Addition and Subtraction

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Say hello.

Describe one thing from our Early Numeracy session which you've put into action.

November 2022

Early Numeracy
- Counting principles
- Connecting number
- Comparison of numbers
- Addition and subtraction concepts

January 2023

Addition and Subtraction
- Addition computation
- Subtraction computation
- Addition and subtraction fluency
- Addition and subtraction word problems

March 2023

Place value and money
- Understanding tens and ones
- Representing thousands, hundreds, tens, and ones
- Money

April 2023

Geometry
- Identification of shapes
- Composing and decomposing shapes

Focus on addition computation

Focus on subtraction computation

Increase addition and subtraction fluency

Teach addition and subtraction word problems

Instructional Platform

Addition and Subtraction

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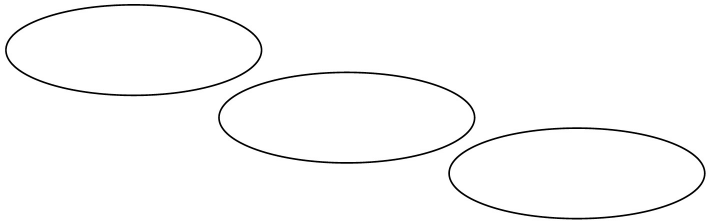
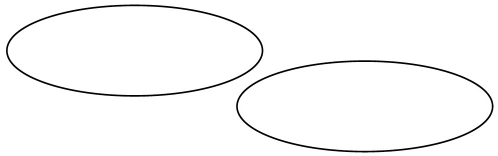
Instructional Platform

Instructional Delivery



Instructional Strategies



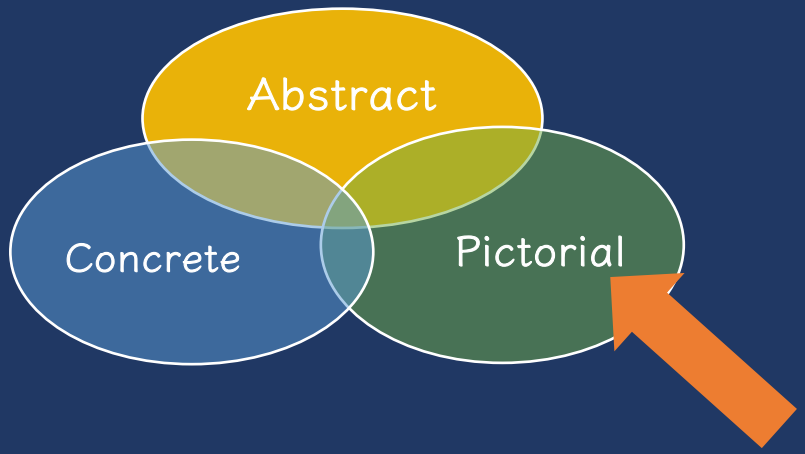
Instructional Platform

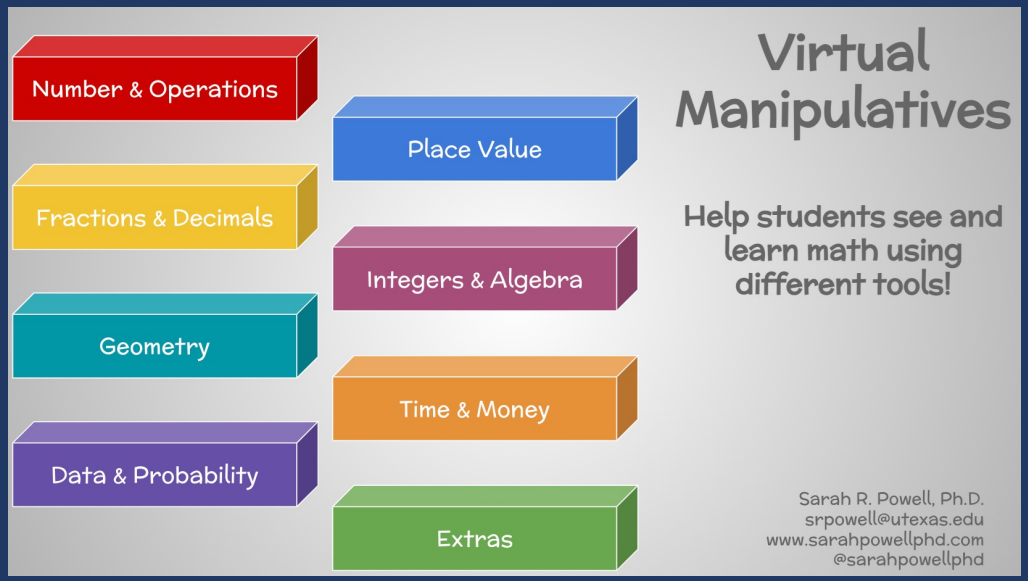
INSTRUCTIONAL DELIVERY

- Explicit instruction
- Precise language
- Multiple representations

INSTRUCTIONAL STRATEGIES

- Fluency building
- Problem solving instruction





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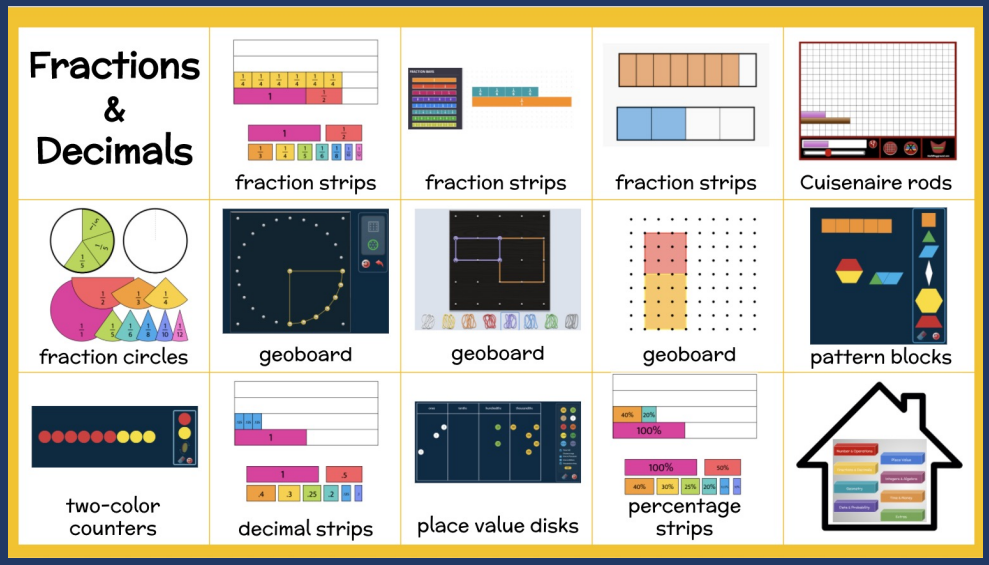


Addition and Subtraction Concepts

Addition Concepts

Subtraction Concepts

Addition

100 addition facts

Single-digit addends sum to a single- or double-digit number

$$\begin{array}{rl} 5 & \text{(addend)} \\ +\ 4 & \text{(addend)} \\ \hline 9 & \text{(sum)} \end{array}$$

Total

Addition

Count one set, count another set, put sets together, count sum

$$2 + 3 = 5$$

Change

Addition

Start with a set, add the other set, count sum

$$2 + 3 = 5$$

Subtraction

100 subtraction facts

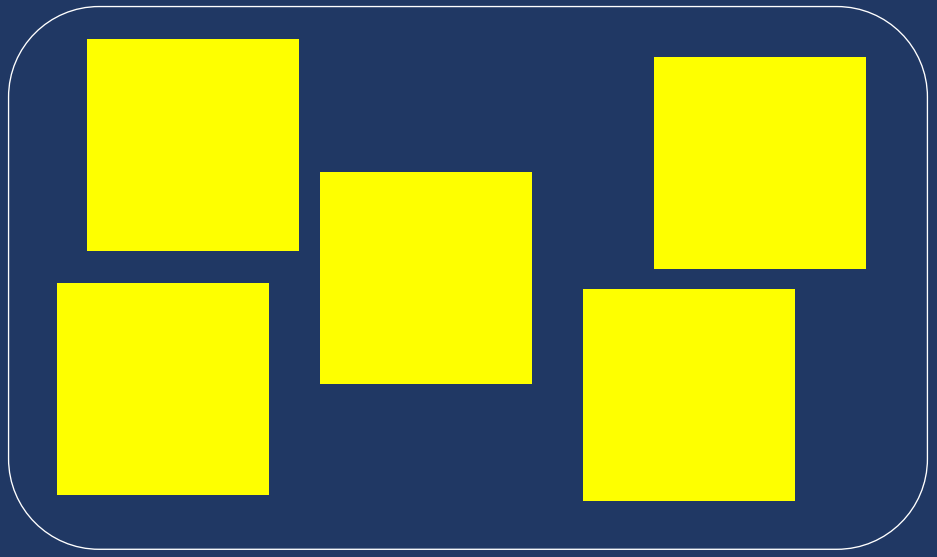
Subtrahend and difference are single-digit numbers and minuend is single- or double-digit number

$$\begin{array}{rl} 16 & \text{(minuend)} \\ -\ \ 8 & \text{(subtrahend)} \\ \hline 8 & \text{(difference)} \end{array}$$

Change

Subtraction

Start with a set, take away from that set, count difference

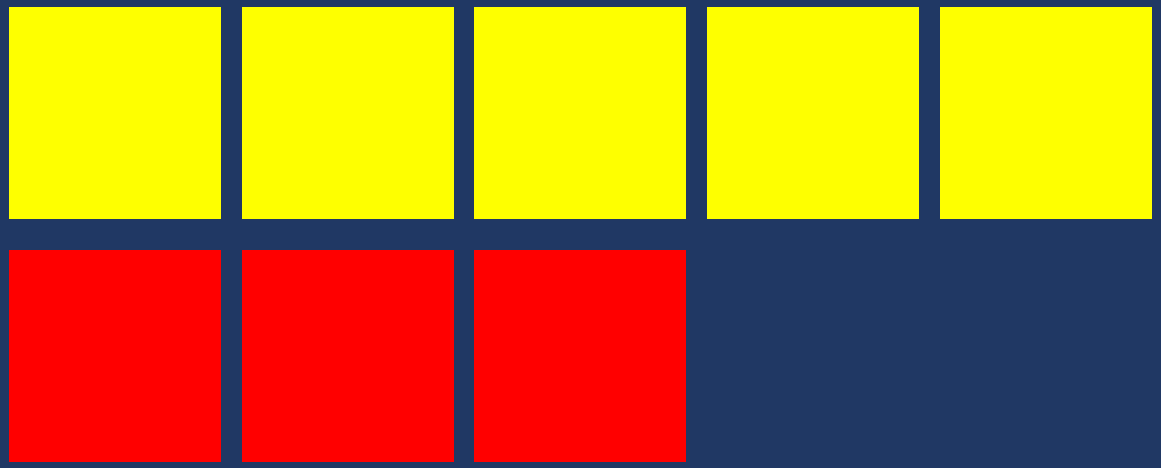


$$5 - 3 = 2$$

Difference

Subtraction

Compare two sets, count difference



$$5 - 3 = 2$$

Focus on addition computation

Focus on subtraction computation

Increase addition and subtraction fluency

Teach addition and subtraction word problems

Addition Computation

Addition Computation

227 + 185 =

Traditional

A.

$$\begin{array}{r} {\scriptstyle 1} \\ 74 \\ +\ 18 \\ \hline 92 \end{array}$$

B.

$$\begin{array}{r} {\scriptstyle 1\ 1} \\ 725 \\ +\ 365 \\ \hline 1{,}090 \end{array}$$

$$\begin{array}{r} 227 \\ +\ 185 \\ \hline \end{array}$$

Partial Sums

A.

$$\begin{array}{r} 74 \\ +\ 18 \\ \hline 80 \\ +12 \\ \hline 92 \end{array}$$

B.

$$\begin{array}{r} 725 \\ +\ 365 \\ \hline 1{,}000 \\ 80 \\ +\ 10 \\ \hline 1{,}090 \end{array}$$

$$\begin{array}{r} 227 \\ +\ 185 \\ \hline \end{array}$$

Opposite Change

A.

$$74 \xrightarrow{-4} 70$$
$$+\ 18 \xrightarrow{+4} +22$$
$$92$$

B.

$$725 \xrightarrow{+5} 730$$
$$+\ 365 \xrightarrow{-5} +360$$
$$1{,}090$$

$$227$$
$$+\ 185$$

(1) Model an addition computation problem using the strategy of your choice.

