

Cooperative Group Problem Solving Cards for Mathematics
From Solving to Designing

Sample videos online at www.drpaulswan.com.au

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CHECK THE CLUES



**A Find My Number
Style Question Set**

SAMPLER 1 (YEARS 2 - 5)

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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

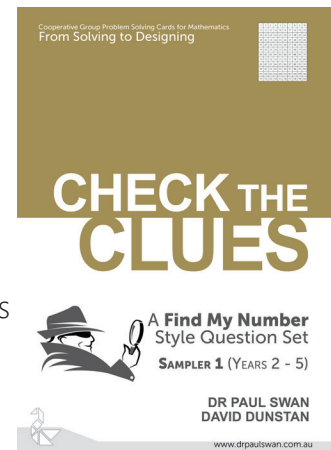
This publication was designed as a sampler to show how cooperative group problems may be used to develop mathematical literacy, that is, vocabulary and symbol recognition when solving word problems in mathematics. The word problems related to one ‘genre’, that of using clues to find solutions.

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

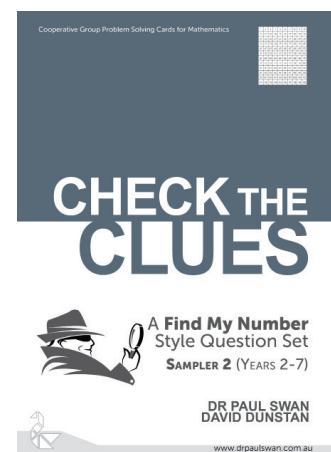
The first set has been created on larger cards and there is a pattern to the way that the cards have been written. This is deliberate. Teachers can point out the way that the clues have been written and then support their students to write their own clues. Some cards have been provided that include starter 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.



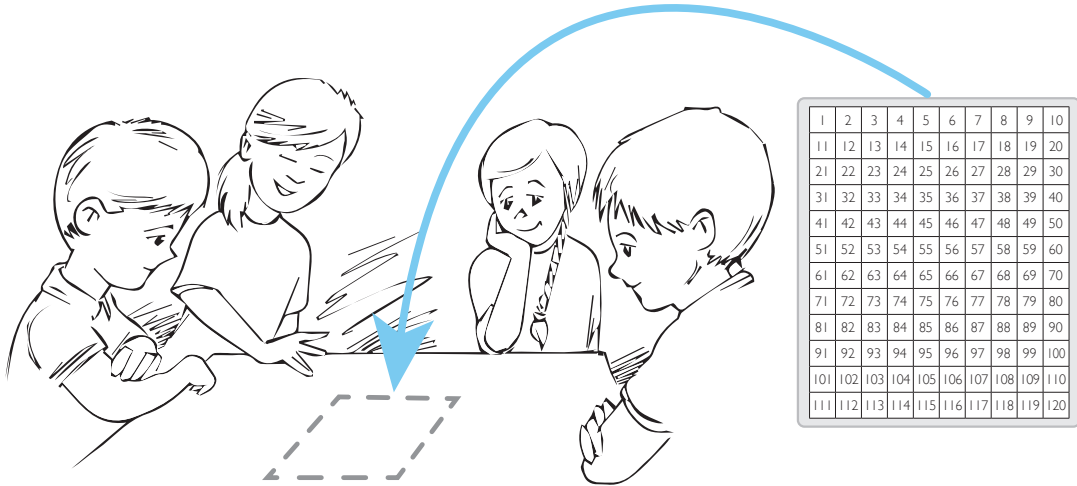
Teachers wishing to pursue the idea of cooperative group solving cards are directed to the following references.

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.

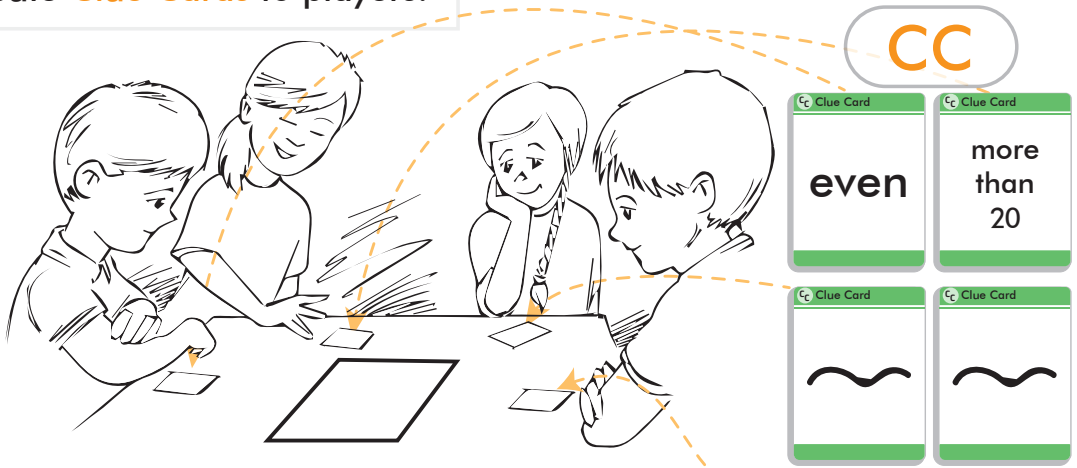
Dunstan, D., & Swan, P. (2015). Check the Clues 2: Cooperative group problem solving cards for mathematics, F – 3. Perth: A-Z Type.

