Best Practices for Maths Intervention

2025

1

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She is currently Associate Director of the Meadows Center for Preventing Educational Risk.

Her research, teaching, and service focus on mathematics, particularly for students who experience mathematics differently.

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2

Learning Difficulties Australia

Learning Difficulties Australia is an association of teachers and other professionals dedicated to assisting students with learning difficulties through effective teaching practices based on scientific research.

www.ldaustralia.org

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@LD_Australia

3

Evidence-Based Practices

4

- Students should use the language of math.
- Students should use various representations.
- Instruction should be systematic.
- Students should build fluency in math.
- Students should learn about word-problem solving.

5

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6

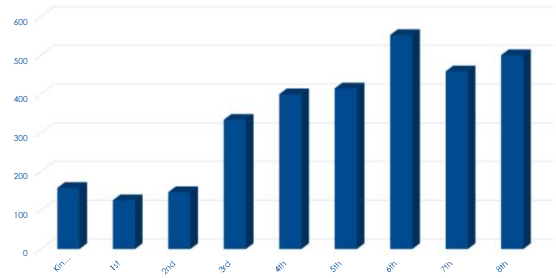
Significant correlation (r = .49) between math vocabulary and math performance. Math vocabulary appears most important for word-problem performance (r = .58).
(Lin et al., 2021)

Early math vocabulary related to mathematics and literacy.
(Hornburg et al., 2018; Purpura et al., 2017)

Students who experience difficulty with math demonstrate lower math vocabulary performance.
(Hughes et al., 2020; Powell & Nelson, 2017; Powell et al., 2017; Unal et al., 2021)

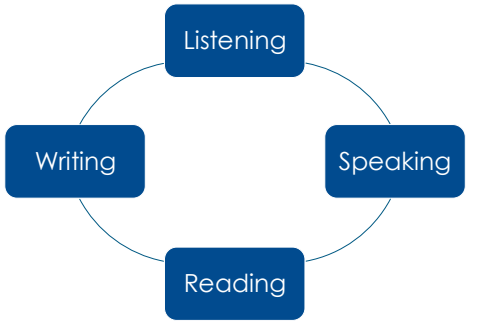
VOCABULARY

7



VOCABULARY

8



VOCABULARY

9

1. Use formal math language
2. Use terms precisely

VOCABULARY

10

6 __ 9

"The alligator eats the bigger number, 9"

"6 is less than 9"

VOCABULARY

11

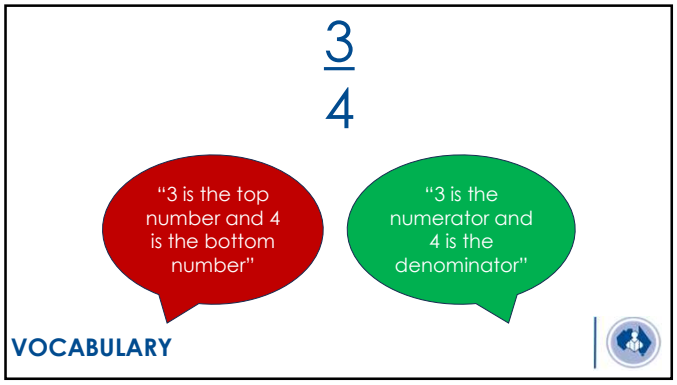
145
+ 58

"Carry the one"

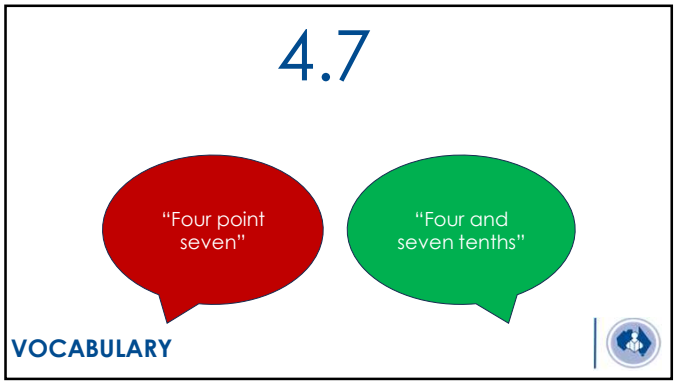
"Regroup or trade or exchange"

VOCABULARY

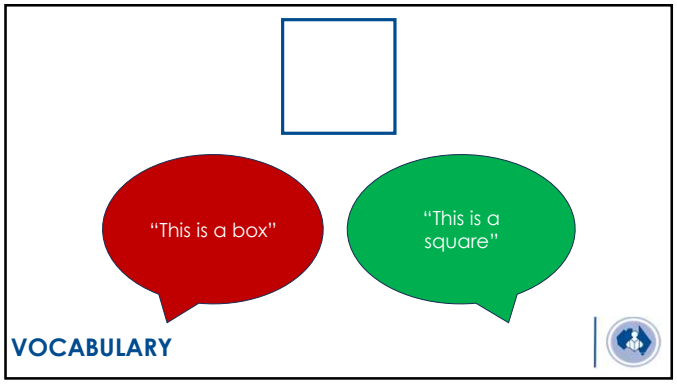
12


3
4
"3 is the top number and 4 is the bottom number"
"3 is the numerator and 4 is the denominator"
VOCABULARY

13


4.7
"Four point seven"
"Four and seven tenths"
VOCABULARY

14


"This is a box"
"This is a square"
VOCABULARY

15

Share an example of "Instead of ____, say ____."

