



YUMI DEADLY CENTRE
School of Curriculum

Enquiries: +61 7 3138 0035




Email: ydc@qut.edu.au

<http://ydc.qut.edu.au>

Professional Learning 3

Addition and Subtraction

Booklet 3.1: Concept of Addition



Queensland University of Technology Australian Catholic University Queensland Government
Education Queensland

Sustainable mathematics education capacity building: Empowering Indigenous teacher aides to enhance rural and remote Indigenous students' numeracy outcomes

This project is funded by an Australian Research Council Linkage Project grant with support from Education Queensland (EQ)

DEADLY MATH TUTORS PROGRAM
Professional Learning 3: Addition and Subtraction
TRIAL PACKAGE 1
CONCEPT OF ADDITION

This booklet prepared by Professor Tom Cooper
for
Deadly Maths Tutors Research Team:

Dr Annette Bature	Assoc Prof Elizabeth Warren
Prof Tom Cooper	Ms Denise Peck
Mr Warwick Collins	ACU
QUT	

and
Contributing EQ Organisations

Mount Isa EQ Regional Office	Morrington Island State School
Boulia State School	Sunset State School
Burketown State School	Urundangi State School
Dajarra State School	Indigenous Education and Training Alliance (IETA)
Doomadgee State School	

YuMi Deadly Maths
Past Project Resource

Acknowledgement

We acknowledge the traditional owners and custodians of the lands in which the mathematics ideas for this resource were developed, refined and presented in professional development sessions.

YuMi Deadly Centre

The YuMi Deadly Centre is a Research Centre within the Faculty of Education at Queensland University of Technology which aims to improve the mathematics learning, employment and life chances of Aboriginal and Torres Strait Islander and low socio-economic status students at early childhood, primary and secondary levels, in vocational education and training courses, and through a focus on community within schools and neighbourhoods. It grew out of a group that, at the time of this booklet, was called “Deadly Maths”.

“YuMi” is a Torres Strait Islander word meaning “you and me” but is used here with permission from the Torres Strait Islanders’ Regional Education Council to mean working together as a community for the betterment of education for all. “Deadly” is an Aboriginal word used widely across Australia to mean smart in terms of being the best one can be in learning and life.

YuMi Deadly Centre’s motif was developed by Blacklines to depict learning, empowerment, and growth within country/community. The three key elements are the individual (represented by the inner seed), the community (represented by the leaf), and the journey/pathway of learning (represented by the curved line which winds around and up through the leaf). As such, the motif illustrates the YuMi Deadly Centre’s vision: *Growing community through education*.

More information about the YuMi Deadly Centre can be found at <http://ydc.qut.edu.au> and staff can be contacted at ydc@qut.edu.au.

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School of Curriculum
QUT Faculty of Education
S Block, Room S404, Victoria Park Road
Kelvin Grove Qld 4059
Phone: +61 7 3138 0035
Fax: + 61 7 3138 3985
Email: ydc@qut.edu.au
Website: <http://ydc.qut.edu.au>

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Queensland University of Technology,
Australian Catholic University &
Education Queensland

Deadly Maths Tutor Program

PROFESSIONAL LEARNING 3: ADDITION & SUBTRACTION

BOOKLET 3.1 CONCEPT OF ADDITION 2008

Research Team:
Prof Tom Cooper
Dr Annette Baturo
Mr Warwick Collins
Assoc Prof Elizabeth Warren
Ms Denise Peck

Contributing EQ Organisations:

Mount Isa EQ Regional Office	Mornington Island State School
Boulia State School	Sunset State School
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Doomadgee State School	(IETA)

Deadly Maths Group
School of Mathematics, Science and Technology Education,
Faculty of Education, QUT

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OVERVIEW

PURPOSE

These materials were designed to be used in conjunction with a Professional Learning program for teacher aides. The objective of this Professional Learning was to empower teacher aides to enhance rural and remote Indigenous students' numeracy outcomes. This document contains the materials of the first of five different booklets on addition and subtraction.

If your school would like to receive a YuMi Deadly Maths Professional Learning program please contact the YuMi Deadly Centre (YDC) on: 07 3138 0035 or ydc@qut.edu.au.

