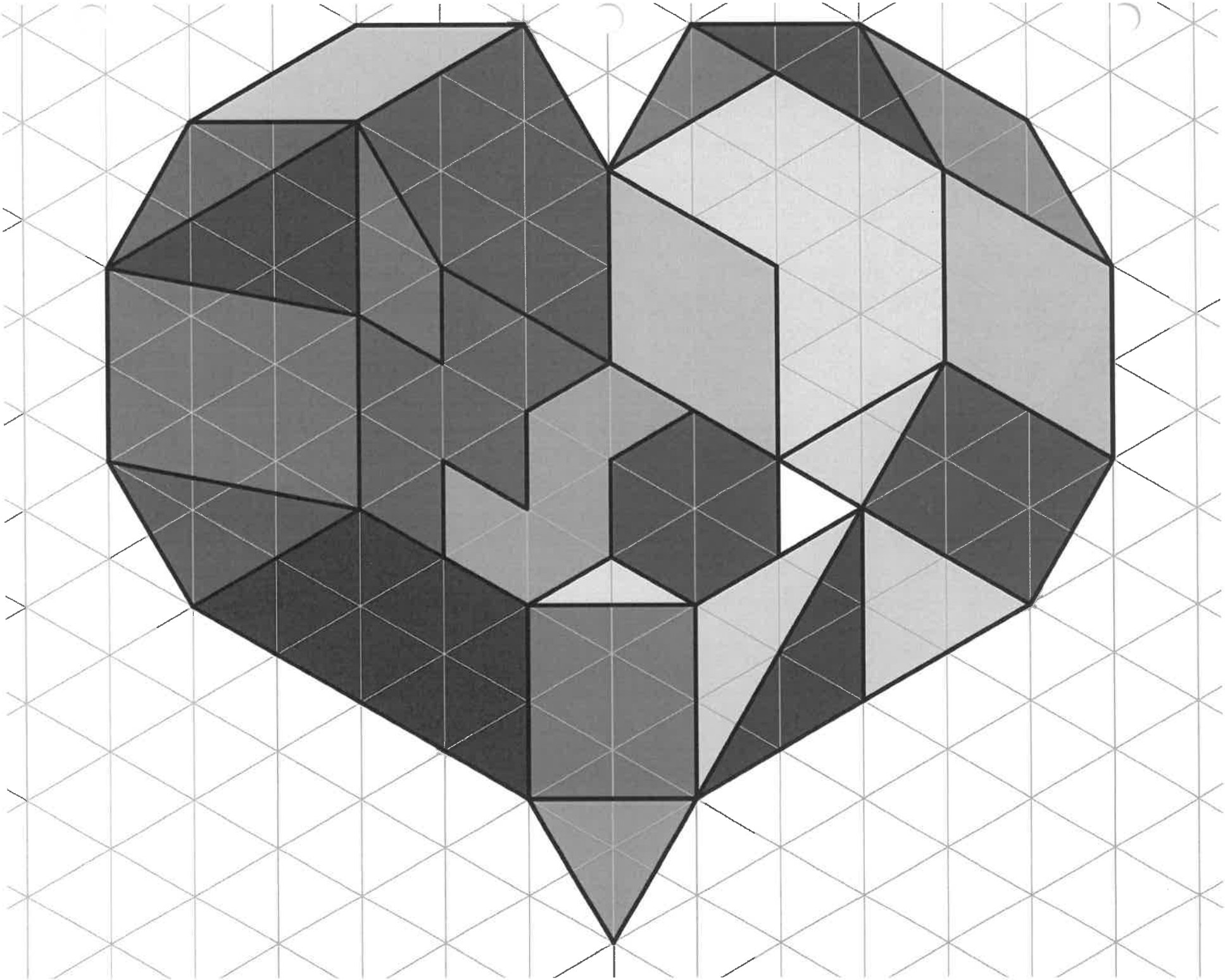
Complete the following sentences:

I see....

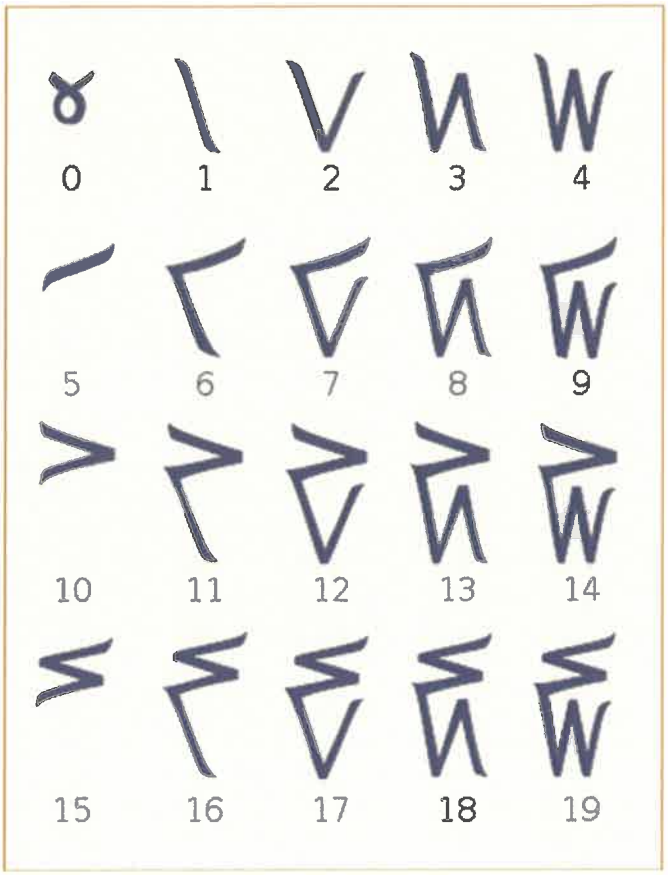
These are ...

I wonder...

Let me summarize...



Provocation No.4



Kaktovik Numerals

Complete the following sentences:

I see....

These are ...

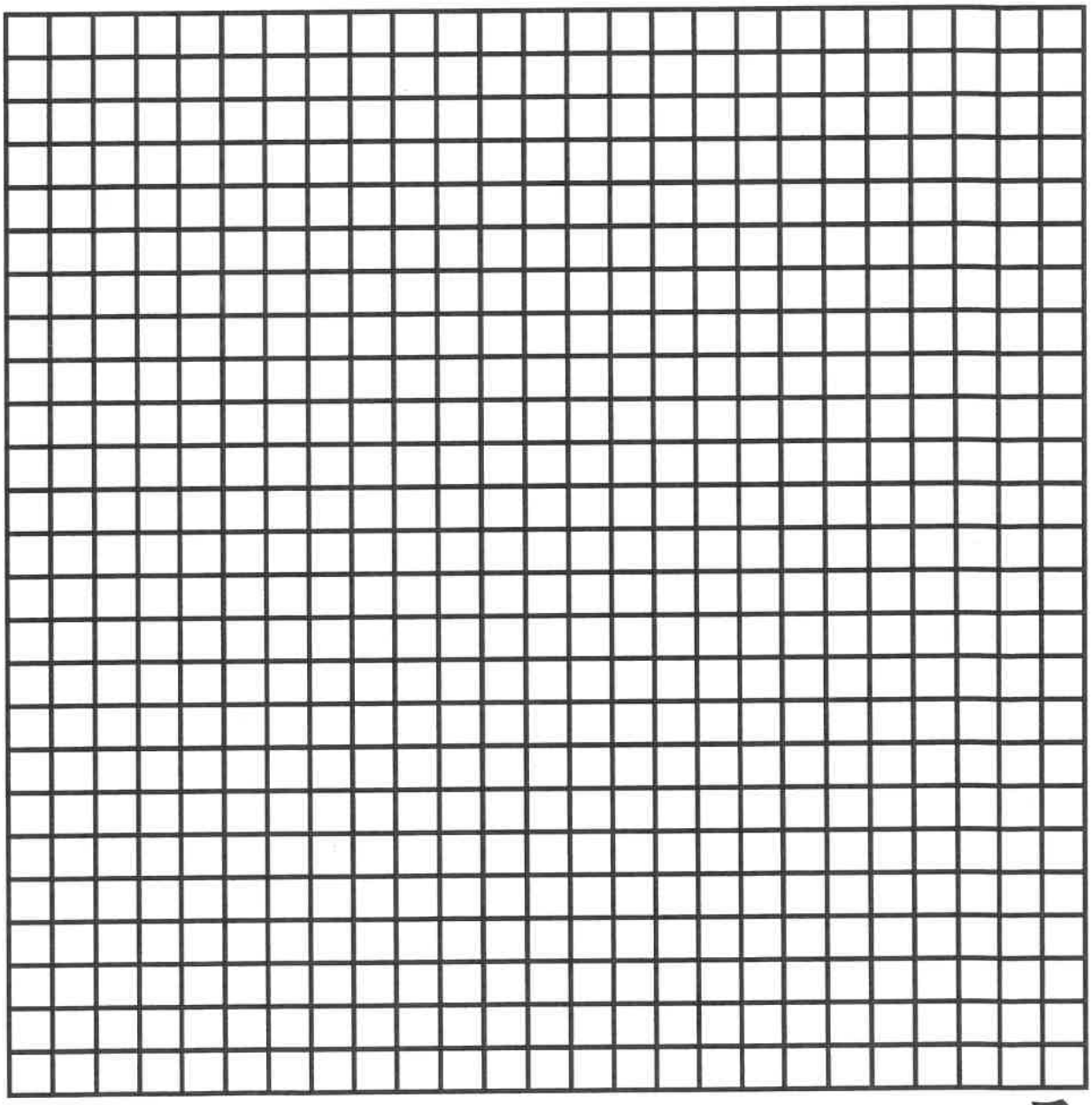
I wonder...

Let me summarize...

ARRAY CAPTURE

1. The first player rolls two dice. Those are the dimensions of their first array. (For example, if a player rolls a four and a five then they will build an array measuring 4 by 5)
2. The first player colors their array with their color. (player two will have a different color) Then they write their multiplication sentence in the array. On the first roll player one must start on the starting square. After that all other arrays will need to touch the array already in place.
3. Player two takes their turn and goes about it in the same fashion as player one, but from their corner.
4. If a player cannot place an array because their isn't room then they skip their turn. Whoever has the most squares filled at the end wins.