VOCABULARY

16

1. Use formal math language
2. Use terms precisely

VOCABULARY

17

Factor

1 x 8 = 8

2 x 4 = 8

factor factor

Multiple

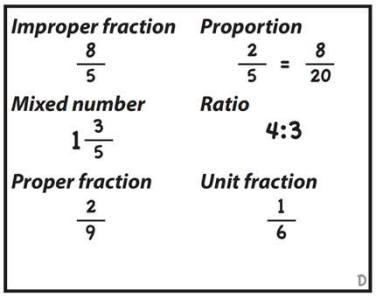
8 x 1 = 8

8 x 2 = 16

multiples of 8

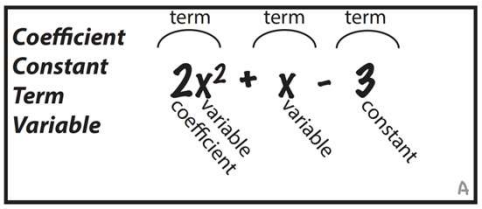
VOCABULARY

18



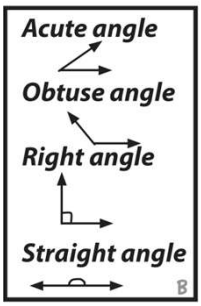
VOCABULARY

19



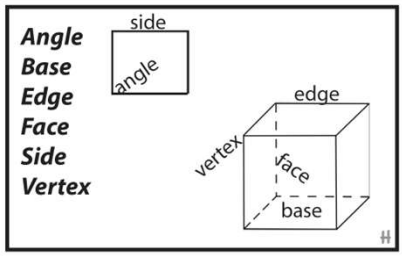
VOCABULARY

20



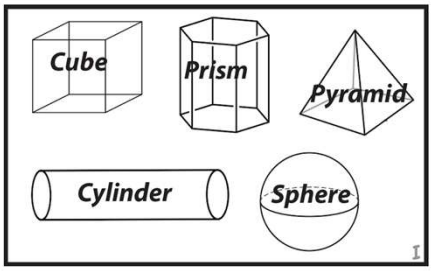
VOCABULARY

21



VOCABULARY

22



VOCABULARY

23

Share an example of terms that students need to use with precision.

VOCABULARY

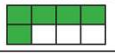
24

1. Use formal math language
2. Use terms precisely

VOCABULARY

25

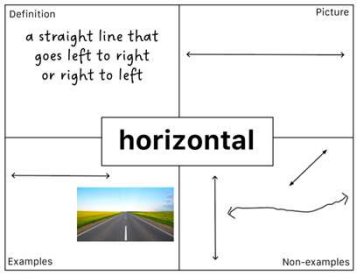
Use semantic maps

Term	Definition	Example	Nonexample
integer	(... -3, -2, -1, 0, 1, 2, 3...)	15	$\frac{1}{3}$
denominator	The equal parts of a whole or set.	$\frac{5}{8}$ 8 is the denominator 	$\frac{5}{8}$ 
numerator	The equal parts of a given fraction.	$\frac{5}{8}$ 5 is the numerator 	$\frac{5}{8}$ 

VOCABULARY

26

Use graphic organizers



VOCABULARY

27

Use word walls

difference
The result of subtracting or the result when comparing two numbers.
5 – 4 = 1
1 is the difference

horizontal line
A straight line that goes from left to right or right to left.

equivalent
Two numbers that have the same value.
$\frac{2}{4}$ is equivalent to $\frac{1}{2}$

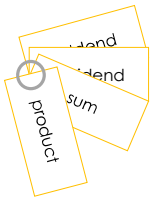
total
The result or sum when adding numbers.
5 + 7 = 12

VOCABULARY

28

Use flash cards

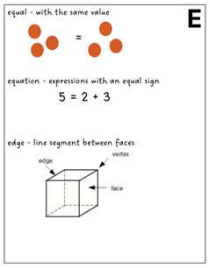
addend | quotient
divisor | dividend
factor | sum
product | difference