Number Board based activities

1 Place the **Number Board** on the table.



2 Distribute **Clue Cards** to players.

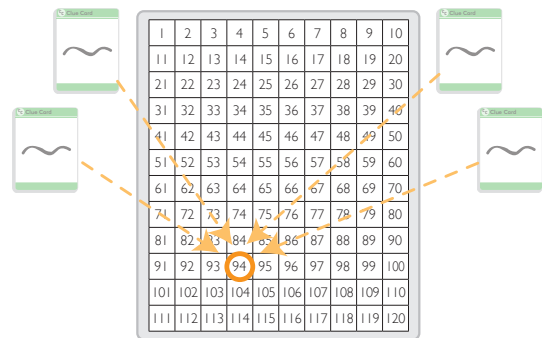
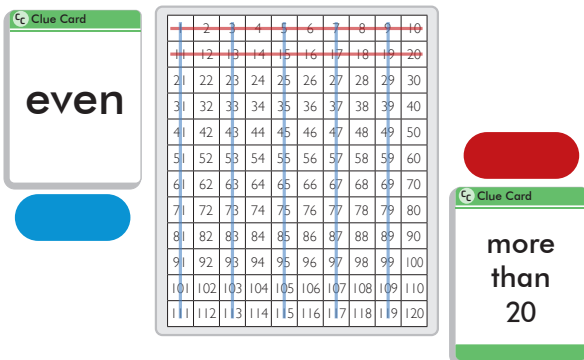


3 Read out your **Clue Card** to the other players.

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

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Vocabulary

above/below, backwards, bigger/smaller than, digits, divided, double, factor, greater/less than, in order, middle, more/less than, multiple, number, number names (one, two, three ... one hundred and twenty), prime number, product, remaining, same, size, solution, starting.

Australian Curriculum Links

Cards A - T

Yr 1: ACMNA012: Develop confidence with number sequences to and from 100 by ones from any starting point. Skip count by twos, fives and tens starting from zero.

Yr 1: ACMNA013: Recognise, model, read, write and order numbers to at least 100...

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 2: ACMNA027: Recognise, model, represent and order numbers to at least 1000.

Yr 2: ACMNA028: Group, partition and rearrange collections up to 1000 in hundreds, tens

Cards H onward

All the above and the following.

Yr 2: ACMNA030: Solve simple addition and subtraction problems using a range of efficient mental and written strategies.

Yr 3: ACMNA051: Investigate the conditions required for a number to be odd or even and identify odd and even numbers.

Yr 4: ACMNA071: Investigate and use the properties of 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.

Answers

A: 44

K: 45

B: 66

L: 66

C: 84

M: 8, 12

D: 36

N: 102, 120

E: 105

O: 56

F: 56

P: 48

G: 45

Q: 108

H: 110

R: 31

I: 20

S: 64, 82

J: 105

T: 30

C_C Find My Number A

The number is
bigger than

20.

Find the number.

C_C Find My Number A

The number is
smaller than

50.

C_C Find My Number A

If you count in twos
starting at zero you
say the number.

C_C Find My Number A

The number has a 4
in the ones place.

Of the three
remaining numbers,
the solution is the
biggest number.

C_C Find My Number B

The number is
bigger than
four tens.

C_C Find My Number B

The number is
smaller than
eight tens.

Find the number.

C_C Find My Number B

If you count in threes
starting at zero you
say the number.

C_C Find My Number B

Both digits are the
same.

C_C Find My Number C

The number is
more than

64.

C_C Find My Number C

The number is
less than

104.

C_C Find My Number C

If you count in fours
starting at zero you
say the number.

C_C Find My Number C

The tens digit is
double the size of
the ones digit.

Find the number.

C_C Find My Number D

The number is
more than

10.

C_C Find My Number D

The number is
less than

59.

C_C Find My Number D

If you count in sixes
starting at zero you
say the number.

C_C Find My Number D

Each digit is a
multiple of three.
There are no zeroes.

Find the number.

C_C Find My Number E

The number is
greater than

72.

C_C Find My Number E

The number is
less than

120.