(2) Discuss the strategies and tools you would use for addition computation.

Focus on addition computation

Focus on subtraction computation

Increase addition and subtraction fluency

Teach addition and subtraction word problems

Subtraction Computation

Subtraction Computation

232 – 164 =

Traditional

A.

$$\begin{array}{r} 5 \\ \not{6}\,{}^{1}2 \\ -\ 17 \\ \hline 45 \end{array}$$

B.

$$\begin{array}{r} 2\,9 \\ \not{3}\,{}^{1}\not{0}\,{}^{1}5 \\ -\ 96 \\ \hline 209 \end{array}$$

$$\begin{array}{r} 232 \\ -\ 164 \\ \hline \end{array}$$

Partial Differences

A.

$$\begin{array}{r} 62 \\ -\ 17 \\ \hline +50 \\ -\ 5 \\ \hline 45 \end{array}$$

B.

$$\begin{array}{r} 305 \\ -\ 96 \\ \hline +300 \\ -90 \\ -1 \\ \hline 209 \end{array}$$

$$\begin{array}{r} 232 \\ -\ 164 \\ \hline \end{array}$$

Same Change

A.

$$\begin{array}{r} 62 \xrightarrow{+3} 65 \\ -\ 17 \xrightarrow{+3} -20 \\ \hline 45 \end{array}$$

B.

$$\begin{array}{r} 305 \xrightarrow{+4} 309 \\ -\ 96 \xrightarrow{+4} -100 \\ \hline 209 \end{array}$$

$$\begin{array}{r} 232 \\ -\ 164 \\ \hline \end{array}$$

Add Up

A.

$$\begin{array}{r} 62 \\ -\ 17 \\ \hline \end{array}$$

$$\begin{array}{r} 17 \\ 20 \quad 3 \\ 60 \quad 40 \\ 62 \quad +\ 2 \\ \hline 45 \end{array}$$

B.

$$\begin{array}{r} 305 \\ -\ 96 \\ \hline \end{array}$$

$$\begin{array}{r} 96 \\ 100 \quad 4 \\ 300 \quad 200 \\ 305 \quad +\ 5 \\ \hline 209 \end{array}$$

$$\begin{array}{r} 232 \\ -\ 164 \\ \hline \end{array}$$

(1) Model a subtraction computation problem using the strategy of your choice.

(2) Discuss the strategies and tools you would use for subtraction computation.

Focus on addition computation

Focus on subtraction computation

Increase addition and subtraction fluency

Teach addition and subtraction word problems

Addition and Subtraction Fluency

Addition and Subtraction Fluency

Fluency is doing mathematics *easily and accurately.*

Fluency in mathematics makes mathematics *easier.*

Fluency provides less stress on working memory.

Fluency helps students build confidence with mathematics.

With fluency, it is important to emphasize both *conceptual learning and procedural learning.*

Addition	Subtraction
Multiplication	Division

Counting

Comparing numbers

Counting coins

Telling time

Identifying equivalent fractions

Knowing multiples

Identifying shapes

Knowing formulas

Addition	Subtraction
Multiplication	Division

memorization
automaticity

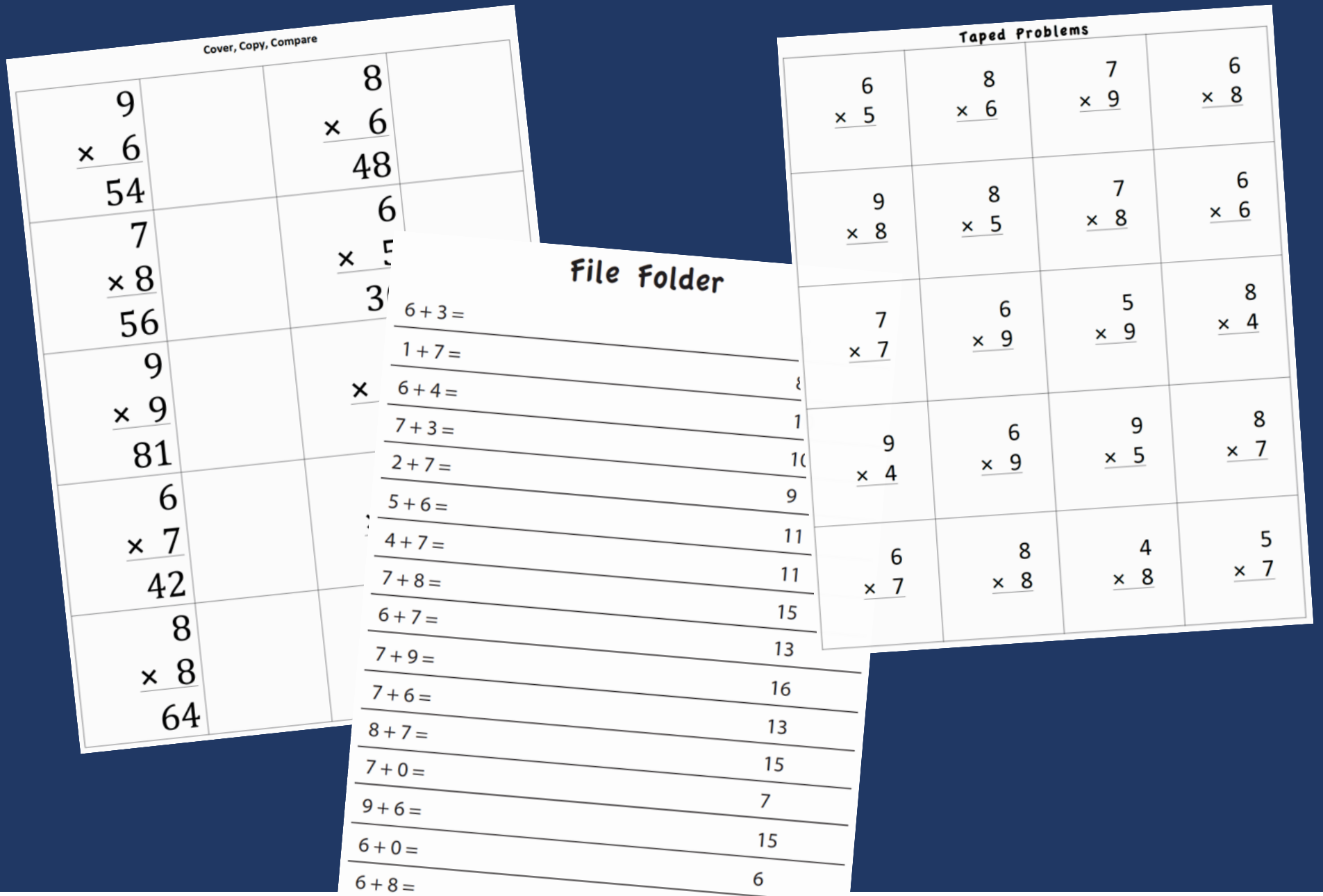
easy use of strategies
accuracy

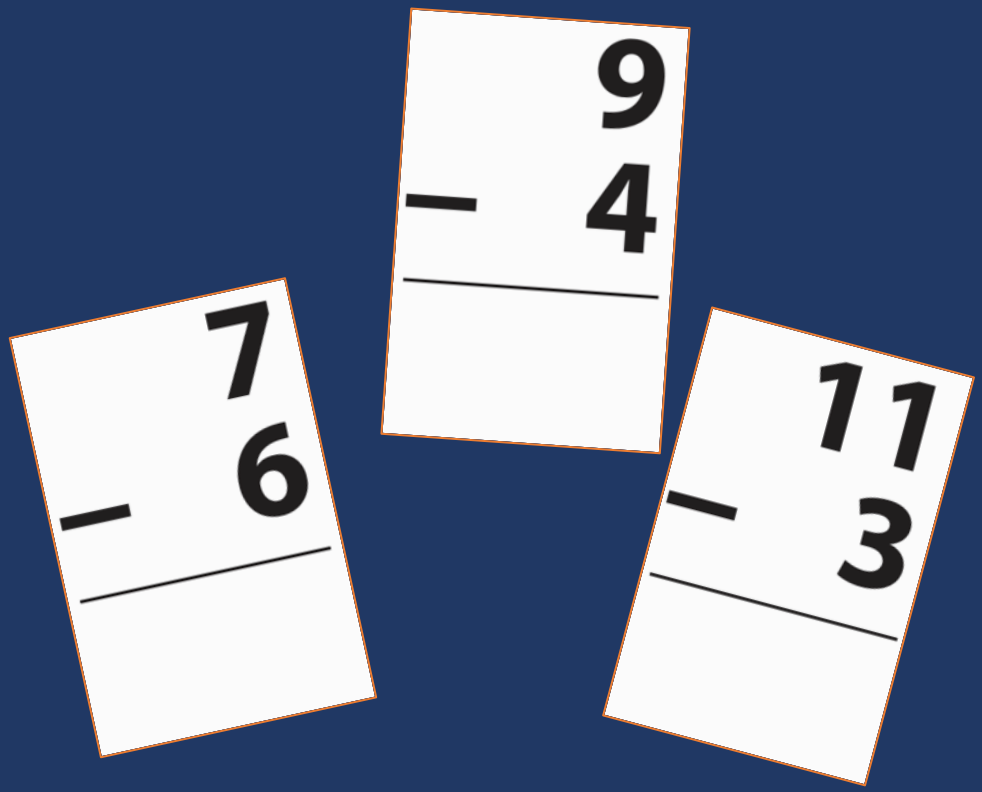
Addition	Subtraction
Multiplication	Division

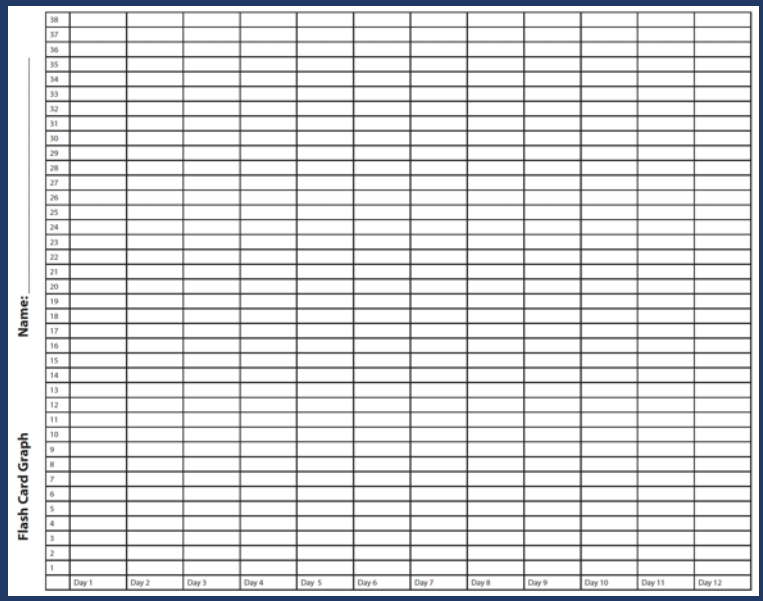
Build fluency with math facts.