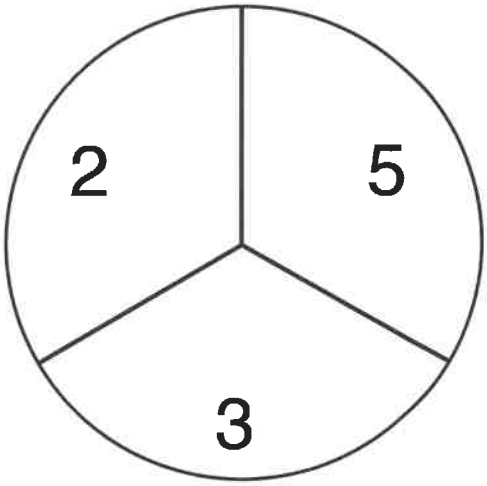
Player 1



Player 2

Prime Factor Game 2

Spin the spinner three times.
These are your factors.
Use your three factors to make one of the products below.
Cover the product in your colour on the game board.
Play until someone has three in a row in their colour.
.



12	18	50	30	20
8	27	75	45	125
12	18	50	30	20
8	27	75	45	125
12	18	50	30	20
8	27	75	45	125

Double or Double-Double

Pick a factor from the ***Factor Box***.
Double it (multiply by 2) or double-double it (multiply by 4).
Find the product below and cover it in your colour.
Four in a row wins!

Factor Box

1	2	3	4	5	6
7	8	9	10	12	14

24	8	6	20	12	4
16	28	14	32	18	24
10	2	6	36	28	40
12	14	18	4	16	20
10	8	24	32	36	2
40	28	18	16	4	6

Carole Fullerton, 2011

based on a game by BEAM –
http://www.beam.co.uk/mathsofthemonth.php

Four in a Row!
A multiplication game

25	30	35	40	45	50
30	36	42	48	54	60
35	42	49	56	63	70
40	48	56	64	72	80
45	54	63	72	81	90
50	60	70	80	90	100

Roll the die. Multiply your numbers.
Find the product on the grid and cover it in your colour.
Give your partner a turn.
First one to have 4 in a line wins!

Name: _____

1. What did you notice?	2. What do you wonder?
3. Main Question:	
4. Estimate:	5. What information do you need?
6. Show your thinking:	

Name:

Date:

I can...

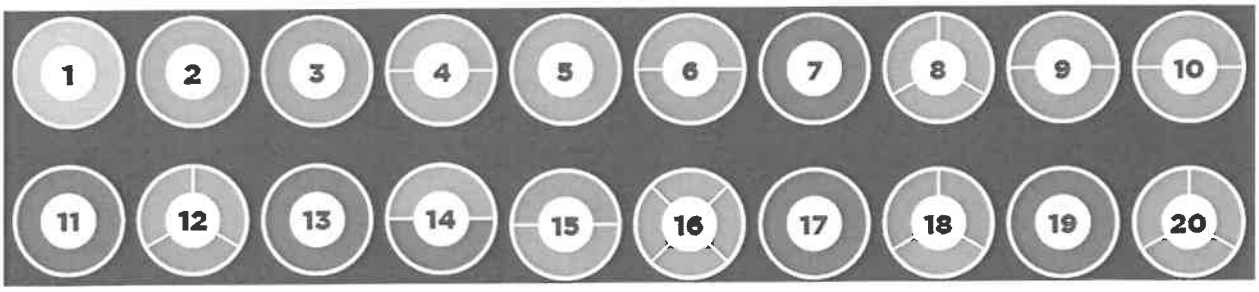
mild	medium
volcano	spicy

CAMPBELL RIVER
School District 72

BIG 4 TEMPLATE

Prime Factorization (Visualizing Divisibility) Name: _____

The first 20 whole numbers:

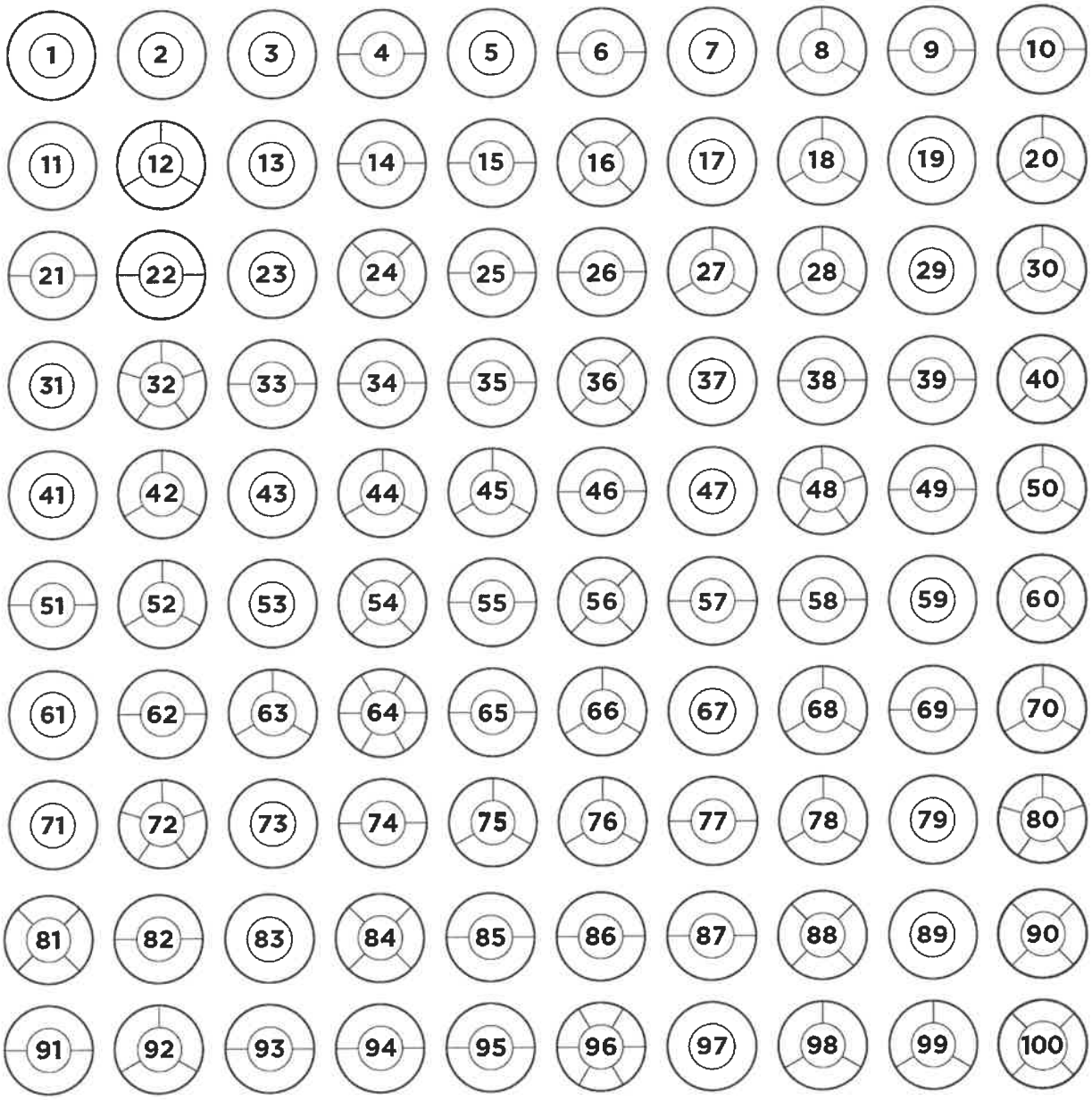


What do you notice?	What do you wonder?
What do you predict?	What patterns or interesting surprises did you find?

Colour Legend:

Description	Multiples of 2	Multiples of 3	Multiples of 5	Multiples of 7	Prime #s
Colour					

Use the factor grid below to colour code the numbers 1-100. As you go, note any patterns that you see.



Math Lab: **Are Rockets Candies Packaged Randomly?**

Name:_____ **Date:**_____

Hypothesis: **If** Rockets are packaged randomly,

then _____.

Independent variable: The Rocket colours/flavours that are possible in a packet

Controlled variable: The number of rockets in one packet

Dependent variable:_____

Materials / Equipment: 1 Packet Rockets candies

1 pencil/pen

4 - 6 pencil crayons or markers

1 ruler

1 Calculator (standard)

Procedure:

1. **Investigate**: How many colours are possible? how big is each packet?
2. **Collect Data**: How many of each colour does your packet contain?
3. **Consolidate Data**: Combine your data with **at least 3** other people's data.
4. **Represent Data**: Create graphs to model the grouped data visually (make a bar and a circle graph)

Required for All Graphs:

❑ A Descriptive Title	❑ Labels
❑ Correct Data	❑ Clear & Precise

5. **Analyze Data:** Describe the data in general and some details (min/max)

Required for Analysis:

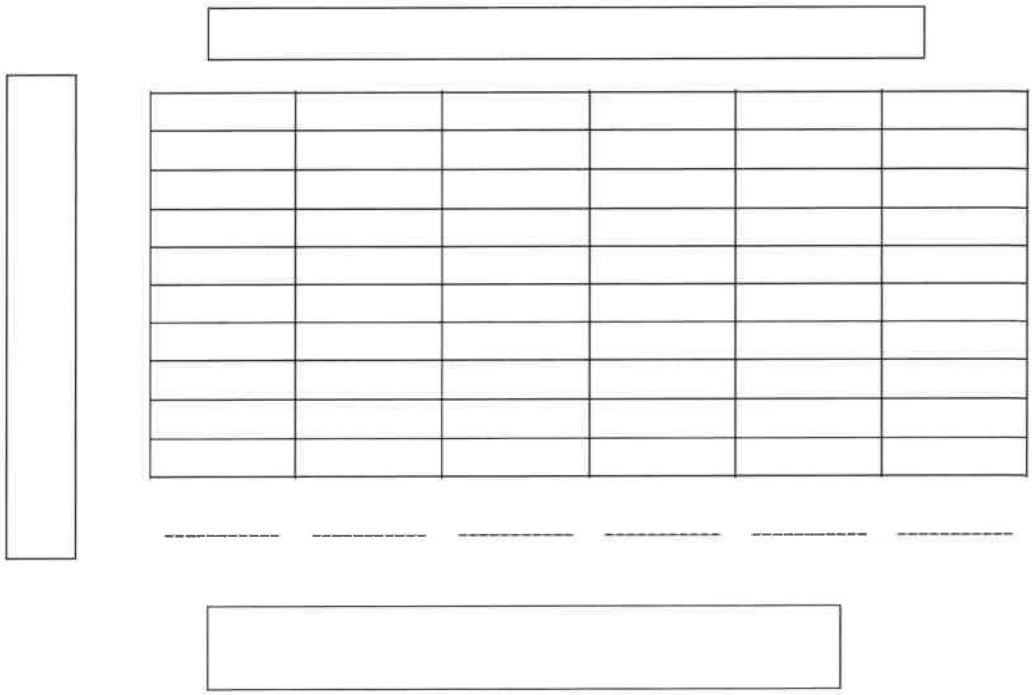
❑ Connection(s) to Results	❑ Numbers from Data
❑ Math Vocabulary & Notation (most, least, equal, %, etc.)	❑ Clear & Accurate Responses