VOCABULARY

29

Use glossaries

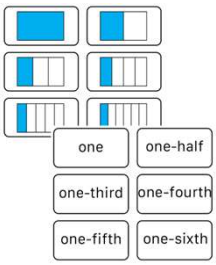


VOCABULARY

30

Use games

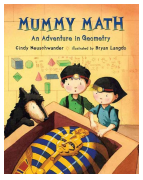
square	circle	decagon	triangular prism	cone
cylinder	cube	sphere	line	pyramid
parallelogram	octagon	FREE	trapezoid	oval
kite	pentagon	cylinder	rectangle	line segment
hexagon	rhombus	triangle	quadrilateral	rectangular prism

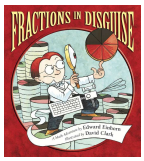


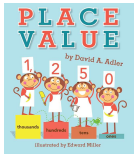
VOCABULARY

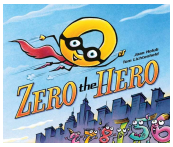
31

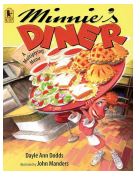
Use read alouds











VOCABULARY

32

Share your strengths.
Share an opportunity for growth.

Share your short- and long-term plans.

VOCABULARY

33

Students should use the language of math.

Students should use various representations.

Instruction should be systematic.

Students should build fluency in math.

Students should learn about word-problem solving.

34

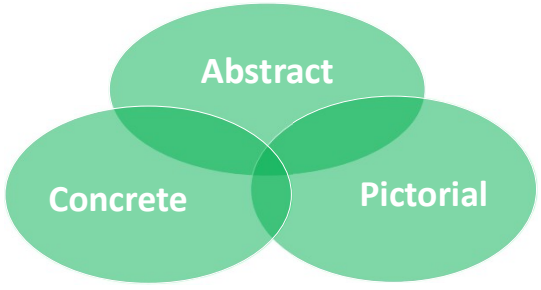
Hands-on manipulatives contribute to increases in mathematics performance.
(Bouck & Park, 2018; Carbonneau et al., 2013; Namkung & Bricko, 2021; Sherman & Bisanz, 2009; Strickland & Maccini, 2012)

Virtual manipulatives contribute to increases in mathematics performance.
(Bouck et al., 2020; Satsangi et al., 2016)

Other visuals (e.g., graphic organizers) contribute to increases in mathematics performance.
(Jitendra et al., 2009; Sharp & Dennis, 2017; van Garderen, 2007; Xin, 2008)

