Cooperative Group Problem Solving Cards for Mathematics

Sample videos online at www.drpaulswan.com.au

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
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120

CHECK THE CLUES

A **Find My Number** Style Question Set

Sampler 2 (Years 2-7)

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Check the Clues Sampler Set

Many students experience difficulty reading and comprehending word questions in mathematics. The "Check The Clues" series is designed to focus on the development of:

- mathematical vocabulary and
- comprehension of mathematics word questions

We have created a sample set of "Check the Clues Cards" to support teachers who want to try a version of Clues.

The Sampler follows the general rules of play for 'Check the Clues' type problems.

- There are four players.
- Each player receives a card and reads their clues to the other players in order to solve a word problem.

The sample cards all relate to a central number grid.

Note that the "Find My Number" type clues are just one version of the clues family of problems. Some Check the Clues "Problems" involve manipulating materials, others involve matching data to graphs and so on. We have chosen to restrict the sampler to a single type of Clue Cards so that teachers and students become familiar with the style of "Check the Clues" problems. Once students become familiar with the "Check the Clues" routine they will be in a position to tackle other types of Clue Cards.

When using this system, the group is encouraged to follow Polya's (1957) four step model.

- **Understand the problem**

  which may involve reading and re-reading the problem

- **Devise a plan**

  often relies on having solved similar problems before and relating the new problem to a previously attempted problem

- **Carry out the plan**

- **Look back**

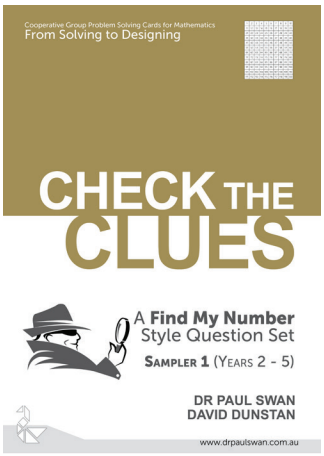
  which may involve reading and re-reading the problem

This publication was designed as a sampler to show how cooperative group problems may be used to develop mathematical literacy, that is, vocabulary and symbol recognition when solving word problems in mathematics. The word problems related to one 'genre', that of using clues to find solutions.

The cards link to two of the *proficiency strands*, **Problem Solving** and **Reasoning**. Where possible links are given to the Australian curriculum and the vocabulary used within the problem. Answers are provided.

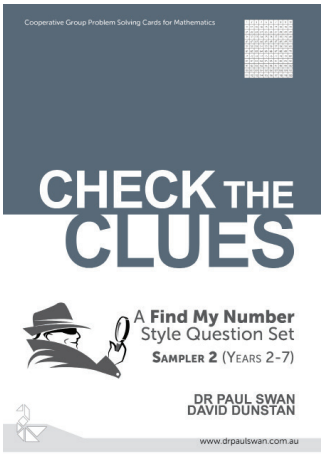
We have created two sampler sets:

Sampler Set 1



The first set has been created on larger cards and there is a pattern to the way that the cards have been written. This is deliberate. Teachers can point out the way that the clues have been written and then support their students to write their own clues. Some cards have been provided that include starter phrases to be used on the cards. Eventually students will be able to write their own clues and pose their own "Find My Number" problems.

Sampler Set 2



The second set of cards is smaller in physical size so they may be glued onto blank playing cards. This will make the sets more durable. This set shows how the same clue type - "Find My Number" may be written at different levels. Cards A, B, C ... are simpler than cards ... X, Y, Z.

A vocabulary list for each card set is provided so that teachers may 'tune students in' to the language used on the cards. Some teachers might like to make up the cards to be used at the start of a lesson, during the body of the lesson or as a task for early finishers.