Data Tables & Graphs

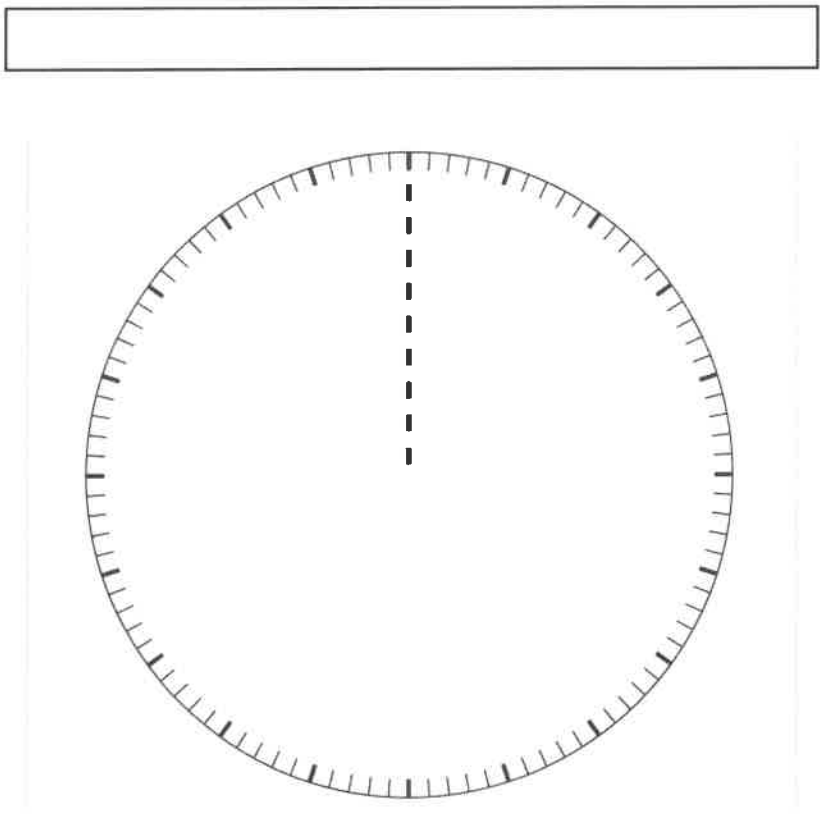
Data Table

Colour	Tally	Number (Frequency)	Percent (%)

Bar Graph



Circle Graph



Analysis:

1) **In general,**

2) **The maximum ...**

3) **The minimum ...**

Conclusion (Refer back to the hypothesis)

In conclusion, it appears that packets of rockets (are / are not) randomly produced,

because _____

Factors that may have influenced my results (or caused errors)

_____

_____

Implication/Connection to the experimental results

(Suggest a follow-up study, a related investigation you could do, or a set of data that would produce different results)

_____

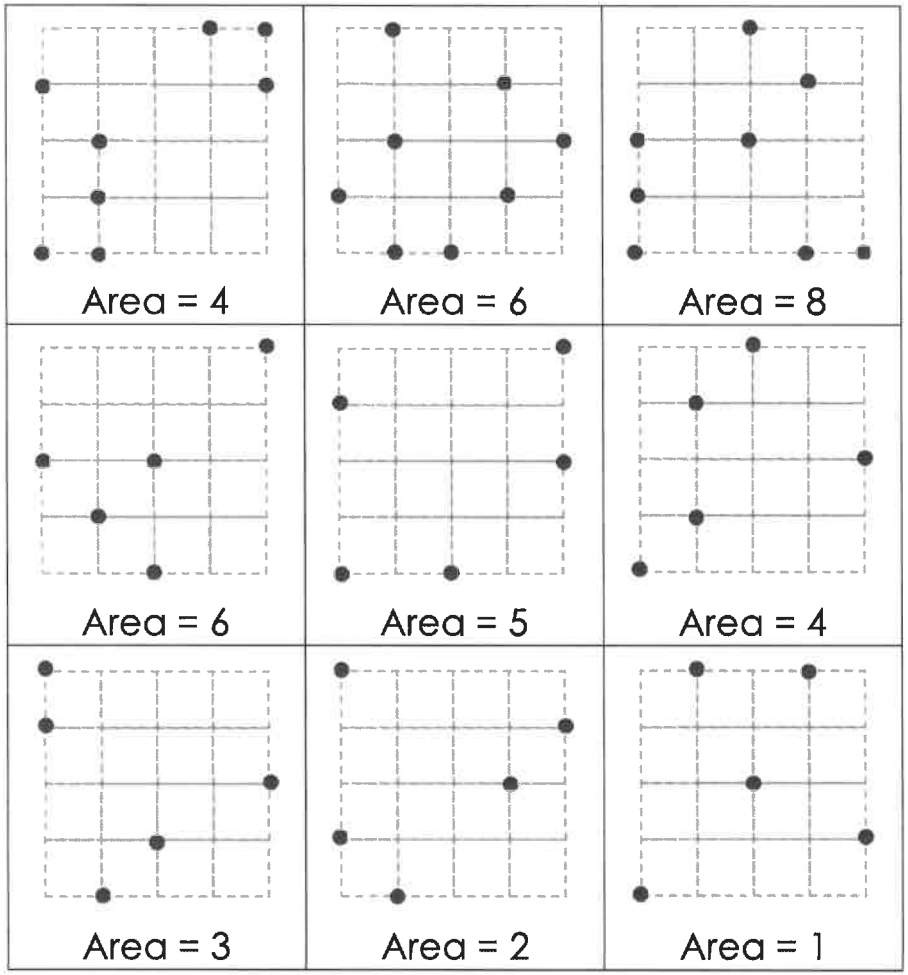
_____

Curricular Competencies

Understanding (Data Collection)	
Solving (Calculate percentages from raw data)	
Reasoning & Analyzing (Hypothesis, Analysis, Conclusion)	
Communicating (Using Mathematical Vocabulary)	
Representing (Model Concrete Data in a table, a circle graph, and a bar graph)	
Connecting and Reflecting (Error analysis & implication/connection)	

SANKAKU PUZZLES BY NAOKI INABA

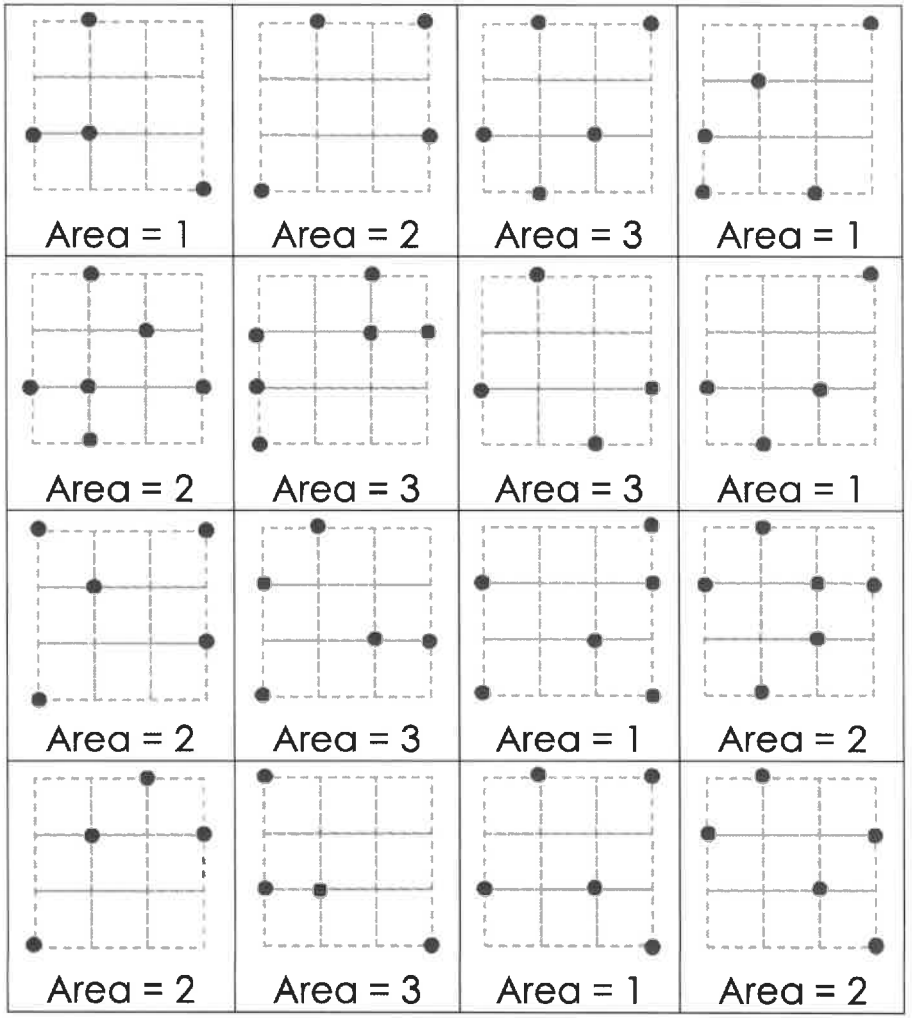
4 x 4 Grids, cont.



SANKAKU PUZZLES BY NAOKI INABA

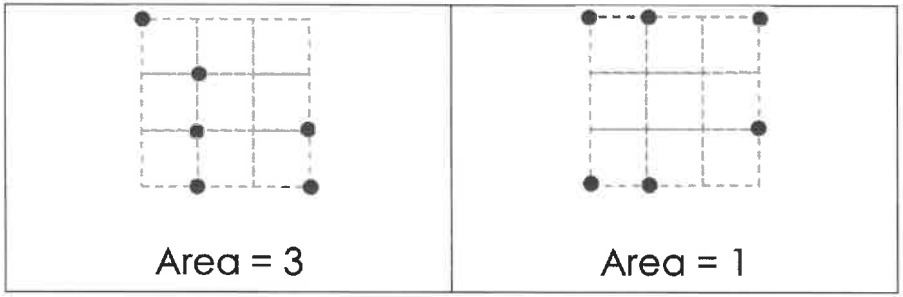
On each grid, connect three dots to form a triangle with the specified area.