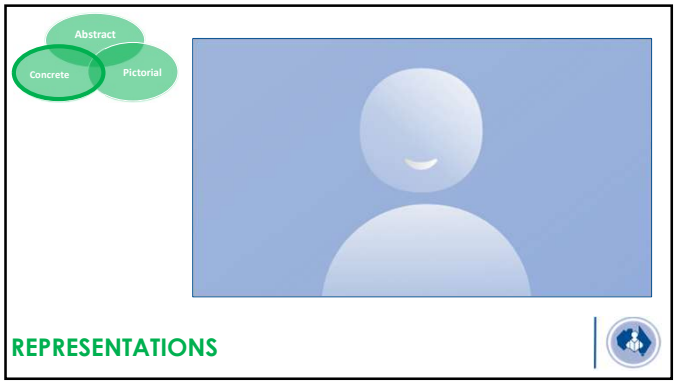
REPRESENTATIONS

35

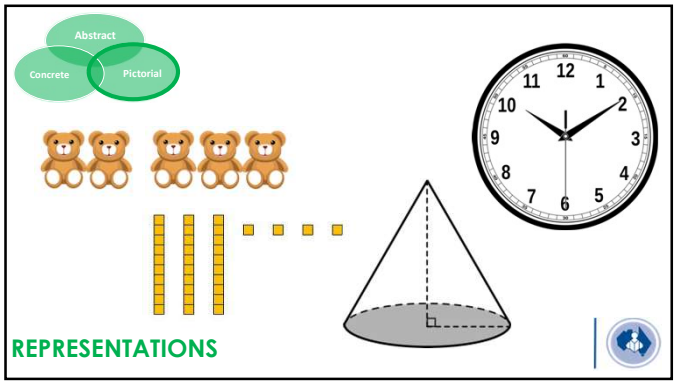


REPRESENTATIONS

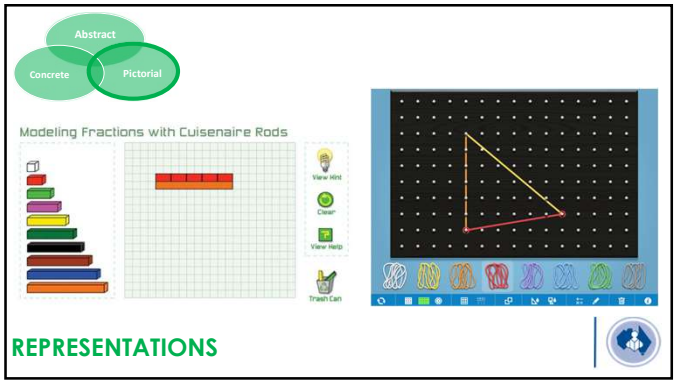
36


Abstract
Concrete
Pictorial
REPRESENTATIONS

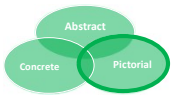
37


Abstract
Concrete
Pictorial
REPRESENTATIONS

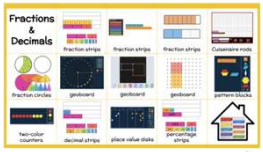
38


Abstract
Concrete
Pictorial
Modeling Fractions with Cuisenaire Rods
REPRESENTATIONS

39

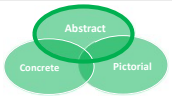


bit.ly/srpowell



REPRESENTATIONS

40



2 + 8 = 10

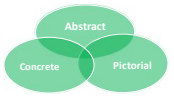
34 = 3 tens and 4 ones

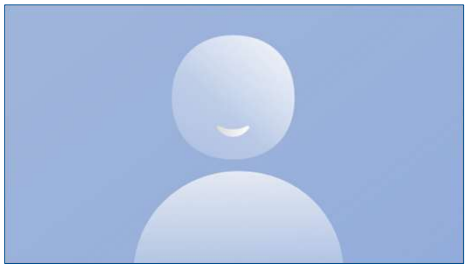
0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

$$\begin{array}{r} 4{,}179 \\ +\ \ 569 \\ \hline \end{array}$$

REPRESENTATIONS

41



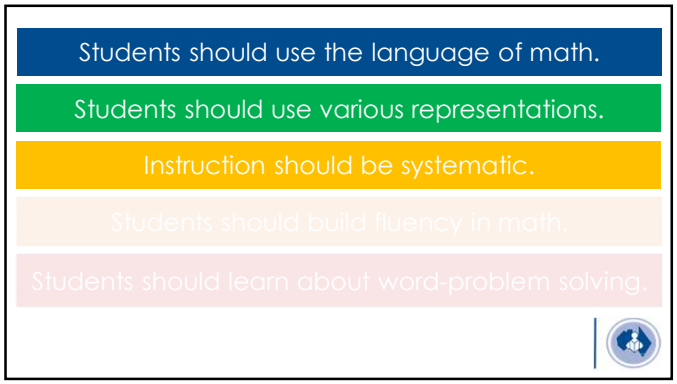


REPRESENTATIONS

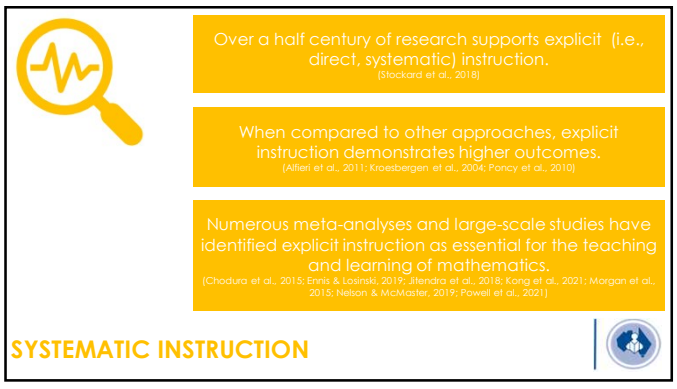
42


Share your strengths.
Share an opportunity for growth.
Share your short- and long-term plans.
REPRESENTATIONS

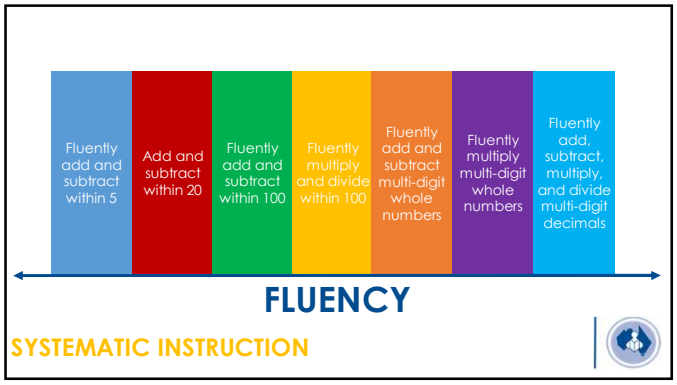
43


Students should use the language of math.
Students should use various representations.
Instruction should be systematic.
Students should build fluency in math.
Students should learn about word-problem solving.

