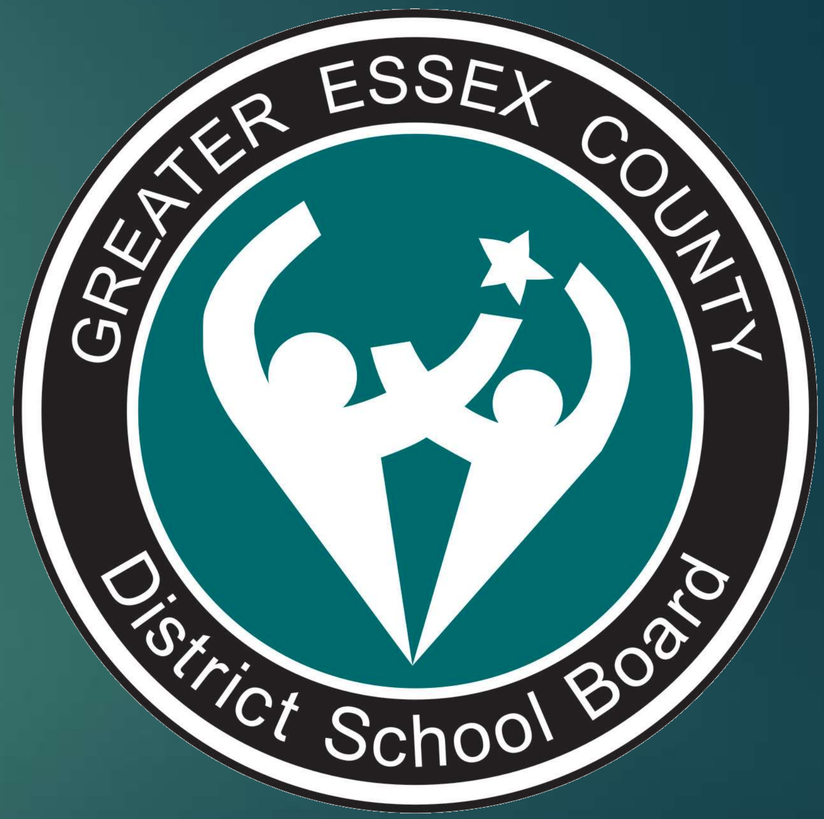
Progression of Fractions



March 23: Brock PS

Plans for today:

Fractions: What do you notice or wonder??
Carton Counting
Review of Paying Attention to Fractions
Doritos---- Hot or Not (Fraction Constructs)
Baking Brownies– unfriendly Fractions
Rolos--- How many pieces?
Fraction Models

LET'S DO SOME MATH!!!!!

Attendance:

- Anne Adamson (P)
- Bryan Johnson (VP)
- Stephanie Douglas
- Cecilia Joseph
- Sheri Gaetz
- Kristi Jasey
- Danilela Amato
- Monica Mackenzie
- Mark Patterson
- Alana Parsons
- Kristine Bentley
- Rebecca Davies
- Stephanie Molenda
- Brian Bartlett
- Andrea Manchen
- Pauline Brown
- Jennifer Kathen Groggin
- Matina Lousisa
- Leah Beherns
- Giovanna Giglio

What do you…


BEST BEFORE
Nutrition Facts per 1 large egg (53 g): Calories 70
Fat 5 g (8 %), Saturates 1.5 g + Trans 0 g (8 %), Cholesterol 195 mg,
Sodium 65 mg (3 %), Carbohydrate 1 g (1 %), Fibre 0 g (0 %), Sugars 0 g,
Protein 6 g, Vit A (10 %), Vit C (0 %), Calcium (2 %), Iron (6 %). % = % Daily Value
Valeur nutritive pour 1 gros œuf (53 g) : Calories 70
Lipides 5 g (8 %), Saturés 1,5 g + Trans 0 g (8 %), Cholestérol 195 mg,
Sodium 65 mg (3 %), Glucides 1 g (1 %), Fibres 0 g (0 %), Sucres 0 g,
Protéines 6 g, Vit A (10 %), Vit C (0 %), Calcium (2 %), Fer (6 %). % = % valeur quotidienne
MEILLEUR AVANT
12 eggs/œufs
KEEP REFRIGERATED GARDER AU RÉFRIGÉRATEUR
large size · calibre : gros
no name® sans nom®
CANADA A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CANADA A

What do you… Notice and Wonder?

How many eggs are there?

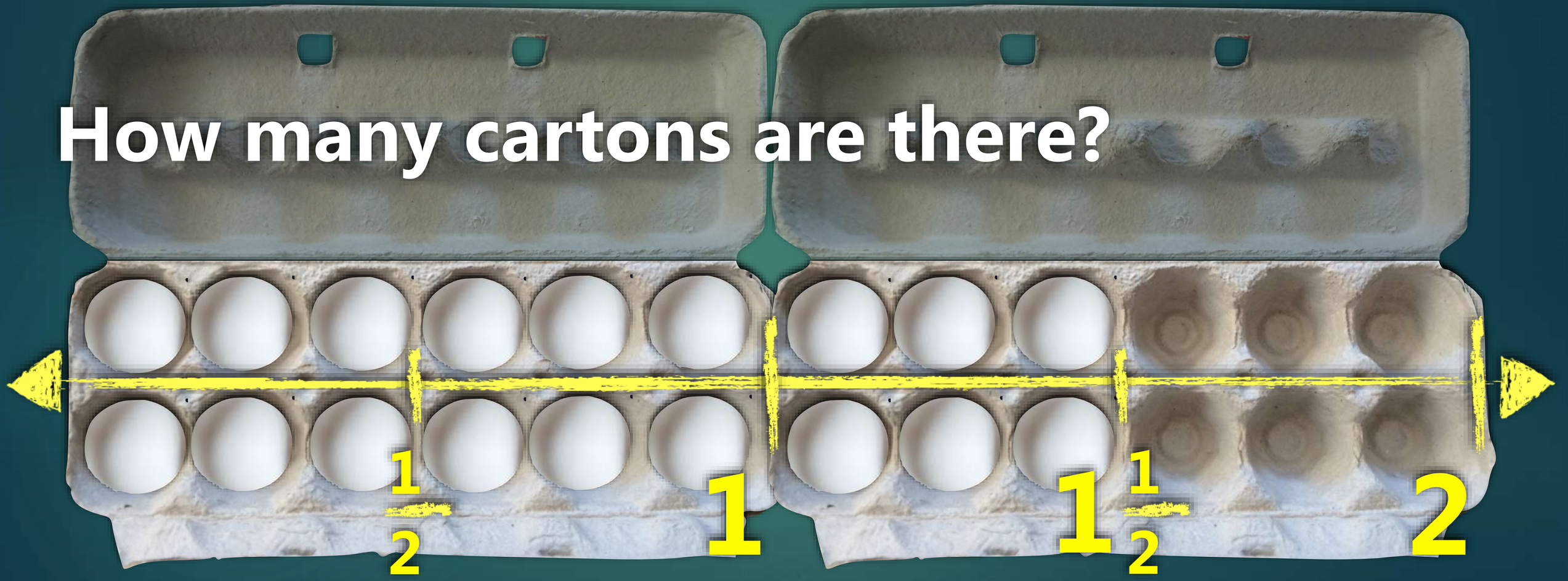
How many eggs are there?

Carton Counting

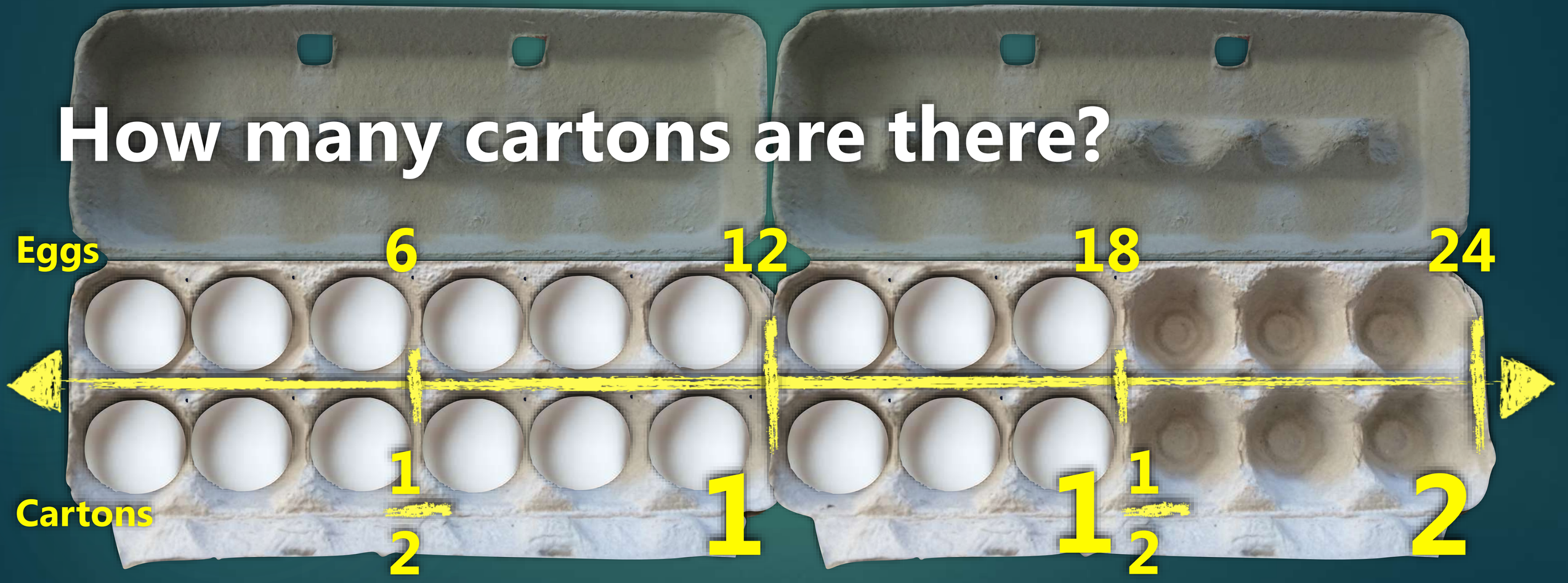
Carton Counting

How many cartons are there?

Carton Counting



Carton Counting



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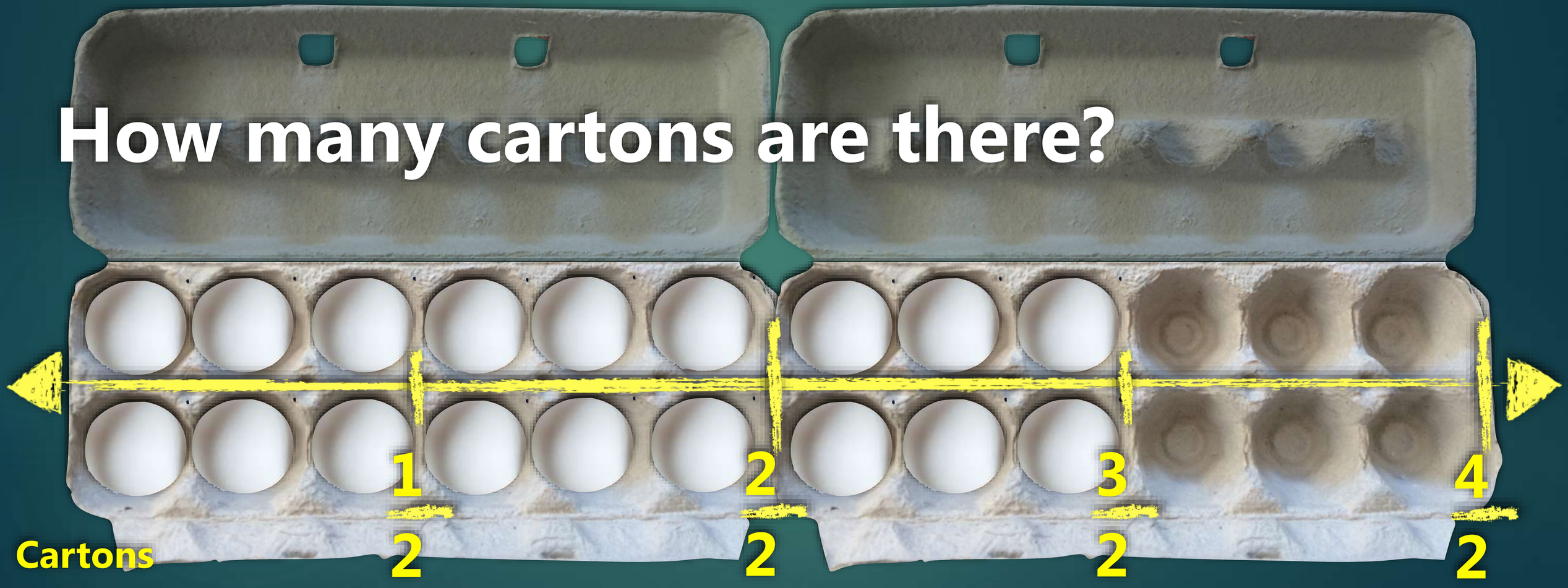

