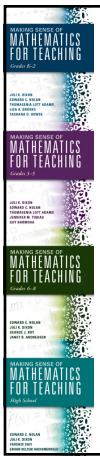


Estimation. What's It All "About?"

Juli K. Dixon, Ph.D.
JuliDixonMath@gmail.com

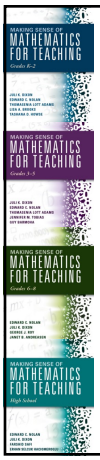
Handout:
http://www.dnamath.com/presentations/

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What words come to mind when you think about estimation?

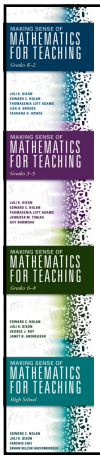
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Session Goals

- Discuss perceptions related to estimation.
- Engage in tasks that are enhanced by estimation.
- Connect estimation to conceptual understanding.

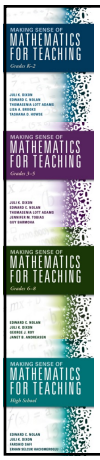
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Does this sound familiar? It has happened to me…

- ✓ A flight attendant informed us that we would land at "**approximately** 7:59 pm."
- ✓ The pilot on my flight shared that the flight would be "**approximately** one hour eleven minutes from take off to landing."

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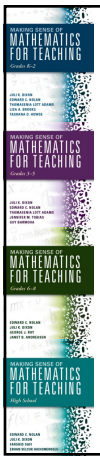


How is this related to estimation?

Estimation helps us to determine if our solutions are good fits.



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Estimation can help make math make sense!

- ✓ My lunch check included choices of tip percentages and the total cost with the tip included. No need to think…
- ✓ My Uber driver took one look at my luggage and threatened to give me a one-star rating…

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Estimate the following:

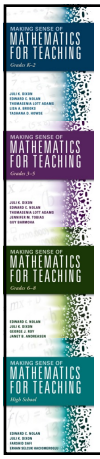
5 x 23

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Estimate the following:

157 + 624

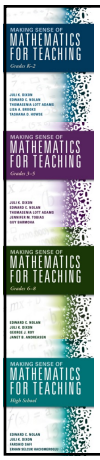
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Estimate the following:

624 – 157

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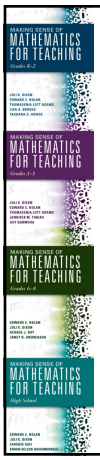
Estimate the following:

624 – 157

Did you use the same values as you did in the first problem?

Did you use the same values as someone near you?

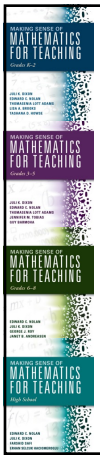
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Estimate the following:

Estimation provides a wonderful context within which to discuss mathematics.

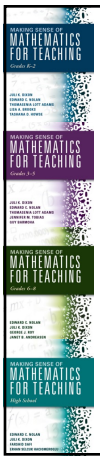
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Discourse Norms

- Provide explanations and justifications with solutions.
- Make sense of others' solutions.
- Communicate when you don't understand or don't agree.

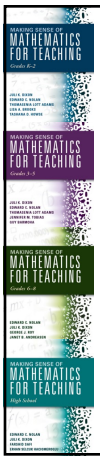
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With what do we estimate?

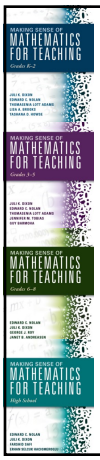
- Quantities
- Computation
  - Whole Numbers
  - Decimals
  - Fractions
- Measurement
  - Time
  - Length
  - Area
  - Volume
  - Mass

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Estimating Quantities

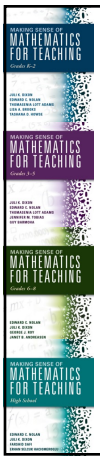
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How many buttons?



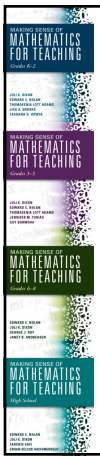
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How many buttons?