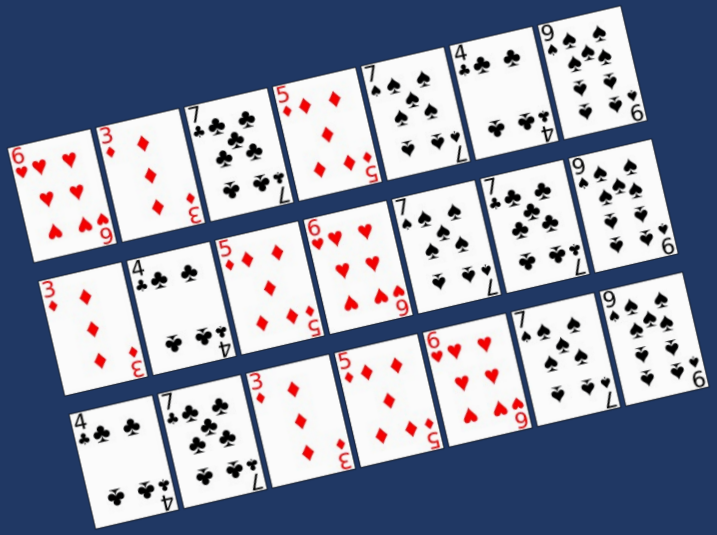
- Addition: single-digit addends
- Subtraction: single-digit subtrahend

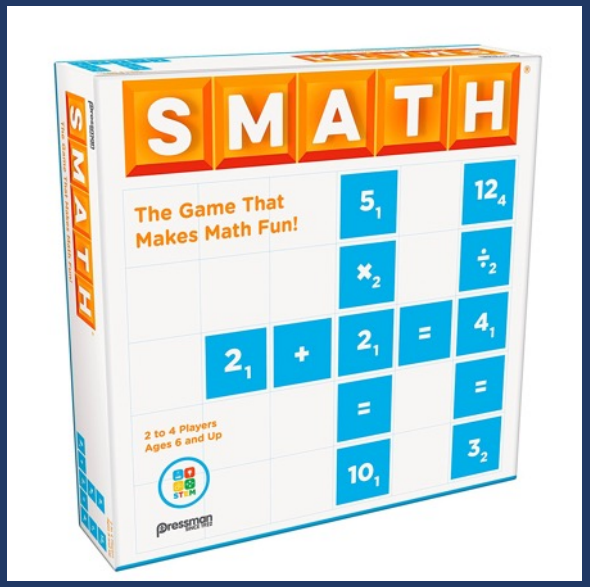
$$\begin{array}{r} 5 \\ +\ 8 \\ \hline \end{array} \qquad \begin{array}{r} 9 \\ -\ 4 \\ \hline \end{array}$$

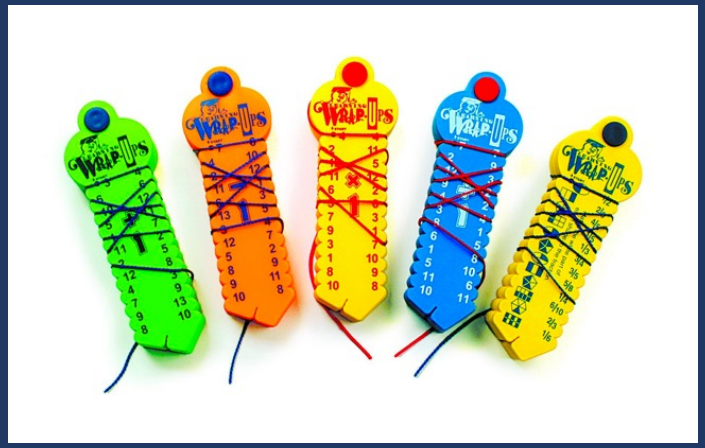


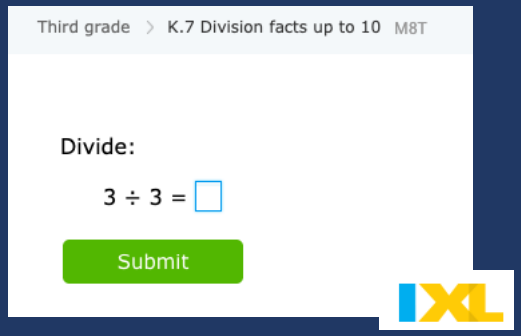


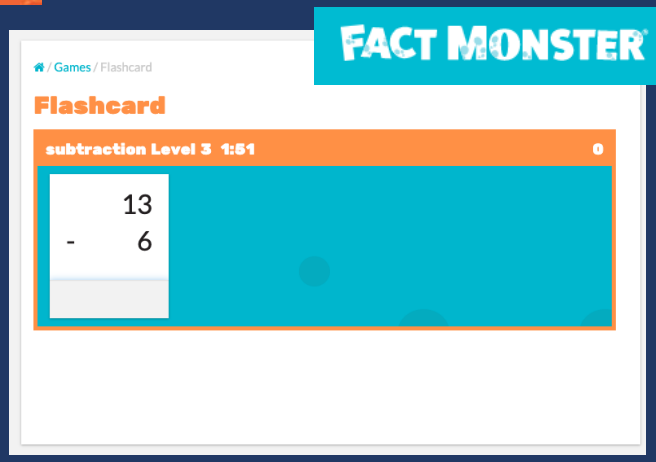












DAILY and BRIEF

Addition	Subtraction
Multiplication	Division

Describe three activities to help students with fact fluency.

Addition	Subtraction
Multiplication	Division

Build fluency with whole-number computation

$$\begin{array}{r} 15 \\ +\ 28 \\ \hline \end{array}$$

$$\begin{array}{r} 1009 \\ -\ 724 \\ \hline \end{array}$$

Addition	Subtraction
Multiplication	Division

Describe one activity to increase computational fluency.

Instructional Platform

INSTRUCTIONAL DELIVERY

- Explicit instruction
- Precise language
- Multiple representations

INSTRUCTIONAL STRATEGIES

- Fluency building
- Problem solving instruction

MODELING

Step-by-step explanation

Planned examples

PRACTICE

Guided practice

Independent practice

SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback

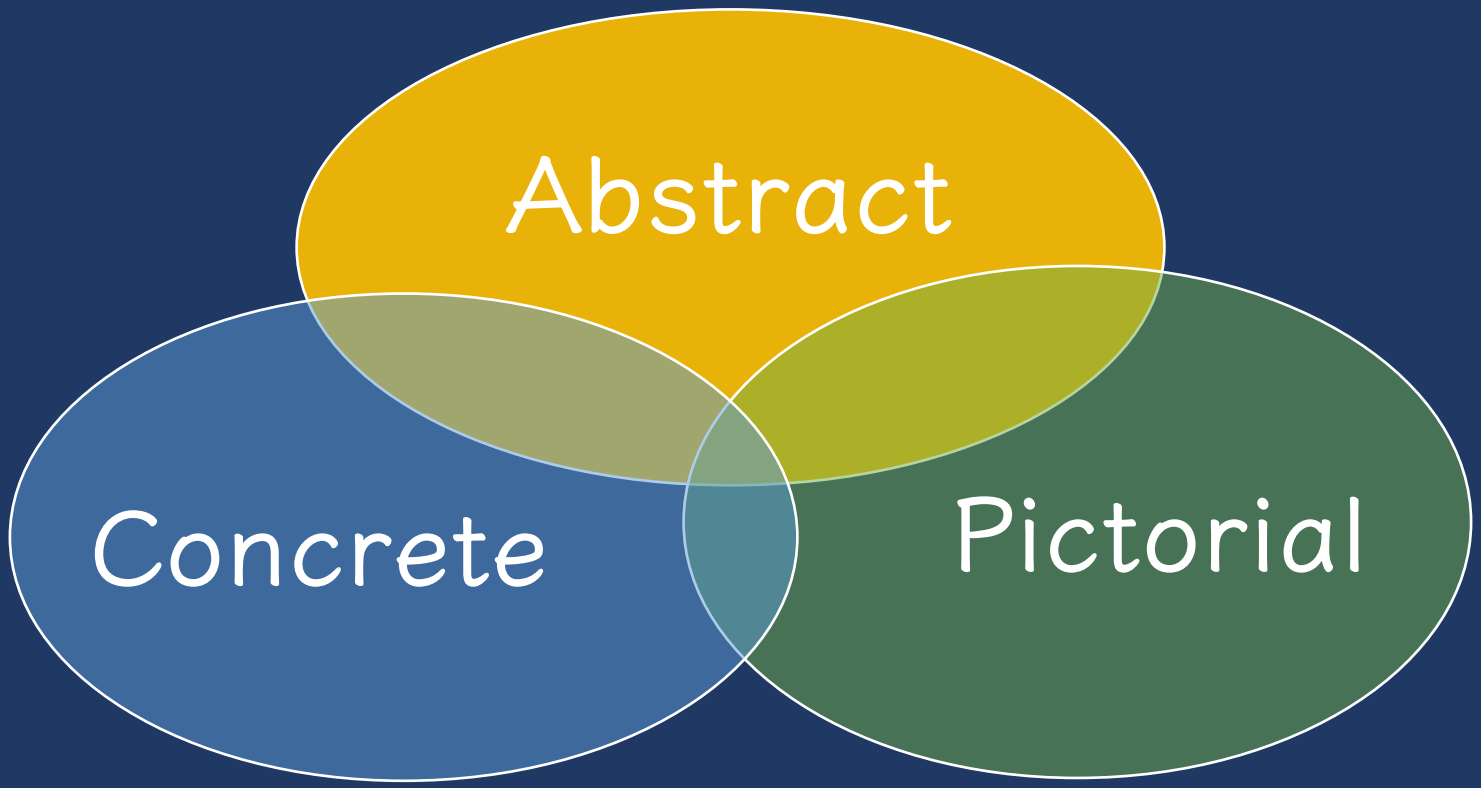
What are your strengths with modeling addition and subtraction?

