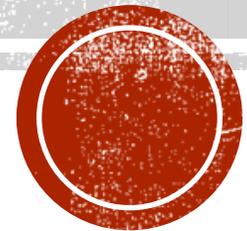


BUILDING COMPUTATIONAL FLUENCY



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COMPUTATIONAL FLUENCY

- The focus needs to be on composition and decomposition.
- If kids don't have multiplication facts, you need to work on making sure they do.



ROLE OF COMPOSITION/DECOMPOSITION

- Let's consider $38 + 17$
- You might decompose like this:

- $30 + 8$
- $\underline{10 + 2 + 5}$
- $40 + 10 + 5$ OR



ROLE OF COMPOSITION/DECOMPOSITION

- Let's consider $38 + 17$
- You might decompose like this:

- $$38 +$$
- $$\underline{10 + 2 + 5}$$
- $$10 + 40 + 5$$



ROLE OF COMPOSITION/DECOMPOSITION

- Let's consider $328 + 948$.

- Maybe

- $328 = 300 + 20 + 8$

- $948 = 200 + 700 + 40 + 2 + 6$

- $200 + 1000 + 60 + 10 + 6$



ROLE OF COMPOSITION/DECOMPOSITION

- Let's consider $51 - 13$
- The distance from 13 to 51 is the same as distance from 10 to 48.
- Do $48 - 10$ instead.



ROLE OF COMPOSITION/DECOMPOSITION

- Let's consider $57 - 18$.
- Could do what I did before or hop:
- 2 (to get to 20)
- 30 (to get to 50)
- 7 (to get to 57) so a total of 39.



ROLE OF COMPOSITION/DECOMPOSITION

- Let's consider $513 - 146$.
- $500 + 10 + 3 = 400 + 40 + 70 + 3$
- $$\begin{array}{r} - 100 - 40 - 3 - 3 \\ \hline 300 + 67 = 367 \end{array}$$
-



ROLE OF COMPOSITION/DECOMPOSITION

- Let's consider 4×38
- $38 = 30 + 8$
- So $4 \times 30 = 120$ and $4 \times 8 = 32$
- $120 + 32 = 152$ OR



ROLE OF COMPOSITION/DECOMPOSITION

- Let's consider 4×38
- $38 = 40 - 2$
- So $4 \times 40 = 160$ and $4 \times 2 = 8$
- $160 - 8 = 152$



ROLE OF COMPOSITION/DECOMPOSITION

- Let's consider 22×13



	20	2
10	200	20
3	60	6



ROLE OF COMPOSITION/DECOMPOSITION

- Let's consider 45×18
- 45 groups of 18 is the same as
- 90 groups of 9



ROLE OF COMPOSITION/DECOMPOSITION

- $156 \div 4$
- $156 = 120 + 36$
- Divide each term by 4 to get $30 + 9 = 39$.



ESTIMATION

- Estimation needs to be an emphasis.



ASK QUESTIONS LIKE

- Which of these are reasonable estimates?
Which would you choose?
- For $175 - 42$
- $180 - 40$ or
- $170 - 40$ or
- $175 - 40$ or
- $172 - 40$



ASK QUESTIONS LIKE

- Which of these are reasonable estimates?
Which would you choose?
- For 26×55
- 30×60 or
- 30×50 or
- 28×50 ($28 \times 100 \div 2$) or
- 25×56 ($25 \times 4 \times 14$)



NUMBER RELATIONSHIPS

- We want students who, when they see pairs of numbers, see potential relationships between them.



I MIGHT ASK:

- Who belongs with these numbers?
- 8, 18, 82



I MIGHT ASK:

- Who belongs with these numbers?
- 2, 7, 11



I MIGHT ASK

■ Who does not belong with the others?

■ $2/3$ $3/4$ $3/8$ $4/5$



I MIGHT ASK

- Who does not belong with the others?
- 5×7
- 9×4
- 4×7
- $124 \div 4$



OR WE COULD ASK

- How could you represent 311 as a little less than a triple?
- How could you represent 0.295 to make it clear it's less than 0.4?
- How could you represent $\frac{2}{5}$ to show it's a little MORE than $\frac{3}{8}$?



BUILDING A CULTURE OF DEEPER THINKING

- Would like to propose we “adopt” from the U.S. their standard for mathematical practice:
- Construct viable arguments and critique the reasoning of others
- I think the heart of math really is reasoning, so this makes sense to me.



SO WHAT MIGHT THIS STANDARD LOOK LIKE

- We will look at grades 7 – 10.
- We will look at two strategies that I think might be interesting.
- One is the use of debates.
- One is the two truths and a lie strategy.



LET'S LOOK AT SOME DEBATES

- Lisette: You can represent -8 with 20 counters.
- Claude: You have to use 8 counters.
- With whom do you agree?



LET'S LOOK AT SOME DEBATES

- René: If you subtract negative integers, the answer is usually positive.
- Kevin: I think it's positive as often as it's negative.
- With whom do you agree?



LET'S LOOK AT SOME DEBATES

- Lise: The area of a triangle can never be equal to the area of a trapezoid.
- Kevin: Yes, it can.

- With whom do you agree?



LET'S LOOK AT SOME DEBATES

- Camille: $[\]/15$ is usually more than $[\]/3$.
- Kevin: I think lots of times it is more, but lots of time it is less.
- With whom do you agree?



LET'S LOOK AT SOME DEBATES

- **Beatrice:** It is not possible to multiply two fractions and get a product with a smaller denominator than the ones you started with.
- **Alexis:** Yes, you can.
- **With whom do you agree?**



LET'S LOOK AT SOME DEBATES

- Benjamin says that when the numerator and a denominator of one fraction are closer together than the numerator and denominator of another, it is greater.
- Jade says that this might not be true.
- With whom do you agree? Why?



2 TRUTHS AND A LIE

- You can add 3 numbers in a row and get the number 74.
- You can add 4 numbers in a row and get the number 74.
- You can add 5 numbers in a row and get the number 75.



2 TRUTHS AND A LIE

- When you add two fractions less than $\frac{3}{4}$, the sum is less than $1\frac{3}{4}$.
- When you add two fractions and the sum is $\frac{\square}{15}$, then neither fraction could have had a denominator of 4.
- You can add two close together fractions and get a result of $\frac{4}{5}$.



2 TRUTHS AND A LIE

- 1. There is a fraction equivalent to $5/11$ where the denominator is between 80 and 100.
- 2. There is a fraction equivalent to $5/11$ where the numerator and denominator are 64 apart.
- 3. There is a fraction equivalent to $5/11$ where the numerator is even.



2 TRUTHS AND A LIE

- Suppose $A = 30\%$ of B .
- 1. $A = 60\%$ of $2B$.
- 2. $2A = 30\%$ of $2B$.
- 3. $A/2 = 15\%$ of B .



2 TRUTHS AND A LIE

- 1. A cone and a pyramid cannot have **EXACTLY** the same volume.
- 2. The volume of a pyramid can be $\frac{2}{3}$ the volume of a prism.
- 3. The volume of a pyramid can be 3 times the volume of a hexagonal prism.



COULD YOU

- create an interesting debate or two truths and a lie question?



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