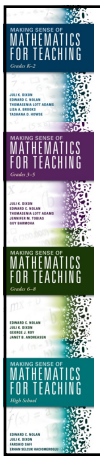
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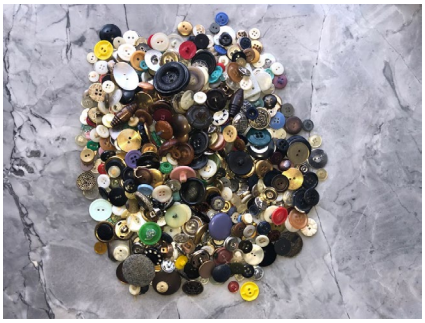
If you knew the quantity of one jar, how could you use it to find the quantity in the other jar?



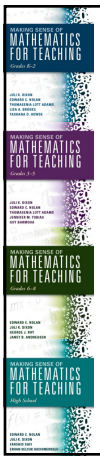
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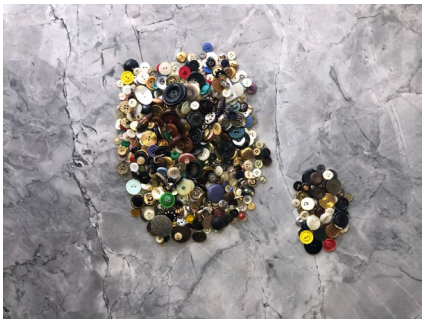
How many buttons?



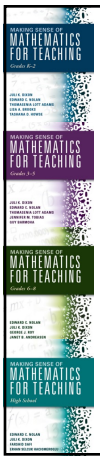
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How many buttons? Fifty buttons are separated out.



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How many buttons?



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How might we estimate with fractions?

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About how much melon?



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What fraction of each plate is red?

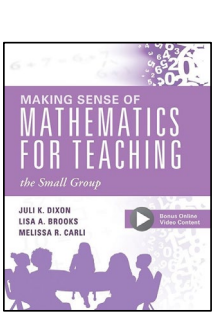


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Estimation. What's it "about"?

What experiences help students to develop the "fraction sense" needed to estimate?

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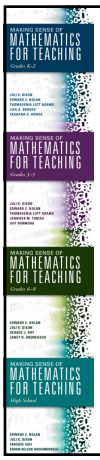
Making Sense of Mathematics for Teaching the Small Group

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Estimation. What's it "about"?

How might these early experiences support sense making with conversion problems.

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Estimation. What's it "about"?

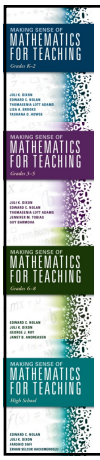
Do you multiply or divide by 1,000 to solve?

520 mm = _____ m

520 mL = _____ L

520 km = _____ m

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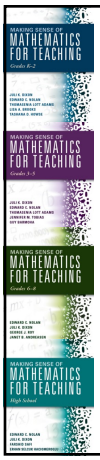
Estimation. What's it "about"?

Let's get back to fractions…

How do we extend early understandings of fractions?

Consider comparing fractions.

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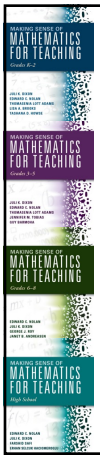


Estimation. What's it "about"?

Why do we compare fractions?

In order to develop a foundational understanding of the magnitude of fractions (if we do it right).

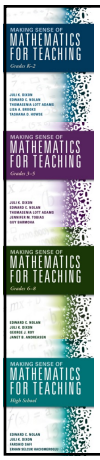
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Estimation. What's it "about"?

Compare $\frac{4}{7}$ and $\frac{4}{5}$.

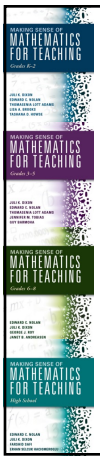
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Estimation. What's it "about"?

Compare $\frac{3}{5}$ and $\frac{4}{9}$.