What are your opportunities for growth?

Use formal math language

Use terms precisely

What are five essential math vocabulary for addition and subtraction?



What are the representations you'll use to teach addition and subtraction?

Focus on addition computation

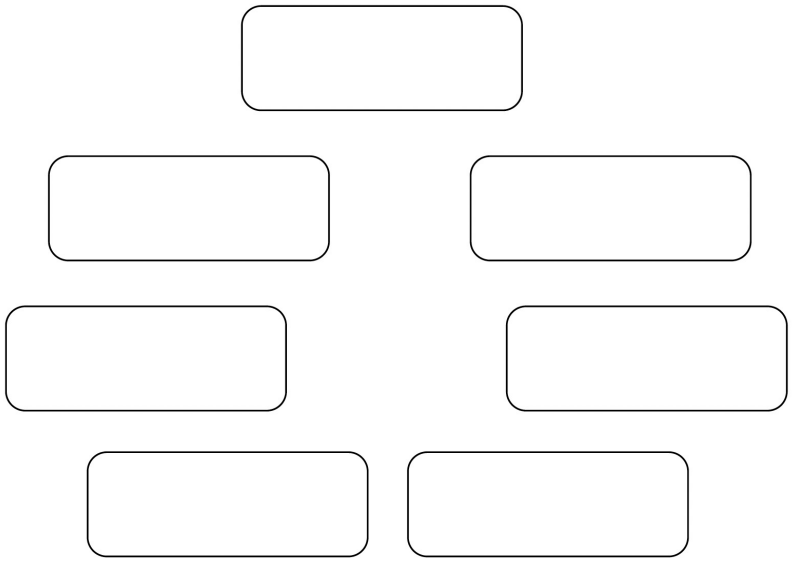
Focus on subtraction computation

Increase addition and subtraction fluency

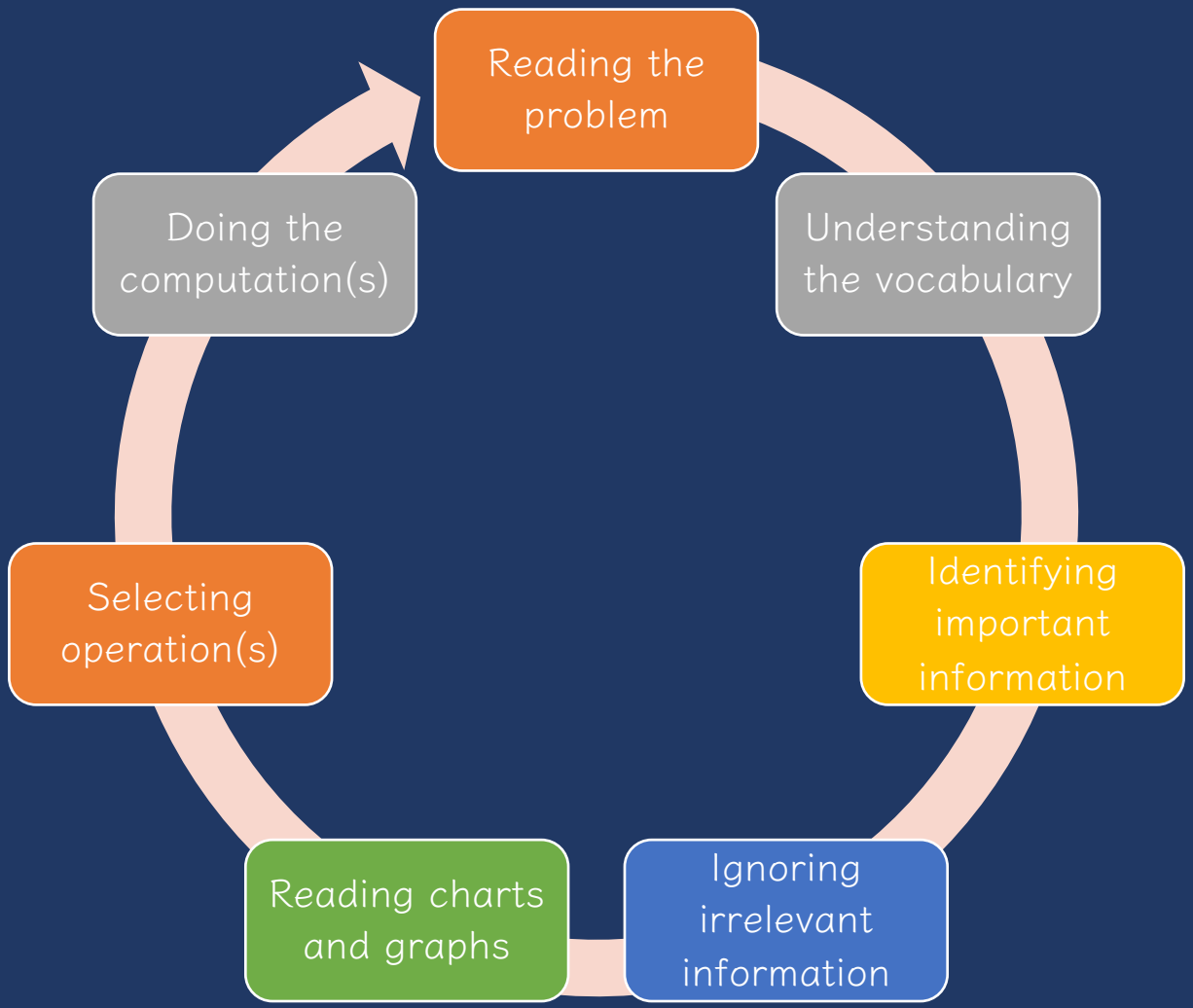
Teach addition and subtraction word problems

Addition and Subtraction Word-Problem Solving

Word-Problem Solving



Teaching Problem Solving

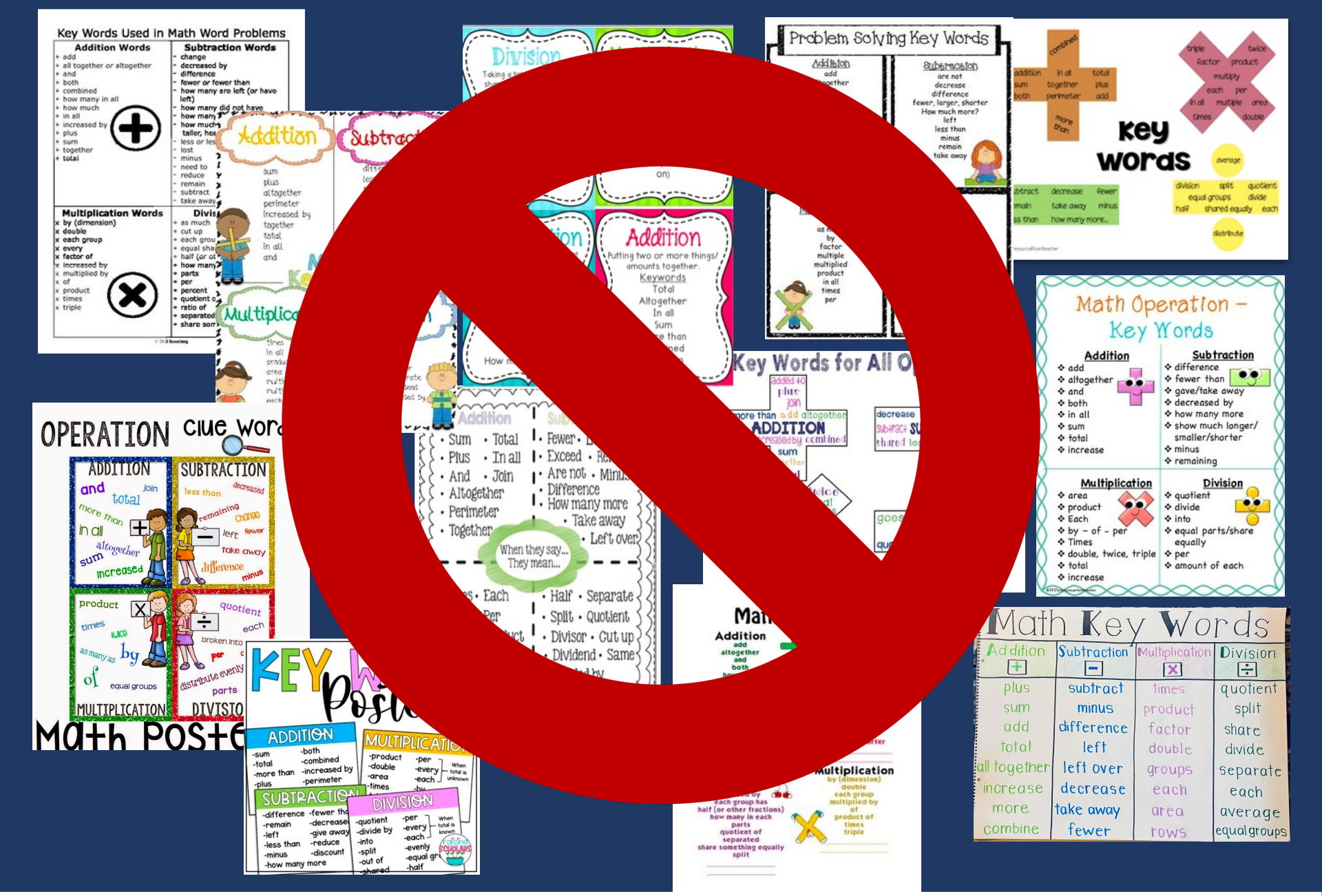


Ineffective Strategies

1. Keywords tied to operations

Lincoln had 8 pencils **fewer** than Roscoe. If Roscoe had 18 pencils, how many pencils did Lincoln have?

Lincoln had 8 pencils **fewer** than Roscoe. If Lincoln had 18 pencils, how many pencils did Roscoe have?



Description of Single-Step Word Problems (n = 132)

Schema	Occurrence of schema		Any keyword		Schema-specific keywords[a]		Multiple keywords[a]		Keyword(s) led to correct solution[a]	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Total	27	20.5	26	96.3	23	88.5	5	19.2	21	80.8
Difference	17	12.9	17	100.0	14	82.4	2	11.8	12	70.6
Change	11	8.3	7	63.6	5	71.4	5	71.4	2	28.6
Equal groups	29	22.0	26	89.7	22	84.6	18	69.2	8	30.8
Comparison	10	7.6	9	90.0	9	100.0	4	44.4	5	55.6
Ratios or proportions	29	22.0	23	79.3	9	39.1	9	39.1	6	26.1
Product of measures	9	6.8	9	100.0	8	88.9	1	11.1	5	55.6

[a]When a problem featured a keyword.