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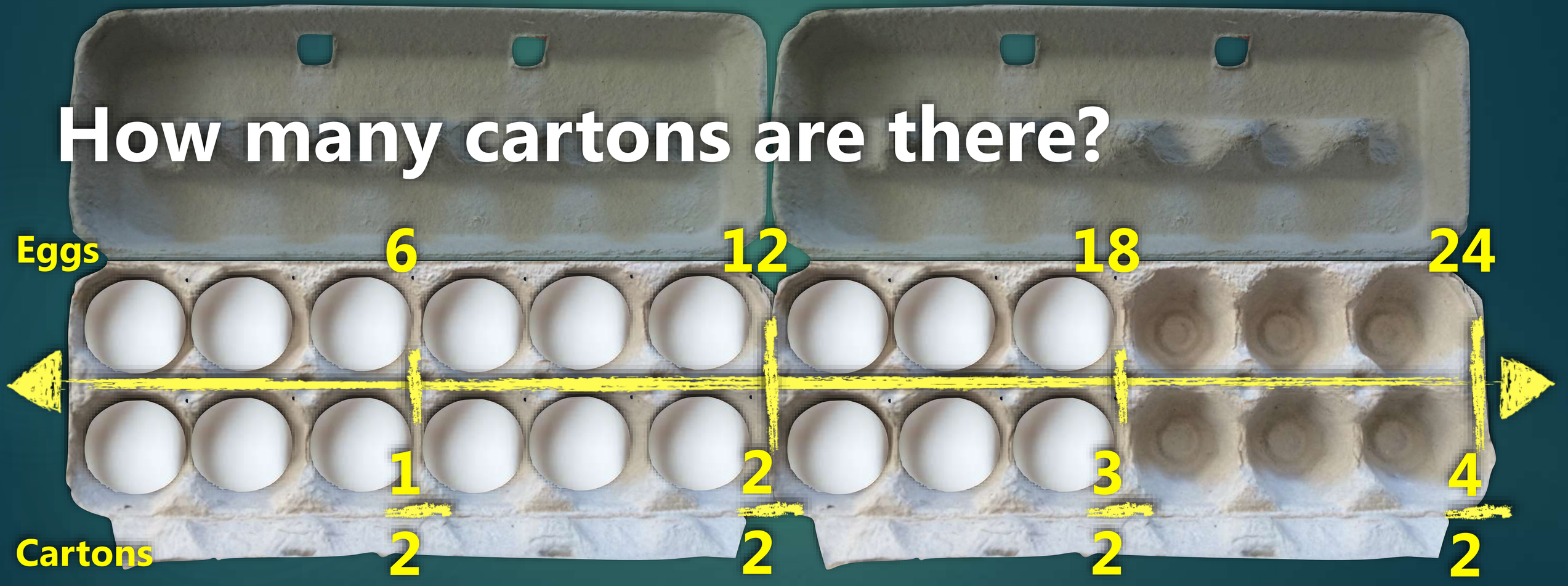
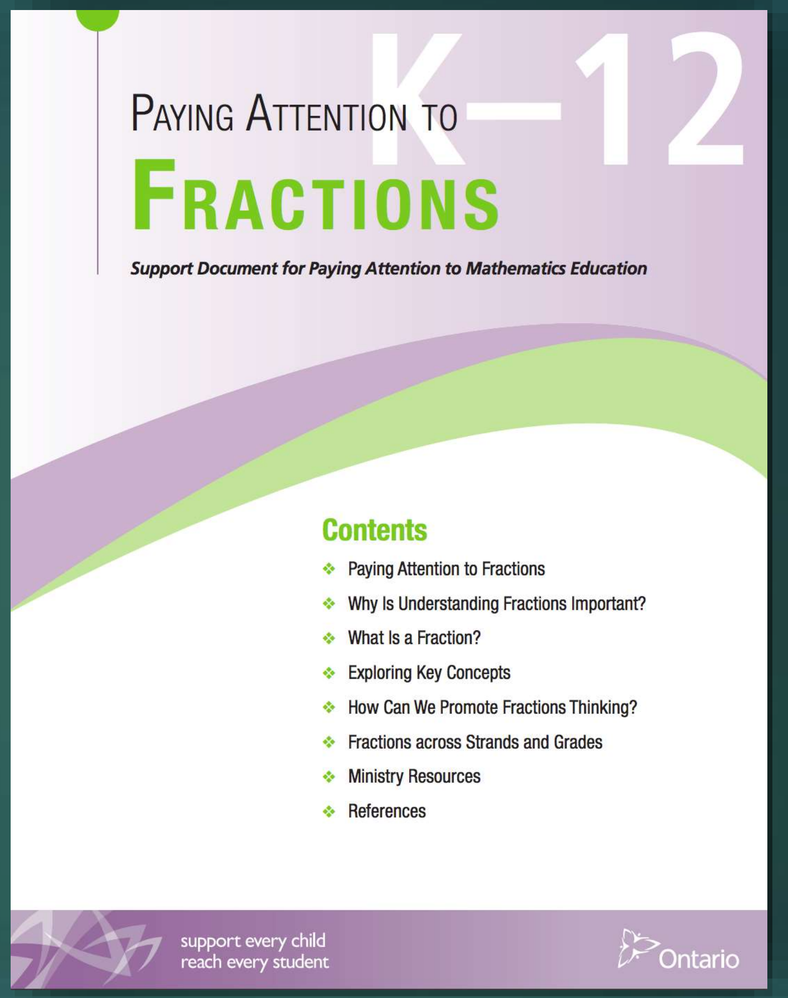



Paying Attention to
K–12
Fractions
Support Document for Paying Attention to Mathematics Education
Contents
Paying Attention to Fractions
Why Is Understanding Fractions Important?
What Is a Fraction?
Exploring Key Concepts
How Can We Promote Fractions Thinking?
Fractions across Strands and Grades
Ministry Resources
References
support every child
reach every student
Ontario

Paying Attention to Fractions

"The research suggests that explicit and precise changes to learning and teaching practices can have a substantial impact on children's **understanding of fractions** and **future mathematical success**. Instructional decisions have a significant bearing upon students' ability to understand the concept of fractions, including the ability to represent fractions appropriately, compare the relative magnitude of two fractions, and complete calculations accurately."

(Bruce, Chang, Flynn & Yearley, 2013, p. 32)

Why Is Understanding Fractions Important?

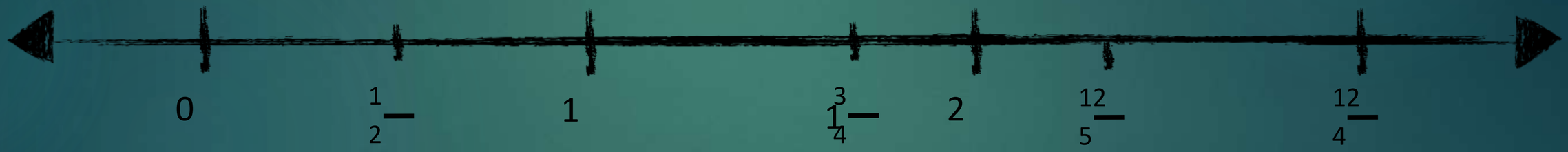
"No area of elementary school mathematics is as mathematically rich, cognitively complicated, and difficult to teach as fractions, ratios, and proportionality. These ideas all express mathematical relationships: fractions and ratios are 'relational' numbers. They are the first place in which students encounter numerals like ' 3/4 ' that represent relationships between two discrete or continuous quantities, rather than a single discrete ('three apples') or continuous quantity ('4 inches of rope')."

(Litwiller & Bright, 2002, p. 3)

What is a Fraction?

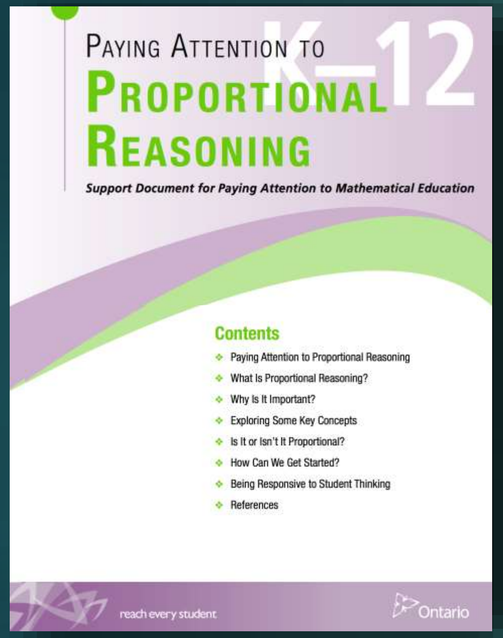
A fraction is a **number**.

While fractional notation is typically used to represent quantities that are **not whole**, it is possible for all quantities to be represented as a fraction.



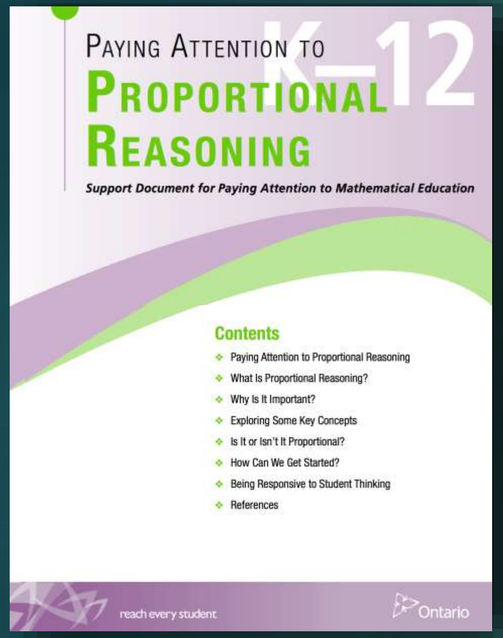
These simple descriptions do not appropriately communicate the complex constructs that lie within this big idea.

Connecting Fractions and Proportional Reasoning



"The essence of proportional reasoning is the consideration of number in relative terms, rather than absolute terms."

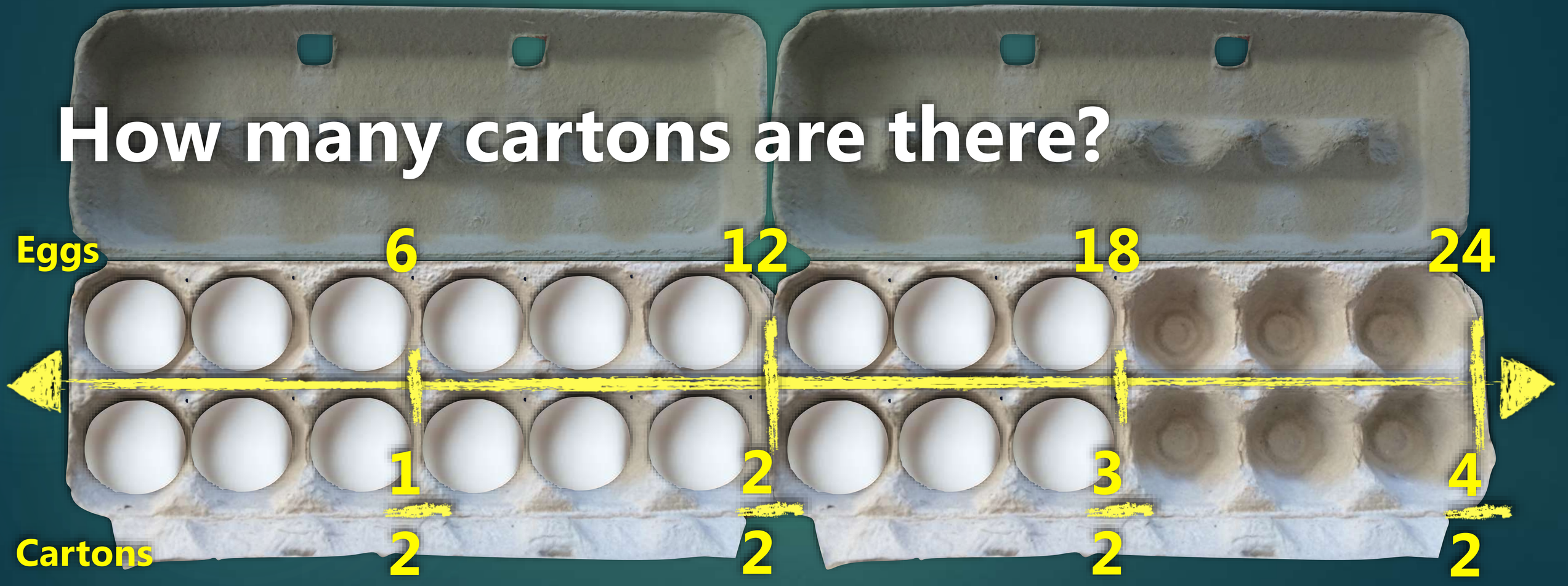
Connecting Fractions and Proportional Reasoning



"The essence of proportional reasoning is the consideration of number in relative terms, rather than absolute terms."