C_C Find My Number E

If you count in
sevens starting at
zero you say the
number.

C_C Find My Number E

My digits add up to
six.

Find the number.

C_C Find My Number F

The number is
greater than

36.

C_C Find My Number F

The number is
less than

77.

Find the number.

C_C Find My Number F

If you count in eights
starting at zero you
say the number.

C_C Find My Number F

Of the five possible
numbers, the
solution is the middle
number.

C_C Find My Number G

The number is
 $> 17.$

C_C Find My Number G

The number is
 $< 64.$

C_C Find My Number G

If you count in nines starting at zero you say the number.

Find the number.

C_C Find My Number G

The number is also a multiple of five.

C_C Find My Number H

The number is
> 61.

C_C Find My Number H

The number is
< 121.

C_C Find My Number H

If you count in
elevens starting at
zero you say the
number.

C_C Find My Number H

The digits are NOT
all the same.

Find the number.

CC Find My Number I

The number is
between
12 and 72.

CC Find My Number I

The number is even.

CC Find My Number I

The number is a
multiple of five.

CC Find My Number I

The number that is
one fewer than the
solution is a prime
number with digits
adding to make 10.

Find the number.

C_C Find My Number J

The number is
between
99 and 118.

C_C Find My Number J

The number is odd.

Find the number.

C_C Find My Number J

The number is a
multiple of three.

C_C Find My Number J

When you multiply
the digits in the
number you are left
with zero.

C_C Find My Number K

The number is
NOT more than

82

and

NOT less than

17

C_C Find My Number K

The number is
NOT even.

C_C Find My Number K

The number is a
multiple of five.

Find the number.

C_C Find My Number K

The number can be
divided by nine.

CC Find My Number L

The number is
NOT more than

113

and
NOT less than

56

CC Find My Number L

The number is
NOT odd.

CC Find My Number L

The number is a
multiple of three.

CC Find My Number L

There are no digits
that are zero. The
digits are all the
same.

Find the number.

C_C Find My Number M

The number is

$$\geq 5.$$

Find the numbers.

C_C Find My Number M

The number is

$$\leq 37.$$

C_C Find My Number M

The number is a
multiple of 4.

C_C Find My Number M

Multiply the number
by ten and it will still
fit on the 120 chart.

C_C Find My Number N

The number is

$$\geq 72.$$

C_C Find My Number N

The number is

$$\leq 120.$$

Find the numbers.

C_C Find My Number N

The number is a
multiple of 6.

C_C Find My Number N

The numbers have
the same digits but in
a different order.

C Find My Number **O**

The number is
more than

$$19 + 15.$$

C Find My Number **O**

The number is
less than

$$75 + 12.$$

C Find My Number **O**

The number is a
multiple of 7.

Find the number.

C Find My Number **O**

The number is even
and its digits are in
order as you would
count them. That is,
the ones digit is one
more than the tens
digit.

C_C Find My Number P

The number is
greater than
 $7 + (3 \times 7)$.

C_C Find My Number P

The number is
less than
 $25 +$
Double 25.

C_C Find My Number P

The number is a
multiple of 8.

C_C Find My Number P

The tens digit is half
of the ones digit.

Find the number.

C_C Find My Number Q

The number is
more than

$$68 + 22.$$

Find the number.

C_C Find My Number Q

The number is
less than

$$58 + 52.$$

C_C Find My Number Q

The number is a
multiple of 9.

C_C Find My Number Q

The number has
three digits.

C_C Find My Number R

The number is
greater than

$$3 \times 7.$$

C_C Find My Number R

The number is
less than

$$11 \times 6.$$

Find the number.

C_C Find My Number R

If you count
backwards from 79
in fours, you say the
number.

C_C Find My Number R

The product of the
digits is 3.

C_C Find My Number S

The number is
above

$$7 \times 8.$$

C_C Find My Number S

The number is
no more than

$$9 \times 11.$$

C_C Find My Number S

If you count
backwards from 106
in sixes you say the
number.

Find the numbers.

C_C Find My Number S

The numbers are
even numbers whose
digits add to ten.

C_C Find My Number T

The number is
NOT less than

$$9 \times 3.$$

C_C Find My Number T

The number is
less than

$$9 \times 7.$$

C_C Find My Number T

If you count
backwards from 65
in sevens you say the
number.

C_C Find My Number T

The number has a
factor of six.

Find the number.

Encourage Writing

Once students become familiar with the style of this type of Clue Card they can write their own. The following pages contain question stems or prompts for the students to complete. To begin with, encourage the students to use the following list of words:

above/below, backwards, bigger/smaller than, digits, divided, double, factor, greater/less than, in order, middle, more/less than, multiple, number, number names (one, two, three ... one hundred and twenty), prime number, product, remaining, same, size, solution, starting.