DIRECTIONS

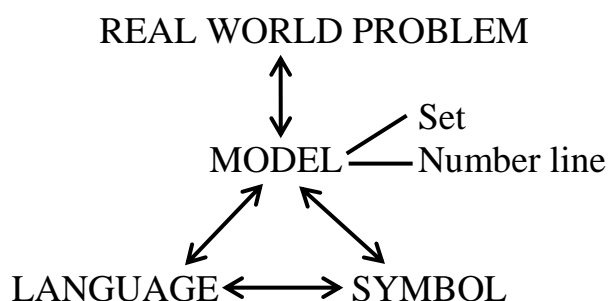
(1) Interviewing the students:

Pick one or more students who appear to be having trouble understanding addition. Interview these students using the interview schedule and the materials. Mark what they do and put their results on the Student Recording Sheet.

(2) Trialling the student activities:

Use the Recording Sheet to work out the activities the students need to do and trial these activities with the students (with each student one at a time or with a group of students). Keep a record of what happens and collect the students' work.

The activities AC1 to AC4 are based on the Rathmell Triangle Relationship below. The idea is to teach students to relate real world problems to set and number line models and to language and symbols and vice versa – switching from one representation to the other – in all directions.



INTERVIEW

INTERVIEW SCHEDULE

MATERIALS

Unifix cubes, deck of playing cards, washable felt pen, pen, paper

Materials with this interview: cards, number tracks, number lines

Student recording sheet

DIRECTIONS

1. Photocopy and laminate attached card, number track and number line pages.
2. Gather other material.
3. Place material in front of students. Give students pen and paper to write with.
4. Tell the students you are trying to find out what they know. Say they are not expected to know it and you will teach what is not known.
5. Give the student directions slowly – read problems. Do not give hints. If student cannot do a question, pass on to the next question.
6. Allow students to use material and make drawings but only after they say they do not know how to do it with symbols alone.

Concept of addition

A1

Show and read the problem on Card 1

- Say: *Act out what the problem is doing with the Unifix cubes.*
- Say: *Draw what the problem is doing in some way. Use circles for fish.*

A2

Show and read Card 2.

- Say: *What if I changed the problem to this?* [Card 2]
- Say: *Act out what this new problem is doing with the Number Track.*
- Say: *Draw what the new problem is doing on a number line.*

A3

Say: *Say the problem.*

If cannot say the problem formally as “three plus/add two equals 5”, say: *Say the problem using the words “add”, “equals”, “three” and “two”.*

A4

Say: *Write the problem in symbols.*

A5

Show Card 3.

Say: *Read the number sentence (or sum).*

A6

- Say: *Draw what the number sentence is doing in some way using circles to show the numbers.*
- Say: *Act out what the problem is doing with counters.*

A7

- Say: *Draw what the number sentence is doing with a number line.*
- Say: *Act out what the number sentence is doing with a Number Track.*

A8

Say: *Make up a story that says what the number sentence is doing.*

INTERVIEW MATERIAL**CARDS**

CARD 1

I had 2 fish, I caught 3 more,
how many fish do I have?

CARD 2

I ran 2 blocks, I ran
another 3 blocks, how
many blocks did I run?

CARD 3

$$\begin{array}{r} 4 \\ + 2 \\ \hline 6 \end{array}$$

NUMBER TRACKS

1	2	3	4	5	6	7	8	9	10	11	12	13
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STUDENT RECORDING SHEET

Name: _____

School/Class: _____

Interview item	Result (✓, ✗)	Comments	Activities to be completed if incorrect
A1: addition problem → set activities/ drawing			AC1
A2: addition problem → number line activities/drawing			AC2
A3: addition problem → addition language			AC3
A4: addition problem → addition symbols			AC4
A5: addition symbols → addition problem			AC4
A6: addition language → addition problem			AC3
A7: number line activities/drawing → addition problem			AC2
A8: set activities/drawing → addition problem			AC1