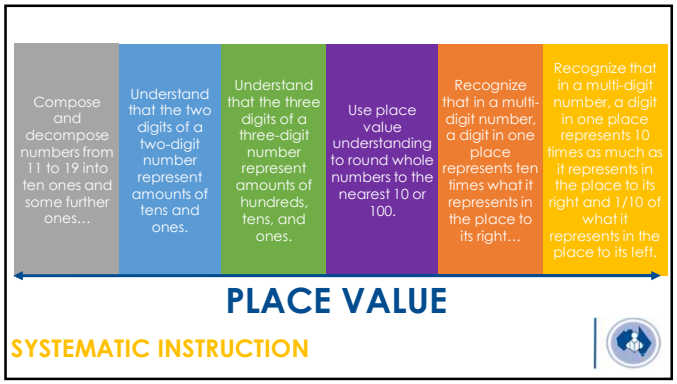
44


Over a half century of research supports explicit (i.e., direct, systematic) instruction.
(Stockard et al., 2018)
When compared to other approaches, explicit instruction demonstrates higher outcomes.
(Alfieri et al., 2011; Kroesbergen et al., 2004; Poncy et al., 2010)
Numerous meta-analyses and large-scale studies have identified explicit instruction as essential for the teaching and learning of mathematics.
(Chodura et al., 2015; Ennis & Losinski, 2019; Jitendra et al., 2018; Kong et al., 2021; Morgan et al., 2015; Nelson & McMaster, 2019; Powell et al., 2021)
SYSTEMATIC INSTRUCTION

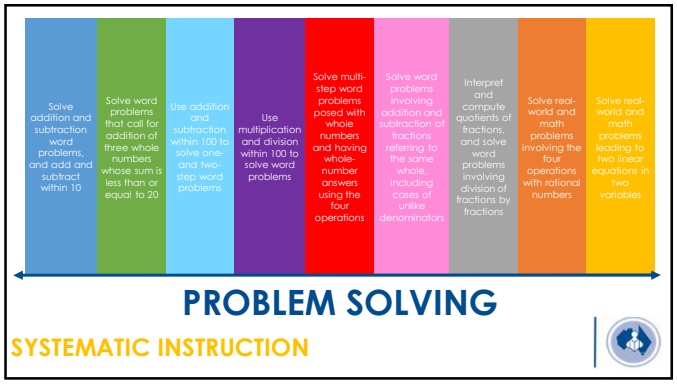
45


Fluently add and subtract within 5
Add and subtract within 20
Fluently add and subtract within 100
Fluently multiply and divide within 100
Fluently add and subtract multi-digit whole numbers
Fluently multiply multi-digit whole numbers
Fluently add, subtract, multiply, and divide multi-digit decimals
FLUENCY
SYSTEMATIC INSTRUCTION

46


Compose and decompose numbers from 11 to 19 into ten ones and some further ones…
Understand that the two digits of a two-digit number represent amounts of tens and ones.
Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones.
Use place value understanding to round whole numbers to the nearest 10 or 100.
Recognize that in a multi-digit number, a digit in one place represents ten times what it represents in the place to its right…
Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.
PLACE VALUE
SYSTEMATIC INSTRUCTION

47


Solve addition and subtraction word problems, and add and subtract within 10
Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20
Use addition and subtraction within 100 to solve one- and two-step word problems
Use multiplication and division within 100 to solve word problems
Solve multi-step word problems posed with whole numbers and having whole-number answers using the four operations
Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators
Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions
Solve real-world and math problems involving the four operations with rational numbers
Solve real-world and math problems leading to two linear equations in two variables
PROBLEM SOLVING
SYSTEMATIC INSTRUCTION

48

MODELING	PRACTICE
Think-aloud Planned examples	Guided practice Independent practice
SUPPORTS Ask high-level and low-level questions Elicit frequent responses Provide affirmative and corrective feedback	

SYSTEMATIC INSTRUCTION

49

Share your strengths.
Share an opportunity for growth.

Share your short- and long-term plans.

SYSTEMATIC INSTRUCTION

50

Students should use the language of math.