3 x 3 Grids

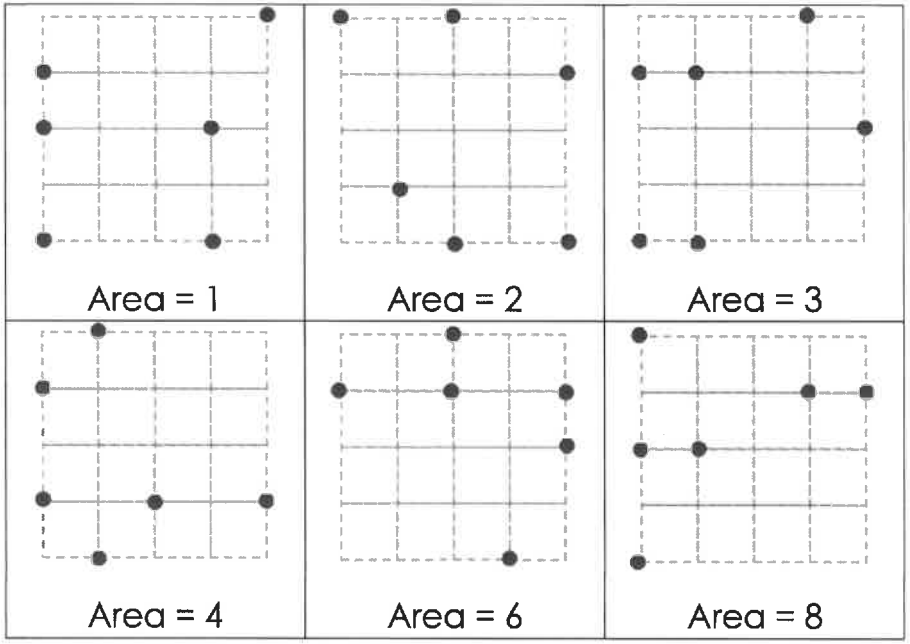


SANKAKU PUZZLES BY NAOKI INABA

3 x 3 Grids, cont.

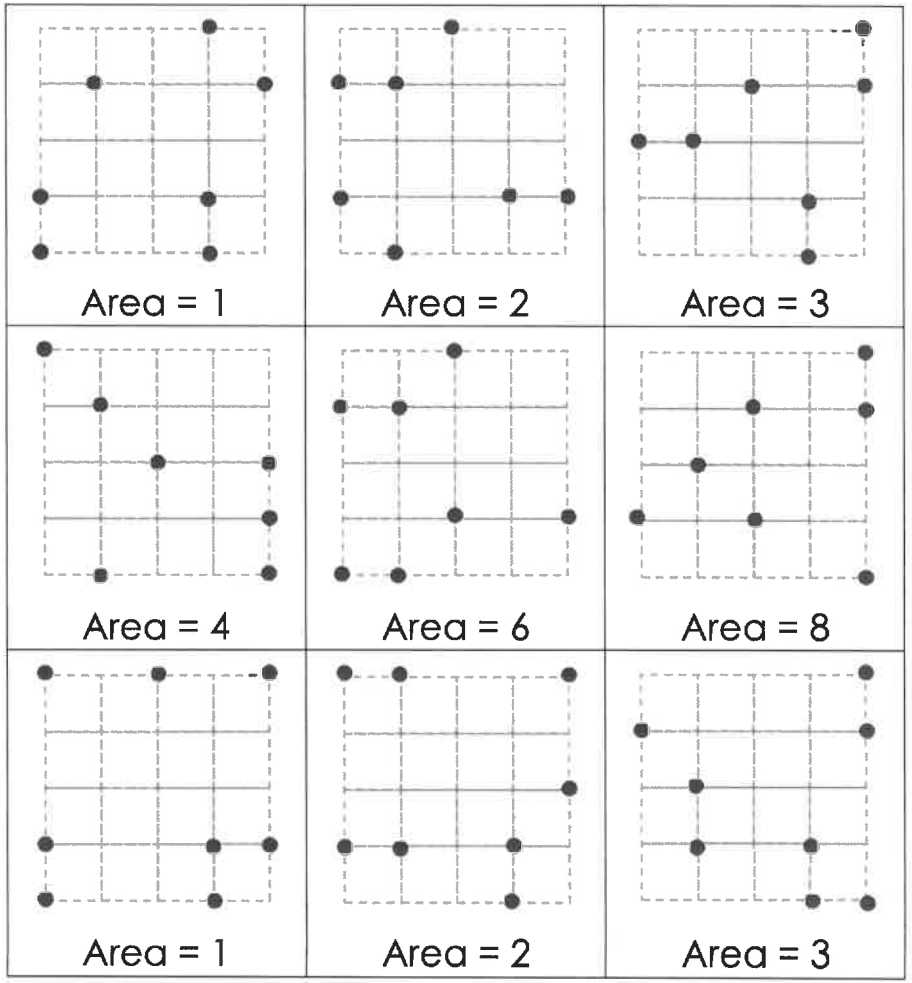


4 x 4 Grids



SANKAKU PUZZLES BY NAOKI INABA

4 x 4 Grids, cont.

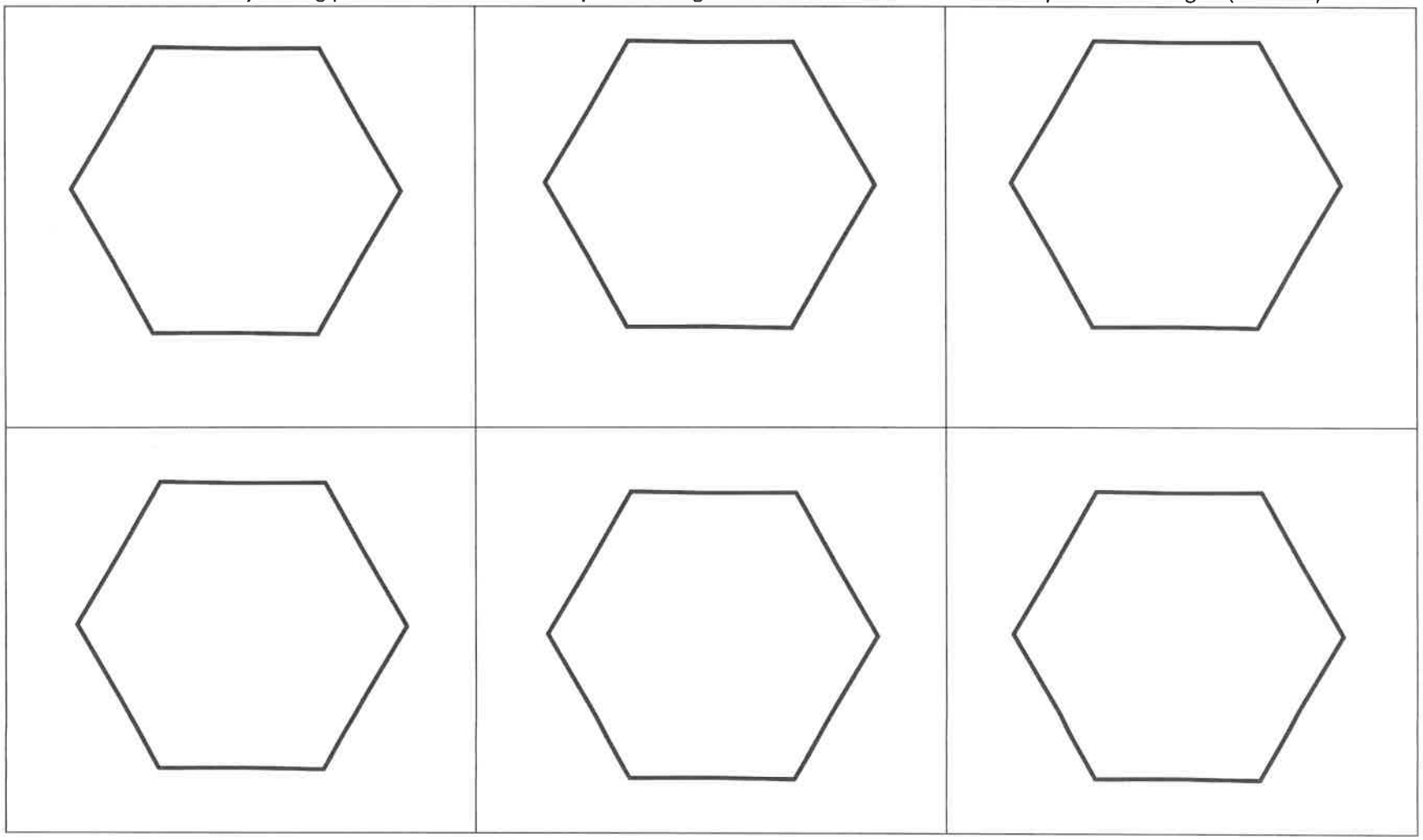


Pattern Block Pizza Template

Use with the pattern block spinner or a draw bag (random selection).

Green triangle = 1/6 Blue rhombus = 1/3 Red trapezoid = ½ (Yellow hexagon = 1)

Create fraction models by adding pattern blocks to the template. Your goal is to add fractions that will complete the hexagon (add to 1)



Group: _____

Challenge!

The $100 Word

If a = $1, b = $2, c = $3, d = $4 .... y = $25 and z = $26, find as many words that are worth $100 as possible.

Sample "Open Middle" Style Problem

Can you make **325** using the numbers **1**, **2**, **3**, **4** and **5** in the circles below?

$$(\bigcirc\times\bigcirc+\bigcirc)\times(\bigcirc+\bigcirc)^2 = 325$$

$$(\bigcirc^3+\bigcirc)\times\bigcirc\times(\bigcirc-\bigcirc) = 325$$

Mystery Plot A Name: _____

Plot points one at a time, **in the order given.** Connect each group of points **in sequence** to reveal a hidden message.

Do not connect one group to the next group. Stop when you see the hand 

Check off each point as you plot them.