Description of Multi-Step Word Problems (n = 84)

	Occurrence of schema[a]		Any keyword		Keyword(s) led to correct solution[b]	
Schema	*n*	%	*n*	%	*n*	%
Total	40	47.6	39	97.5	3	7.7
Difference	11	13.1	11	100.0	1	9.1
Change	21	23.8	19	95.0	1	5.3
Equal groups	49	58.3	48	98.0	1	2.1
Comparison	7	8.3	7	100.0	0	0.0
Ratios or proportions	22	25.0	16	76.2	1	6.3
Product of measures	7	8.3	7	100.0	2	28.6

[a]Sum across schemas does not equal 100 because each word problem featured more than one schema.

[b]When a problem featured a keyword.

Mr. Rivera's taxable income is $20 each hour before taxes are taken out. Mr. Rivera worked a total of 40 hours each week for 50 weeks.

What is the dollar amount, to the nearest dollar, taken out for taxes based on Mr. Rivera's taxable income?

Jessica rented 1 video game and 3 movies for a total of $11.50.

- The video game cost $4.75 to rent.
- The movies cost the same amount each to rent.

What amount, in dollars, did Jessica pay to rent each movie?

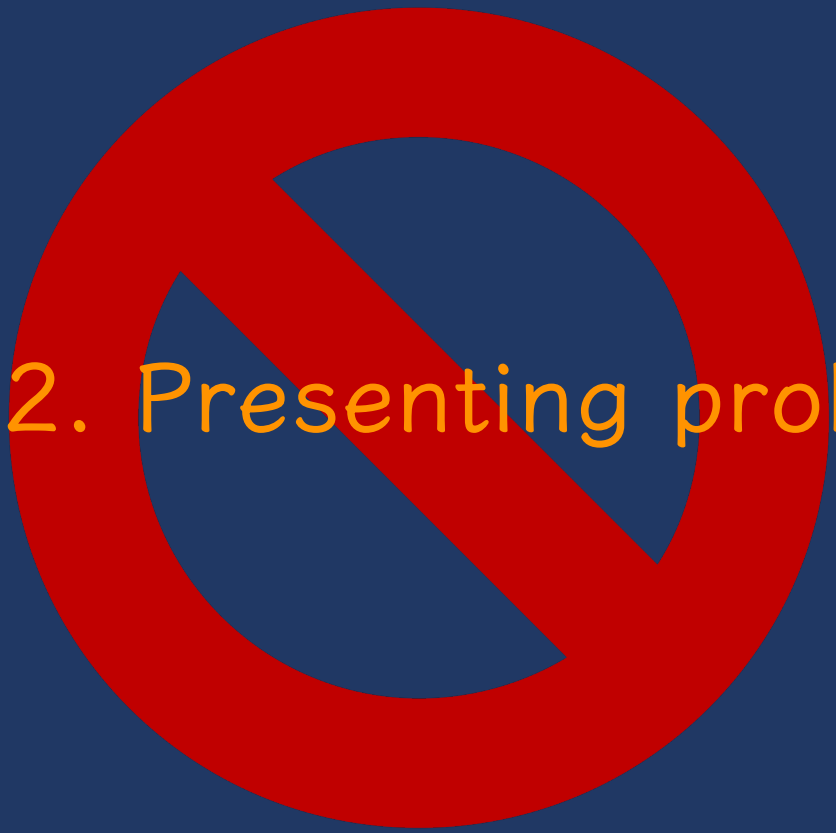
The temperature of a substance decreased by 24°C per minute for 3 minutes. What was the overall change of the temperature of the substance?

Keywords are important to identify and understand

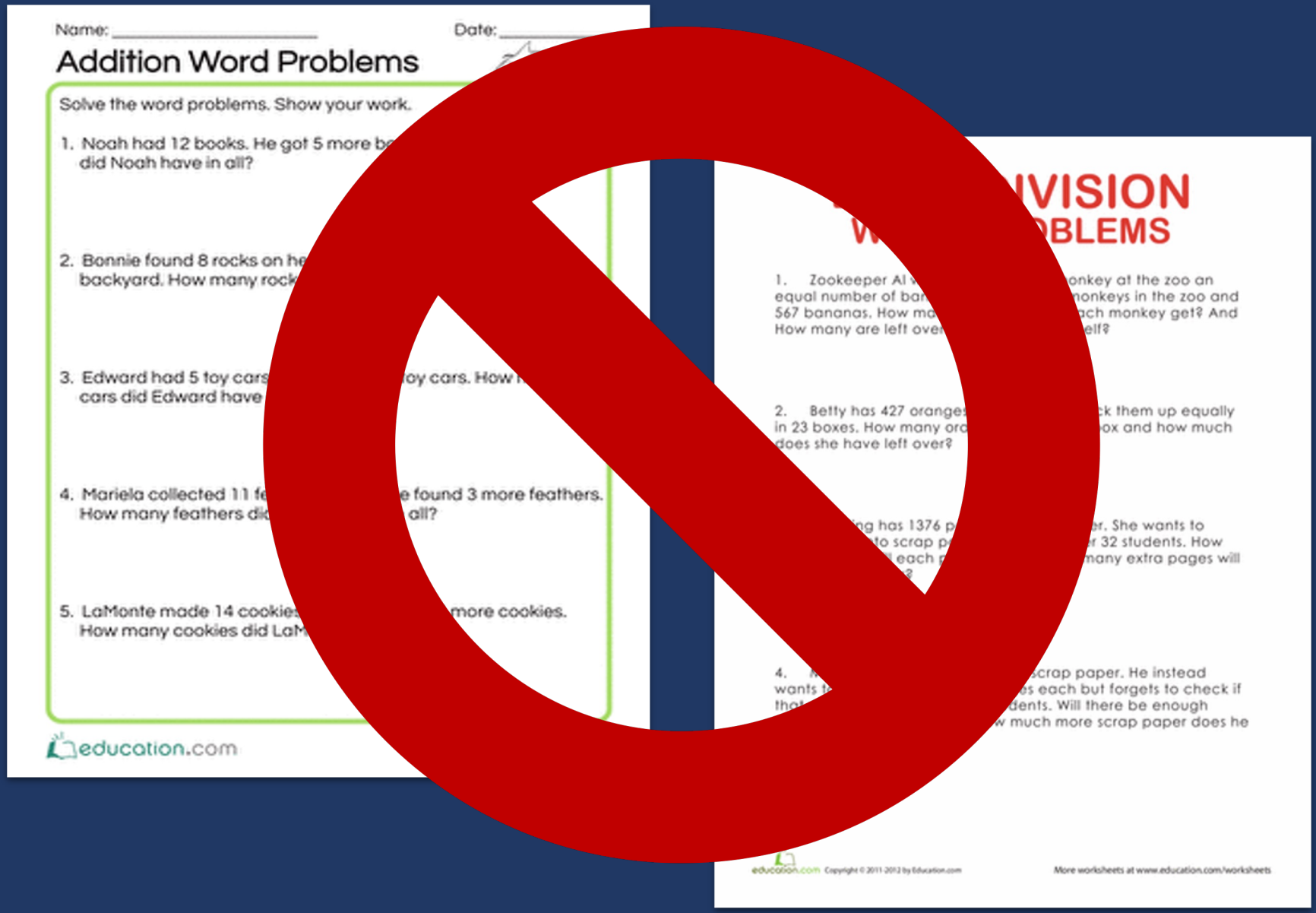
Keywords are the mathematical vocabulary that help an students understand what the story is about and what they need to do

Talk about keywords ("What does *more than* tell you about?")

But, *do not* tie a keyword to a specific operation!



2. Presenting problems by operation



Effective Strategies

Teach an attack strategy

Teach about schemas

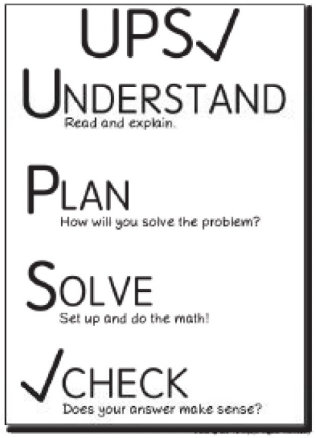
Attack Strategy

SOLVE

Study the problem.
Organize the facts.
Line up the plan.
Verify the plan with computation.
Examine the answer.

R-CUBES

Read the problem.
Circle key numbers.
Underline the question.
Box action words.
Evaluate steps.
Solve and check.



RIDE

Read the problem.

Identify the relevant information.

Determine the operation and unit for the answer.

Enter the correct numbers and calculate, then check the answer.

RIDGES

Read the problem.
I know statement.
Draw a picture.
Goal statement.
Equation development.
Solve the equation.

RICE

Read and record the problem.
Illustrate your thinking.
Compute.
Explain your thinking.

STAR

Stop and read the problem carefully.
Think about your plan and the strategy you will use.
Act. Follow your plan and solve the problem.
Review your answer.

SUPER

Slowly read the story problem twice.
Underline the question and circle the numbers you need.
Picture it. Draw the scenario to show what is happening.
Explain the problem with a number sentence.
Rewrite the answer in a sentence.

SHINES

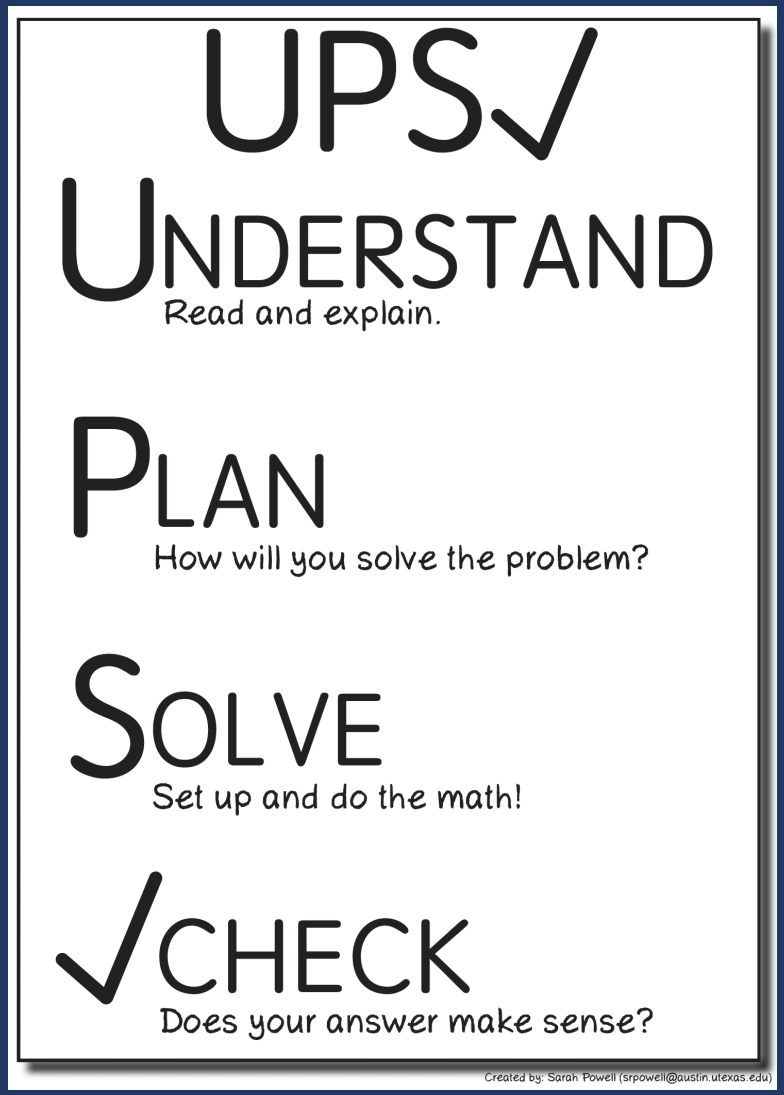
Slowly and carefully read the problem.
Highlight or underline key information.
Identify the question by drawing a circle around it.
Now solve the problem. Show your work.
Examine your work for precision, accuracy, and clarity.
Share your answer by writing a sentence.

