



Leading effective math instruction V

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Agenda

- Your school PL experience in math
- Computational fluency
- Balancing shared learning and individual accountability



Agenda

- What will you try to accomplish in math the rest of this year?
- How will you start next year differently?
- My observations of changes in your teachers



Your PL experience

- At your tables, share one successful or unsuccessful PL experience in math this year.
- We will share stories from different groups.

Computational fluency

- What does this mean?
- It means that teachers are working on building computational flexibility and, in particular, mental math.
- That should be K – 12.



Computational fluency

- This probably requires a school-wide discussion and focus.



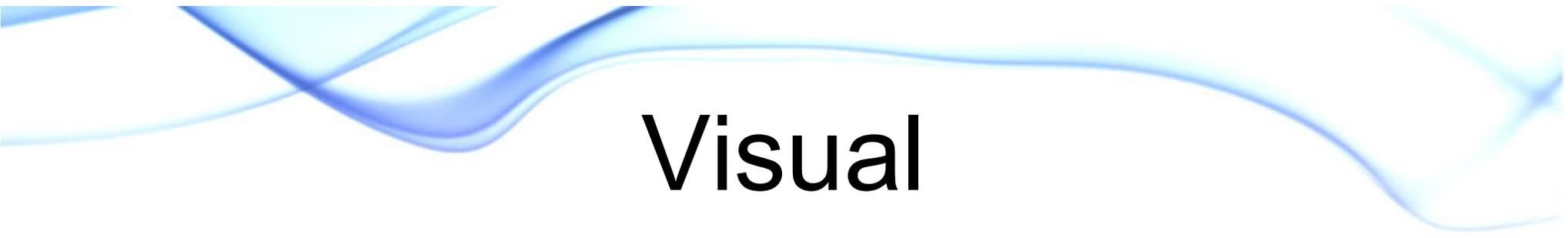
We want students

- who (from grade 3 or 4 forwards) can add $48 + 37$ IN THEIR HEADS.



To get there

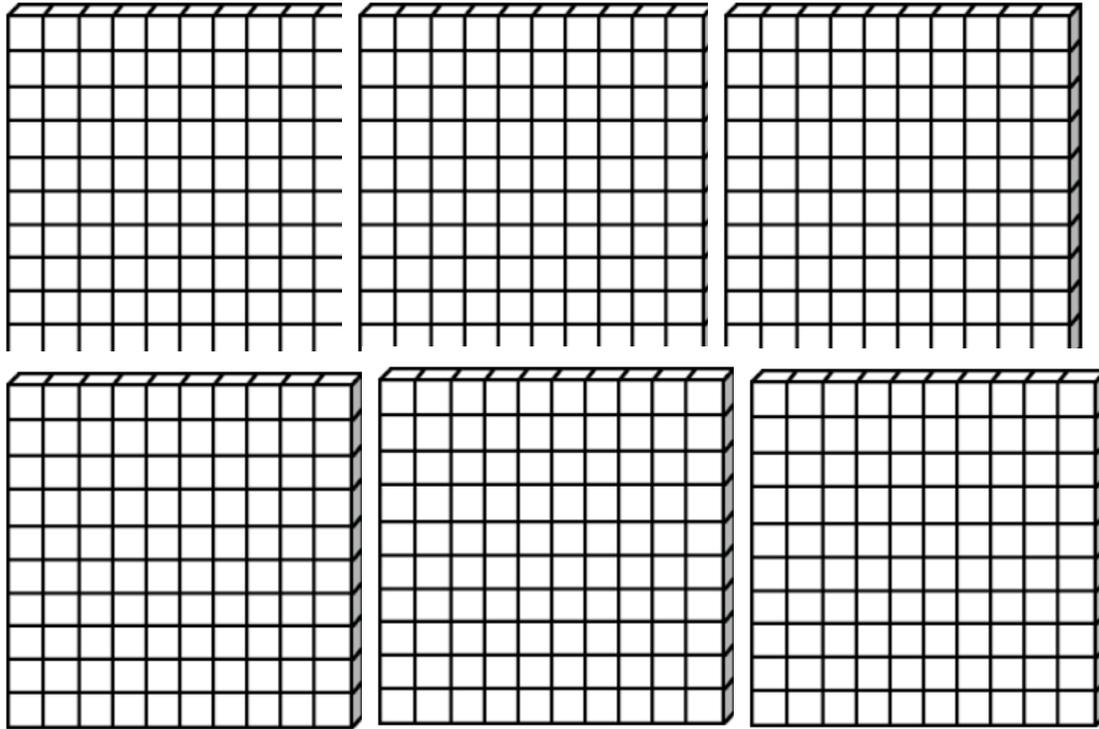
- Teachers need to use visual, oral and kinesthetic strategies to promote mental math