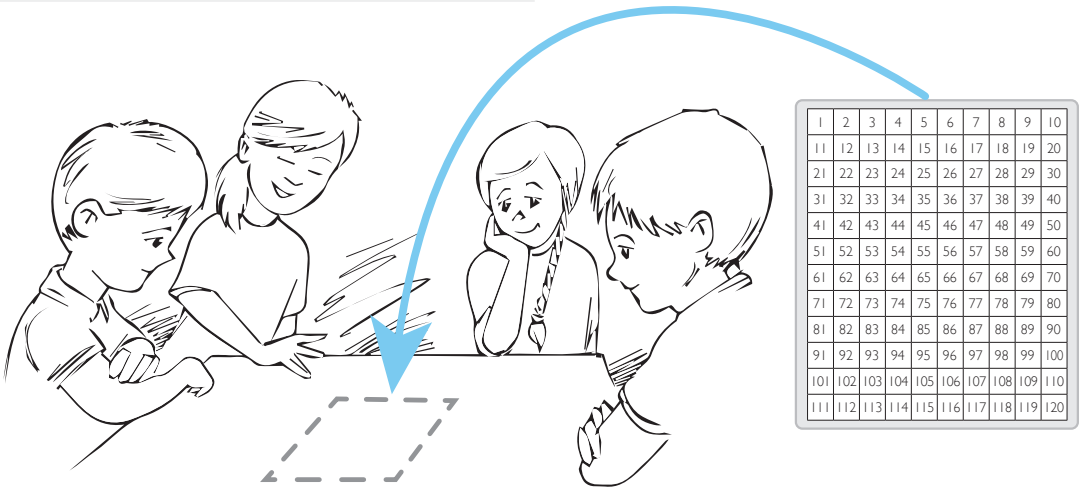
Teachers wishing to pursue the idea of cooperative group solving cards are directed to the following references.

Dunstan, D., Farmer, P., Humphreys, K., & Swan, P. (2014). Check the Clues: Cooperative group problem solving cards for mathematics, F – 3. Perth: A-Z Type.

Dunstan, D., & Swan, P. (2015). Check the Clues 2: Cooperative group problem solving cards for mathematics, F – 3. Perth: A-Z Type.

Number Board based activities

1. Place the Number Board on the table.



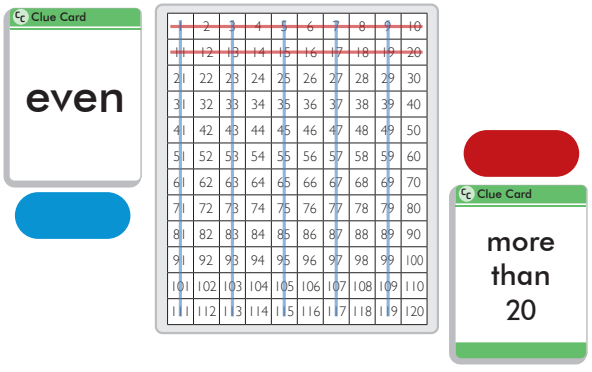
2. Distribute Clue Cards to players.

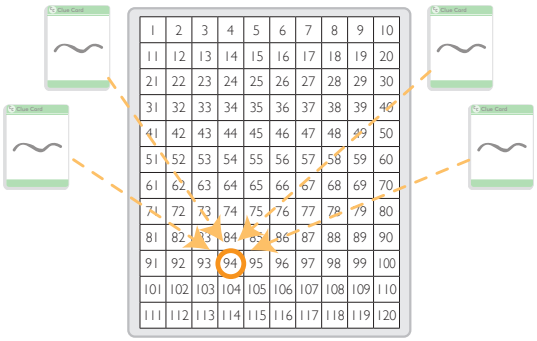
3. Read out your Clue Card to the other players.

4. The group decides which clue to use first.

5. Use a marker pen to cross out numbers as per the Clue Cards.

6. Check the Clues to make sure the answer you're left with is correct.





Students' Role

The students' reason together to solve the problem. They can manipulate, order materials and make notes to aid in the solving process. Most importantly, it is the responsibility of the group to ensure that all group members can explain how they solved their problem. If all students agree that they need help, only then, do they seek teacher help.

Teachers' Role

The teacher needs to carefully plan when to use these cooperative learning card tasks. Generally, these tasks are best placed once a sufficient number of lessons have been delivered to develop both the necessary skills and language that will support the problem solving and reasoning processes.

By knowing these tasks well, the teacher can anticipate student difficulties and prepare written prompts. As the teacher monitors the students, these prompts, timely feedback and good questions can be offered. A key skill is knowing when to hold back.

Students need to be educated on how the cooperative learning process operates and the teacher builds the learning culture, which would include persistence. If groups indicate similar difficulties, then whole class point of need teaching may be appropriate.

Also, the teacher can observe the interactions taking place in the groups. From the student dialogue and actions, the teacher can make annotations for assessment purposes.