R-CUBES

Read the problem.
Circle key numbers.
Underline the question.
Box action words.
Evaluate steps.
Solve and check.

SOLVE

Study the problem.
Organize the facts.
Line up the plan.
Verify the plan with computation.
Examine the answer.



Share your favorite attack strategy.

Describe how you will use the attack strategy in your teaching,

Teach an attack strategy

Teach about schemas

Total

Difference

Change

Equal Groups

Comparison

Ratios/Proportions

Total

Count one set, count another set, put sets together, count sum

$$2 + 3 = 5$$

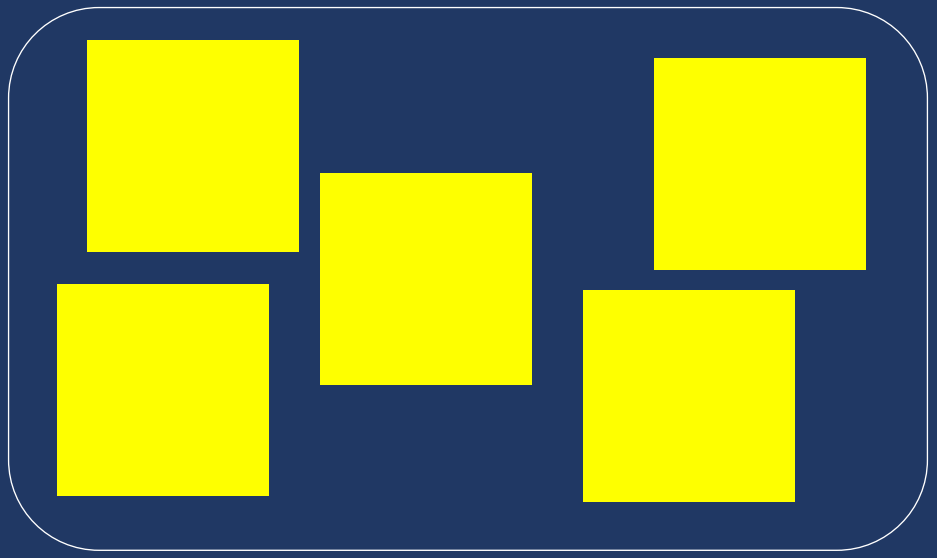
Change

Start with a set, add the other set, count sum

$$2 + 3 = 5$$

Change

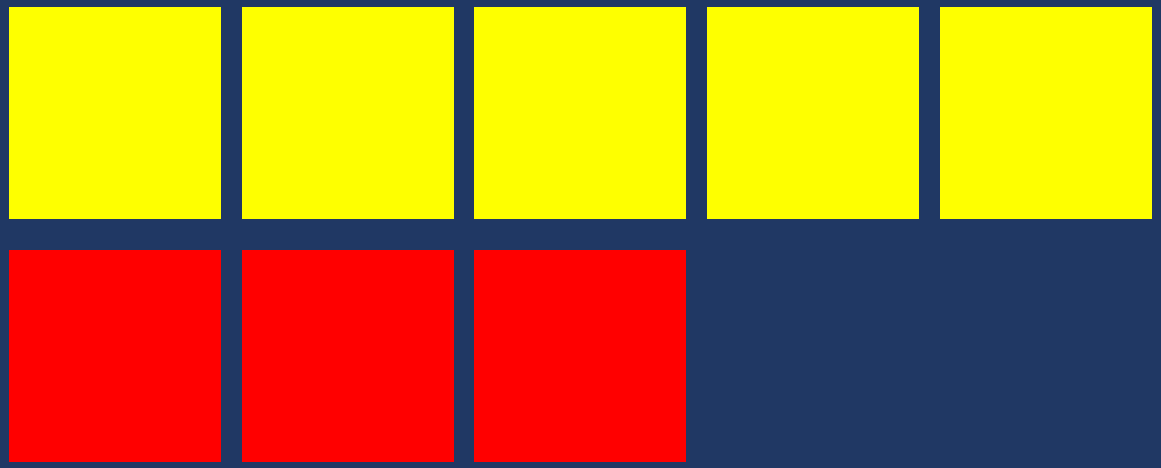
Start with a set, take away from that set, count difference



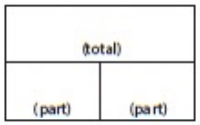
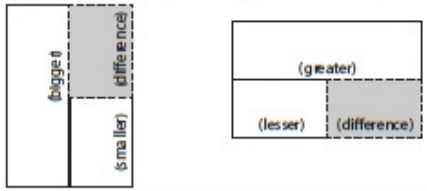
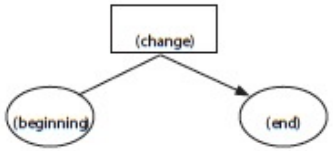
$$5 - 3 = 2$$

Difference

Compare two sets, count difference



$$5 - 3 = 2$$

Schema and Definition	Equations and Graphic Organizers	Examples			Variations
Total (Combine; Part-part-whole) Parts combined for a sum	P1 + P2 = T (part + part = total)  	Sum unknown: Lyle has 11 red apples and 18 green apples. How many apples does Lyle have altogether?	Part unknown: Lyle has 29 red and green apples. If 11 of the apples are red, how many green apples does Lyle have?		More than two parts: Lyle has 34 apples. Of the apples, 11 are red, 18 are green, and the rest are yellow. How many yellow apples does Lyle have?
Difference (Compare) Sets compared for a difference	B – s = D (bigger – smaller = difference) G – L = D (greater – less = difference)  	Difference unknown: Sasha wrote 85 words in her essay, and Tabitha wrote 110 words. How many fewer words did Sasha write than Tabitha?	Bigger/greater unknown: Tabitha wrote 25 more words than Sasha. If Sasha wrote 85 words, how many words did Tabitha write?	Smaller/lesser unknown: Tabitha wrote 110 words in her essay. Sasha wrote 25 words fewer than Tabitha. How many words did Sasha write?	(None)
Change (Join; Separate) An amount that increases or decreases	ST +/– C = E (start +/– change = end)   	End (increase) unknown: Jorge had $52. Then, he earned $16 babysitting. How much money does Jorge have now? End (decrease) unknown: Jorge had $52. Then, he spent $29 at the ballpark. How much money does Jorge have now?	Change (increase) unknown: Jorge had $52. Then, he earned some money babysitting. Now, Jorge has $68. How much did Jorge earn babysitting? Change (decrease) unknown: Jorge had $52 but spent some money when he went to the ballpark. Now, Jorge has $23. How much did Jorge spend at the ballpark?	Start (increase) unknown: Jorge has some money, and then he earned $16 for babysitting. Now, Jorge has $68. How much money did he have to start with? Start (decrease) unknown: Jorge had some money. Then, he spent $29 at the ballpark and has $23 left. How much money did Jorge have before going to the ballpark?	Multiple changes: Jorge had $78. He stopped and bought a pair of shoes for $42 and then he spent $12 at the grocery. How much money does Jorge have now?

Total

Additive Word Problems

A. Ali delivered 12 boxes of cookies on Friday and 25 boxes of cookies on Saturday. How many boxes of cookies did Ali deliver?	B. In March and April, it rained a total of 11 inches. If it rained 3 inches in March, how many inches did it rain in April?
C. Sam mows lawns and made $560 last week. She made $95 on Monday, $135 on Tuesday, and $70 on Wednesday. How much did Sam make on Thursday and Friday?	NOTES ABOUT TOTAL PROBLEMS:

Total

Part-part-whole
Combine

Parts put together into a total

Dina saw 3 canoes and 8 kayaks. How many boats did Dina see?

Total

Dina saw 11 boats. If 3 of the boats were canoes, how many were kayaks?

Part

Dina saw 11 boats. 8 of the boats were kayaks, how many were canoes?

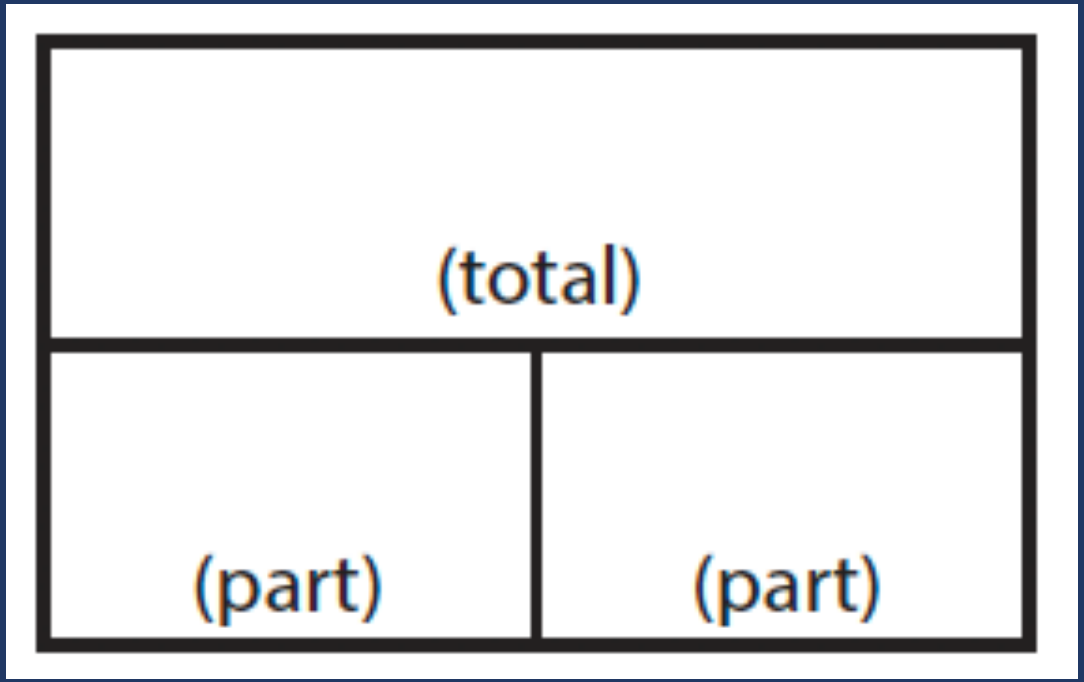
Part

Total

"Are parts put together for a total?"