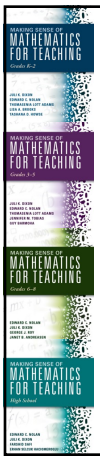
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Estimate the following:

$$\frac{1}{2} + \frac{2}{5}$$

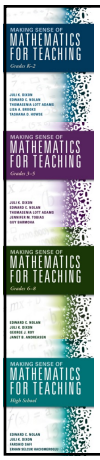
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Estimate the following:

$$\frac{2}{7} + \frac{3}{13}$$

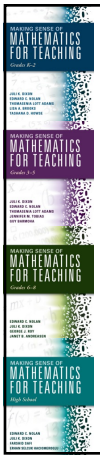
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Estimate the following:

$$3\frac{4}{5} + 1\frac{1}{3}$$

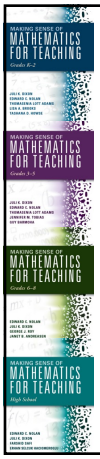
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Estimate the following:

$$1\frac{7}{8} - \frac{1}{2}$$

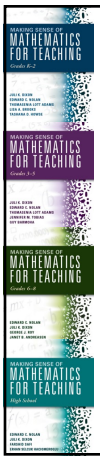
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We need to:

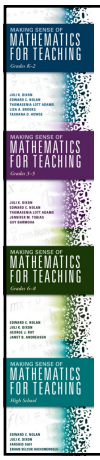
- Develop general understandings of fractions.
- Estimate with "nasty" fractions by using "friendly" fractions.
- Connect whole number operations to operations with fractions through context.

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Consider $\frac{3}{5} \times \frac{7}{8}$.

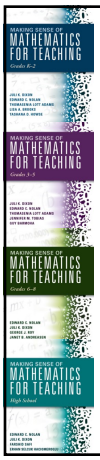
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Now consider 3 x 4.

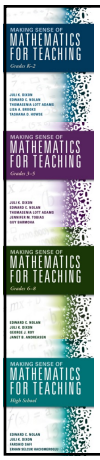
What does it mean?

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Now consider $\frac{3}{5}$ x 4.

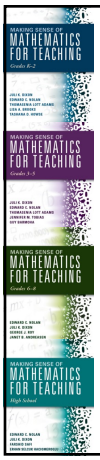
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Now consider $\frac{3}{5}$ x 4.

"A serving of cookies is 4 cookies. If I eat $\frac{3}{5}$ of a serving, how many cookies will I eat?"

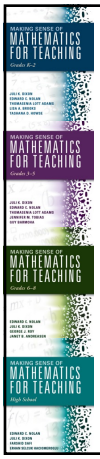
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Now estimate $\frac{3}{5}$ x 4.

"A serving of cookies is 4 cookies. If I eat $\frac{3}{5}$ of a serving, about how many cookies will I eat?"

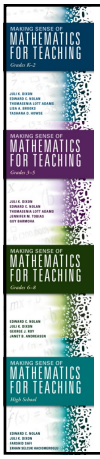
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Reconsider $\frac{3}{5}$ x $\frac{7}{8}$.

What does this mean? Put it in the context of cookies?

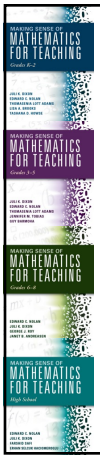
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Now estimate $\frac{3}{5}$ x $\frac{7}{8}$.

"What is close to $\frac{3}{5}$ of $\frac{7}{8}$ of a cookie?"

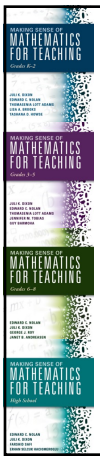
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Estimate the following:

$$1\frac{2}{3} \times \frac{3}{5}$$

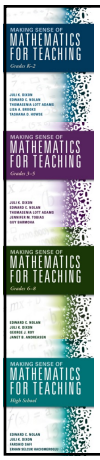
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Estimate the following:

$$\frac{7}{8} \times 9$$

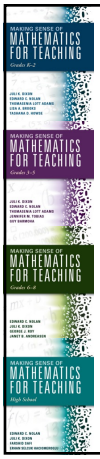
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Estimate the following:

$$5\frac{1}{4} \div \frac{8}{9}$$

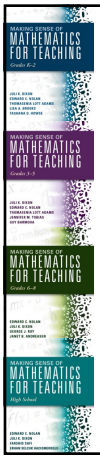
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Estimate the following:

$$\frac{5}{6} \div \frac{1}{4}$$

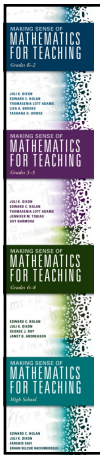
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Consider 12 ÷ 4.

"I have 12 cookies. If I share them among 4 friends, how many cookies will each friend get?"