$\frac{3}{4}$ Relationship

Part-Whole Relationship




Trans Fat
0 gras trans
Doritos
Roulette
ATTENTION
SOME CHIPS VERY HOT
CERTAINES CHIPS SONT VRAIMENT ÉPICÉES
TORTILLA CHIPS
CHIPS TORTILLA AROMATISÉES

What do you…

Notice?

Wonder?

Nutrition Facts
Valeur nutritive

Per 21 chips (50 g)
pour 21 croustilles (50 g)

Amount / Teneur	% Daily Value / % valeur quotidienne
Calories / Calories 260	**21** %
Fat / Lipides 13 g	**10** %
Saturated / saturés 2 g + Trans / trans 0 g	**0** %
Cholesterol / Cholestérol 0 mg	**16** %
Sodium / Sodium 370 mg	**10** %
Carbohydrate / Glucides 31 g	**9** %
Fibre / Fibres 2 g	
Sugars / Sucres 1 g	
Protein / Protéines 3 g	
Vitamin A / Vitamine A	0 %
Vitamin C / Vitamine C	0 %
Calcium / Calcium	6 %
Iron / Fer	4 %

INGREDIENTS: SELECTED CORN, VEGETABLE OIL, SEASONING (CORN MALTODEXTRIN, SALT, CHEDDAR CHEESE, WHEY, MONOSODIUM GLUTAMATE, BUTTERMILK, ROMANO CHEESE, WHEY PROTEIN CONCENTRATE, ONION POWDER, VEGETABLE OIL, CORN FLOUR, NATURAL AND ARTIFICIAL FLAVOUR, DEXTROSE, TOMATO POWDER, LACTOSE, SPICES, COLOUR, LACTIC ACID, CITRIC ACID, SUGAR, GARLIC POWDER, SKIM MILK, RED AND GREEN BELL PEPPER POWDER, DISODIUM INOSINATE, DISODIUM GUANYLATE, MODIFIED CORN STARCH), CALCIUM HYDROXIDE.

CONTAINS MILK INGREDIENTS.

Nutrition Facts
Valeur nutritive

Per 21 chips (50 g)
pour 21 croustilles (50 g)

Amount
Teneur

Calories / Cal

Fat / Lipides 13 g

Saturated / saturés

+ Trans / trans 0 g

Cholesterol / Cholestérol 0

m 370 mg

Carbohydrate / Glucides 3


Trans Fat
0 gras trans
Doritos
Roulette
ATTENTION
SOME CHIPS VERY HOT
CERTAINES CHIPS SONT VRAIMENT ÉPICÉES
TORTILLA CHIPS
CHIPS TORTILLA AROMATISÉES

“Hot or Not”


0 Trans Fat
0 gras trans
Doritos
Roulette
ATTENTION
SOME CHIPS VERY HOT
CERTAINES CHIPS SONT VRAIMENT ÉPICÉES
FLAVOURED TORTILLA CHIPS
CHIPS TORTILLA AROMATISÉES
235 g


HOT

“Hot or Not”

What fraction of hot chips to not hot chips are there in a bag of Doritos Roulette?

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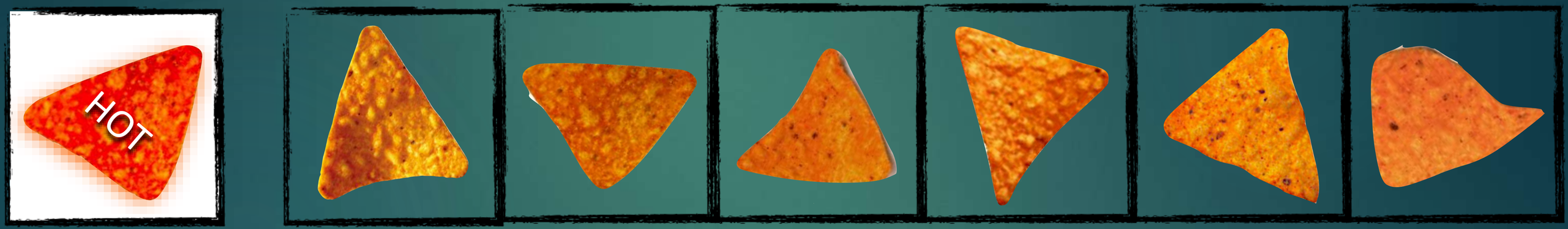

$$\frac{1}{6}$$

“Hot or Not”

What fraction of hot chips to not hot chips are there in a bag of Doritos Roulette?

“Hot” Chips

$$\frac{1}{6}$$

“Hot or Not”

What fraction of hot chips to not hot chips are there in a bag of Doritos Roulette?

1 “Hot” Chips

6 “Not Hot” Chips

“Hot or Not”

What fraction of hot chips to not hot chips are there in a bag of Doritos Roulette?

$\frac{1}{6}$ ← “Hot” Chips

← “Not Hot” Chips

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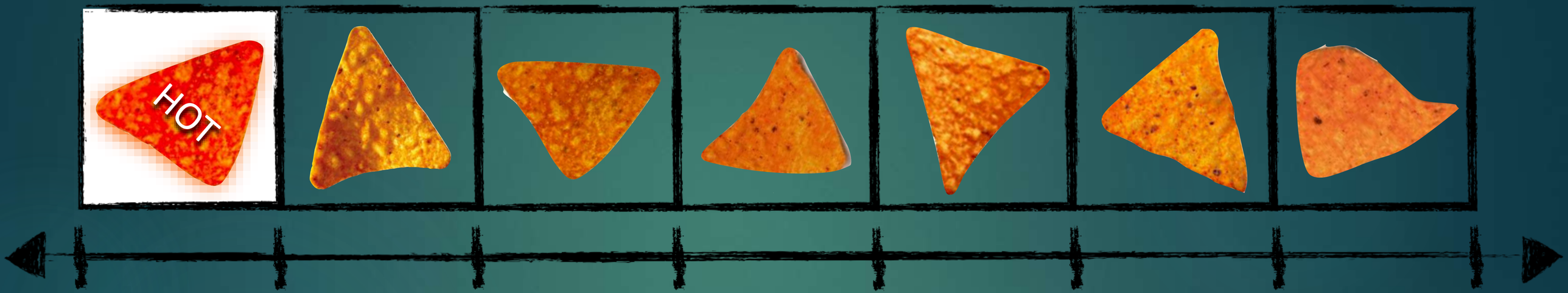
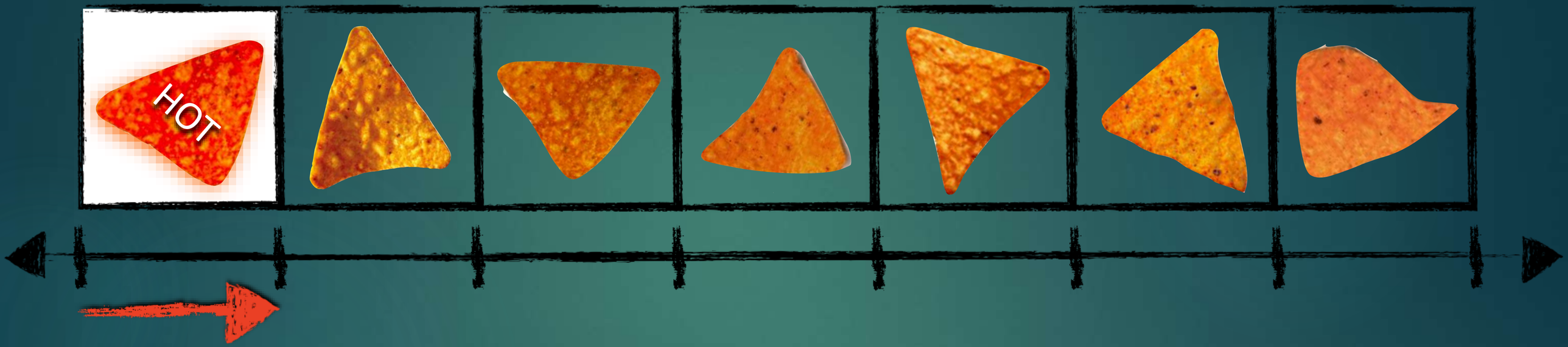


$\frac{1}{6}$ “Hot” Chips

“Not Hot” Chips

What fraction of hot chips to not hot chips are there in a bag of Doritos Roulette?



"Hot"

1 "Hot" Chips

6 "Not Hot" Chips

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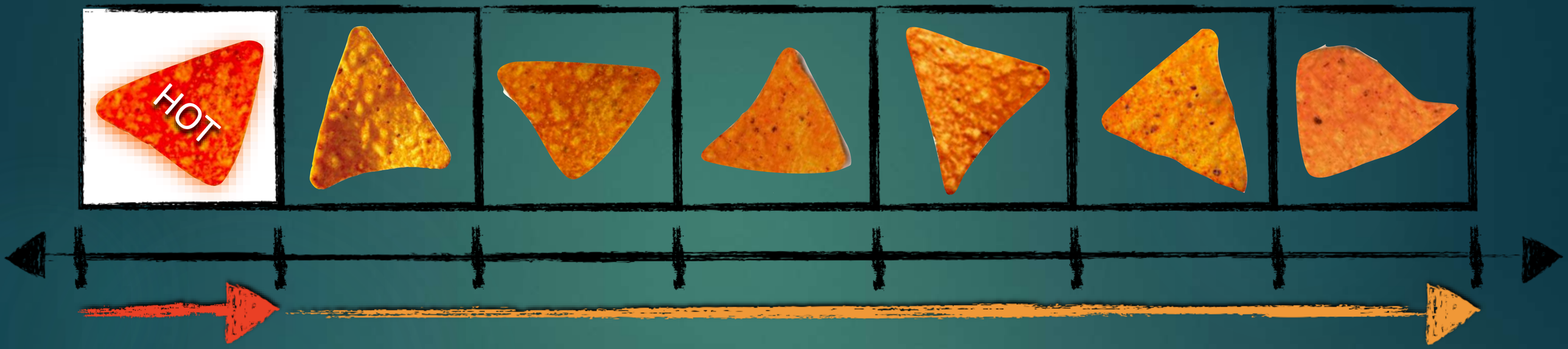

"Hot" "Not Hot"