Total

P1 + P2 = T



Fuchs et al. (2008); Griffin & Jitendra (2009)

Total

Additive Word Problems

A. Ali delivered 12 boxes of cookies on Friday and 25 boxes of cookies on Saturday. How many boxes of cookies did Ali deliver?	B. In March and April, it rained a total of 11 inches. If it rained 3 inches in March, how many inches did it rain in April?
C. Sam mows lawns and made $560 last week. She made $95 on Monday, $135 on Tuesday, and $70 on Wednesday. How much did Sam make on Thursday and Friday?	NOTES ABOUT TOTAL PROBLEMS:

Total

Write a Total problem.

Difference

Compare

Greater and lesser amounts compared for a difference

Bethany has 10 pencils. Grant has 4 pencils. How many more pencils does Bethany have?

Difference

Bethany has 6 more pencils than Grant. If Grant has 4 pencils, how many does Bethany have?

Greater amount

Grant has 6 fewer pencils than Bethany. Bethany has 10 pencils. How many pencils does Grant have?

Lesser amount

Total

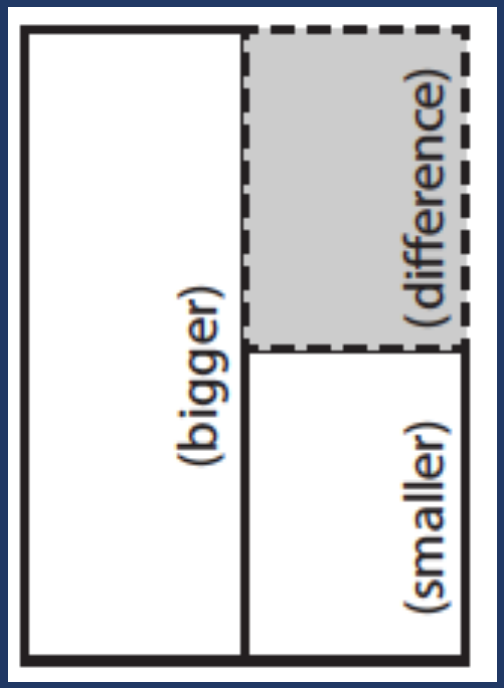
"Are parts put together for a total?"

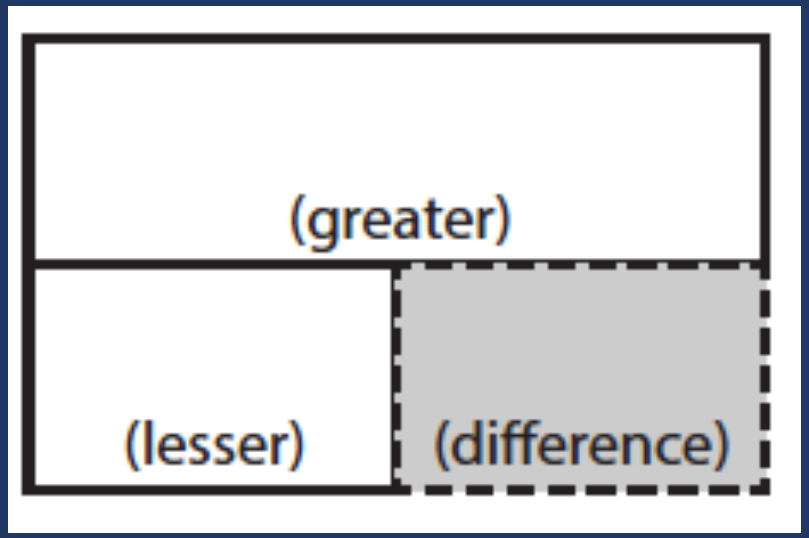
Difference

"Are amounts compared for a difference?"

Difference

G – L = D





Fuchs et al. (2008); Griffin & Jitendra (2009)

Difference

Additive Word Problems

D. Audrey has 162 wooden beads and 95 glass beads. What is the difference between Audrey's wooden beads and glass beads?	E. Damian's dog eats 9 cups of dog food each week. Monte's dog eats 4 cups less each week than Damian's dog. How much does Monte's dog eat in a week?
F. The temperature in Norfolk was 12 degrees warmer than in Roanoke where the temperature was 79 degrees. It was 86 degrees in Marion. What was the temperature in Norfolk?	NOTES ABOUT DIFFERENCE PROBLEMS:

Difference

Write a Difference problem.

Change

Join

An amount that **increases** or decreases

Maura had 6 notebooks. Then, she bought 3 notebooks. How many notebooks does Maura have now?

Maura had 6 notebooks. Then, she bought a few more notebooks. Now, Maura has 9 notebooks. How many notebooks did she buy?

Maura had some notebooks. Then, she bought 3 notebooks. Now, Maura has 9 notebooks. How many notebooks did she have to start with?

End amount

Change amount

Start amount

Change

Separate

An amount that increases or **decreases**

Adia baked 20 cookies. Then, she ate 3 of the cookies. How many cookies does Adia have now?

Adia baked 20 cookies. Then, she ate some of the cookies. Now, she has 17 cookies. How many cookies did Adia eat?

Adia baked some cookies. She ate 3 of the cookies and has 17 cookies left. How many cookies did Adia bake?

End amount

Change amount

Start amount

Total

"Are parts put together for a total?"

Difference

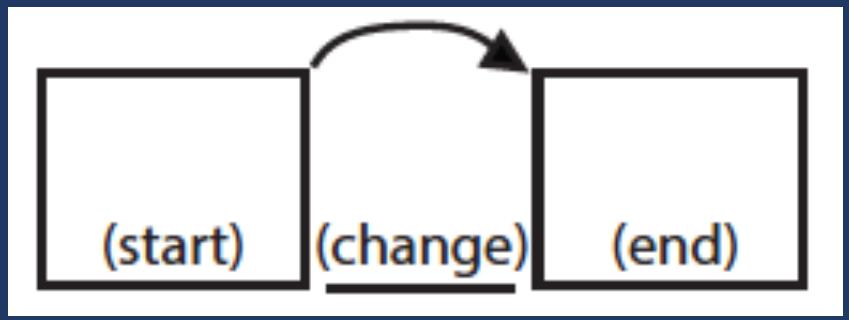
"Are amounts compared for a difference?"

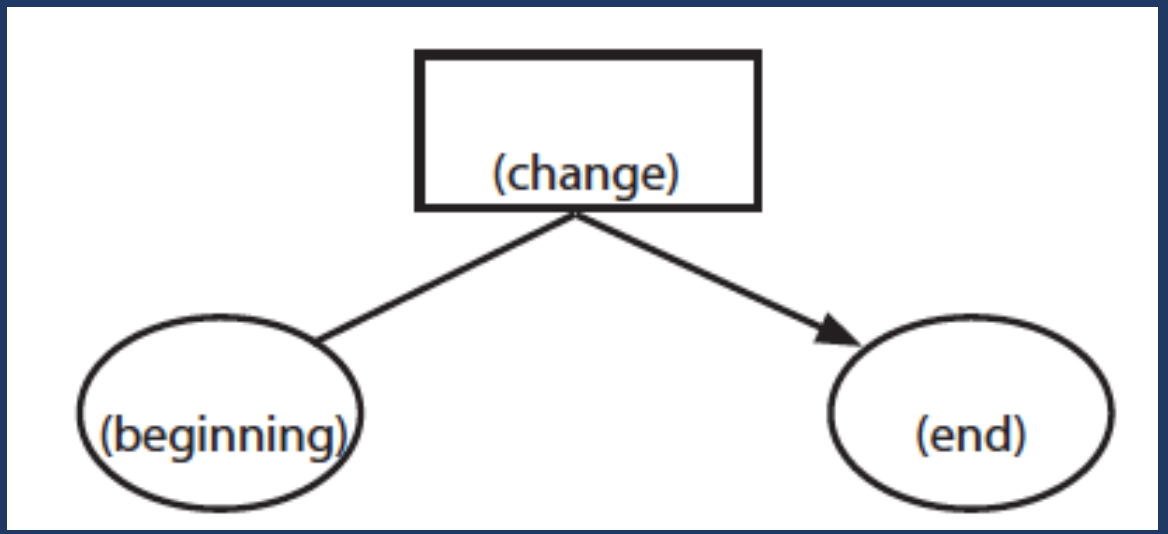
Change

"Does an amount increase or decrease?"

Change

ST +/− C = E





Fuchs et al. (2008); Griffin & Jitendra (2009)

Change

Additive Word Problems

G. A plant was 3 inches tall at the beginning of June. By the end of July, the plant was 9 inches tall. How many inches did the plant grow in 2 months?	H. Martina has some money in her bank account. Then, she spent $135 and has a balance of $24. How much money did Martina have to begin with?
I. Hui saved $70 in January. In February, she spent $64 of the money she saved. She saved $92 more in March. How much has Hui saved by the end of March?	NOTES ABOUT CHANGE PROBLEMS:

Change

Write a Change problem.

Schema Check!

Change

Pablo goes to a stamp show where he can share, buy, and sell stamps.

26. Part A

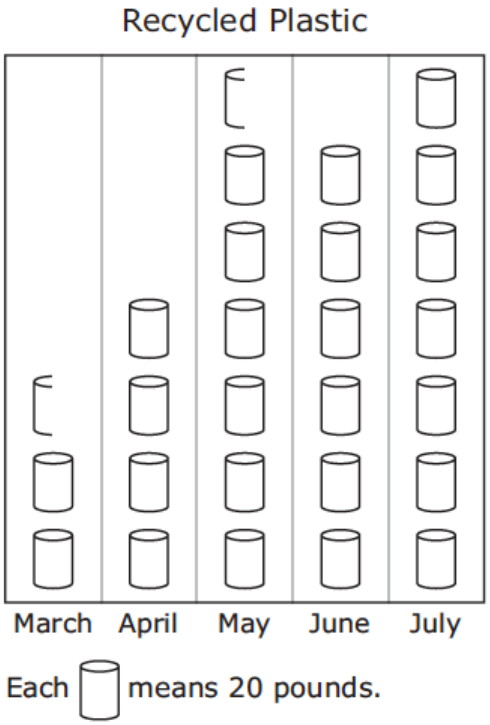
The first day, Pablo starts with 744 stamps. He buys 27 stamps from his friend. He then sells 139 stamps.

What is the total number of stamps that Pablo has after the first day of the stamp show?

Grade 3 PARCC

Difference

The graph below shows the number of pounds of plastic the Keller family recycled for five months.



Based on the graph, how many more pounds of plastic did the family recycle in July than in April?

Grade 3 STAAR

Total

Mr. Conley delivers packages. The bar graph shows the total number of packages he delivered on five days last week.

10. Part A

What is the total number of packages Mr. Conley delivered on Monday and Tuesday?