Shape A

- ☐ (6 , 5)
- ☐ (7 , 6)
- ☐ (8 , 6)
- ☐ (9, 5)
- ☐ (9 , 4)
- ☐ (6 , 1)
- ☐ (3 , 4)
- ☐ (3 , 5)
- ☐ (4 , 6)
- ☐ (5 , 6)
- ☐ (6 , 5)

- ☐ (-6 , 6)
- ☐ (-2 , 6)

- ☐ (-6 , 1)
- ☐ (-2 , 1)

- ☐ (-4 , 6)
- ☐ (-4 , 1)

- ☐ (1 , -3)
- ☐ (5 , -3)

- ☐ (-9 , -7)
- ☐ (-9 , -3)
- ☐ (-7 , -5)
- ☐ (-5 , -3)
- ☐ (-5 , -7)

- ☐ (-4 , -7)
- ☐ (-4 , -5)
- ☐ (-2 , -3)
- ☐ (0 , -5)
- ☐ (0 , -7)

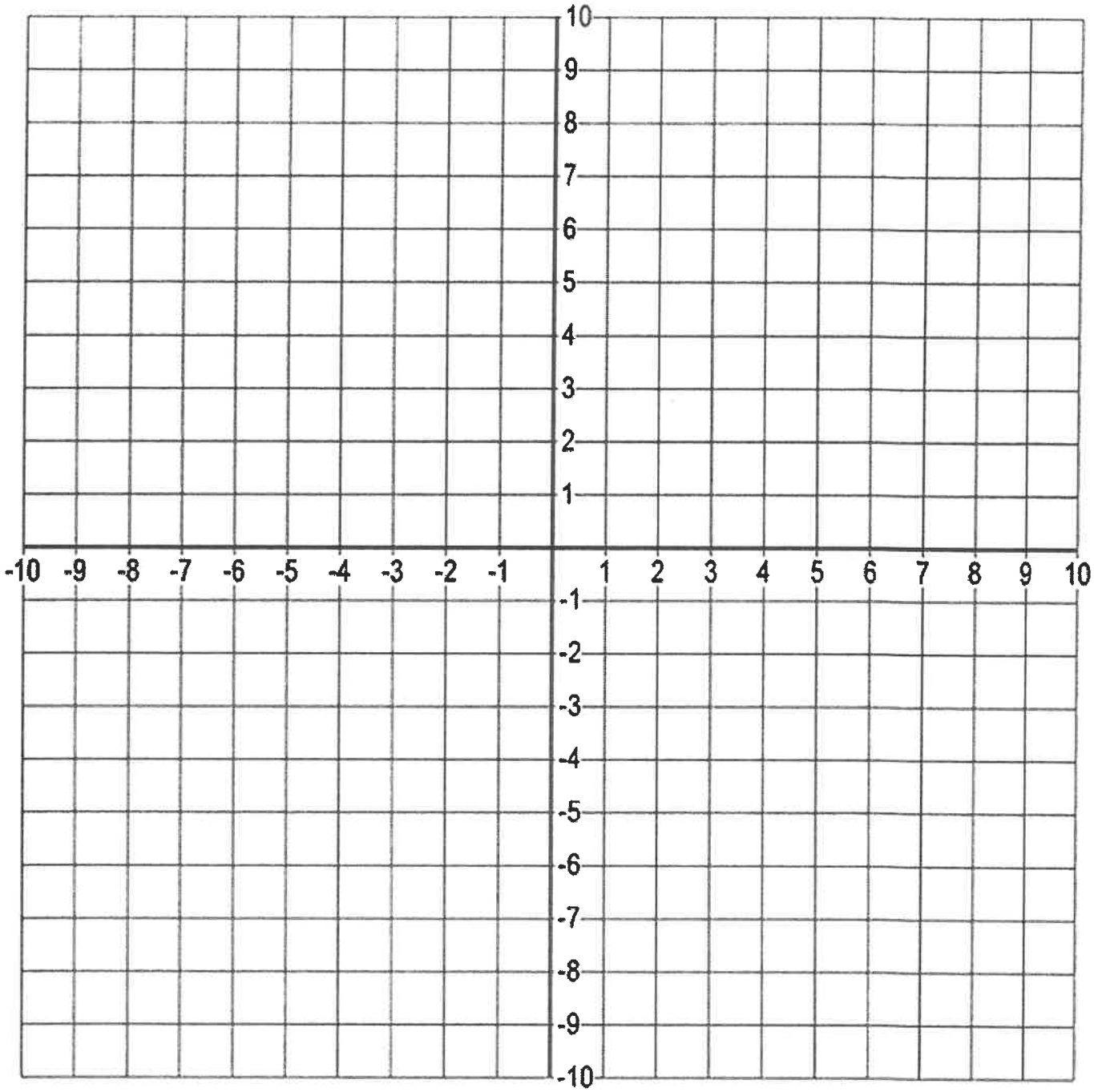
- ☐ (3 , -3)
- ☐ (3 , -7)

- ☐ (6 , -7)
- ☐ (6, -3)

- ☐ (6, -5)
- ☐ (9 , -5)

- ☐ (-2 , 5)
- ☐ (-1 , 3)
- ☐ (-1 , 7)

Mystery Plot



Mystery Plot B

Name: _____

Plot points one at a time, **in the order given.** Connect each group of points <u>in sequence</u> to reveal a hidden message.

Do not connect one group to the next group.

Check off each point as you plot them.

- ☐ (2 , 3)
- ☐ (0 , 3)
- ☐ (0 , 7)
- ☐ (2, 7)

- ☐ (-2 , -2)
- ☐ (-4 , -2)
- ☐ (-4 , 2)
- ☐ (-2 , 2)

- ☐ (1 , -7)
- ☐ (-1 , -7)

- ☐ (-1 , -3)
- ☐ (1 , -3)

- ☐ (2, -2)
- ☐ (2 , 2)
- ☐ (4 , -2)
- ☐ (4 , 2)

- ☐ (5 , -3)
- ☐ (6 , -7)
- ☐ (7 , -3)

- ☐ (10 , -7)
- ☐ (8 , -7)
- ☐ (8 , -3)
- ☐ (10, -3)

- ☐ (-1 , -2)
- ☐ (-1 , 0)
- ☐ (0 , 2)
- ☐ (1 , 0)
- ☐ (1 , -2)

- ☐ (-10 , -5)
- ☐ (-8 , -5)
- ☐ (-5 , -7)
- ☐ (-7 , -7)
- ☐ (-7 , -3)
- ☐ (-5 , -3)

- ☐ (0 , 5)
- ☐ (1 , 5)

- ☐ (2 , -5)
- ☐ (3 , -5)

- ☐ (-2 , -7)
- ☐ (-2 , -3)

- ☐ (-4 , -5)
- ☐ (-2 , -5)

- ☐ (-4 , -7)
- ☐ (-4 , -3)

- ☐ (2 , -7)
- ☐ (4 , -7)

- ☐ (8 , -5)
- ☐ (9 , -5)

- ☐ (0, -3)
- ☐ (0 , -7)

- ☐ (-10 , -7)
- ☐ (-10 , -5)
- ☐ (-9 , -3)
- ☐ (-8 , -5)
- ☐ (-8 , -7)

- ☐ (-3 , 7)
- ☐ (-3 , 3)
- ☐ (-2 , 5)
- ☐ (-1 , 3)
- ☐ (-1 , 7)

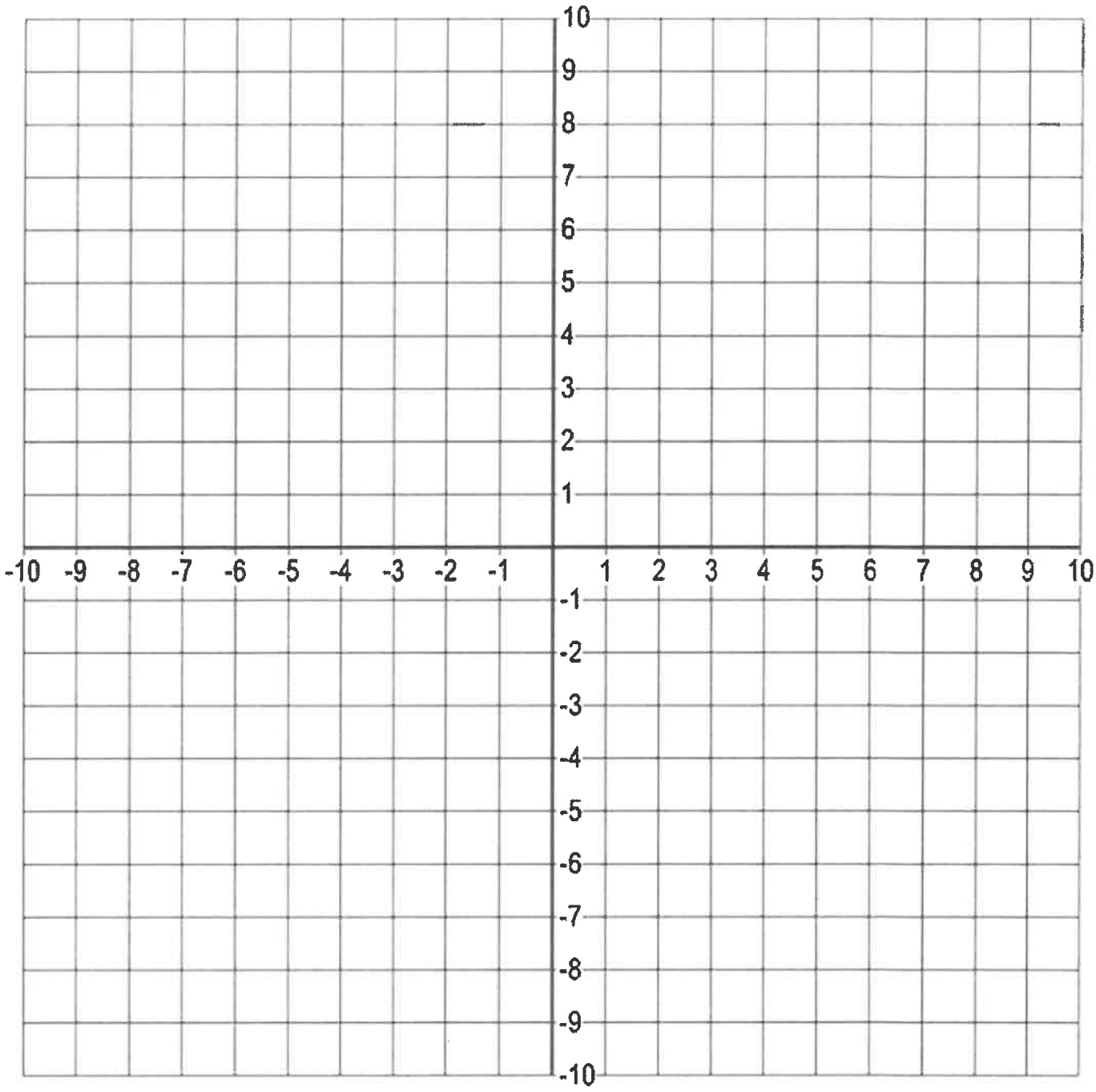
- ☐ (-1 , 0)
- ☐ (1 , 0)

- ☐ (2 , -7)
- ☐ (2 , -3)

- ☐ (2 , -3)
- ☐ (4 , -3)

- ☐ (0, -7)
- ☐ (0, -3)

Mystery Plot B



Name: _____

A. 1.

NOTE: In each section, do NOT connect the last point back to first point.