1 ← "Hot" Chips

6 ← "Not Hot" Chips

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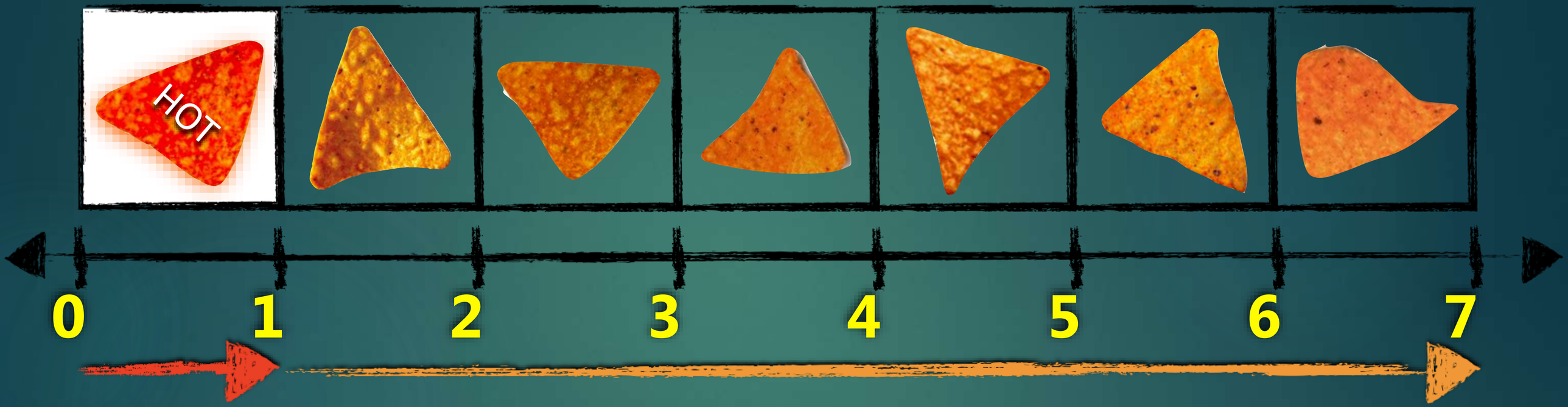
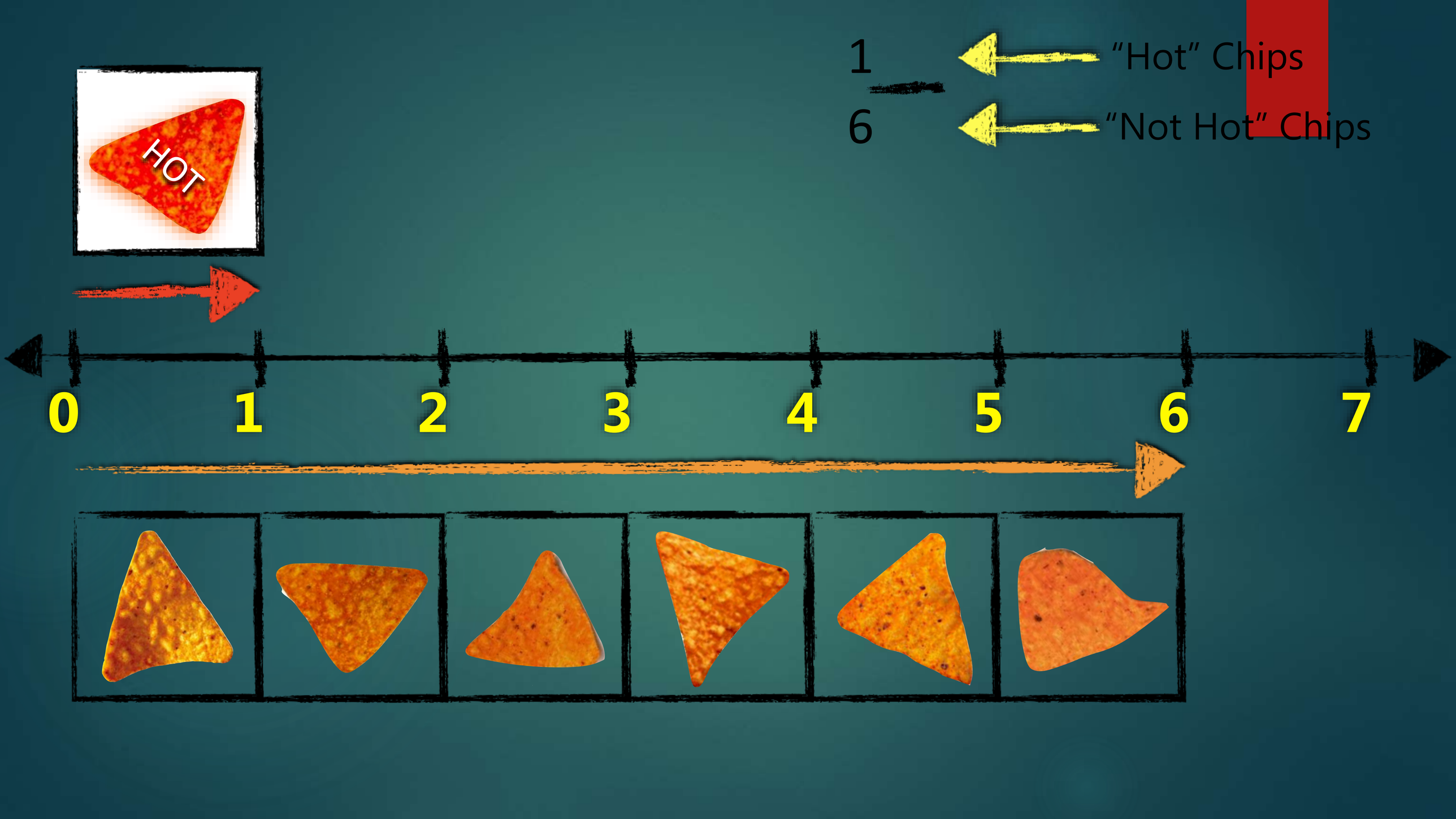


"Hot"

"Not Hot"

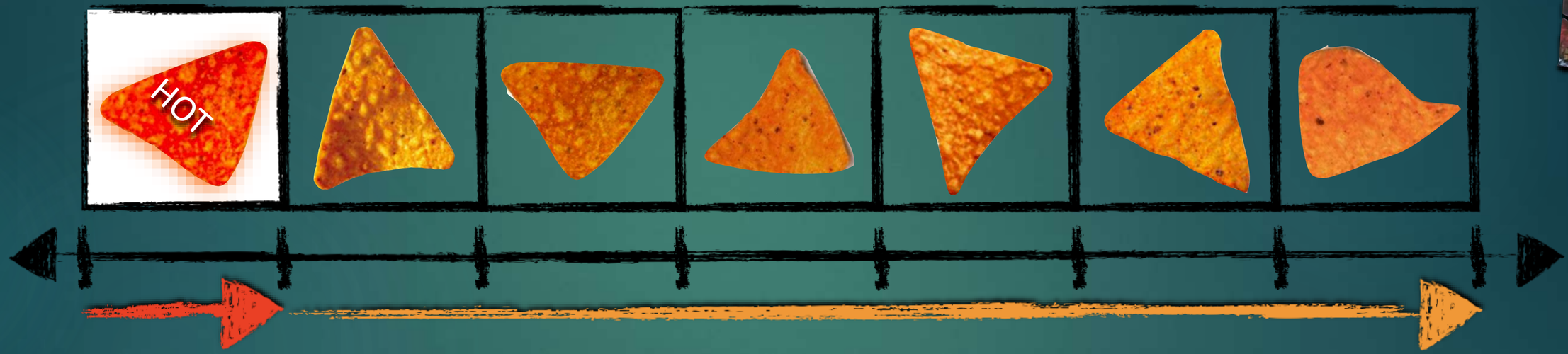
$\frac{1}{6}$ "Hot" Chips

"Not Hot" Chips


HOT
1
“Hot” Chips
6
“Not Hot” Chips
0
1
2
3
4
5
6
7

Part-Part Relationship

What fraction of hot chips to not hot chips are there in a bag of Doritos Roulette?



$\frac{1}{6}$ "Hot" Chips : "Not Hot" Chips

Baking Brownies

Baking Brownies

How can 4 friends share 6 brownies fairly?

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How can 4 friends share 6 brownies fairly?

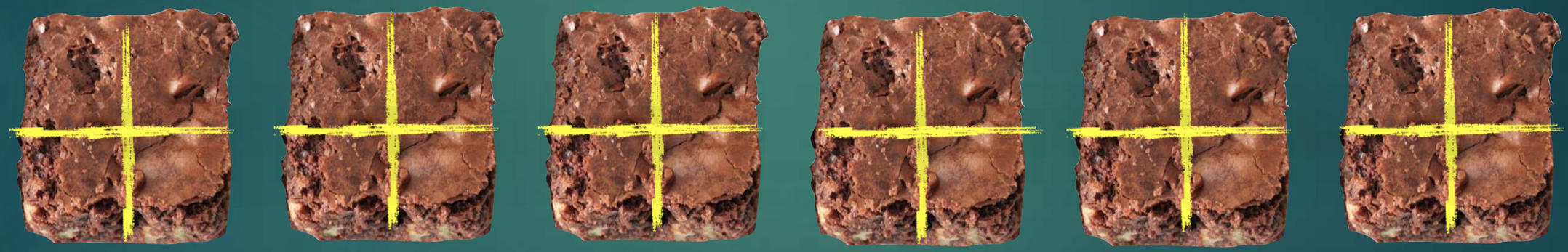
Multiple Representations:

Baking Brownies

How can 4 friends share 6 brownies fairly?

Multiple Representations:

Partitioning Brownies into Fourths



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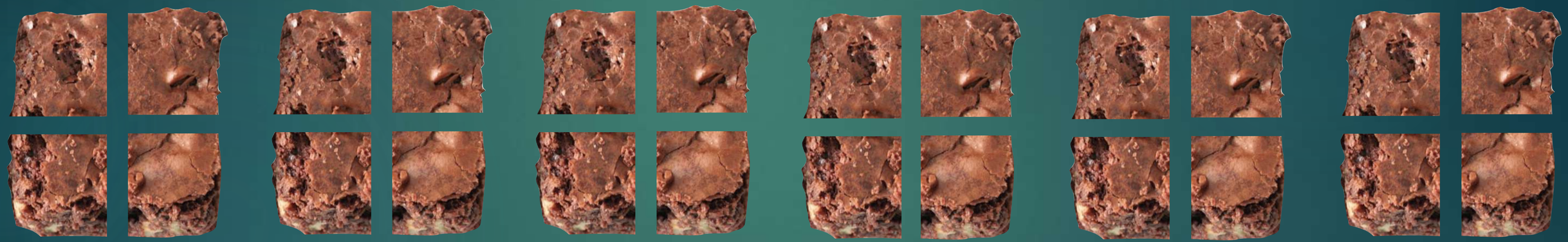

$$\frac{6 \text{ brownies}}{4 \text{ people}}$$

Baking Brownies

How can 4 friends share 6 brownies fairly?

Multiple Representations:

Partitioning Brownies into Fourths

$$\frac{6 \text{ brownies}}{4 \text{ people}} = \frac{6}{4}$$

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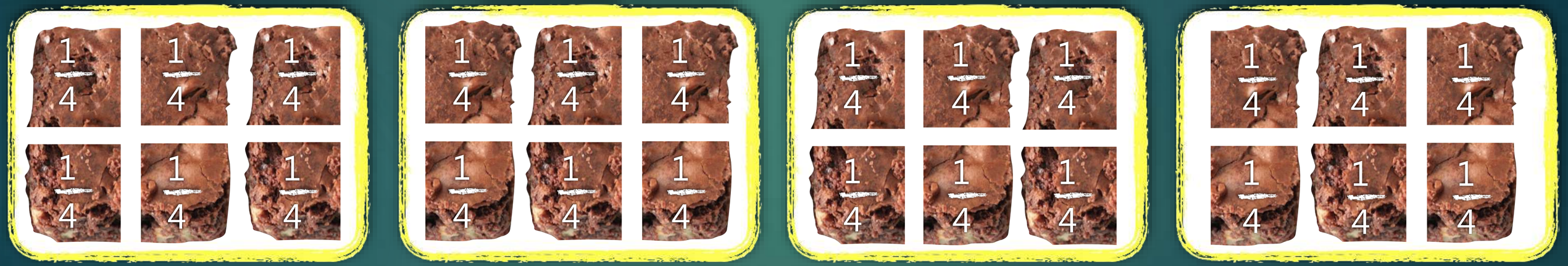
Partitioning Brownies into Fourths



$$\frac{6 \text{ brownies}}{4 \text{ people}} = \frac{6}{4}$$

Each person would get 6 one-fourth pieces of brownies.

Baking Brownies

How can 4 friends share 6 brownies fairly?

Multiple Representations:

Sharing full brownies equally

Baking Brownies

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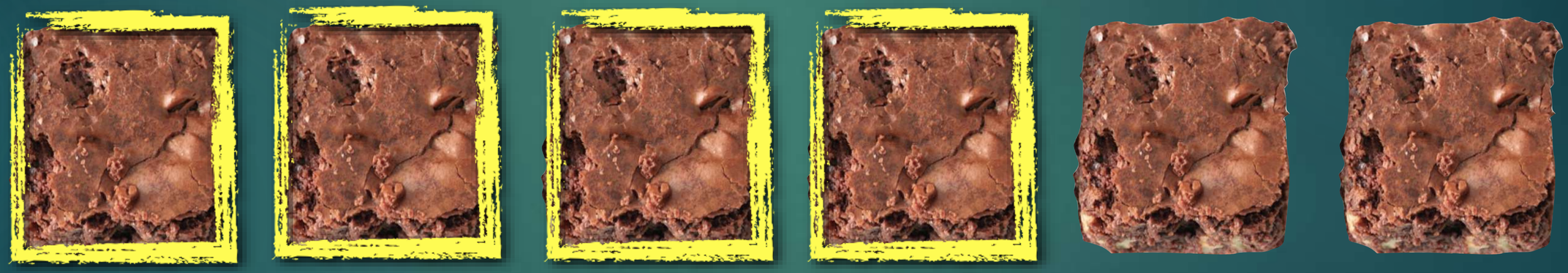
Multiple Representations:

Sharing full brownies equally

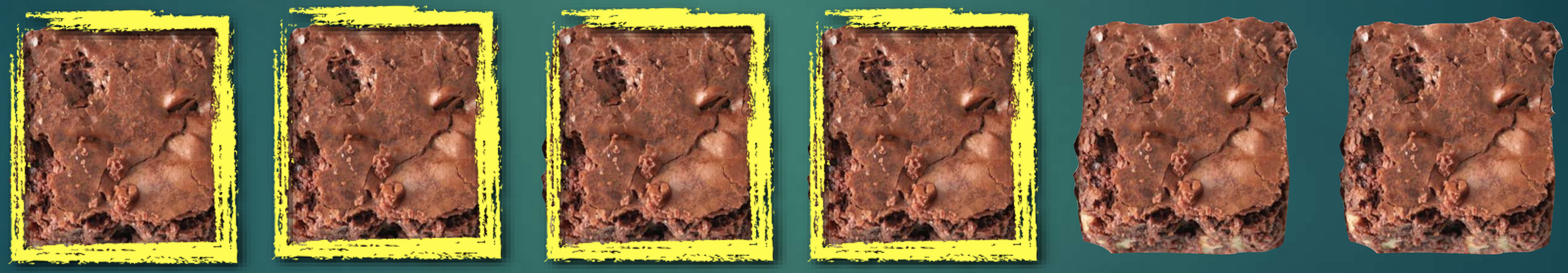


Baking Brownies

How can 4 friends share 6 brownies fairly?