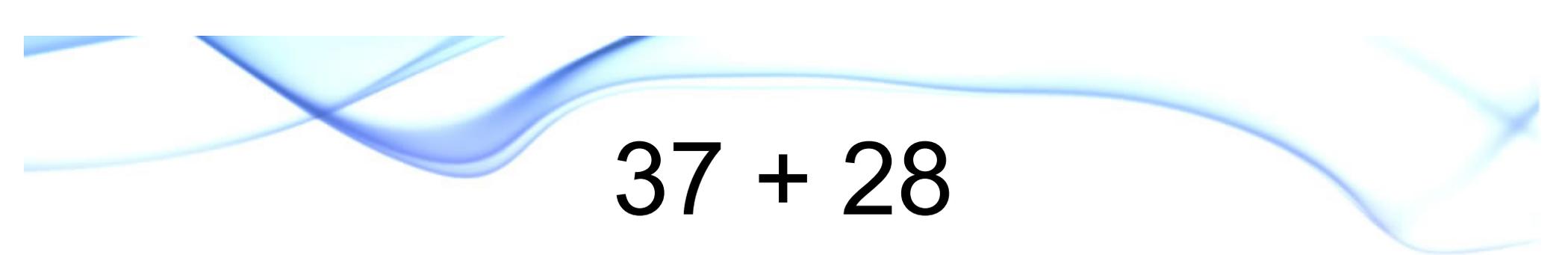


Visual

- What do you see in your head when I say 20×30 ?
- It might be this picture:

20 x 30



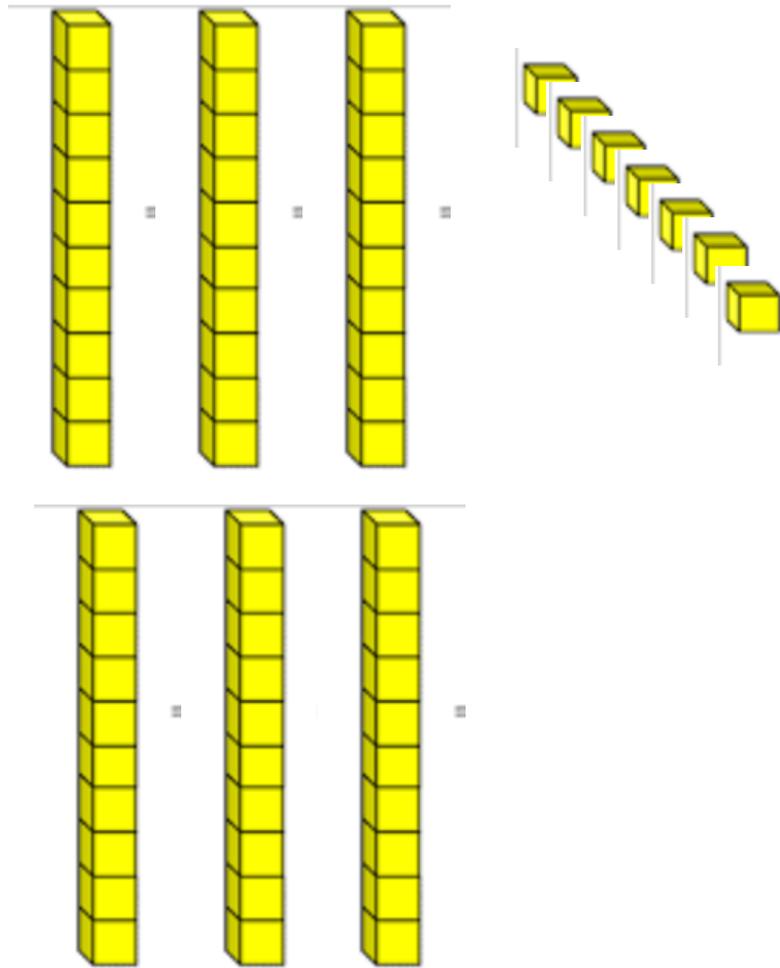

$$37 + 28$$

- What do you see in your head?
- It might be

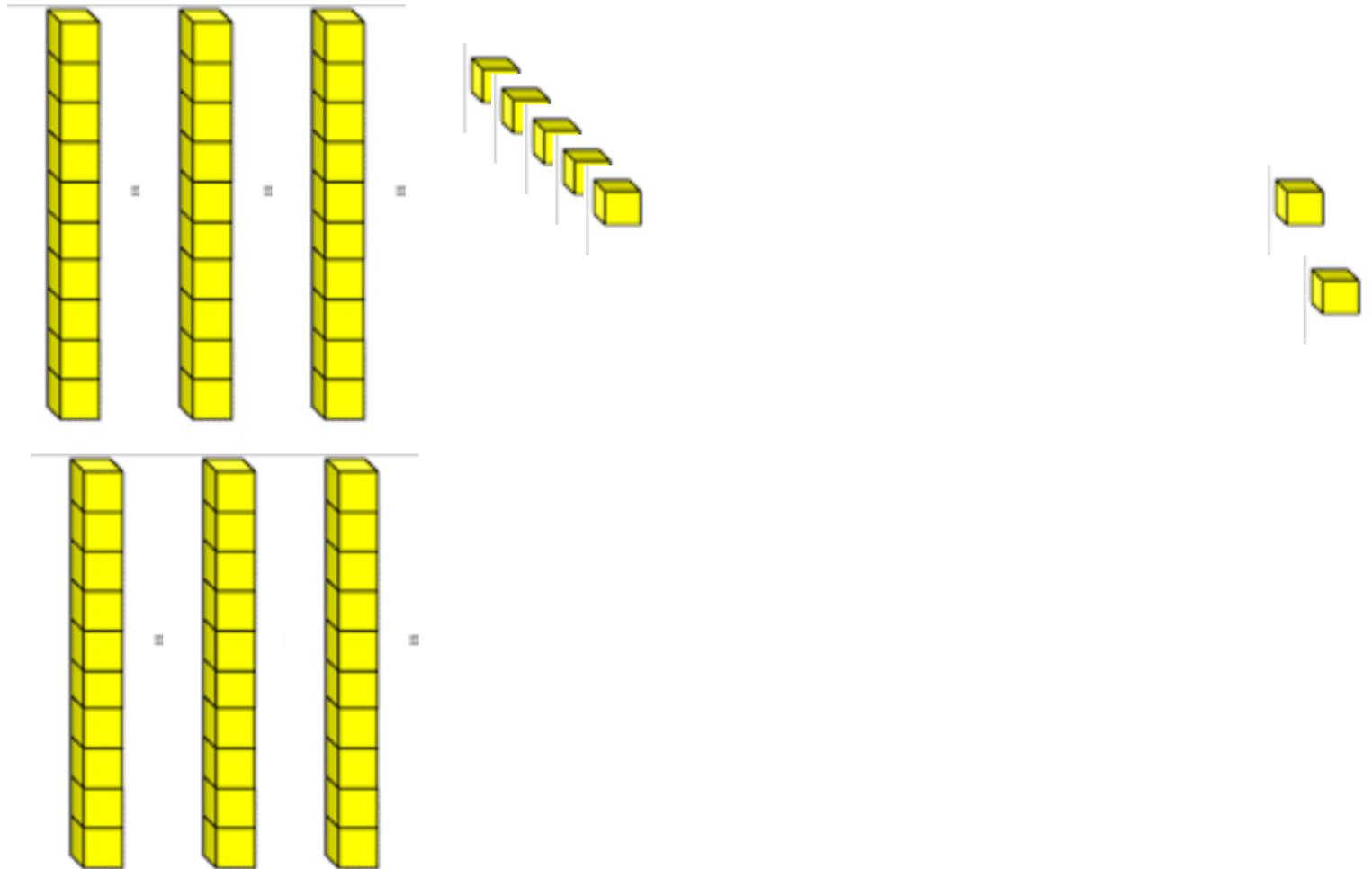
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



It might be



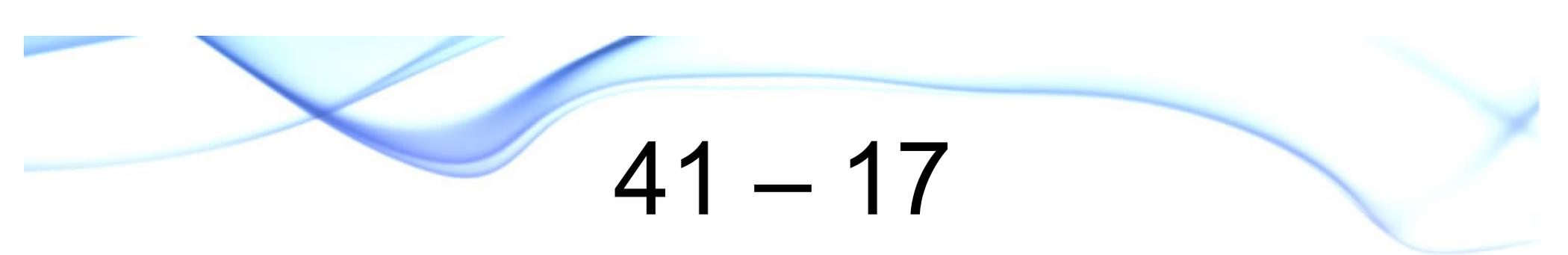
It might be





What about...