To assist teachers:

- Links to the Australian Curriculum Mathematics have been supplied.
- Comprehensive teacher notes with a particular focus on the mathematical vocabulary associated with the topic.
- Where possible parallel tasks have been provided.
- Answers are given.

It is recommended when first using Check the Clues cards to either read out the instruction sheet or make copies for the students, as required.

Number Grid

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
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51	52	53	54	55	56	57	58	59	60
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Find My Number

Australian Curriculum Links

Cards A to D

Yr 2 (ACMNA026) Investigate number sequences, initially those increasing and decreasing by twos, threes, fives and ten from any starting point, then moving to other sequences.

Yr 3: (ACMMA051): Investigate odd and even numbers …

Yr 4: (ACMNA074): Investigate number sequences involving multiples of 3, 4, 6, 7, 8, and 9

Yr5:(ACMNA098): Identify and describe factors and multiples of whole numbers …

Cards E to J

Yr 2 (ACMNA028) Group, partition and rearrange collections up to 1000 in hundreds, tens and ones …

Yr 2 (ACMNA026) Investigate number sequences, initially those increasing and decreasing by twos, threes, fives and ten from any starting point, then moving to other sequences.

Yr 3: (ACMMA051): Investigate odd and even numbers …

Yr 4: (ACMNA074): Investigate number sequences involving multiples of 3, 4, 6, 7, 8, and 9

Cards K to T

Yr 2 (ACMNA026) Investigate number sequences, initially those increasing and decreasing by twos, threes, fives and ten from any starting point, then moving to other sequences.

Yr 3: (ACMMA051): Investigate odd and even numbers …

Yr 4: (ACMNA074): Investigate number sequences involving multiples of 3, 4, 6, 7, 8, and 9

Yr 4: (ACMNA075): Recall multiplication facts up to 10 × 10 and related **division** facts

Yr5:(ACMNA098): Identify and describe factors and multiples of whole numbers …

Yr 6: (ACMNA122): Identify and describe properties of prime, composite, square and triangular numbers.

The prime numbers are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97, 101, 103, 107, 109, 113.

Note: Triangular numbers are 0, 1, 3, 6, 10, 15, 21, 28, 36, 45, 55, 66, 78, 91, 105, 120.

Cards U to Z

Yr 6: (ACMNA122): Identify and describe properties of prime, composite, square and triangular numbers.

Yr 6: (ACMNA127) Find a simple fraction of a quantity where the result is a whole number …

Yr 7: (ACMNA158) Find percentages of quantities ….

Prior to

Students will have explored the number grid. Students may be asked to put their finger on a certain number and then subtract ten, add ten, add one etc. Play "I am thinking of a number" and have the students ask you questions to try to hunt the number down. For example, "Is it odd?", "Is it greater than …?" The number grid may be used to support the following tasks.

Reference

See pages 26 - 28 of Bana, J., Marshall, L., & Swan, P. (2014). *Maths Handbook for teachers and parents: Explaining mathematical content and proficiencies*. Perth: RIC Publications.

Find My Number A

It is
greater than
50.

Find My Number A

It is
less than
60.

Find My Number B

It is
more than
25.

What is the number?

Find My Number B

It is
less than
40.

Find My Number A

It is
even.

Find My Number A

When you **count in threes** you say the number.

What is the number?

Find My Number B

It is
odd.

Find My Number B

It is
a multiple of
9.

Find My Number C

It is
> 36.

Find My Number C

It is
< 60.

What is the number?

Find My Number D

It is
not more than 53.

Find My Number D

It is
not less than 36.

Find My Number C

It is
~~**even.**~~

Find My Number C

It is
a multiple of 7.

Find My Number D

It is
not odd.

What are my numbers?

Find My Number D

It is
a multiple of 8.

Find My Number E

It is
> 56.

Find My Number E

It is
≤ 96.

Find My Number F

It is
≥ 20.

What is the number?

Find My Number F

It is
< 60.

Find My Number E

The **ten's digit**

~~6,~~
~~7,~~
~~8.~~

Find My Number E

The **digit in the one's place** is 6.

What is the number?

Find My Number F

You say the number when you **count by sixes,** starting from zero.

Find My Number F

You say the number when you **count by fives,** starting from zero.

Find My Number G

The number is **between** 22 and 62.

Find My Number G

It is ~~**odd.**~~

What is the number?

Find My Number H

The number is **between** 40 and 71.