Multiple Representations:

Sharing full brownies equally , then partitioning the remainder.



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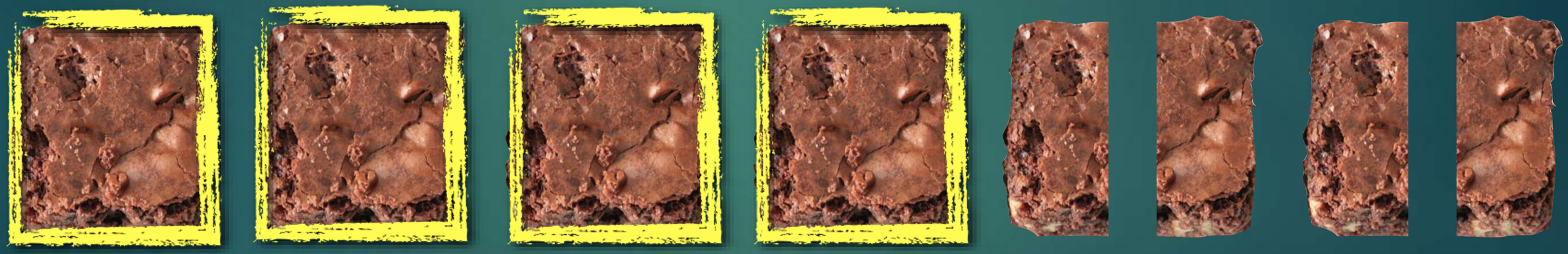

Baking Brownies

How can 4 friends share 6 brownies fairly?

Multiple Representations:

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Multiple Representations:

Sharing full brownies equally , then partitioning the remainder.

$$\frac{6 \text{ brownies}}{4 \text{ people}} = 1\frac{1}{2}$$

Baking Brownies

How can 4 friends share 6 brownies fairly?

Multiple Representations:

Sharing full brownies equally , then partitioning the remainder.

$$\frac{6 \text{ brownies}}{4 \text{ people}} = 1\frac{1}{2}$$

Each person would get 1 full and 1 half piece of brownies.

Baking Brownies

How can 4 friends share 6 brownies fairly?

Multiple Representations:

Partition the brownies into four equal-size portions

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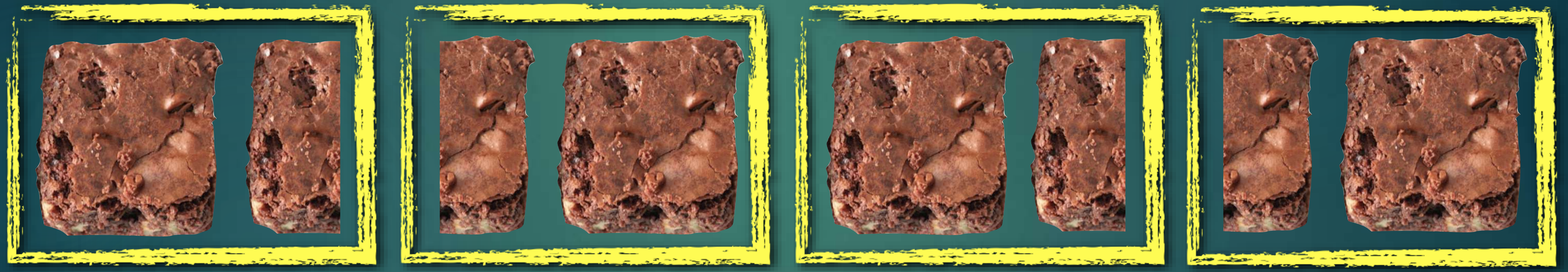

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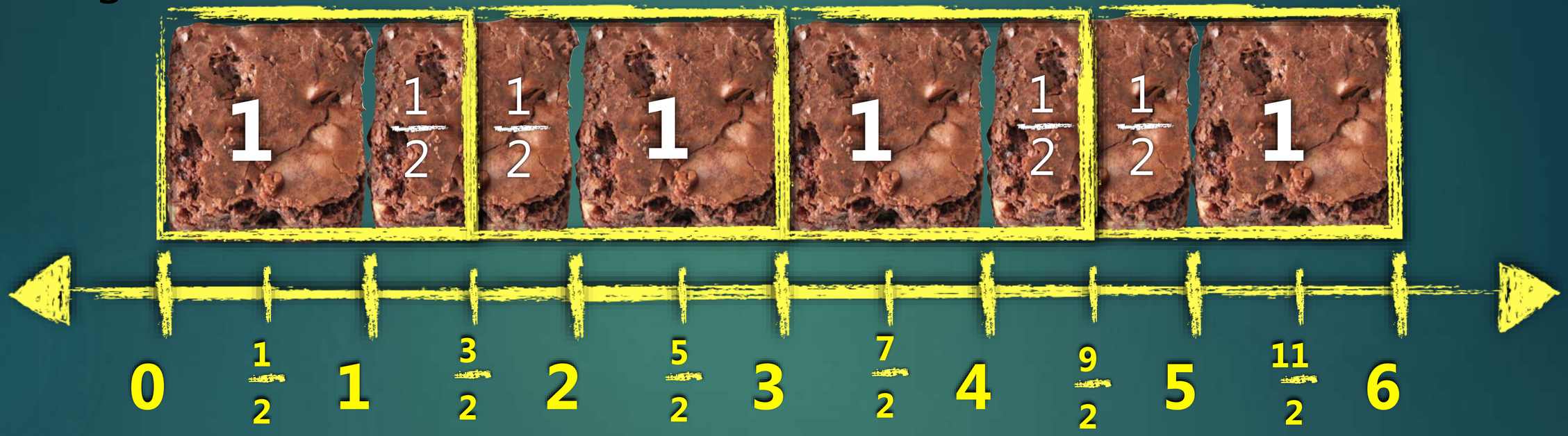
How can 4 friends share 6 brownies fairly?

Multiple Representations:

Using a number line



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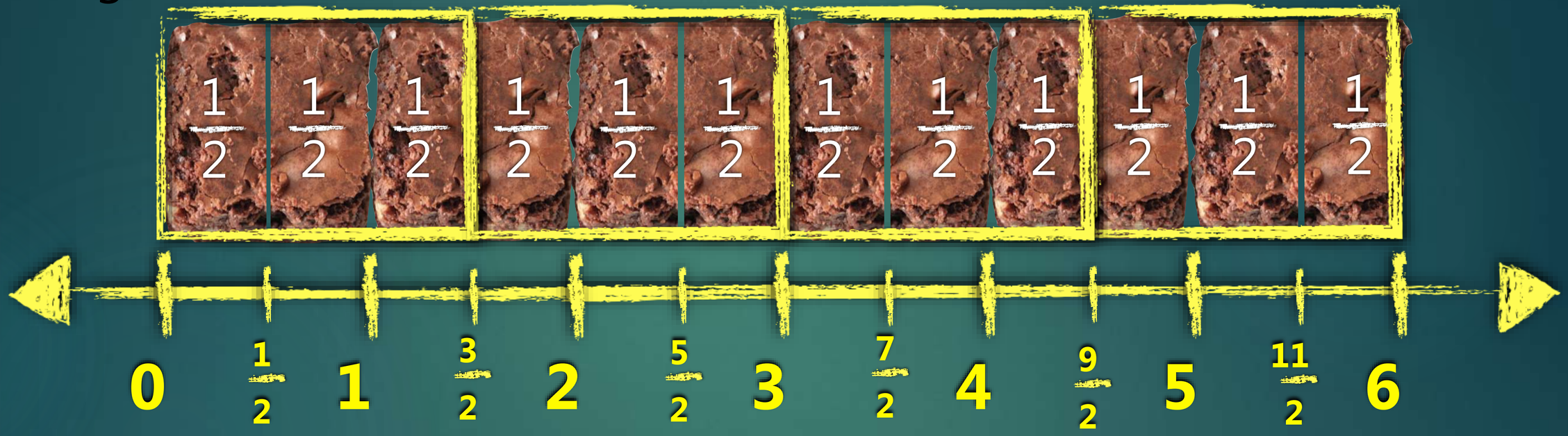

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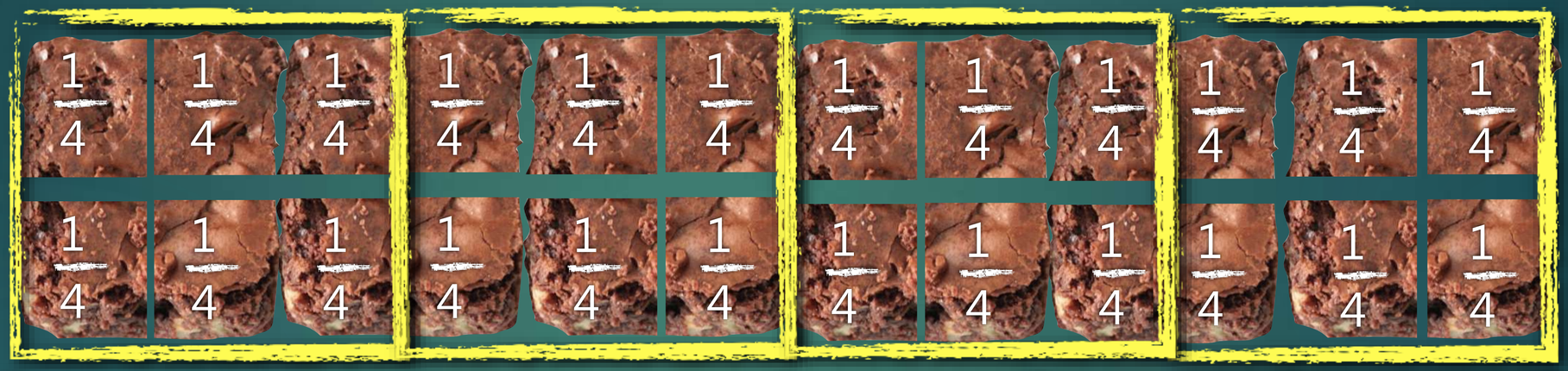

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Each person would get 1 full and 1 half piece of brownies.

Fraction as Quotient

How can 4 friends share 6 brownies fairly?

Multiple Representations:

Partition the brownies into four equal-size portions

$$\frac{6 \text{ brownies}}{4 \text{ people}} = 1\frac{1}{2}$$

Each person would get 1 full and 1 half piece of brownies.

How Many Rolos?

How Many Rolos?

There are 7 pieces in every roll of Rolo chocolate.

How Many Rolos?

There are 7 pieces in every full roll of Rolo chocolate.

Two partially eaten rolls are found in a drawer; one with 5 pieces and the other with 4 pieces. How many full rolls of Rolo are there?