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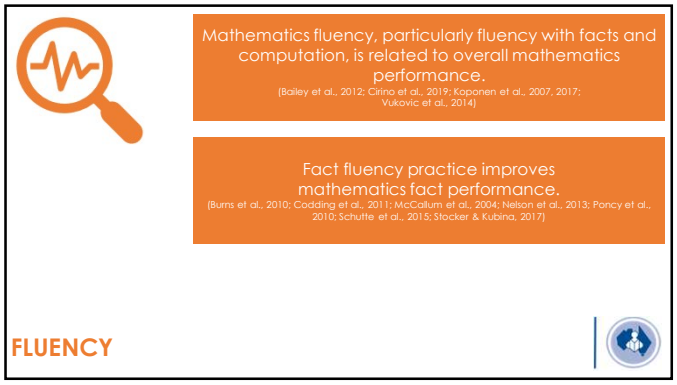
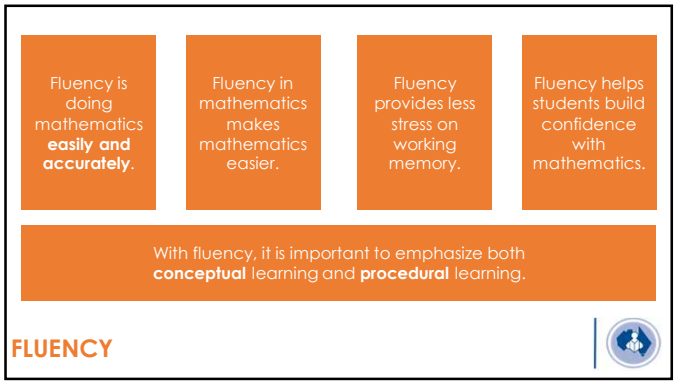
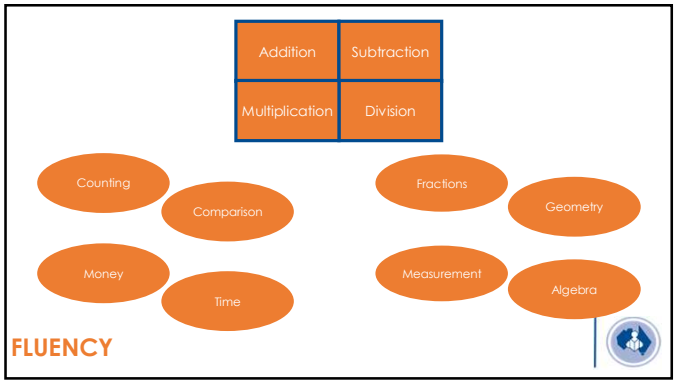
51


Mathematics fluency, particularly fluency with facts and computation, is related to overall mathematics performance.
(Bailey et al., 2012; Cirino et al., 2019; Koponen et al., 2007, 2017; Vukovic et al., 2014)
Fact fluency practice improves mathematics fact performance.
(Burns et al., 2010; Codding et al., 2011; McCallum et al., 2004; Nelson et al., 2013; Poncy et al., 2010; Schutte et al., 2015; Stocker & Kubina, 2017)
FLUENCY

52


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.
FLUENCY

53


Addition
Subtraction
Multiplication
Division
Counting
Comparison
Money
Time
Fractions
Geometry
Measurement
Algebra
FLUENCY

54

Ease and accuracy

Memorization or automaticity

FLUENCY

55

Addition	Subtraction
Multiplication	Division

Build fluency with math facts.

- Addition: single-digit addends
- Subtraction: single-digit subtrahend
- Multiplication: single-digit factors
- Division: single-digit divisor

$$\begin{array}{r} 5 \\ +\ 8 \\ \hline \end{array} \qquad \begin{array}{r} 9 \\ -\ 4 \\ \hline \end{array} \qquad \begin{array}{r} 6 \\ \times\ 7 \\ \hline \end{array} \qquad \begin{array}{r} 56 \\ \div\ 8 \\ \hline \end{array}$$

FLUENCY

56

DAILY

BRIEF

Work on small sets of facts

Work on unknown facts
(in combination with known facts)

FLUENCY

57

Dice

Roll the Dice

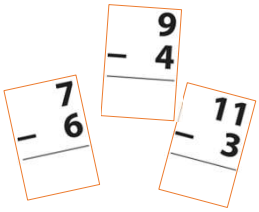
___ + ___ = ___
8 + ___ = 15
___ - ___ = ___
___ - ___ = ___

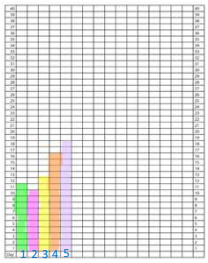
___ + ___ = ___
___ + ___ = ___
___ - ___ = ___
___ - ___ = ___

FLUENCY

58

Flash Cards





FLUENCY

59

Beach Ball

4 plus 6 equals 10.

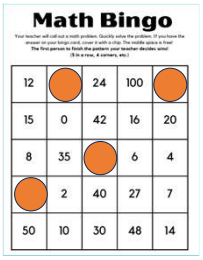
7 plus 6 equals 13.

2 plus 2 equals 4.

FLUENCY

60

Bingo



8 times 10 equals...

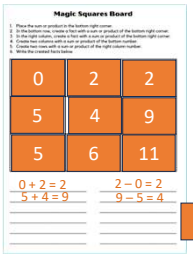
3 times 1 equals...

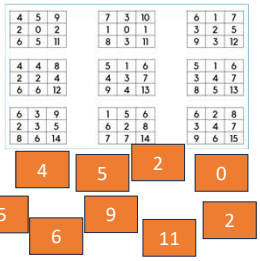
2 plus 3 equals...