ACTIVITIES

ACTIVITY AC1

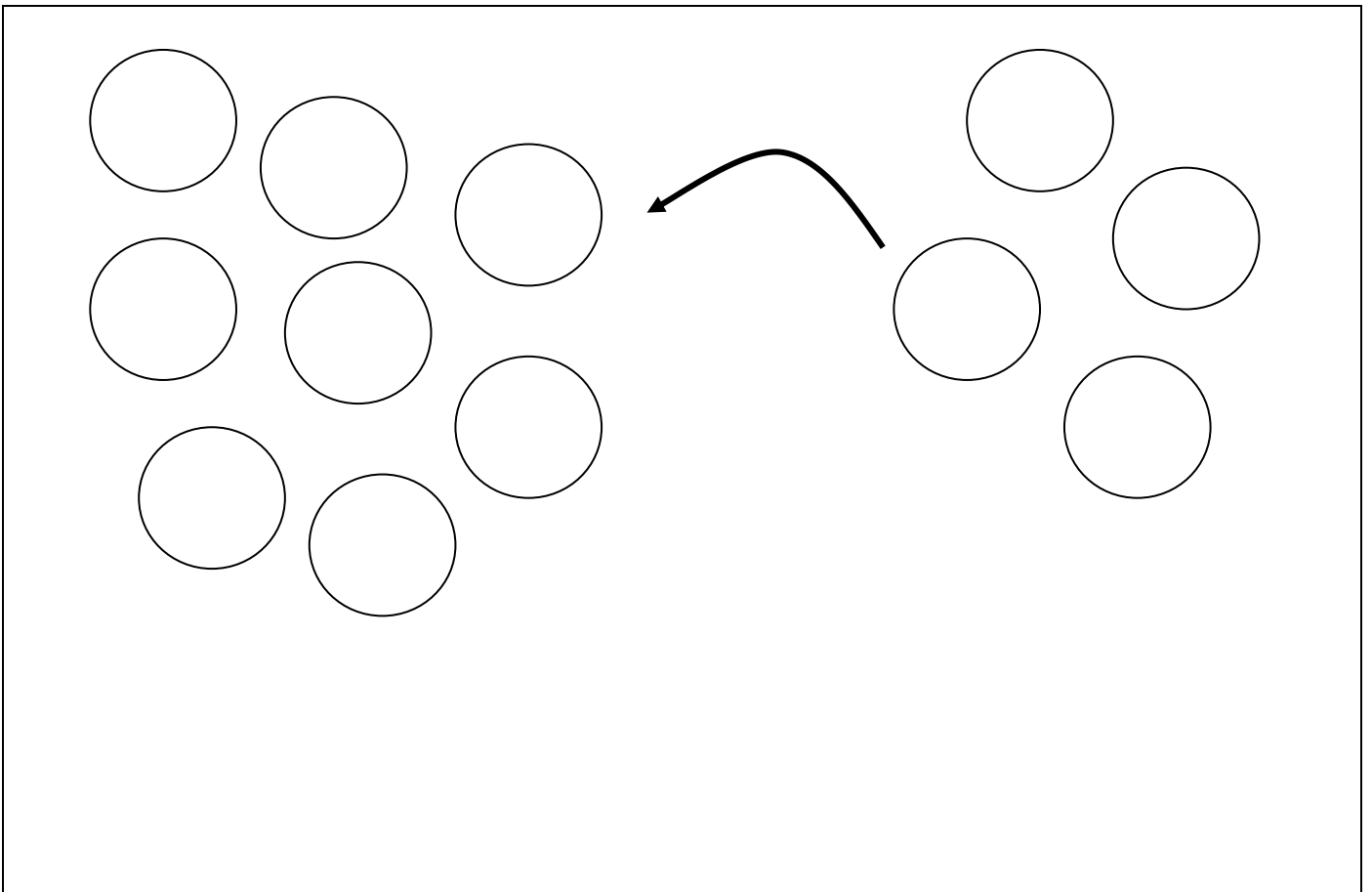
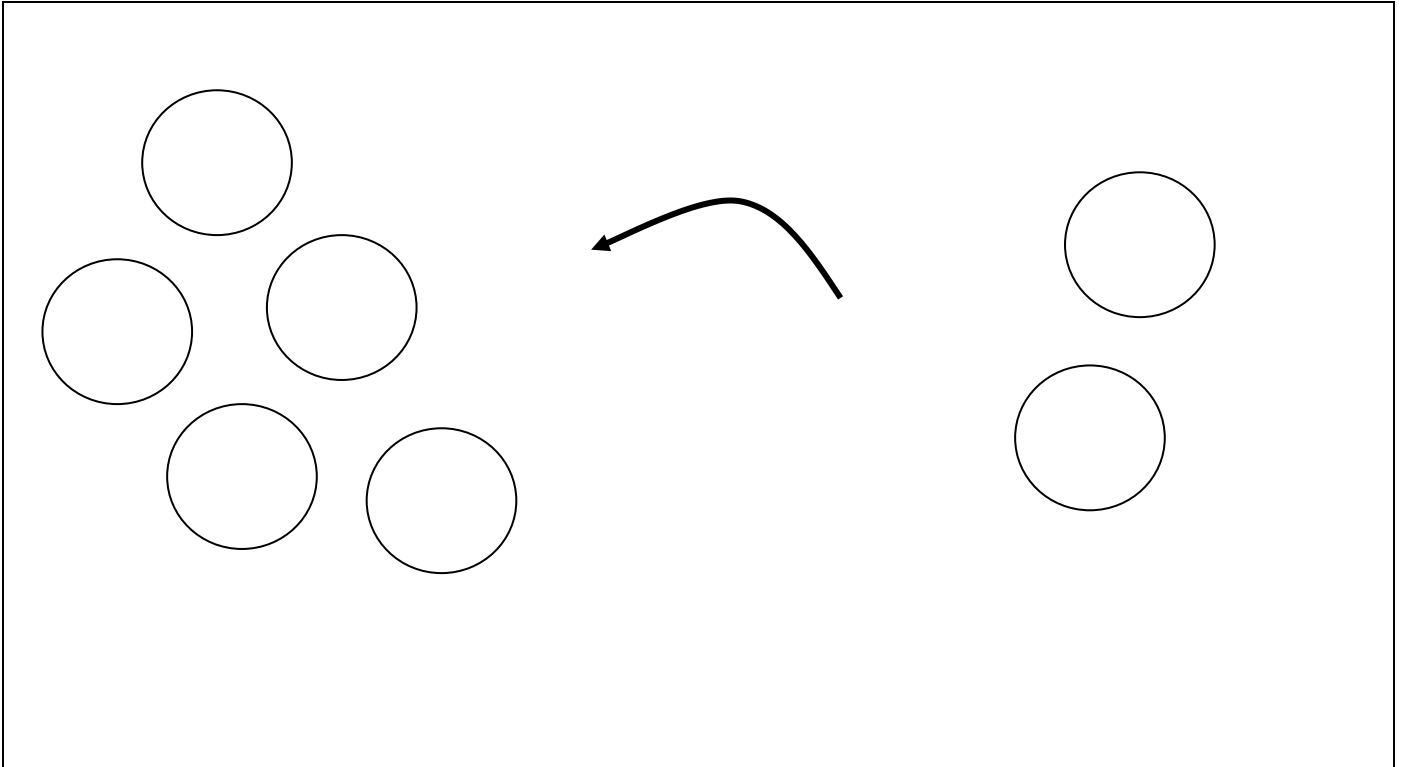
[Addition problem \leftrightarrow set activities/drawing]