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$$\frac{5 \text{ pieces}}{7 \text{ pieces}} + \frac{4 \text{ pieces}}{7 \text{ pieces}} = \frac{9 \text{ pieces}}{7 \text{ pieces}}$$

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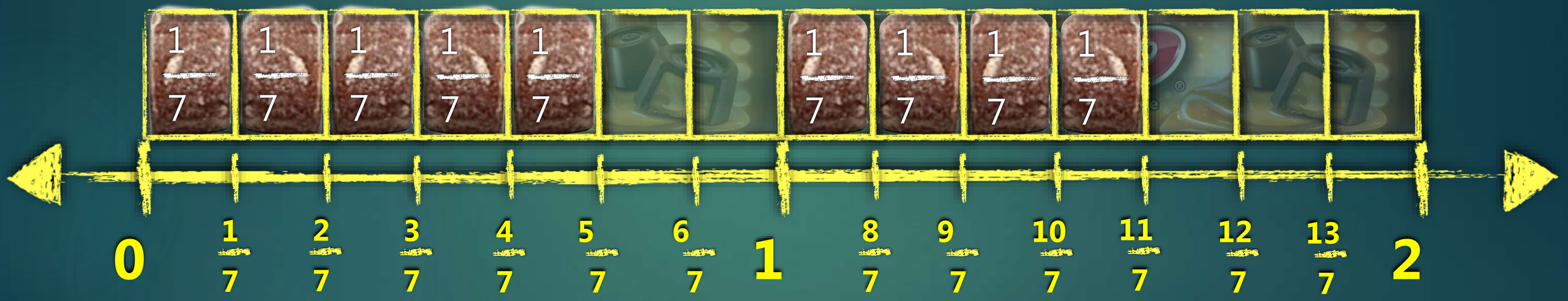

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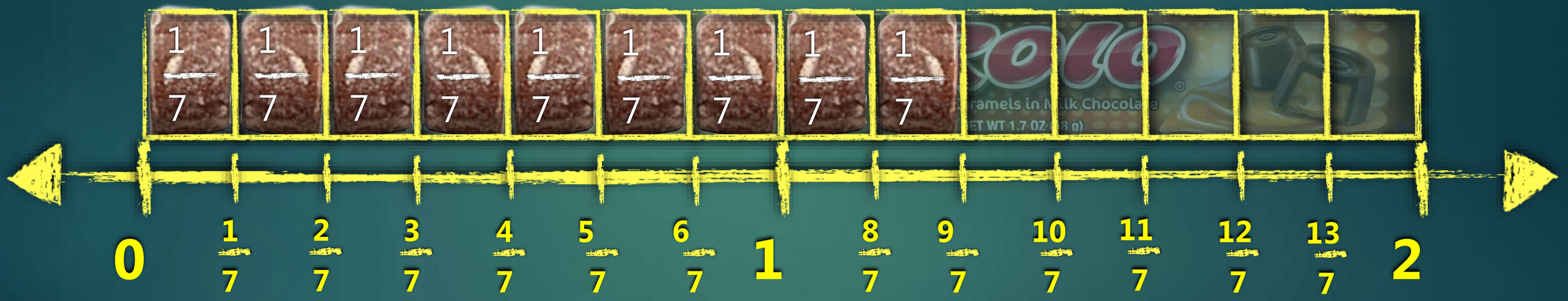

$$\frac{5 \text{ pieces}}{7 \text{ pieces}} + \frac{4 \text{ pieces}}{7 \text{ pieces}} = \frac{9 \text{ pieces}}{7 \text{ pieces}}$$

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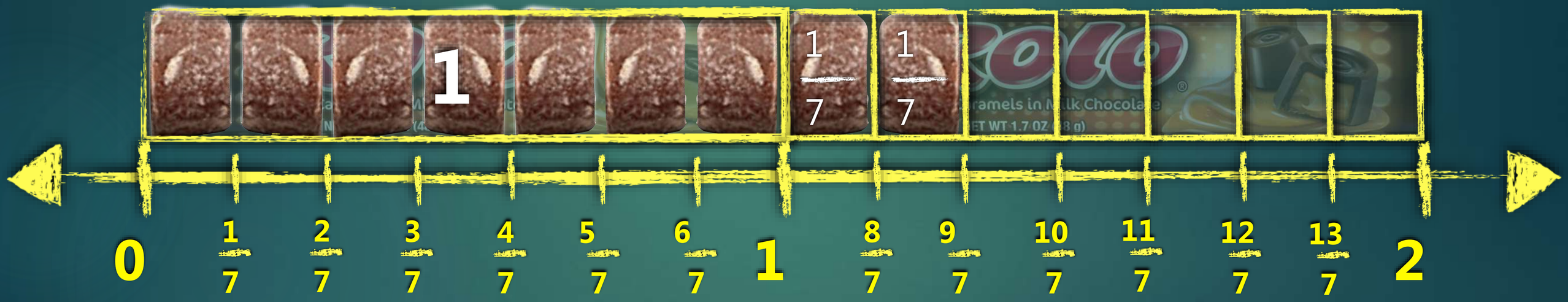

$$\frac{5}{7} + \frac{4}{7} = 1\frac{2}{7}$$

There is one full roll of Rolos and an additional 2 pieces out of a roll of 7.

Fractions As Operators

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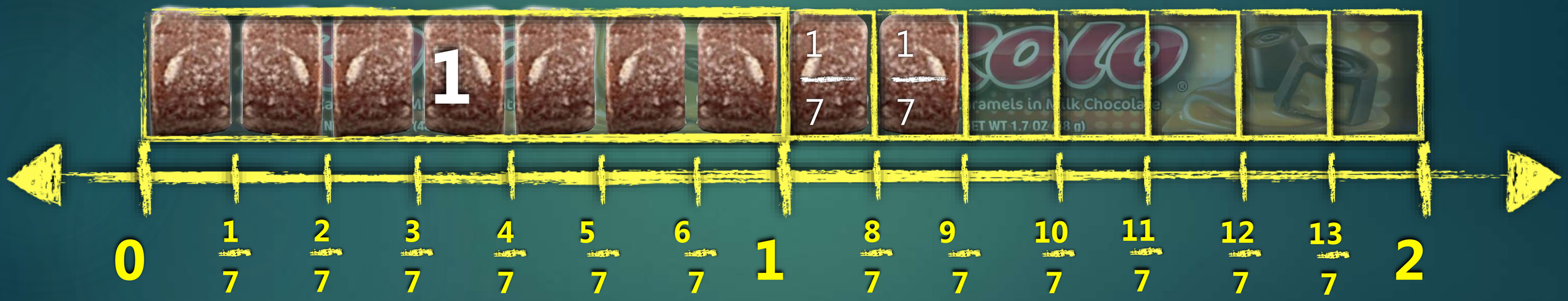

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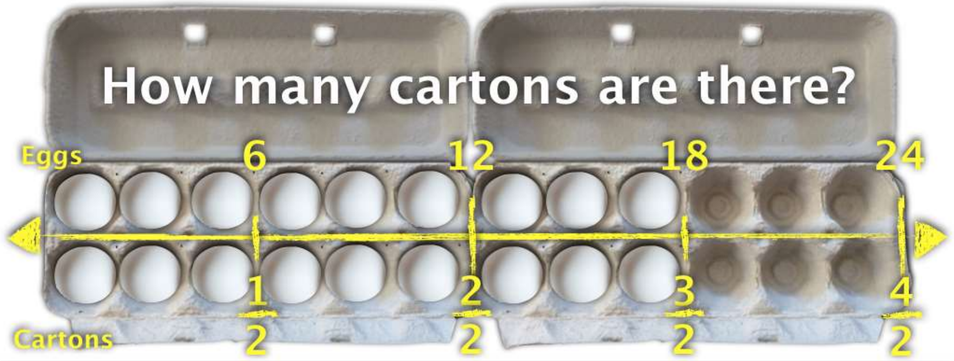
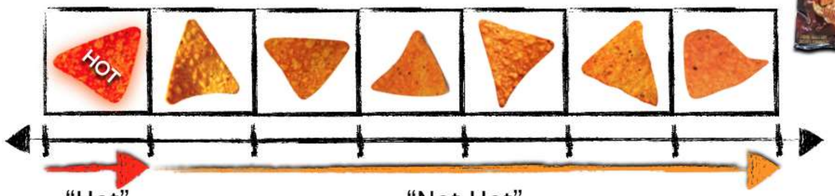
Fraction Constructs

Part-Whole Relationship



Part-Part Relationship

What fraction of hot chips to not hot chips are there in a bag of Doritos Roulette?



$\frac{1}{6}$ ← "Hot" Chips

← "Not Hot" Chips

Fraction as Quotient

How can 4 friends share 6 brownies fairly?

Multiple Representations:

Partition the brownies into four equal-size portions

$\frac{6 \text{ brownies}}{4 \text{ people}} = 1\frac{1}{2}$

Each person would get 1 full and 1 half piece of brownies.

Fractions As Operators

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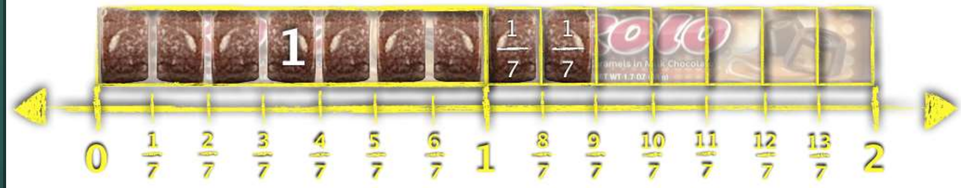

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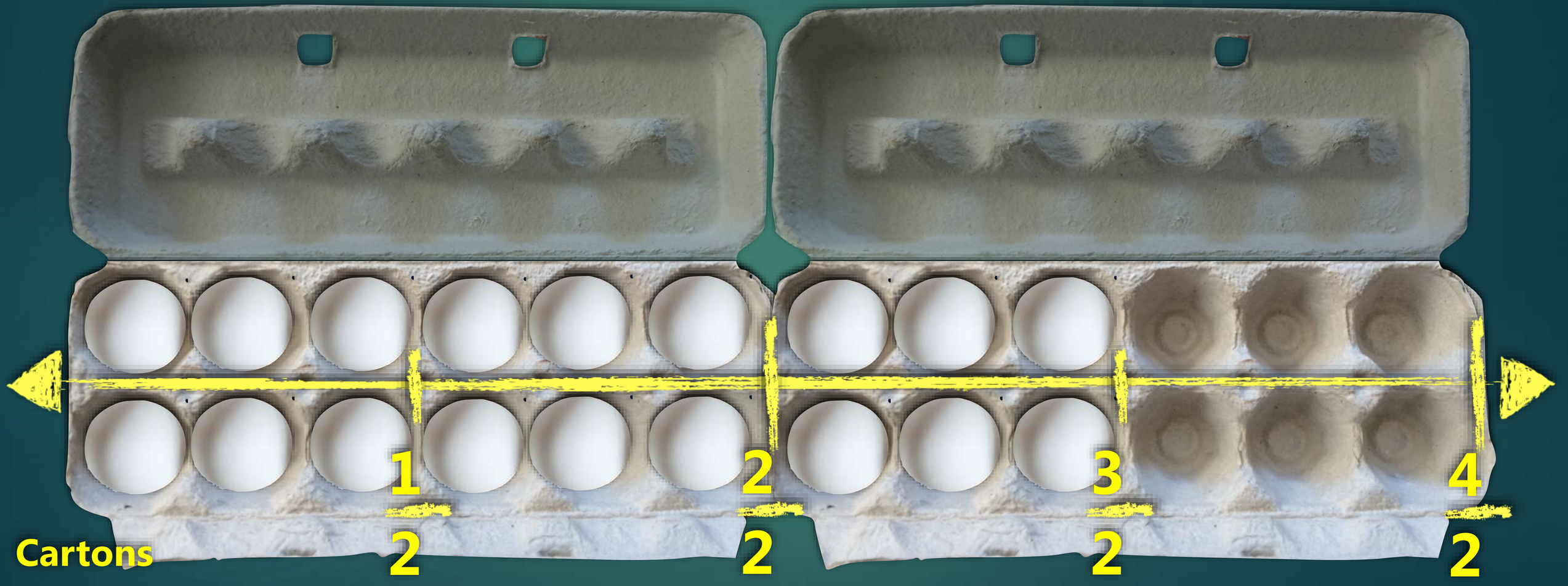
Four Fraction Models