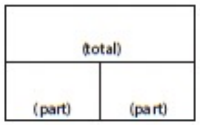
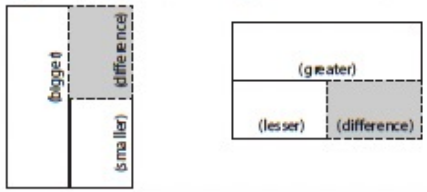
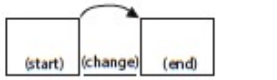
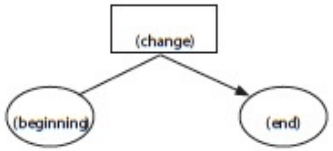
Ⓐ 300

Ⓑ 340

Ⓒ 350

Ⓓ 360

Grade 3 PARCC

Schema and Definition	Equations and Graphic Organizers	Examples			Variations
Total (Combine; Part-part-whole) Parts combined for a sum	P1 + P2 = T (part + part = total)  	Sum unknown: Lyle has 11 red apples and 18 green apples. How many apples does Lyle have altogether?	Part unknown: Lyle has 29 red and green apples. If 11 of the apples are red, how many green apples does Lyle have?		More than two parts: Lyle has 34 apples. Of the apples, 11 are red, 18 are green, and the rest are yellow. How many yellow apples does Lyle have?
Difference (Compare) Sets compared for a difference	B – s = D (bigger – smaller = difference) G – L = D (greater – less = difference)  	Difference unknown: Sasha wrote 85 words in her essay, and Tabitha wrote 110 words. How many fewer words did Sasha write than Tabitha?	Bigger/greater unknown: Tabitha wrote 25 more words than Sasha. If Sasha wrote 85 words, how many words did Tabitha write?	Smaller/lesser unknown: Tabitha wrote 110 words in her essay. Sasha wrote 25 words fewer than Tabitha. How many words did Sasha write?	(None)
Change (Join; Separate) An amount that increases or decreases	ST +/– C = E (start +/– change = end)   	End (increase) unknown: Jorge had $52. Then, he earned $16 babysitting. How much money does Jorge have now? End (decrease) unknown: Jorge had $52. Then, he spent $29 at the ballpark. How much money does Jorge have now?	Change (increase) unknown: Jorge had $52. Then, he earned some money babysitting. Now, Jorge has $68. How much did Jorge earn babysitting? Change (decrease) unknown: Jorge had $52 but spent some money when he went to the ballpark. Now, Jorge has $23. How much did Jorge spend at the ballpark?	Start (increase) unknown: Jorge has some money, and then he earned $16 for babysitting. Now, Jorge has $68. How much money did he have to start with? Start (decrease) unknown: Jorge had some money. Then, he spent $29 at the ballpark and has $23 left. How much money did Jorge have before going to the ballpark?	Multiple changes: Jorge had $78. He stopped and bought a pair of shoes for $42 and then he spent $12 at the grocery. How much money does Jorge have now?

Total

Difference

Change

Which of these schemas would be important to teach?

How do you plan to teach the schemas to your students?

What additional information or materials do you need?

Total

Difference

Change

Equal Groups

Comparison

Ratios/Proportions

Total

Difference

Change

Josh ran 18 miles last week. He ran twice as many miles this week. How many miles did he run this week?

Total

Difference

Change

Josh ran 18 miles last week. He ran twice as many miles this week. How many miles did he run this week?

Total

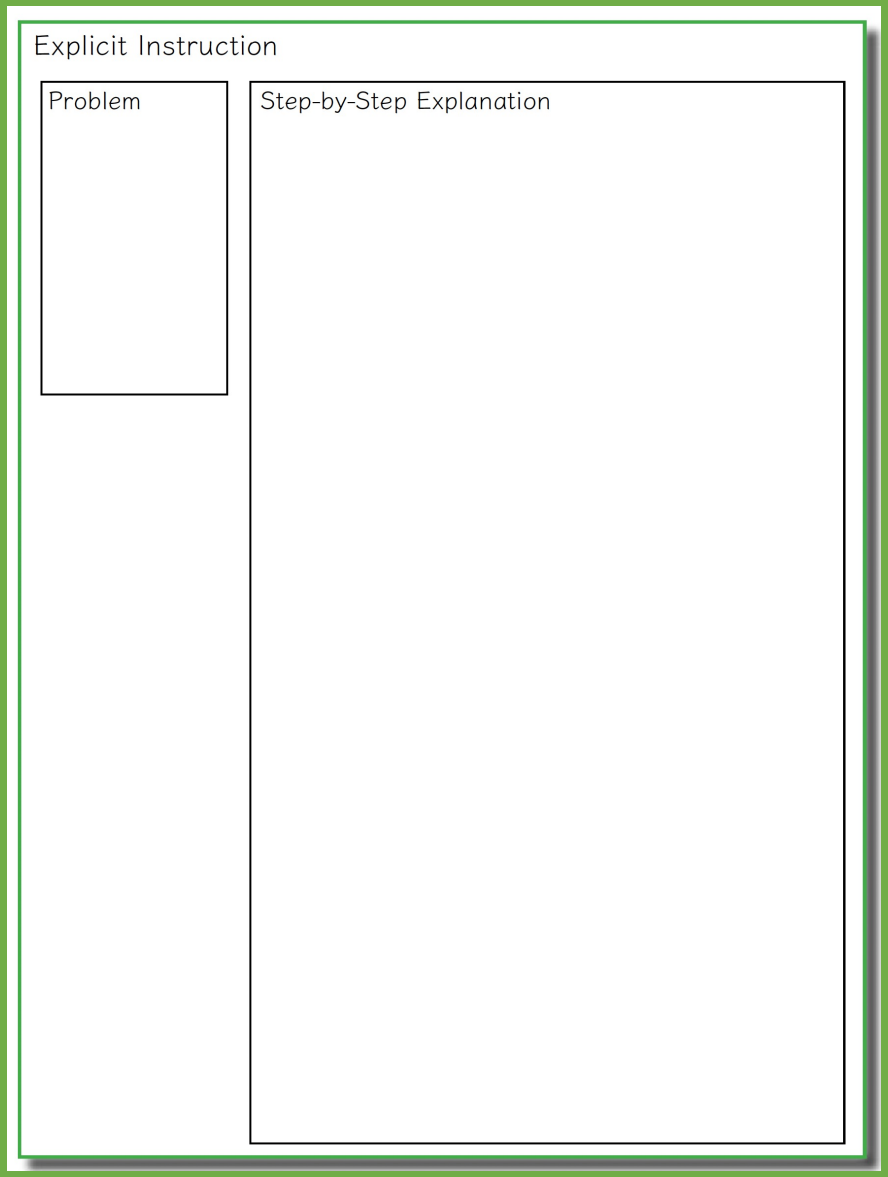
Difference

Change

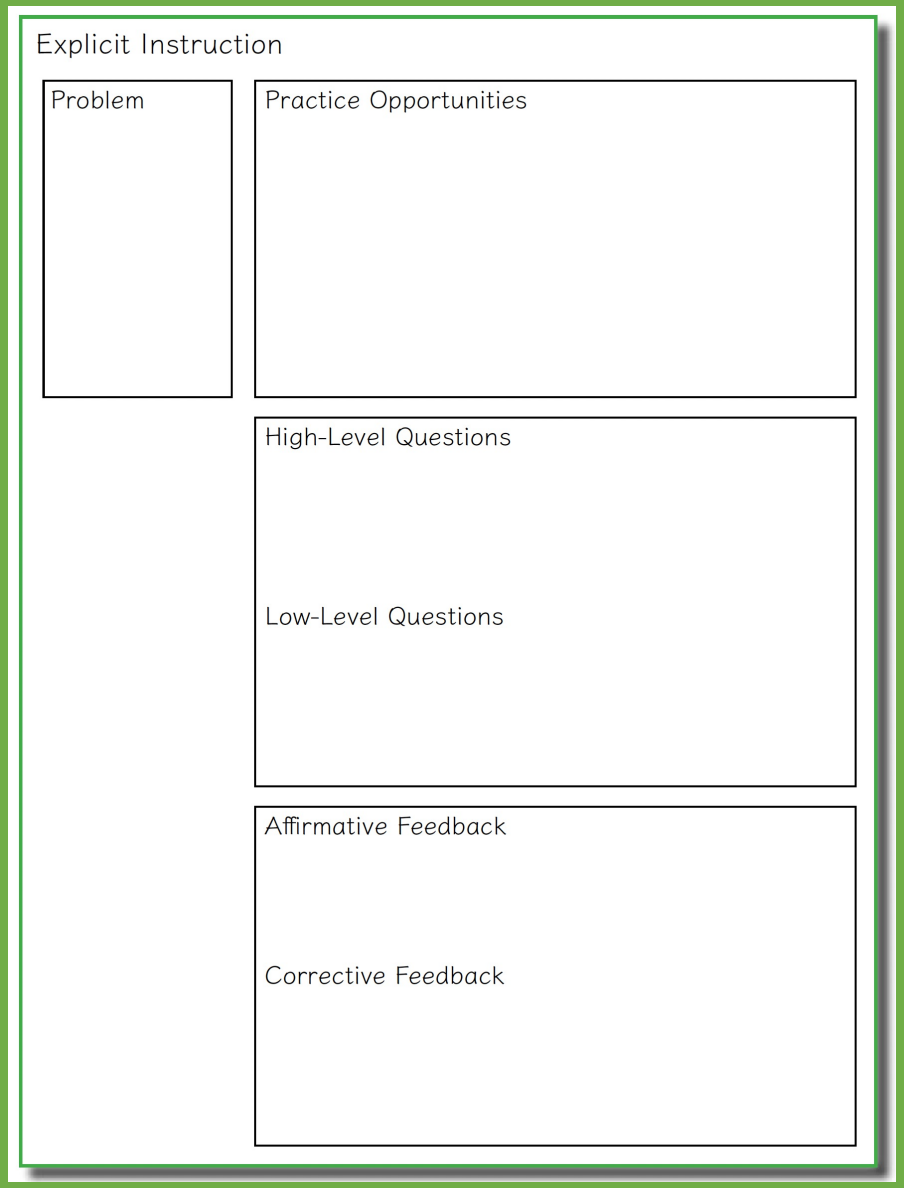
Josh ran 18 miles last week. He ran twice as many miles this week. How many miles did he run this week?

Teach an attack strategy

Teach about schemas



1. Choose a math problem.
2. Write a step-by-step explanation. Focus on the language of math in your explanation. Consider the representations you will use.



1. Describe the practice opportunities you will use.
2. Write 3 high-level questions.
3. Write 3 low-level questions.
4. Write 2 ways to provide affirmative feedback.
5. Write 2 ways to provide corrective feedback.

November 2022

Early Numeracy
- Counting principles
- Connecting number
- Comparison of numbers
- Addition and subtraction concepts

January 2023

Addition and Subtraction
- Addition computation
- Subtraction computation
- Addition and subtraction fluency
- Addition and subtraction word problems

March 2023

Place value and money
- Understanding tens and ones
- Representing thousands, hundreds, tens, and ones
- Money

April 2023

Geometry
- Identification of shapes
- Composing and decomposing shapes

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