Materials: Unifix, pen, paper, objects (pens, shells etc. – better if natural and local), material attached (worksheet, game directions, gameboard)

Directions:

1. Tell a story, acting it out as you go. *I have three (objects) and I pick up two more. How many (objects) do I have?*
2. Act out the story again for the students. Ask them to follow you with their counters.
Ask: How many (objects) did I start with? State: Show me these with your counters.
Ask: How many (objects) did I pick up? State: Show me these with your counters.
State: Join your counters as I pick up the (objects). Ask: How many counters do you now have?
3. Ask students to act out the story again with their counters. *Ask: How many did I start with? How many could I pick up? How many in total?*
4. Ask students to draw the activity with circles to show the numbers. If needed, ask:
What did we do with the counters? How can we draw this activity? What happens to the parts? How can we show this on the drawing? Discuss the drawings. *Ask: Please tell me the story pointing to your drawing as you go.*
5. Tell a new story: *I have 5 (objects) and I pick up 3 more. How many objects do I have?*
Ask: Act this out with your counters. Ask: Draw the counters.
6. Show students worksheet. *State: The circles are objects. The arrow means they are joining.* *Ask: Act this out with counters. Ask: Make up a story that this drawing is telling.*
7. Repeat step 6 for the second drawing on worksheet.
8. Complete Game Addition 'Two Up'