Four Fraction Models



Four Fraction Models

Linear Model

DOUBLE CLOTHESLINE

DOUBLE CLOTHESLINE

0.2

DOUBLE CLOTHESLINE

0.2

DOUBLE CLOTHESLINE

0.2

? %

DOUBLE CLOTHESLINE

0.2

? %

DOUBLE CLOTHESLINE

0.2

0

? %

0 %

DOUBLE CLOTHESLINE

0	0.2
0 %	? %

DOUBLE CLOTHESLINE

0

0.2

1

0 %

? %

DOUBLE CLOTHESLINE

0	0.2	1
0 %	? %	

DOUBLE CLOTHESLINE

0

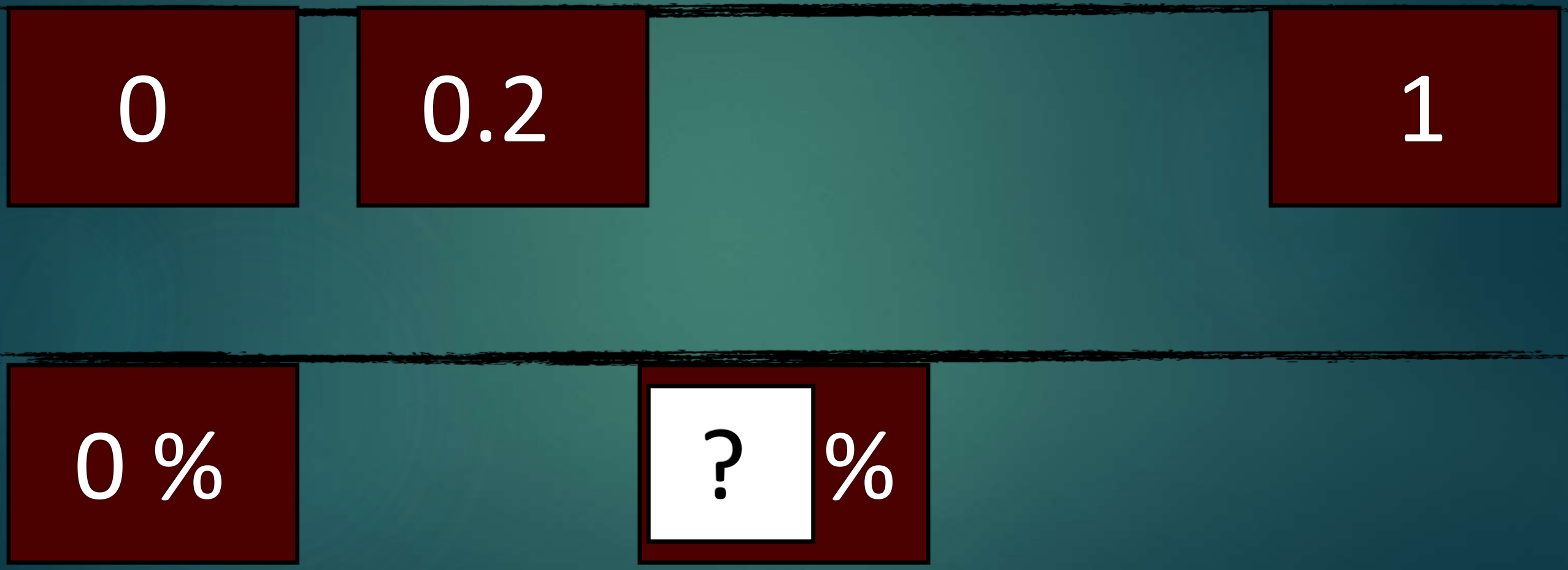
0.2

1

0 %

? %

DOUBLE CLOTHESLINE



DOUBLE CLOTHESLINE

0	0.2		1
0 %	?	%	

DOUBLE CLOTHESLINE

0	0.2	1
0 %	20 %	100 %

DOUBLE CLOTHESLINE

DOUBLE CLOTHESLINE

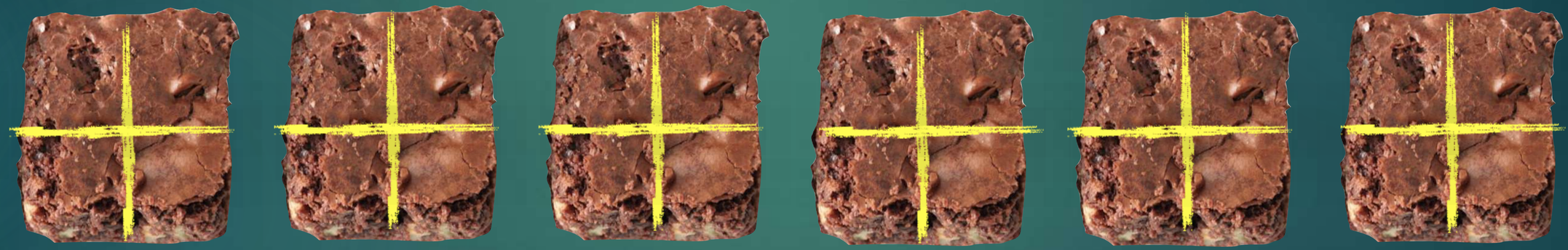
DOUBLE CLOTHESLINE

DOUBLE CLOTHESLINE

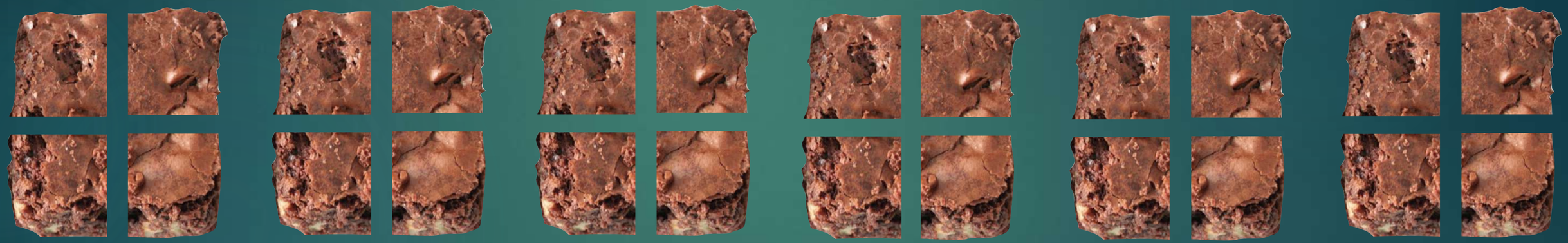
0	0.2	0.4	0.6	0.8	1
0 %	20 %	40 %	60 %	80 %	100 %

Four Fraction Models

Four Fraction Models

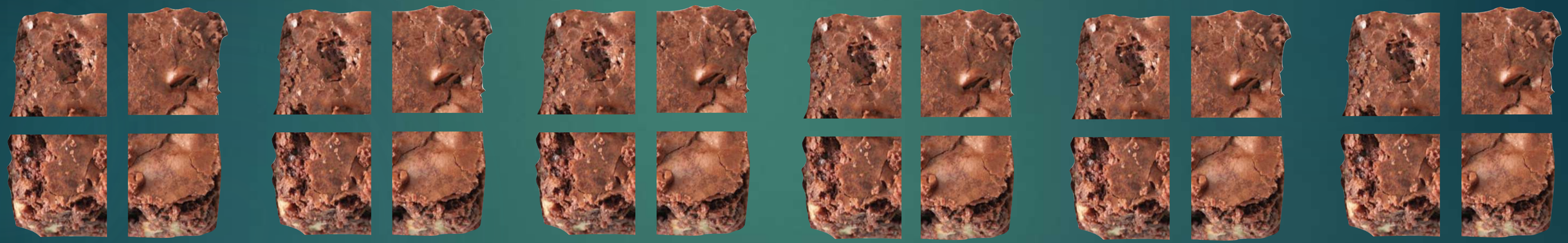


Four Fraction Models



Four Fraction Models

Area Model



Four Fraction Models

Four Fraction Models

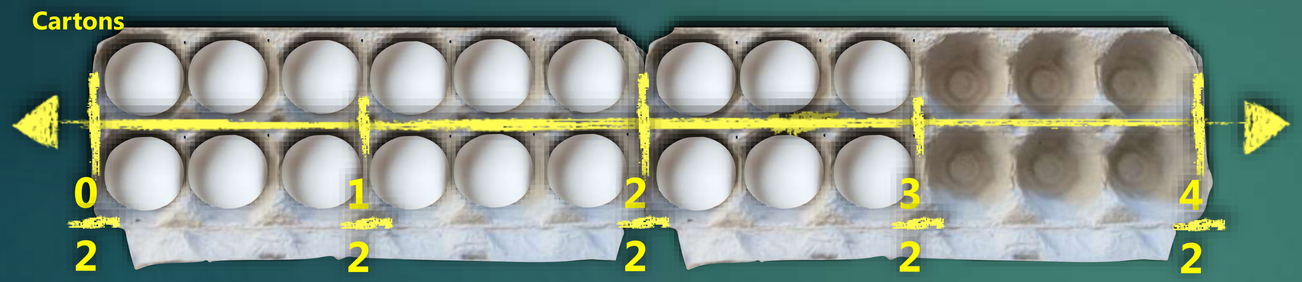
Set Model

Four Fraction Models

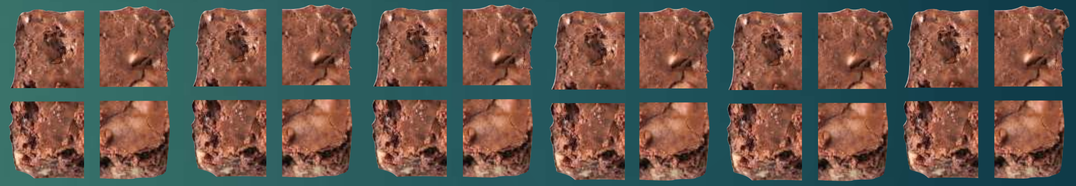
Volume Model

Four Fraction Models

Linear Model

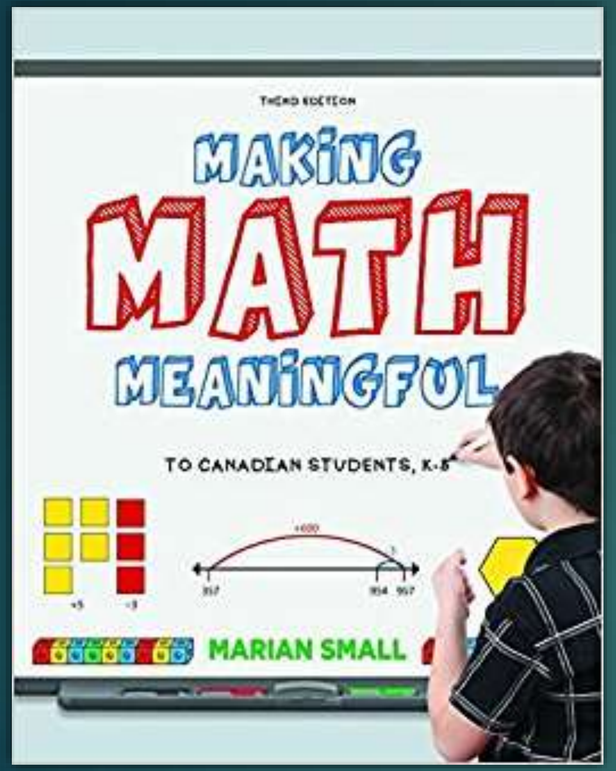


Area Model



Set Model

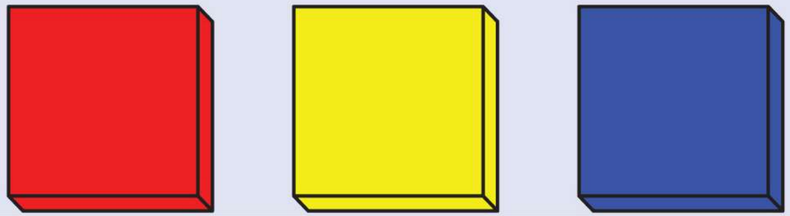
Volume Model



Create a design where there are

- twice as many yellow squares as red ones and
- twice as many blue squares as yellow ones.

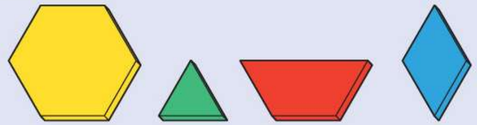
What fraction of the area is yellow?



Create a design where there are

- twice as many yellow pattern blocks as red ones and
- twice as many blue pattern blocks as yellow ones.

What fraction of the area is yellow?

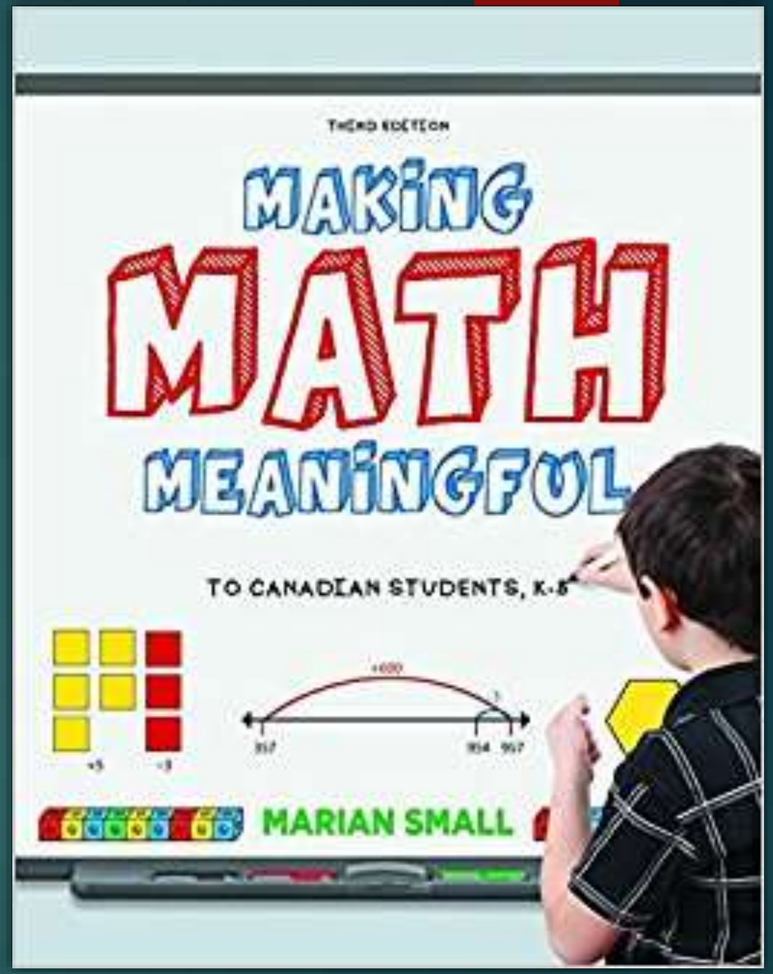


ACTIVITY 12.4

Display circle graphs like this one to students. Ask questions related to fractions about them. For example,