Find My Number H

When my number is **divided by five** there is a remainder.

Find My Number G

You say the number when you **count by 7**, starting from zero.

Find My Number G

You say the number when you **count by 3**, starting from zero.

Find My Number H

You say the number when you **count by 6**, starting from zero.

What is the number?

Find My Number H

You say the number when you **count by 4**, starting from zero.

Find My Number I

The number is
greater than
30.

Find My Number I

The number is
not more than
50.

Find My Number J

~~7~~
in the **ten's place**

What is the number?

Find My Number J

It is
> 40.

Find My Number I

You say the number when you **count from 3** in **fives**.
3, 8, 13, ...

Find My Number I

You say the number when you **count from 7** in **threes**.
7, 10, 13, ...

Find My Number J

You say the number when you **count forward** from 34 in sixes.

Find My Number J

You say the number when you **count back** from 120 in tens.

CC Find My Number K

The number is **divisible by eight** without leaving a remainder.

CC Find My Number K

4_.

What is the number ?

CC Find My Number L

They are **square numbers.**

CC Find My Number L

They are **even** numbers.

CC Find My Number K

You say the number when you **count forward in threes** from 21.

CC Find My Number K

You say the number when you **count back** from 66 **in sixes**.

CC Find My Number L

They are **<** 50.

What are the numbers?

CC Find My Number L

They are **two digit** numbers.

Find My Number M

My ten's digit is **smaller** than my one's digit.

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Find My Number M

The **sum** of my digits **is even.**

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Find My Number N

The **product** of my digits is 24.

What is the number ?

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Find My Number N

Two is a **factor** of my number.

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Find My Number M

I am a **two-digit** number.

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Find My Number M

If you **count back** from 94 **in eights**, you will say the number.

What is the number?

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Find My Number N

Four, five and six are **not factors** of the number.

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Find My Number N

If I **double the number** it would be **<** 90.

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Find My Number O

If I **added five** to the number it would be a **multiple of 10**.

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Find My Number O

The **sum** of my digits is **≥** 10.

What is the number?

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Find My Number P

The number is a **three-digit** number that appears on a 1 - 120 grid.

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Find My Number P

All of the digits are **different**.

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Find My Number O

If the **two digits** are **multiplied** the result is **even**.

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Find My Number O

There are two possible answers. Choose the **greater** of the two.

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Find My Number P

There is a **zero** in the **ten's place**.

What is the number?

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Find My Number P

When the numbers are **arranged** in **ascending order**, the number is the third from the right.

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Find My Number Q

The number is a **factor** of 90.

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Find My Number Q

It is **odd.**

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Find My Number R

The number is a **composite** number.

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Find My Number R

The number is **not** a **triangular number**. It is **not** a **square number**.

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Find My Number Q

The number is a **multiple of** 3. The **sum** of the digits **is nine**.

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Find My Number Q

It is a **two-digit** number, with the **least difference between** the digits.

What is the number?

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Find My Number R

The number is **not a multiple** of 11, 9, 5 or 2.

The number can be found on the 120 grid.

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Find My Number R

When **divided by three**, there will be a remainder.

What is the number?

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Find My Number S

I am **six more** than a **prime number**.

What is the number?

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Find My Number S

I am **not less** than 69 and **not more** than 120.

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Find My Number T

I am a **two-digit triangular** number and my two digits are **not the same**.

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Find My Number T

The digit **one does not appear** in my number.

What is the number?

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Find My Number S

I am **five less** than a **multiple of ten**.

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Find My Number S

When **arranged** in **descending order** I am the number in the **middle**.

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Find My Number T

The number is a **multiple of 3**.

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Find My Number T

When placed an **ascending order** the number will be in the **middle**.

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Find My Number U

I am a **square number**.

Write the number in words.

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Find My Number U

I can be found on the 1 to 120 grid.

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Find My Number V

$\sqrt{\text{number}}$ is a **single digit** number. Write the **answers in words**.

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Find My Number V

Three is **not a factor** of my number.

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Find My Number U

I am **divisible by three**.

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Find My Number U

No digits are repeated. My number is the larger of the two numbers that remain.

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Find My Number V

Two is **not a factor** of my number.

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Find My Number V

If you **cube the square root** of my number it will **end in the same digit** as my number.

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Find My Number W

$\frac{1}{2}$ of my number is **>** 44.