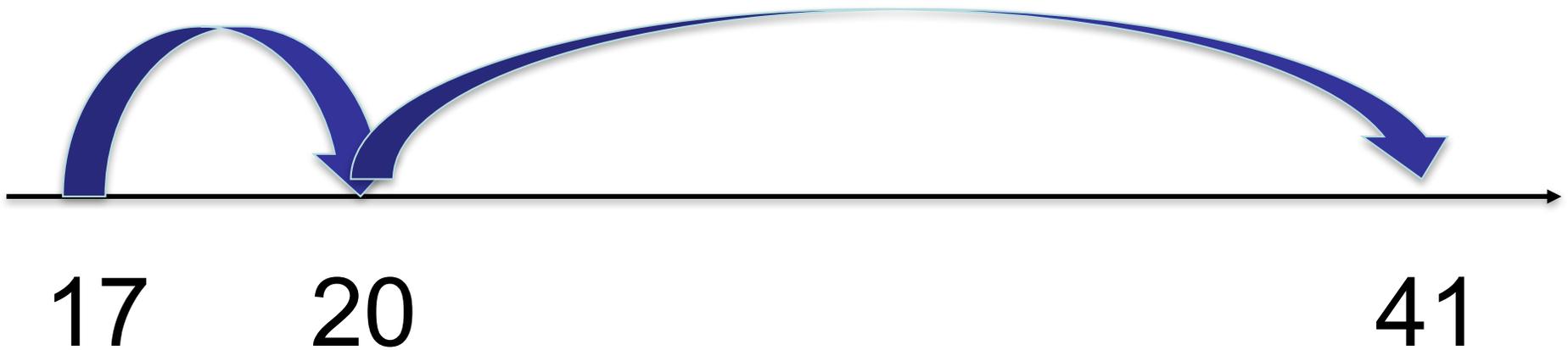
- What do you see in your head when I say $41 - 17$?


$$41 - 17$$

- $40 - 20$
- Then $+1$ (for 41)
- Then $+3$ (relating 20 to 17)