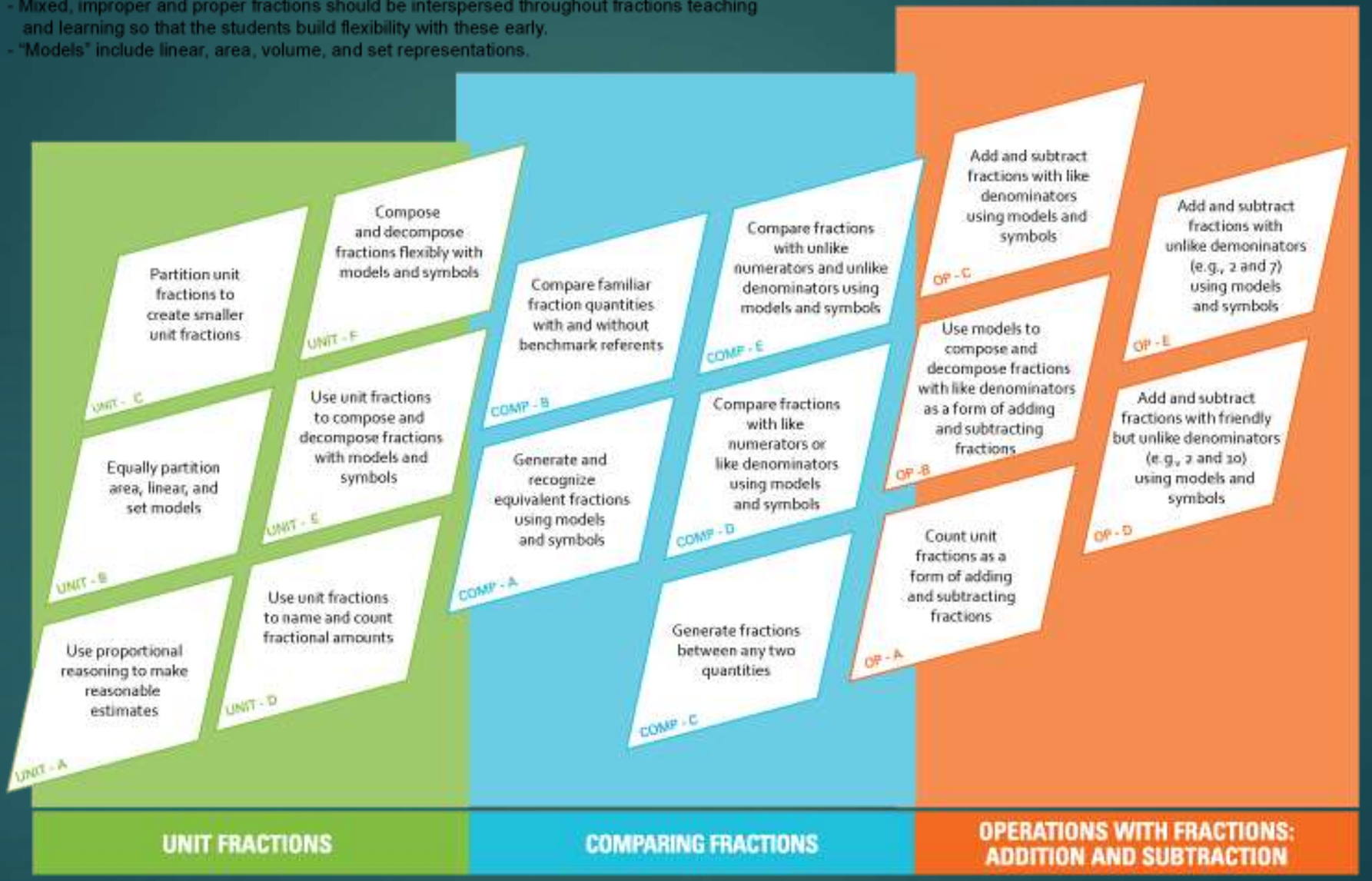
- *About what fraction of the school population is in each grade? How do you know?*
- *What is the probability that a student chosen at random is a Grade 1 student?*
- *How might the graph change if about $\frac{1}{4}$ of the students were in kindergarten?*

Students in K to Grade 3

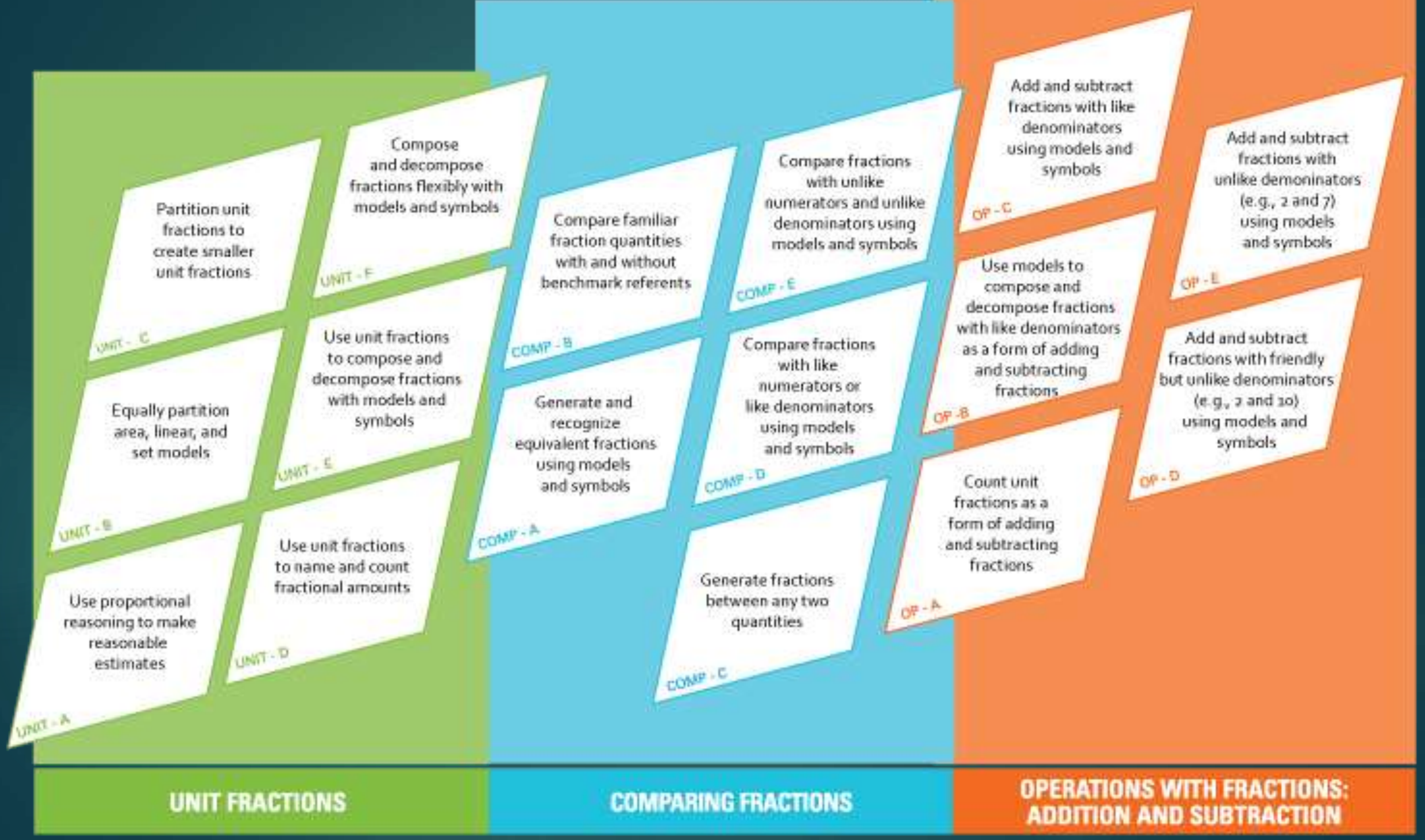


Fractions Learning Pathways

Please Note:
- Mixed, improper and proper fractions should be interspersed throughout fractions teaching and learning so that the students build flexibility with these early.
- "Models" include linear, area, volume, and set representations.

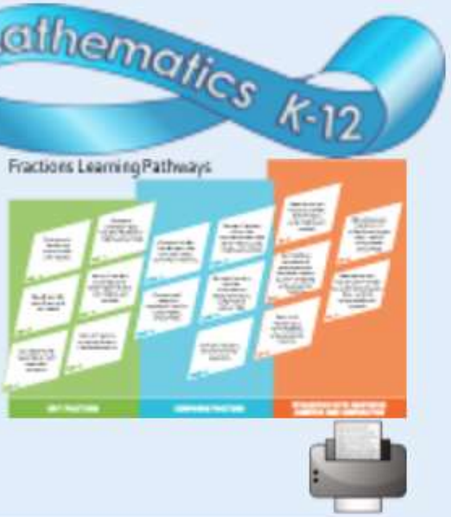


Created by Dr. Cathy Bruce, Tara Flynn and Shelley Yearley.
Fractions Learning Pathways are inspired by Dr. Jere Confrey's work, based on international and Ontario classroom research, and informed by feedback from classroom teachers and student thinking.


Partition unit fractions to create smaller unit fractions
UNIT - C
Compose and decompose fractions flexibly with models and symbols
UNIT - F
Equally partition area, linear, and set models
UNIT - B
Use unit fractions to compose and decompose fractions with models and symbols
UNIT - E
Use proportional reasoning to make reasonable estimates
UNIT - A
Use unit fractions to name and count fractional amounts
UNIT - D
Compare familiar fraction quantities with and without benchmark referents
COMP - B
Compare fractions with unlike numerators and unlike denominators using models and symbols
COMP - E
Generate and recognize equivalent fractions using models and symbols
COMP - A
Compare fractions with like numerators or like denominators using models and symbols
COMP - D
Generate fractions between any two quantities
COMP - C
Add and subtract fractions with like denominators using models and symbols
OP - C
Use models to compose and decompose fractions with like denominators as a form of adding and subtracting fractions
OP - B
Count unit fractions as a form of adding and subtracting fractions
OP - A
Add and subtract fractions with unlike demoninators (e.g., 2 and 7) using models and symbols
OP - E
Add and subtract fractions with friendly but unlike denominators (e.g., 2 and 10) using models and symbols
OP - D
UNIT FRACTIONS
COMPARING FRACTIONS
OPERATIONS WITH FRACTIONS: ADDITION AND SUBTRACTION

Unit A

Unit Fractions



Use proportional reasoning to make reasonable estimates

Understanding proportional reasoning requires students to consider a number or quantity in relative terms. With fractions, students must consider the fraction in context, such as one half of a whole figure. Students use proportional reasoning to partition a whole into unit fractions.

BACKGROUND

A unit fraction is the base unit of any fraction and always has a numerator of 1; for example, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{23}$ are all unit fractions. Every

TASKS

Walk the Line

Students actively equi-partition a number line using different fractional units (e.g., halves, fifths) as they place mixed and improper fractions. Students will enjoy walking, jumping or using every day classroom items as a method of

Walk the Line

Description
Students actively equi-partition a number line using different fractional units (e.g., halves, fifths) as they place mixed and improper fractions. Students will enjoy walking, jumping or using every day classroom items as a method of kinaesthetically partitioning a number line on the floor. This task becomes increasingly complex based upon the sets of fractions used.

Mathematics
Accurately placing fractions on a number line involves significant spatial reasoning and the use of a large number line allows students to gesture and walk to communicate their spatial reasoning. Research shows that the number line is a powerful model for representing fractions tha supports a deeper understanding of fraction as number (as opposed to a circle model). Unit amounts are purposefully scaffolded to allow students to use their knowledge of benchmark fractions (e.g., $\frac{1}{5}$) to place other fractions (e.g., $\frac{6}{5}$).

Curriculum Connections
Students will:

- understand a fraction as a number on the number line;
- represent and compare fractions;
- accurately place fractions on a number line by reasoning about their relative size.

Instructional sequence

Explore the Progression

Explore the Fraction Learning Pathway with a partner.

Where do you feel your grade level curriculum aligns with the Pathway?

Pick an Activity

Select a topic from the Pathway.

Read the topic and explore the suggested activity.

Be ready to share out your thinking to the group.

Making Sense Series

The Progression of Fractions
Meaning, Equivalence, & Comparison

gfletchyfractions

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Progression of Fractions