Eventually students can create their own cards by beginning with the answer and working backwards to write the clues.

CC

The number is bigger
than

CC

The number is
smaller than

CC

If you count in

starting at zero, you
say the number

CC

Cc

The number is
>

Cc

The number is
<

Cc

If you count back in

starting at ____, you
say the number

Cc

CC

The number is
more than





CC

The number is
less than

CC

The number is a
multiple of

CC

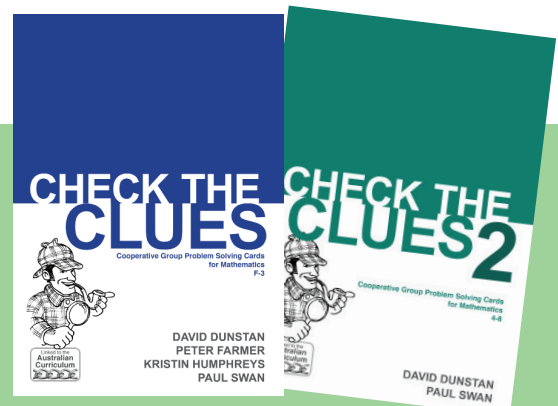
	
	

CHECK THE CLUES



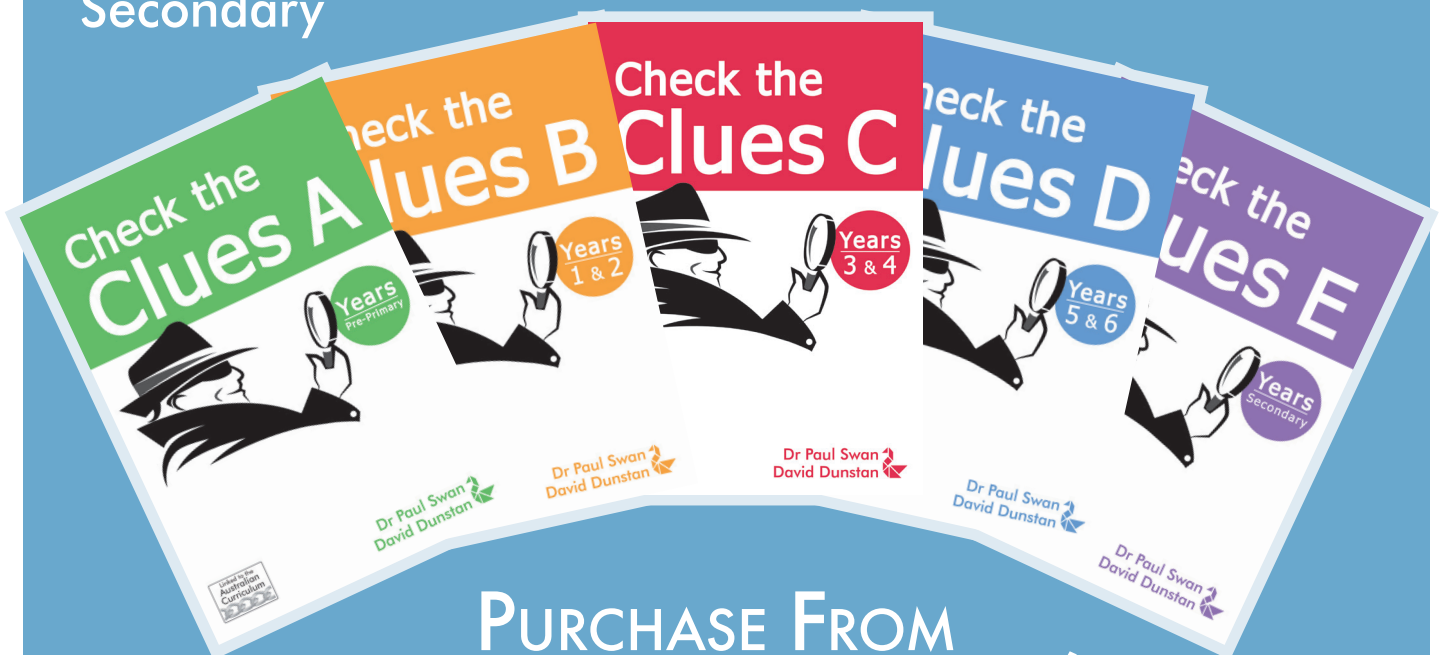
Cooperative Group Problem Solving
Cards for Mathematics

Original Series:
Check the Clues (F-3)
Check the Clues 2 (4-8)



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Pre-Primary, Years 1 & 2, Years 3 & 4, Years 5 & 6 and
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Mathematics Manipulatives Manual

Numeracy with Number Boards

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Dr Paul Swan

Numeracy with Number Boards:
Games and activities to make use of Number Boards.

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