AC1 – Worksheet



AC1 – Game: Addition ‘Two Up’

Materials: 2 dice, unifix cubes (one colour for each player)

Number of players: 2-4

Directions:

- 1) Players in turn throw 2 dice
- 2) Dice added by counting dots
- 3) Players put unifix cube of their colour on board to cover addition sum.
- 4) If number already covered by opponent, then player places unifix over top of opponent's.
- 5) Winner is first with 3 in a row (across, down, or diagonal)

AC1 – ‘Two Up’ Addition Board

11	4	10
3	7	6
5	9	7
12	2	8

ACTIVITY AC2

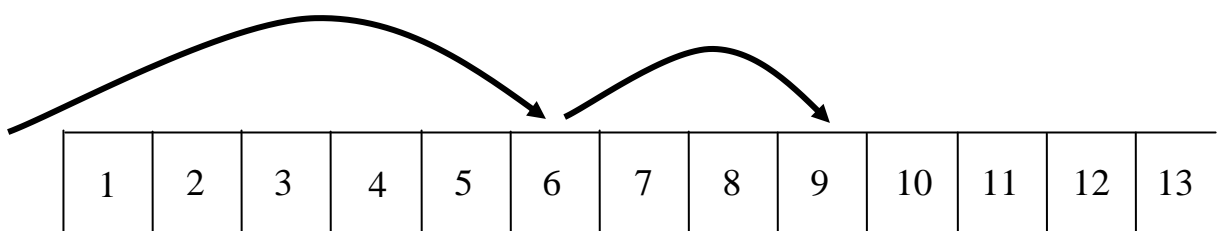
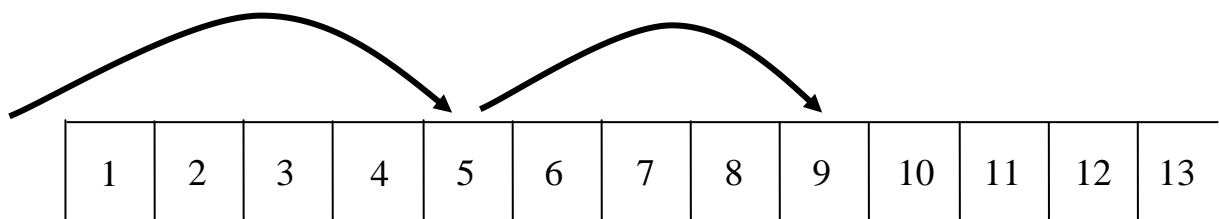
[Addition problem \leftrightarrow number line activities/drawing]

Materials: Large number track on floor, pen, paper, materials attached (worksheet, game directions, gameboard)

Directions:

1. Make up a large number track. Put each number 1 to 12 on a sheet of A4 paper. Lay the numbers out on floor so children can walk beside them counting as they go.
2. Tell a story: acting it out as you go. *I ran three blocks and I ran another two blocks. How many blocks did I run?*
3. Act out the story again for the students on the large number track. Ask: *How many blocks did I run first?* [3] State: *Step this out.* Ask: *How many blocks did I then run?* [2] State: *Step this out from the 3.* Ask: *How many blocks have I now run?* [5]
4. Ask students to “walk” the story on a small number track. Ask: *How many did I walk first? How many did I walk second? How many in total?*
5. Ask students to draw the activity with a number line to show the problem. If needed, ask: *What did we do first? Second? How can we draw these steps? What happens to these steps? How can we show this on the drawing?* Discuss the drawing. Ask: *Please tell me the story pointing to your drawing as you go.*
6. Tell a new story: *I walk 5 blocks and then 3 more.* Ask: *Act this out with a number track.* Ask: *Draw the walk.*
7. Show students worksheet. State: *The arrows show the blocks run. Put end to end means the walks are joined.* Ask: *Act this out on large number track.* Ask: *Make up a story that this drawing is telling.*
8. Repeat step 6 for the second drawing on worksheet.
9. Complete Game *Addition Racetrack*