(X, Y)
☐ (1, -20)
☐ (1, -19)
☐ (3, -18)
☐ (5, -18)
☐ (7, -19)
☐ (7, -20)
☐ (1, -20)
STOP
☐ (-1, -20)
☐ (-1, -19)
☐ (-3, -18)
☐ (-5, -18)
☐ (-7, -19)
☐ (-7, -20)
☐ (-1, -20)
STOP
☐ (3, -14)
☐ (5, -14)
☐ (6, -13)
☐ (6, -12)
☐ (5, -11)
☐ (3, -11)
☐ (2, -12)
☐ (2, -13)
☐ (3, -14)
STOP
☐ (-3, -14)
☐ (-5, -14)
☐ (-6, -13)
☐ (-6, -12)
☐ (-5, -11)
☐ (-3, -11)
☐ (-2, -12)
☐ (-2, -13)
☐ (-3, -14)
STOP

(X, Y)
☐ (2, -5)
☐ (5, -2)
☐ (6, -2)
☐ (6, -8)
☐ (5, -9)
☐ (3, -9)
☐ (2, -8)
☐ (2, -5)
STOP
☐ (-2, -5)
☐ (-5, -2)
☐ (-6, -2)
☐ (-6, -8)
☐ (-5, -9)
☐ (-3, -9)
☐ (-2, -8)
☐ (-2, -5)
STOP
☐ (1, -4)
☐ (4, -1)
☐ (4, 1)
☐ (-4, 1)
☐ (-4, -1)
☐ (-1, -4)
☐ (1, -4)
STOP
☐ (-3, 4)
☐ (-5, 8)
☐ (-5, 12)
☐ (5, 12)
☐ (5, 8)
☐ (3, 4)
☐ (-3, 4)
STOP

(X, Y)
☐ (3, 19)
☐ (-3, 19)
☐ (-4, 18)
☐ (-4, 14)
☐ (-3, 13)
☐ (3, 13)
☐ (4, 14)
☐ (4, 18)
☐ (3, 19)
STOP
☐ (-6, 11)
☐ (-7, 12)
☐ (-9, 12)
☐ (-10, 11)
☐ (-10, 9)
☐ (-9, 8)
☐ (-7, 8)
☐ (-6, 9)
☐ (-6, 11)
STOP
☐ (6, 11)
☐ (7, 12)
☐ (9, 12)
☐ (10, 11)
☐ (10, 9)
☐ (9, 8)
☐ (7, 8)
☐ (6, 9)
☐ (6, 11)
STOP
☐ (-2, 19)
☐ (-2, 20)
☐ (2, 20)
☐ (2, 19)
STOP
☐ (2, 4)
☐ (2, 1)
STOP

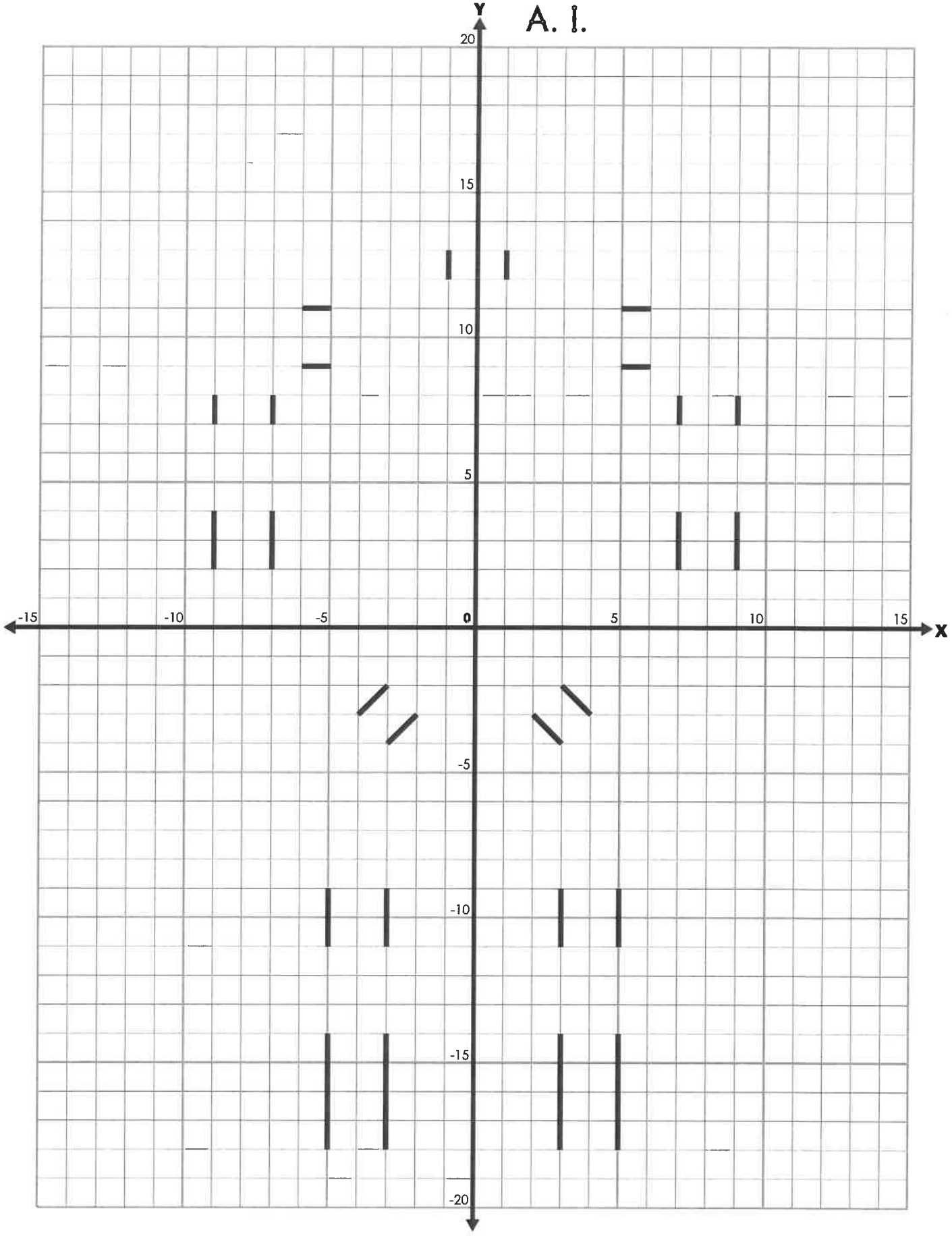
(X, Y)
☐ (-6, 6)
☐ (-7, 7)
☐ (-9, 7)
☐ (-10, 6)
☐ (-10, 5)
☐ (-9, 4)
☐ (-7, 4)
☐ (-6, 5)
☐ (-6, 6)
STOP
☐ (6, 6)
☐ (7, 7)
☐ (9, 7)
☐ (10, 6)
☐ (10, 5)
☐ (9, 4)
☐ (7, 4)
☐ (6, 5)
☐ (6, 6)
STOP
☐ (6, 1)
☐ (6, -1)
☐ (7, -1)
☐ (7, 0)
☐ (8, 1)
☐ (9, 0)
☐ (9, -2)
☐ (10, -2)
☐ (10, 1)
☐ (9, 2)
☐ (7, 2)
☐ (6, 1)
STOP
☐ (2, 15)
☐ (2, 14)
☐ (-2, 14)
☐ (-2, 15)
☐ (2, 15)
STOP

(X, Y)
☐ (-6, 1)
☐ (-6, -1)
☐ (-7, -1)
☐ (-7, 0)
☐ (-8, 1)
☐ (-9, 0)
☐ (-9, -2)
☐ (-10, -2)
☐ (-10, 1)
☐ (-9, 2)
☐ (-7, 2)
☐ (-6, 1)
STOP
☐ (1, 16)
☐ (3, 16)
☐ (3, 18)
☐ (1, 18)
☐ (1, 16)
STOP
☐ (-1, 16)
☐ (-3, 16)
☐ (-3, 18)
☐ (-1, 18)
☐ (-1, 16)
STOP
☐ (-3, 11)
☐ (-3, 8)
☐ (3, 8)
☐ (3, 11)
☐ (-3, 11)
STOP
☐ (-2, 4)
☐ (-2, 1)
STOP

Now color your picture.