Find My Number W

Number ÷ 9 has **no remainder**.

Find My Number X

Let ***x*** be the value of the missing number.

I am **not** an **odd** number.

Find My Number X

$\frac{1}{3}$ ***x*** **<** 30

Find My Number W

$\frac{1}{3}$ of my number is **<** 40.

What is the number?

Find My Number W

Zero is **not** one of my digits.

Find My Number X

I am a **whole number**.

Write down any possible numbers that satisfy all of the criteria.

Find My Number X

The **product** of my digits is a **multiple** of 4.

I am the **furthest away** from a square number.

CC Find My Number Y

My number is **not** on the 120 chart, however, $^{1}/_{10}$ **of my number is**.

How many tens in my number ?

CC Find My Number Y

5% of my number lies **between** 41 and 49.

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CC Find My Number Z

If I call the value of my number 'x', then $x - 1$ = **even**.

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CC Find My Number Z

x^2 = **two-digit** number.

Write down the number and its square.

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CC Find My Number Y

If I call the value of my number 'n', then $n + 1$ = **odd**.

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CC Find My Number Y

If you **multiply** the digits of $^{1}/_{20}$ of my number the result is a **square number**.

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CC Find My Number Z

$x^2 < 50$

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CC Find My Number Z

Two numbers will remain. When you **square** the number the **ones digit** is the same.

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Vocabulary:

A: greater than, less than, even, multiple

B: more than, less than, odd, multiple

C: >, <, not even, multiple

D: not more/less than, odd, multiple

E: digit, >, ≤

F: ≥, <, count by ...

G: between, count by ..

H: between, divisible, count by ..

I: greater than, not more ..., count from ... in ...

J: more than, count forward/backward

K: no remainder, count forward/backward

L: square, even <, two-digit

M: even, sum, count back, two-digit

N: product, factor, not, double, less, <

O: multiple, sum, ≥, multiplied, greater

P: digit, place, ascending, third from right

Q: factor, not, multiple, sum, difference

R: composite, not, multiple, largest

S: prime number, not less, not more, multiple, descending.

T: triangular number,difference, multiple, ascending

U: more than, prime, not less/more than, descending

V: two-digit, triangular, multiple, ascending

W: remainder, various fractions, digit

X: 'x', product, digits, multiple, <

Y: fractions, percentages, variables, how many tens ...

Z: variables, 'x', squared

Answers:

A: 54

B: 27

C: 49

D: 40 and 48

E: 96

F: 30

G: 42

H: 48

I: 43

J: 100

K: 48

L: 16, 36

M: 46

N: 38

O: 85

P: 107

Q: 45

R: 119

S: 95

T: 45

U: eighty one (81)

V: one (1) and twenty five (25)