AC2 – Worksheet



AC2 – Number Tracks

1	2	3	4	5	6	7	8	9	10	11	12	13
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1	2	3	4	5	6	7	8	9	10	11	12	13
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1	2	3	4	5	6	7	8	9	10	11	12	13
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1	2	3	4	5	6	7	8	9	10	11	12	13
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1	2	3	4	5	6	7	8	9	10	11	12	13
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AC2 – Game: Addition Racetrack

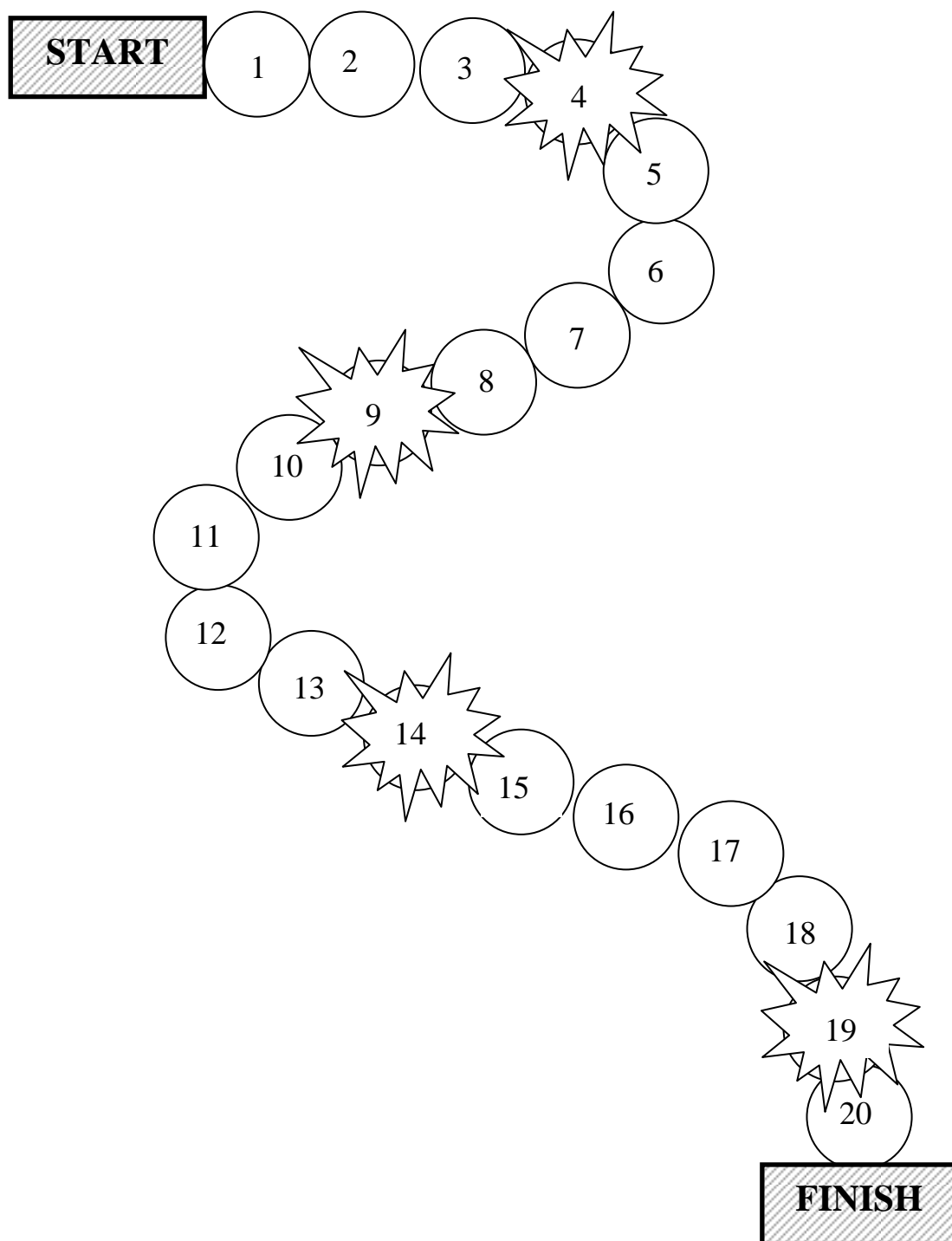
Materials: Addition Racetrack Board, 1 die