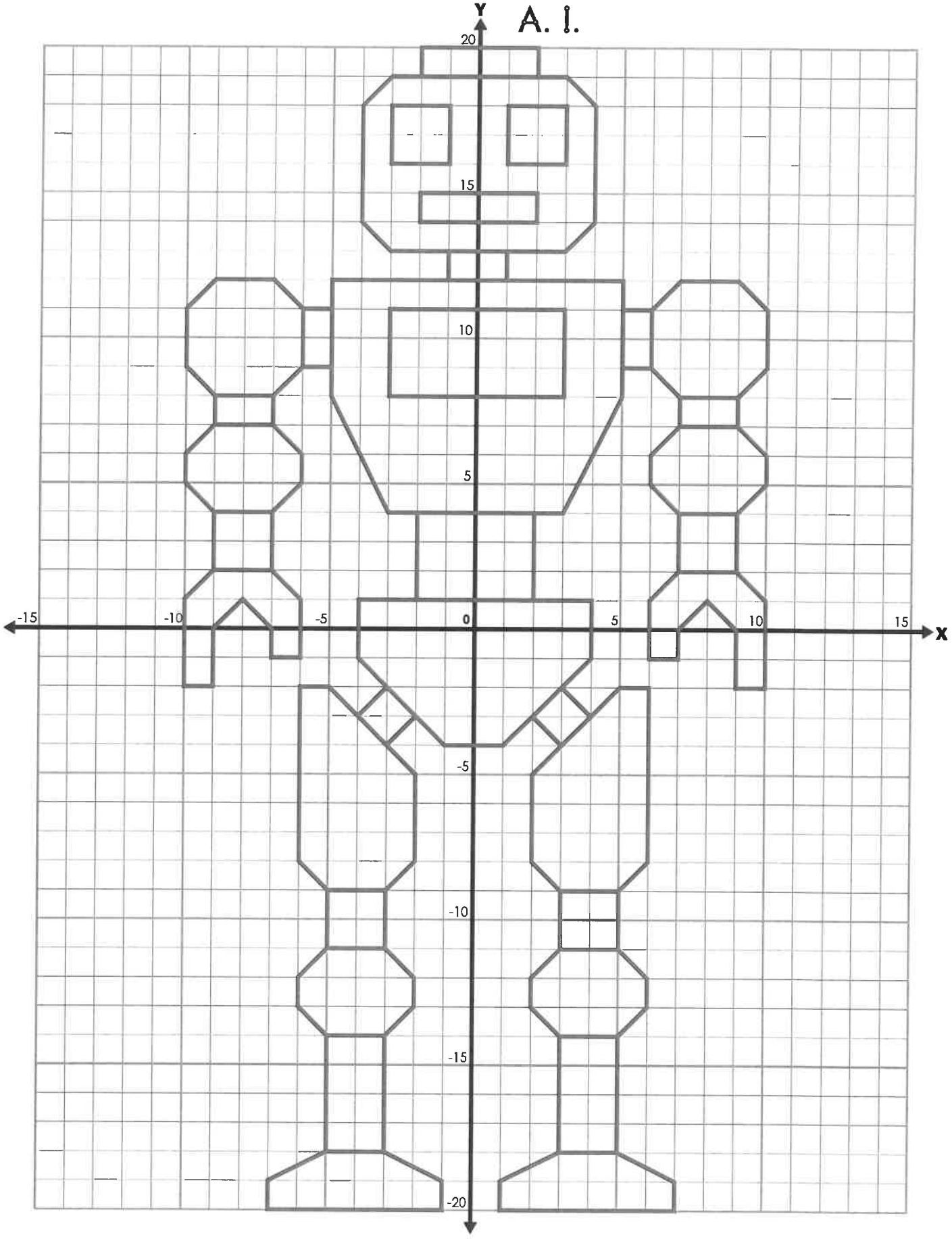
Name: _____

A. 1.

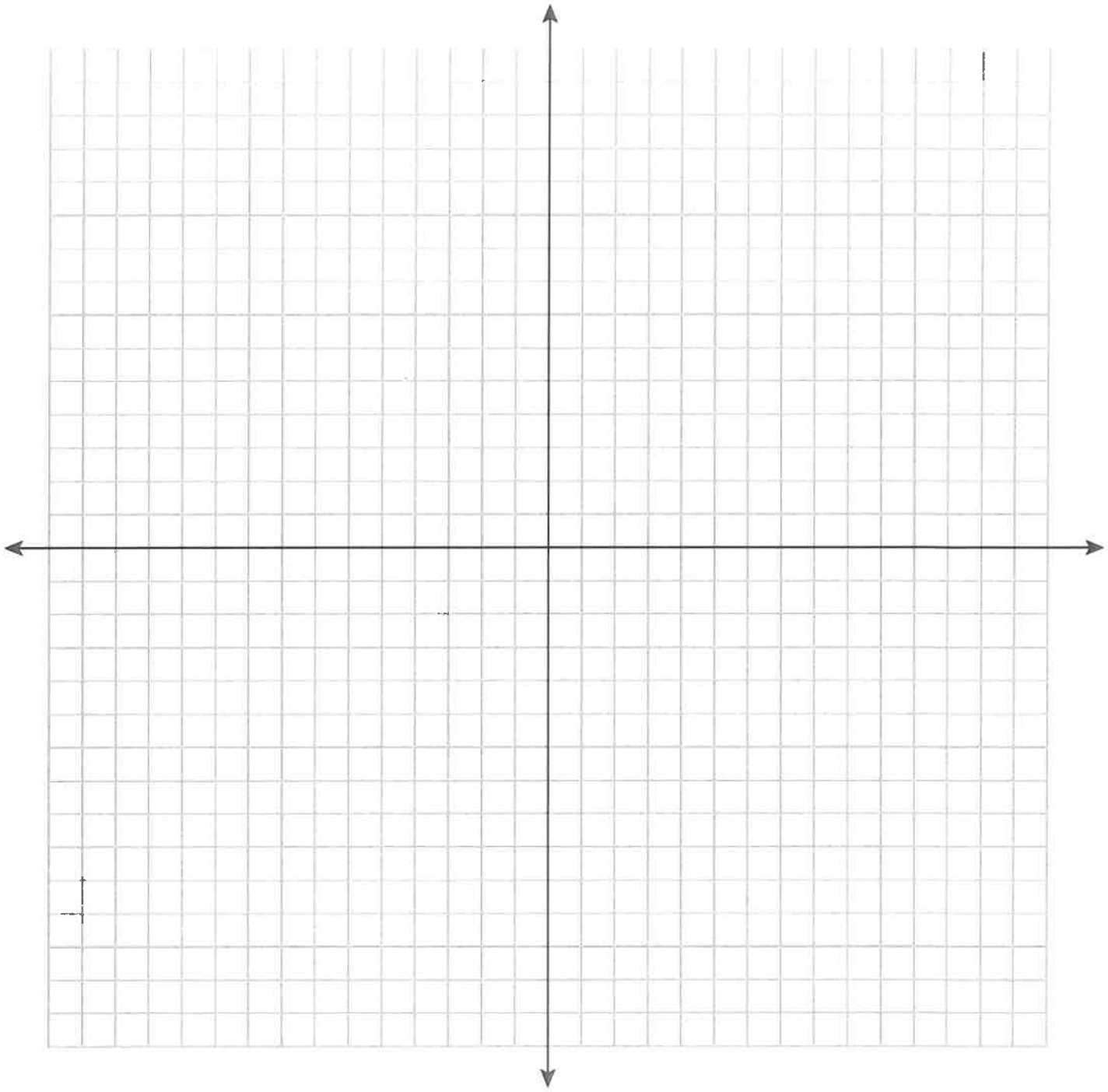


ANSWER KEY

A. I.



Name : _____ Date : _____



Rich Task Problem Assessment Name: _____

Planning & Self -Assessment Protocol

DEFINE THE KEY INFORMATION

State any given information and logical assumptions

SET A RANGE OF POSSIBLE VALUES

Establish a range of logical values (min and max) that would make sense in the given context

DEVELOP A PLAN (WHAT STRATEGIES WILL YOU USE?)

Clearly identify (list) the specific strategies, processes, algorithms, and models that you will use to solve the problem

Consider appropriate uses of technology and other tools

IMPLEMENT THE PLAN (DO THE MATH)

Select the most effective method to solve the problem.

This could include a combination of calculations, logic statements, graphs, equations, etc.

VERIFY AND STATE YOUR SOLUTION

Develop a correct, legible, accurate solution

Write a summary statement (usually a sentence))

AREA FOR IMPROVEMENT:

Problem Solving Strategies

Understanding / Tackling the problem

- [ ] Re-read a question more slowly if it doesn't make sense the first time
- [ ] Highlight or underline important pieces of information
- [ ] Break the problem down into smaller parts
- [ ] Refer to a similar example that you have seen before
- [ ] Ask for help

Represent/Visualize

- [ ] Build or draw a model
- [ ] Draw a tally chart
- [ ] Draw a graph

Use a Pattern

- [ ] Create a table
- [ ] List elements in the table
- [ ] Find or describe the pattern
- [ ] Use the pattern to extend the table

Work Backwards/Forwards/Inwards

- [ ] Use logic to fill in gaps in knowledge
- [ ] Include algebra to show reasoning

Strategic Guessing and Revision

- [ ] Identify logical minimum and maximum
- [ ] Write an equation or rule, test the rule with at least 2 values
- [ ] Use substitution to test strategic guesses

Verify a Solution

- [ ] Use a different method - do you end up at the same result?
- [ ] Compare with a peer
- [ ] Ask yourself: Is the answer reasonable? Likely? Possible?

Self Assessment : 1: Rarely | 2: Occasionally | 3: Often or Usually | 4: Consistently, Exemplary Skill Shown

CAMPBELL RIVER
School District 72

SNAP 6
Number Sense (Thousandths to Billions)

Name: _____

Date: _____

Draw to represent the value of the number

Write to describe your picture

Write the number in expanded form

Create 3 equations that equal the number

Write a real-life example that shows the value of the number

Count forwards by ____ from the number.

Count backwards by ____ from the number.

Communicating & Representing

Understanding & Solving

Reasoning & Analyzing

Show where the number belongs on the number line

Connecting & Reflecting: Where is this number likely to show up?

Adapted from Student Numeracy Assessment and Practice (SNAP), SD33

CAMPBELL RIVER
School District 72

SNAP 6
Operations (w/ Decimals)

Name: _____

Date: _____

Operation: _____

Estimate – justify your thinking:

Represent with a sketch or drawing :

Explain your sketch :

Calculate:

Write a Real-Life Example or Word Problem: _____

_____

_____

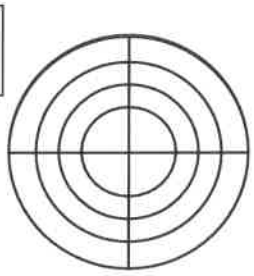
Connecting & Reflecting: How well does the context make sense? Is it possible? Is it realistic? What would make it better?

Communicating & Representing

Overall

Reasoning & Analyzing

Estimate & Justify



Understanding & Solving

Represent & Calculate

Connecting & Reflecting

Real-Life Problem & Reflection

Adapted from Student Numeracy Assessment and Practice (SNAP), SD33

CAMPBELL RIVER
School District 72

SNAP 7
Number Sense (Integers)

Name: _____

Date: _____

Draw to represent the value of the number

Write to describe your picture

Write the number in expanded form

Create 3 equations that equal the number

Write a real-life example that shows the value of the number

Count backwards by ____ from the number.

Count forwards by ____ from the number.

Communicating & Representing

Understanding & Solving

Show where the number belongs on the number line

Reasoning & Analyzing

Connecting & Reflecting: Where is this number likely to show up?

Adapted from Student Numeracy Assessment and Practice (SNAP), SD33

CAMPBELL RIVER
School District 72

SNAP 7
Operations (w/ Fractions)

Name: _____

Date: _____

Operation: _____

Estimate – justify your thinking:

Represent with a sketch or drawing :

Explain your sketch :

Calculate:

Write a Real-Life Example or Word Problem: _____

_____

_____

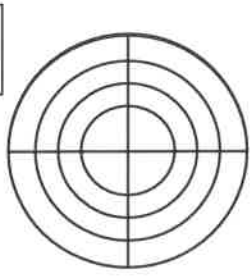
Connecting & Reflecting: How well does the context make sense? Is it possible? Is it realistic? What would make it better?