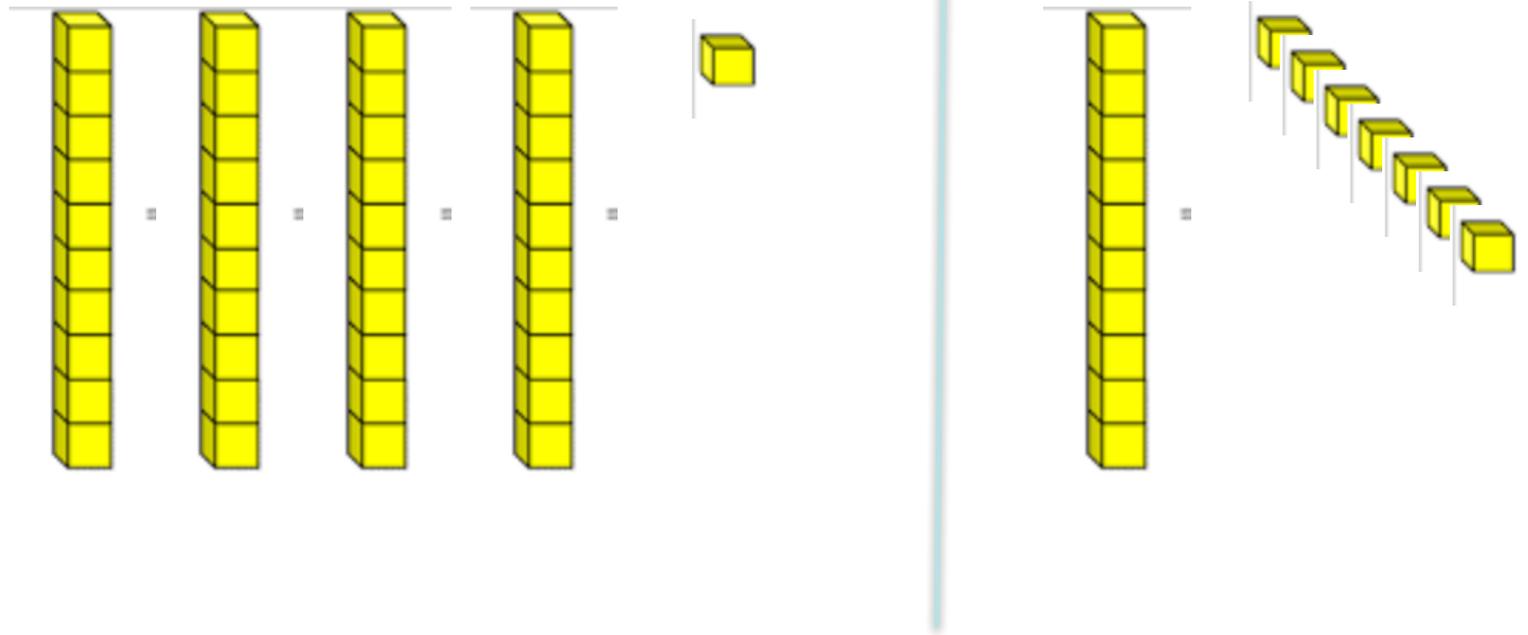
$$41 - 17$$

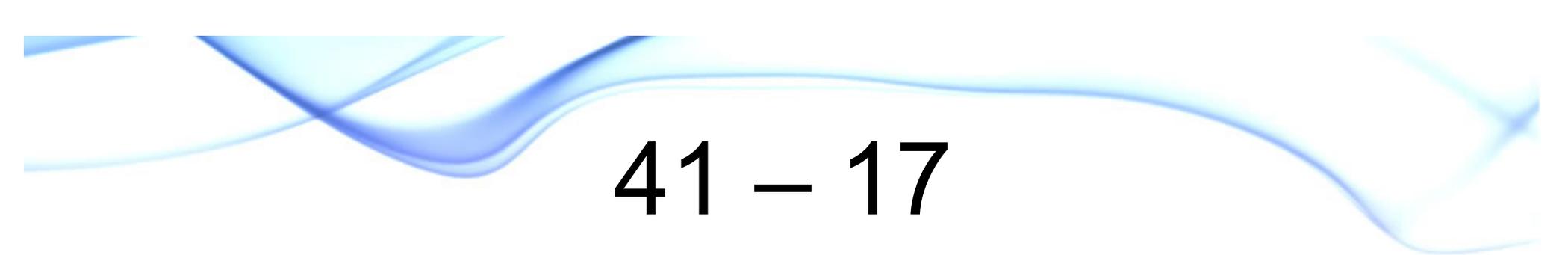
- I will add up: $3 + 21 = 24$



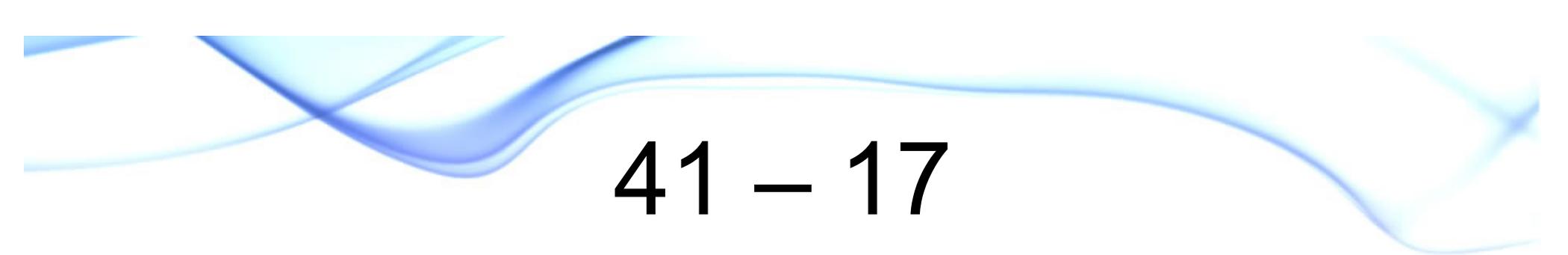
$$41 - 17$$

- I think 30 extra in tens – 6 extra in ones = 24.




$$41 - 17$$

- I think $47 - 17 = 30$ and then take away the 6 I added.


$$41 - 17$$

- I think $41 - 11$ and then take away 6 more.



What about percents?

- What is 15% of 120?



Maybe

- 10% is 12 and another 5% is 6, so $12 + 6$ is 18.



Maybe

- 10% is 12 and 20% is 24, so it's halfway between.



What about 13% of 220?

- I'd think 13% of 100 is 13, so
- 13% of 200 is 26, so
- 13% of 20 is 2.6.
- The total is 28.6



Fractions

- This is a particular nemesis for teachers and kids.
- There is lots of Ministry research.
- But... bottom line...

What does a fraction mean?

- I need kids to know that:
- Fractions are numbers.
- They describe whole numbers or numbers between them (e.g. $\frac{2}{3}$ or $\frac{7}{3}$).

What does a fraction mean?

- They are not just about cutting areas into equal parts.
- They might be about cutting a group into equal parts, e.g. half of 12.

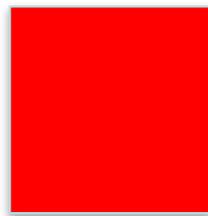


What does a fraction mean?

- That if it's about equal parts, the parts only have to be equal in the attribute being considered.

What does a fraction mean?

- For example, it is true that blue is half of the set even though the pieces are unequal in size.



What does a fraction mean?

- They might be about a comparison, e.g. the fraction $4/8$ is about comparing 4 to 8.





What does a fraction mean?

- They can be compared by thinking about how the numerator and denominator relate.

What does a fraction mean?

- For example,...
- $1/5$ is a LOT less than $7/8$
since 1 is hardly any of a 5 but
7 is a lot of an 8.

What does a fraction mean?