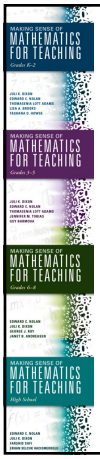
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$$\frac{5}{6} \div \frac{1}{4}$$

I have $\frac{5}{6}$ of a cookie. If I share what I have among $\frac{1}{4}$ of a friend…

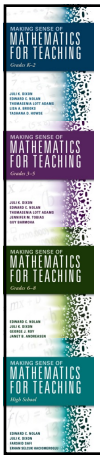
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$$\frac{5}{6} \div \frac{1}{4}$$

Sharing cookies doesn't help!

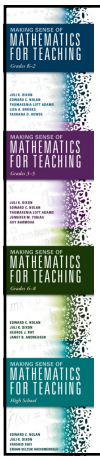
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Making Sense of Division Problem Types

Problem Structure	Number of Groups (a)	Number of Objects in Each Group (b)	Total Number of Objects (c)
Multiplication	a	b	?
Sharing Division	a	?	c
Measurement Division	?	b	c

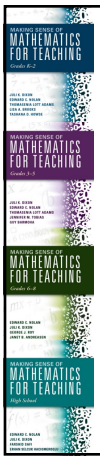
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Consider 12 ÷ 4.

"I have 12 cookies. If 4 cookies is a serving, how many servings of cookies do I have?"

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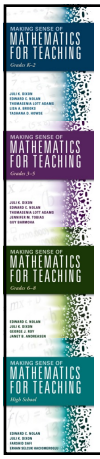


Estimate the following:

$$\frac{5}{6} \div \frac{1}{4}$$

I have $\frac{5}{6}$ of a cookie. If a serving is $\frac{1}{4}$ of a cookie, how many servings of cookie do I have?

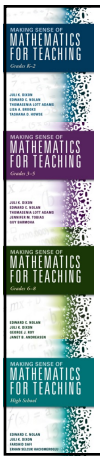
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Estimation. What's it "about"?

The problem type AND the quantities matter when making sense of fraction division problems.

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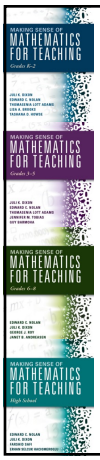


Estimate the following:

Consider $\frac{5}{6} \div 4$

"I have $\frac{5}{6}$ of a cookie. If I share it equally among 4 friends, how much of a cookie will each friend get?"

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Analyze this:

$$1\frac{3}{4} \div \frac{1}{2}$$

a) $\frac{7}{8}$

b) $3\frac{1}{4}$

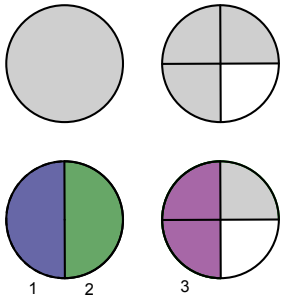
c) $\frac{4}{14}$

d) $3\frac{1}{2}$

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Where does $3\frac{1}{4}$ come from?

$1\frac{3}{4} \div \frac{1}{2}$



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Estimation. What's it "about"?

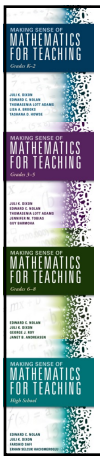
Estimation provides a more valuable return on the investment of time we spend on multiple choice problems.

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With what do we estimate?

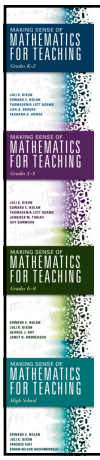
- Quantities
- Computation
  - Whole Numbers
  - Decimals
  - Fractions
- Measurement
  - Time
  - Length
  - Area
  - Volume
  - Mass

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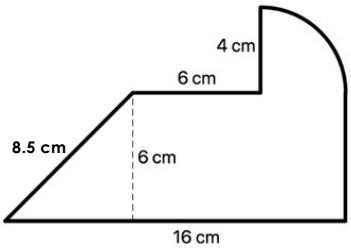


Estimating Computation with Measurement

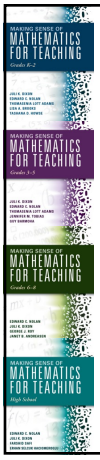
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Estimation. What's it "about"?



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What words come to mind when you think about estimation?



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