Communicating & Representing

Overall

Reasoning & Analyzing

Estimate & Justify



Understanding & Solving

Represent & Calculate

Connecting & Reflecting

Real-Life Problem & Reflection

Adapted from Student Numeracy Assessment and Practice (SNAP), SD33

CAMPBELL RIVER
School District 72

SNAP 8
Number Sense (Linear Pattern)

Name: _____

Date: _____

INPUT Values

OUTPUT Values

Draw to represent the visual pattern

Write to describe the pattern (increasing, etc.)

When the input is 3, What is the output?

Write an equation that represents the pattern rule (in symbols)

Write a real-life scenario that could follow this pattern rule

Communicating & Representing

What values are included in the pattern? Represent the minimum and maximum

Understanding & Solving

Connecting & Reflecting: Are there any values that are impossible or excluded? Explain.

Reasoning & Analyzing

Adapted from Student Numeracy Assessment and Practice (SNAP), SD33

CAMPBELL RIVER
School District 72

SNAP 8

Operations (Fractions, Decimals, %)

Name: _____

Date: _____

Operation: _____

Estimate – justify your thinking:

Represent with a sketch or drawing :

Explain your sketch :

Calculate:

Write a Real-Life Example or Word Problem: _____

_____

_____

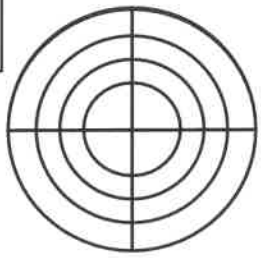
Connecting & Reflecting: How well does the context make sense? Is it possible? Is it realistic? What would make it better?

Communicating & Representing

Overall

Reasoning & Analyzing

Estimate & Justify



Understanding & Solving

Represent & Calculate

Connecting & Reflecting

Real-Life Problem & Reflection

Adapted from Student Numeracy Assessment and Practice (SNAP), SD33

CAMPBELL RIVER
School District 72

SNAP 9

Operations (Order of Operations)

Name: _____

Date: _____

Operation: _____

Estimate – justify your thinking:

Represent with a sketch or drawing :

Explain your sketch :

Calculate:

Write a Real-Life Example or Word Problem: _____

_____

_____

Connecting & Reflecting: How well does the context make sense? Is it possible? Is it realistic? What would make it better?

Communicating & Representing	Understanding & Solving	Reasoning & Analyzing	Connecting & Reflecting
Overall	Represent & Calculate	Estimate & Justify	Real-Life Problem & Reflection

Adapted from Student Numeracy Assessment and Practice (SNAP), SD33

CAMPBELL RIVER
School District 72

SNAP 9

Name: _____

Algebraic Reasoning (Solving Equations)

Date: _____

Identify the Type of Problem

- 1-step equation
- 2-step equation
- Multi-step equation
- area problem
- perimeter problem
- trigonometry problem
- substitution / simplification
- Volume problem
- Money Problem
- Percent Problem

Model or sketch of mathematical context if appropriate

Define the variable(s)

Write an equation that represents the relationship or problem to be solved

State a logical range of possible values for the solution

Solve the equation

Templates and/or tools that may be h[illegible]l

- PEDMAS
- Pythagorean Theorem
- Proportion
- Graph
- Number line

Formula:

Communicating & Representing

Write a real-life scenario that could be represented by this equation

Understanding & Solving

Connecting & Reflecting: Which parts of the problem require special care or attention to detail? Explain.

Reasoning & Analyzing

Adapted from Student Numeracy Assessment and Practice (SNAP), SD33

CAMPBELL RIVER
School District 72

SNAP Rubric
Number Sense

Name: _____

Date: _____

Stretches

Strengths

Communicating & Representing

- ☐ Pictures are clear and represent the target number accurately
- ☐ Descriptions are accurate and add clarity
- ☐ Information is organized in a way that makes it easy to understand
- ☐ Shape, spacing, and position of numbers respect place value and conventional ways of representing quantities

Understanding & Solving

- ☐ Uses grade-appropriate operations correctly
- ☐ Uses standard symbols and mathematical notation correctly
- ☐ Creates new equations from known facts.

(ex. a sum from a total, a difference from a sum, a factor from a product, etc.)

Connecting & Reflecting

- ☐ A reasonable real-life example is provided
- ☐ Example demonstrates understanding of the number value
- ☐ Reflection highlights both strengths and stretches

"I feel confident with _____

_____ was challenging

My goal is _____"

Reasoning & Analyzing

- ☐ Estimate is reasonable and 3 or more benchmarks are appropriately identified
- ☐ Pattern making (counting forward and backward is consistent and accurate
- ☐ Assumptions are logical & process shows evidence of planning or refinement

Overall Proficiency

Emerging | Developing | Proficient | Extending

CAMPBELL RIVER
School District 72

SNAP Rubric
Operations

Name: _____

Date: _____

Stretches

Strengths

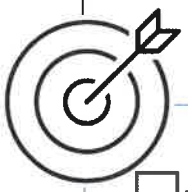
Communicating & Representing

- ☐ Communicates clear understanding multiple ways:
  - Written
  - Pictorial
  - Symbolic
- ☐ Uses **conventional** ways of representing quantities (ex. base 10, arrays, expanded form, standard, etc.)

Understanding & Solving

- ☐ Uses **grade-appropriate** strategies and operations to solve the problem and show understanding
- ☐ Uses standard symbols and mathematical notation correctly
- ☐ Creates new equations from known facts.

(ex. a sum from a total, a difference from a sum, a factor from a product, etc.)



Connecting & Reflecting

- ☐ Provides a reasonable real-life example
- ☐ Connects mathematical concepts to each other and to other topics
- ☐ Reflects on personal mathematical thinking strengths and stretches

"I feel confident with _____

I need to remember _____

My goal is _____"

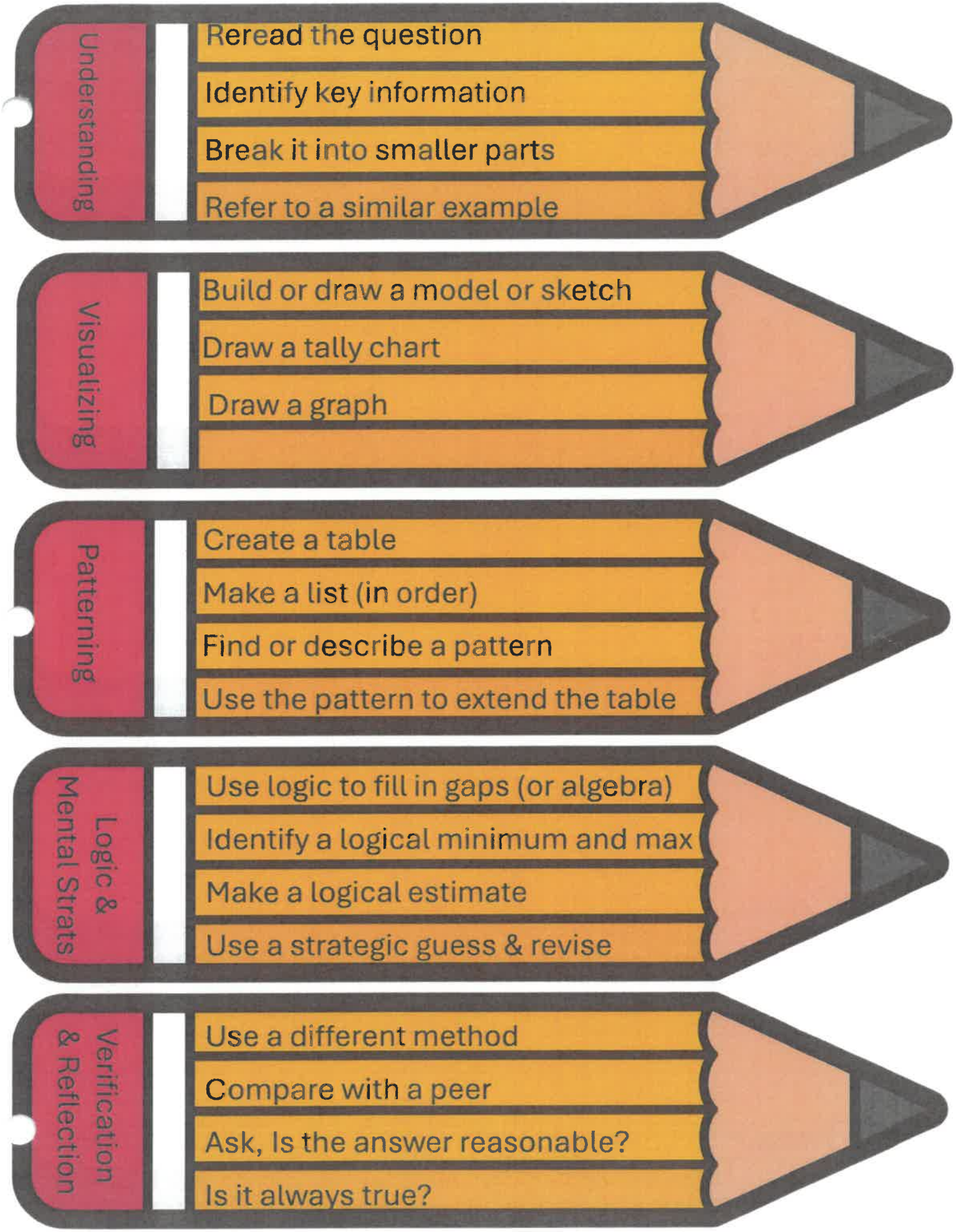
Reasoning & Analyzing

- ☐ Estimation / mental math strategies are reasonable
- ☐ Any assumptions are logical and clearly stated
- ☐ Process is detailed (outlined, step by step) and shows evidence of planning or refining

Overall Proficiency

Emerging | Developing | Proficient | Extending

Adapted from Student Numeracy Assessment and Practice (SNAP), SD33


Understanding
Reread the question
Identify key information
Break it into smaller parts
Refer to a similar example
Visualizing
Build or draw a model or sketch
Draw a tally chart
Draw a graph
Patterning
Create a table
Make a list (in order)
Find or describe a pattern
Use the pattern to extend the table
Logic & Mental Strats
Use logic to fill in gaps (or algebra)
Identify a logical minimum and max
Make a logical estimate
Use a strategic guess & revise
Verification & Reflection
Use a different method
Compare with a peer
Ask, Is the answer reasonable?
Is it always true?

3-4 Assessment Writing