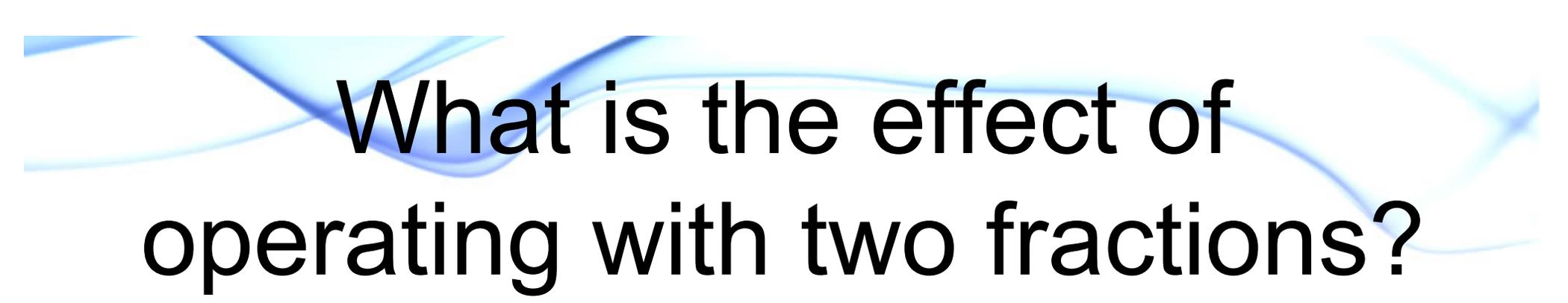
- For example,...
- $20/30 = 2/3$ since 20 is $2/3$ of 30.

What does a fraction mean?

- For example,...
- $3/8 < 3/5$ since 3 is a smaller part of an 8 than it is of a 5.

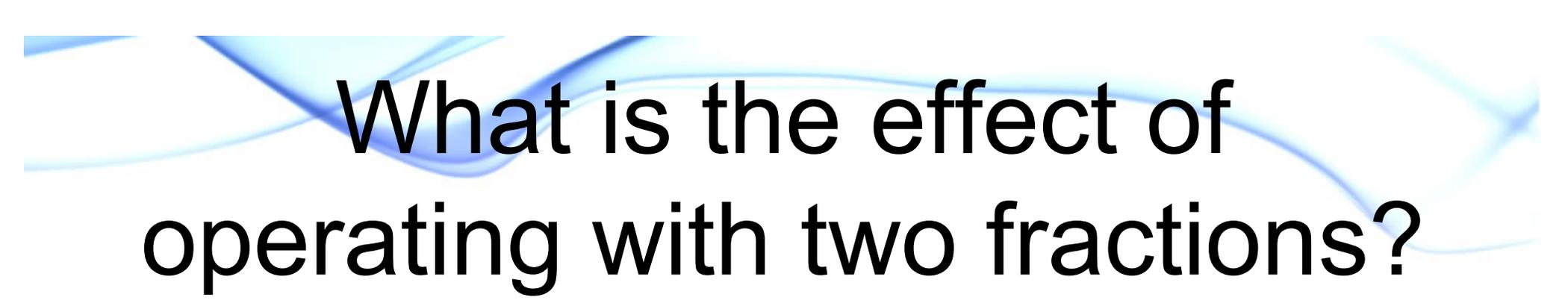
What is the effect of operating with two fractions?

- Students need to know that, e.g. $\frac{2}{3} + \frac{1}{2}$ has to be a bit more than 1 since $\frac{2}{3}$ is a bit more than $\frac{1}{2}$ and $\frac{1}{2}$ and $\frac{1}{2}$ is 1.



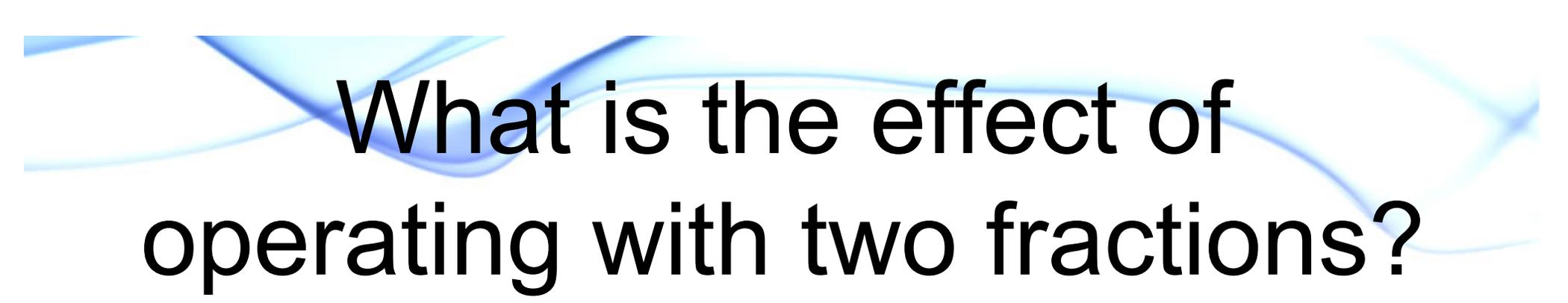
What is the effect of operating with two fractions?