FLUENCY

61

Magic Squares



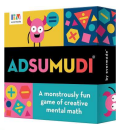


4 5 2 0
5 6 9 11 2

FLUENCY

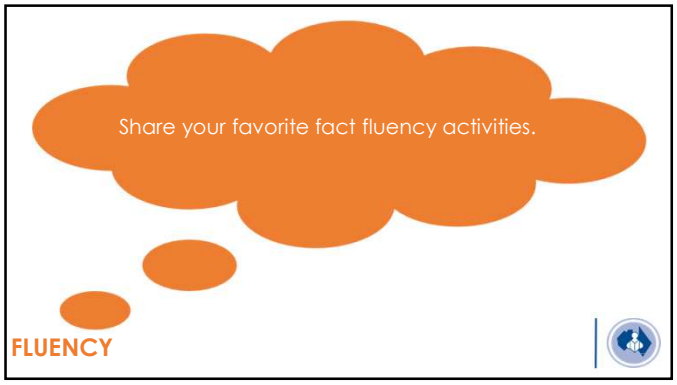
62

Games

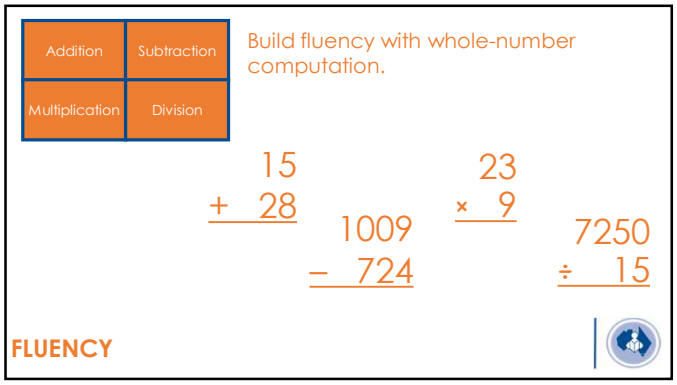


FLUENCY

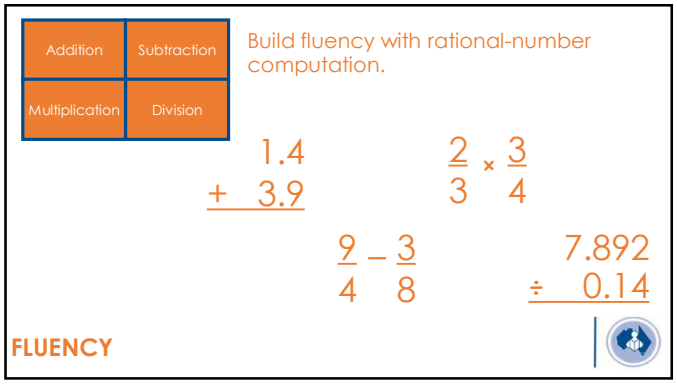
63


Share your favorite fact fluency activities.
FLUENCY

64


Addition
Subtraction
Multiplication
Division
Build fluency with whole-number computation.
15 + 28
23 × 9
1009 − 724
7250 ÷ 15
FLUENCY

65


Addition
Subtraction
Multiplication
Division
Build fluency with rational-number computation.
1.4 + 3.9
2/3 × 3/4
9/4 − 3/8
7.892 ÷ 0.14
FLUENCY

66

Addition	Subtraction
Multiplication	Division

Build fluency with integer computation.

$$\begin{array}{r} 1.4 \\ +\ -3.9 \\ \hline \end{array} \qquad \begin{array}{r} 6 \\ \times\ -12 \\ \hline \end{array}$$

$-14 - (-7) =$ $-135 \div 2 =$

FLUENCY

67

Share your strengths.
Share an opportunity for growth.

Share your short- and long-term plans.

FLUENCY

68

Students should use the language of math.

Students should use various representations.

Instruction should be systematic.

Students should build fluency in math.

Students should learn about word-problem solving.

69

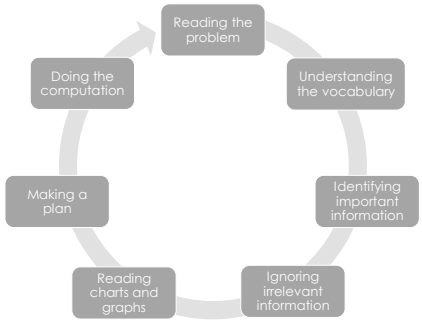
Key words tied to operations is an ineffective word-problem strategy.
(Karp et al., 2019; Powell et al., 2022)

Using a meta-cognitive strategy improves word-problem performance.
(Freeman-Green et al., 2015; Krawec et al., 2012; Montague et al., 2011; Swanson et al., 2014)

A focus on schemas improves word-problem performance.
(Alghamdi et al., 2020; Cook et al., 2020; Flores et al., 2016; Fuchs et al., 2021; Griffin et al., 2019; Jitendra et al., 2013; Lein et al., 2020; Peltier et al., 2020; Powell et al., 2022; Xin & Xhang, 2009; Zheng et al., 2013)