W: 117

X: 58

Y: 88 tens

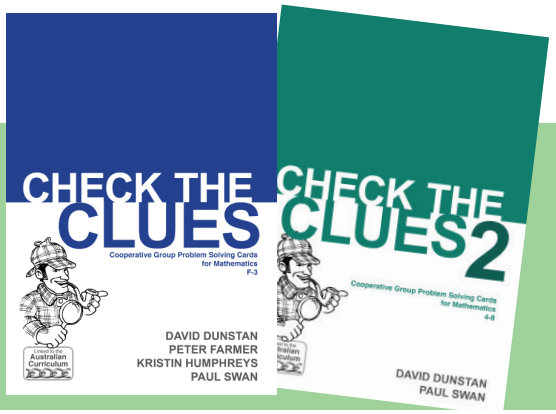
Z: 5 and 25

CHECK THE CLUES

Cooperative Group Problem Solving Cards for Mathematics

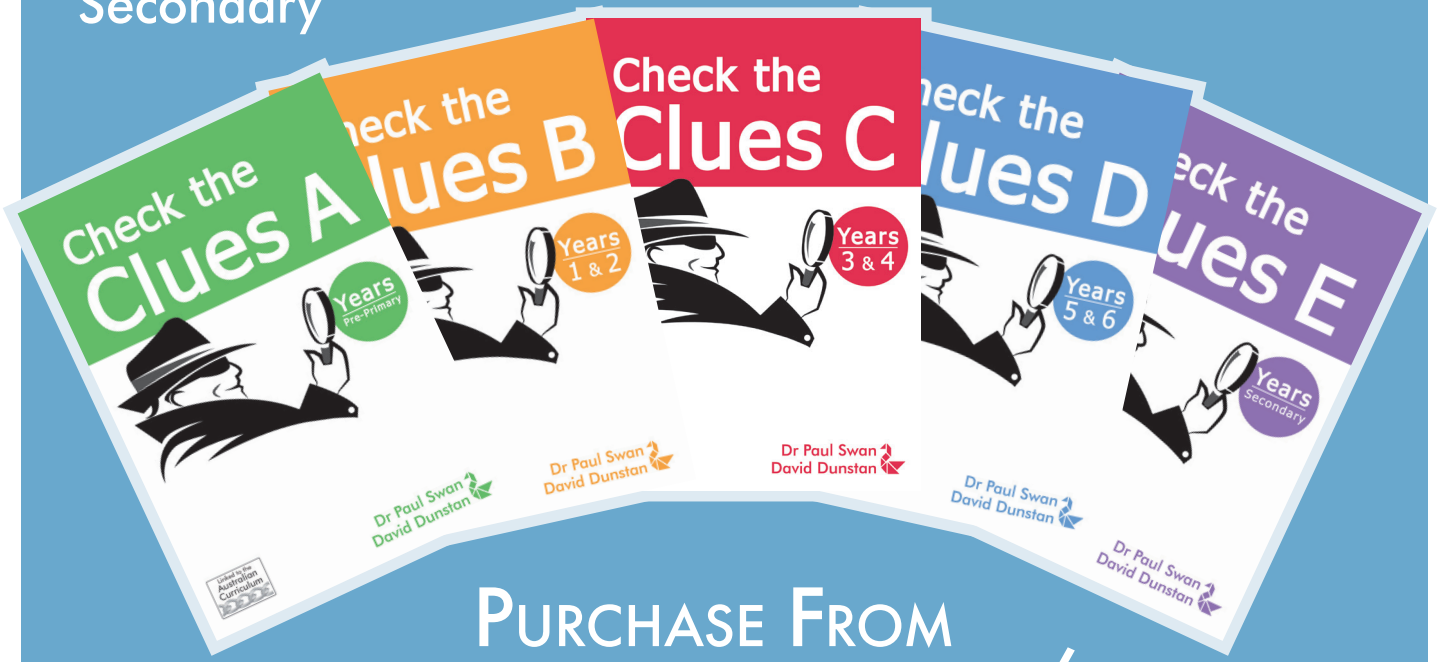
Original Series:

Check the Clues (F-3)
Check the Clues 2 (4-8)



New Series books:

Pre-Primary, Years 1 & 2, Years 3 & 4, Years 5 & 6 and Secondary



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Mathematics Manipulatives Manual

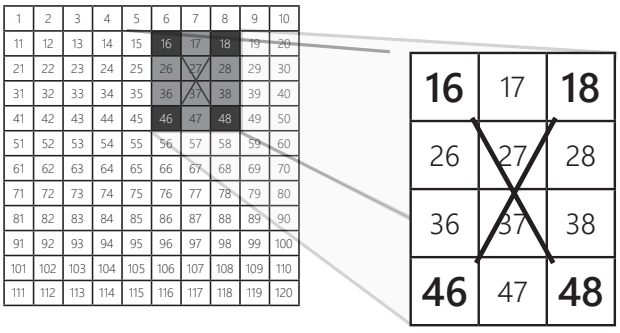
Numeracy with Number Boards

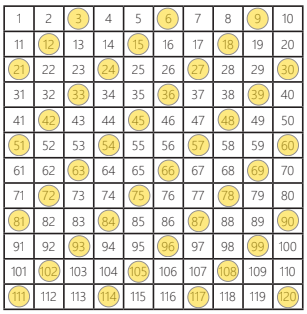
Linked to the Australian Curriculum

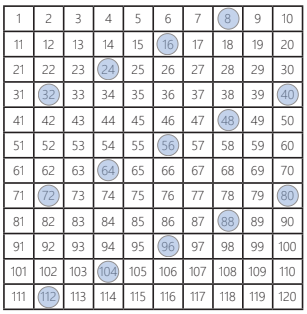
Dr Paul Swan

Numeracy with Number Boards:

Games and activities to make use of Number Boards.







Use **Check the Clues** and Number Boards to improve mathematical vocabulary and comprehension of word questions!