- Students need to know that, e.g. $\frac{2}{3} - \frac{1}{2}$ has to be a tiny amount since $\frac{2}{3}$ is not much more than $\frac{1}{2}$.



What is the effect of operating with two fractions?

- Students need to know that, e.g. $\frac{2}{3} \times \frac{7}{8}$ is more than half of the $\frac{7}{8}$ but less than the $\frac{7}{8}$.

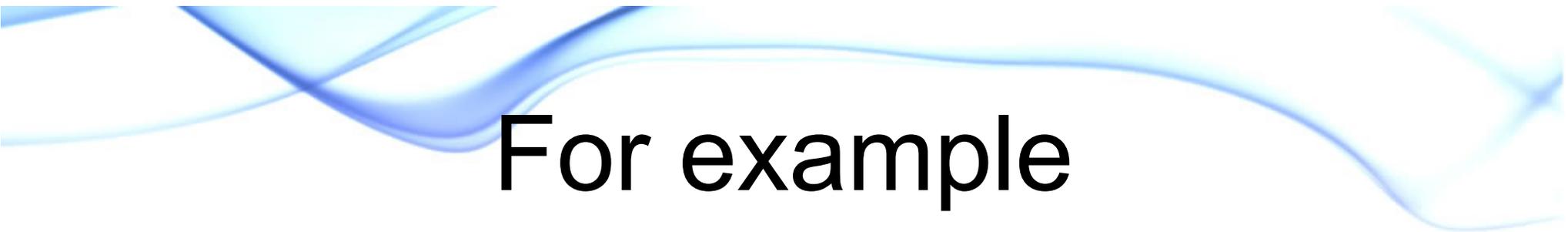


What is the effect of operating with two fractions?

- Students need to know that, e.g. $\frac{2}{3} \div \frac{1}{6}$ asks how many $\frac{1}{6}$ s fit in $\frac{2}{3}$ and it's quite a few.

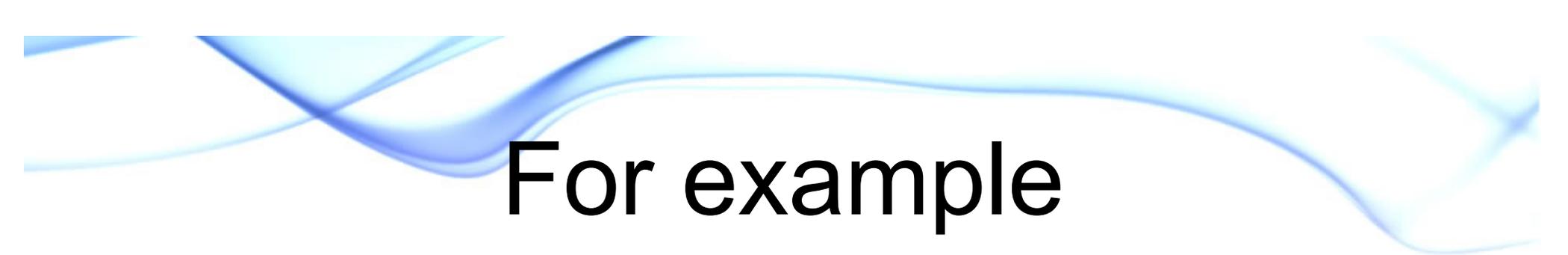
Cross-strand fraction work

- Fractions can easily come up in data, measurement or pattern/algebra situations by setting appropriate conditions.



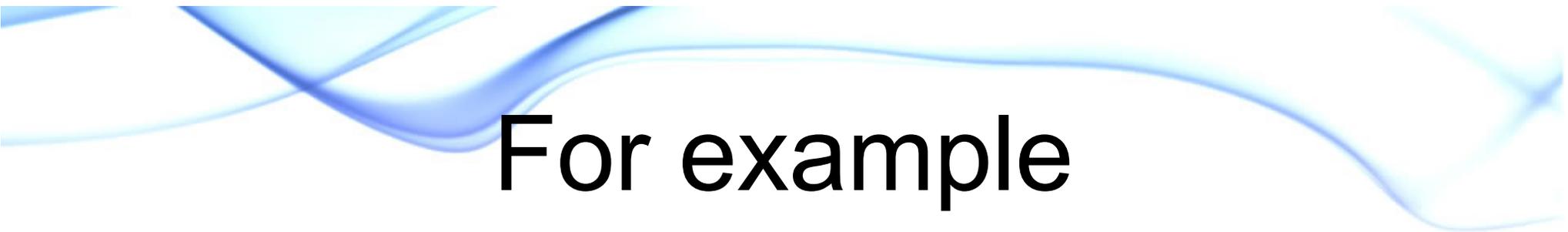
For example

- The mean of a set of fractions is $\frac{5}{8}$.
- What could the fractions be?