PROBLEM SOLVING

70



PROBLEM SOLVING

71

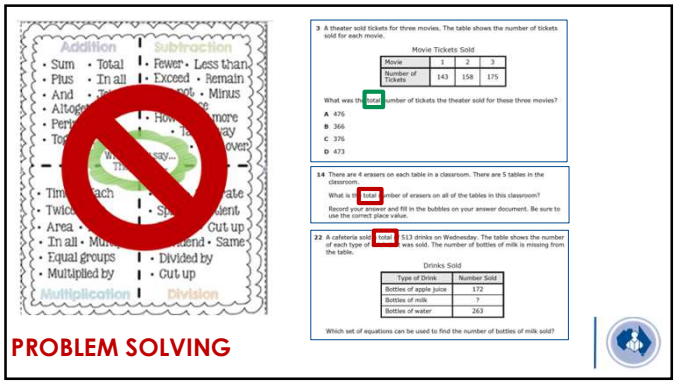
Do not use key words tied to operations

Use an attack strategy

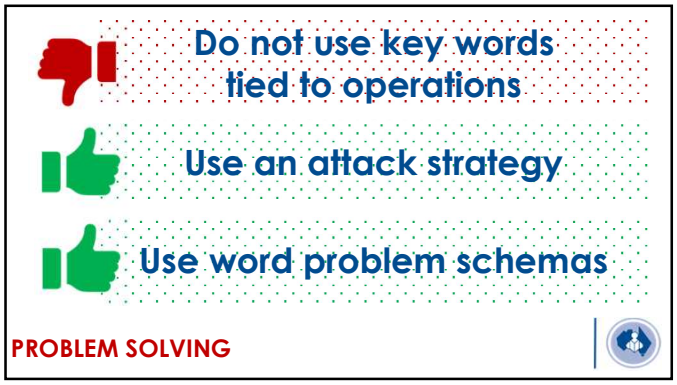
Use word problem schemas

PROBLEM SOLVING

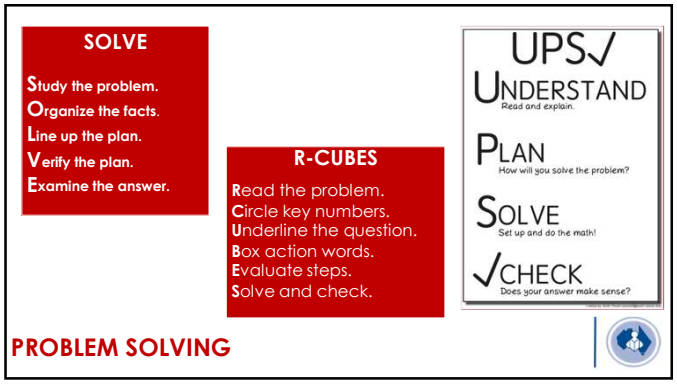
72


Addition
Subtraction
Sum
Total
Plus
In all
Fewer
Less than
Exceed
Remain
And
Minus
Equal groups
Multiplied by
Divided by
Cut up
Same
Multiplication
Division
Movie Tickets Sold
Movie
Number of Tickets
143
158
175
Drinks Sold
Type of Drink
Number Sold
Bottles of apple juice
172
Bottles of milk
?
Bottles of water
263
PROBLEM SOLVING

73


Do not use key words tied to operations
Use an attack strategy
Use word problem schemas
PROBLEM SOLVING

74


SOLVE
Study the problem.
Organize the facts.
Line up the plan.
Verify the plan.
Examine the answer.
R-CUBES
Read the problem.
Circle key numbers.
Underline the question.
Box action words.
Evaluate steps.
Solve and check.
UPS
UNDERSTAND
Read and explain.
PLAN
How will you solve the problem?
SOLVE
Set up and do the math!
CHECK
Does your answer make sense?
PROBLEM SOLVING

75

Do not use key words tied to operations

Use an attack strategy

Use word problem schemas

PROBLEM SOLVING

76

Total

Equal Groups

Difference

Set

Change

Proportion

PROBLEM SOLVING

77

Do not use key words tied to operations

Use an attack strategy

Use word problem schemas

PROBLEM SOLVING

78

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Students should learn about word-problem solving.

79

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Sarah R. Powell is a former kindergarten teacher who graduated with her Ph.D. from Vanderbilt University in 2009.

She is currently Associate Director of the Meadows Center for Preventing Educational Risk.

Her research, teaching, and service focus on mathematics, particularly for students who experience mathematics differently.

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Learning Difficulties Australia

Learning Difficulties Australia is an association of teachers and other professionals dedicated to assisting students with learning difficulties through effective teaching practices based on scientific research.

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