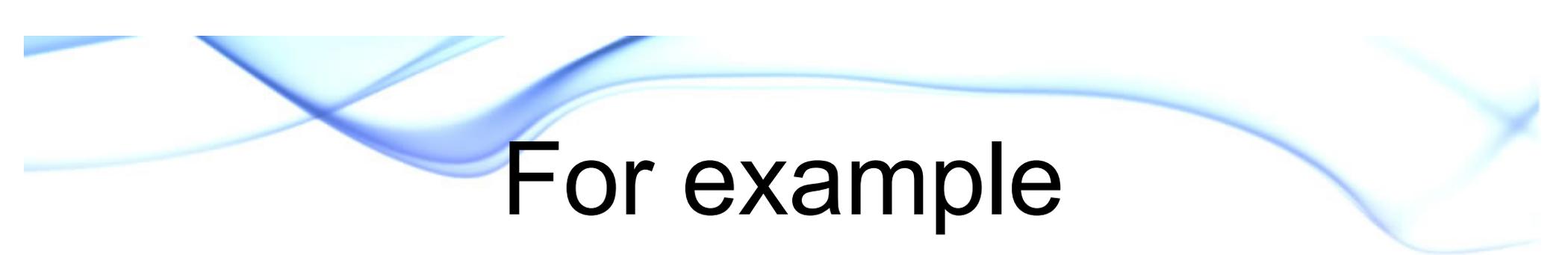
For example

- The perimeter of a rectangle is $13 \frac{2}{3}$ units.
- What could the dimensions be?



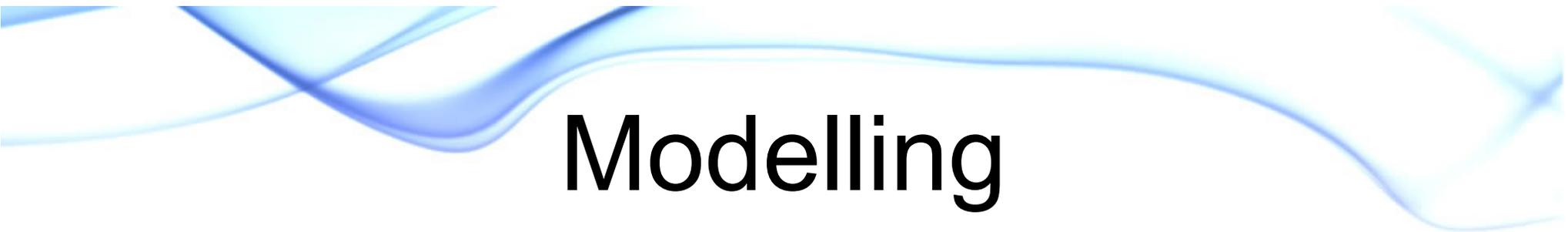
For example

- The solution to an equation is $4\frac{1}{2}$. What could the equation be?



For example

- A pattern increases by $\frac{2}{3}$ every term. What might the 20th term be?



Modelling

- Teachers need to model their own thinking when doing mental math for some students to really “get” what it sounds like.



Estimation

- There needs to be a **HUGE** focus on estimation, whether it's estimating a computation or estimating the solution to an equation.



Estimation

- Students do not bother estimating unless teachers force it.
- I think it's generally better if estimations are forced **BEFORE** computations if the computation is also expected.



Estimation

- It's useful to ask questions like these:
- Which of these are reasonable ways to estimate $134 - 86$?



134 – 86 estimates

- 130 – 90?
- 134 – 84?
- 136 – 86?
- 130 – 80?

Estimating 35×35

- Which way do you think is better?
- 40×40 ?
- 40×30 ?

Estimating a solution

- What number is **DEFINITELY** a BAD estimate for solving
- $3x - 20 = 5x - 82$
- **WITHOUT SOLVING**, what number might be a reasonable estimate?

Shared learning/individual accountability

- Most of us learn better with other people.
- Most learning should be partners or groups, usually groups.



Individual accountability

- But we need to report on individual kids.
- If the tasks were real problems or tasks and not skills, we might consider...

Individual accountability

- That kids are allowed to work together for 5 – 10 or 15 minutes (depending on the task) to get going, and then complete individually.



Exit tickets

- Should there be an exit ticket every class?
- How many questions and what do you ask them?
- Is it...



Exit tickets

- That they tell you the “crux” of what they learned?
- That students do some exercises?
- That they ask a question about what is still not clear?



Finishing this year

- I hope you are trying to achieve one more step forward with your staff in math this year; where would you focus in the next 2–3 months?



Starting next year

- How would you encourage teachers to start their math year differently next year?
- What steps would you/could you put in place to decrease resistance?



Starting next year

- How could you encourage a school-wide direction?
- How might you encourage more physical math visibility in the school?

Defining a good math student

- How would your teachers (and/or you) define a good math student?
- Is this definition something worth working on collaboratively in your school?



Questions

- What other questions do you have?

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TimminsAdminV