Number of players: 2-4

Directions:

- 1) Throw die and move forward amount shown
- 2) If land on star move back 2
- 3) First to the end, wins

AC2 – Addition Racetrack Board



ACTIVITY AC3

[Addition problem \leftrightarrow addition language]

Materials: Counters, pen, paper, 8 objects (pens, shells, etc.), number tracks (see AC2), Attachments (addition big & small race track board, addition cards)

Directions:

1. Tell a story: acting it out with imaginary people as you go. *Jack had 3 (objects), Fred gave him 5 more. How many does Jack have?*
2. Recap how to act this out with counters and to draw it with circles or other shapes. Ask as they do this: *How many did Jack have? How many did Fred give him? How many does Jack have now? Then move on to: What was Jack's part? What was Fred's part? How many in total?*
3. Ask students to state the story in language. If difficulty, ask: *How many did Jack have? [three] How many did Fred give him? [five] What do we call joining? [add] How many in total? [eight] What do we call making a total? [equals] Say this: Three add five equals eight.* Get students to point at the counters as they say the language.
4. Tell a new story: *Jack walked 4 blocks. Then he walked 6 more blocks. How many blocks did Jack walk?* Ask students to act it out with a number track (get track from AC2). Ask the students to say this with language.
5. Say: *Three add four equals 7.* Act this out with unifix and draw a drawing for it. Ask: *Make up a story that gives this sum.*
6. Repeat this for: *Four plus five equals 9*, but use a number track not unifix to act it out (get track from AC2). Again, ask: *Make up a story that gives this sum.*
7. Play the attached addition card games – Addition Big & Small, Addition Snap, Addition Rummy.

AC3 – Addition Card Games**Addition Big and Small**

Materials: Deck of cards numbers 1, 2 & 3, Deck of cards numbers 7, 8 & 9,
Racetrack Board, unifix cubes (one to a player)
(Print the cards in two different colours – to make two “suits”)

Number of players: 2-3

Directions:

- 1) Shuffle both card decks. Players in turn, select one card from each deck and use the pictures to add the cards.
- 2) Players score points as per table (at right) and move the number of steps scored with unifix on Racetrack Board.
- 3) First player to finish wins.

<u>SUM</u>	<u>SCORE</u>
8	1 point
9	2 points
10	3 points
11	2 points
12	1 point

Addition Snap

Materials: Deck of addition cards (without symbol cards)

Number of players: 2

Directions:

- 1) Shuffle the operation cards. Deal out all cards.
- 2) In turn play cards. First to call snap when two cards show the same operation wins a point.
- 3) The player with the most points wins when all cards played.

Addition Rummy

Materials: Deck of addition cards (without symbol cards)

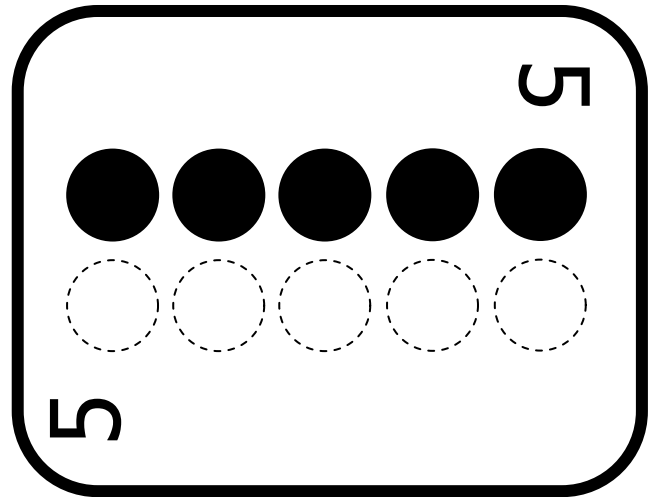
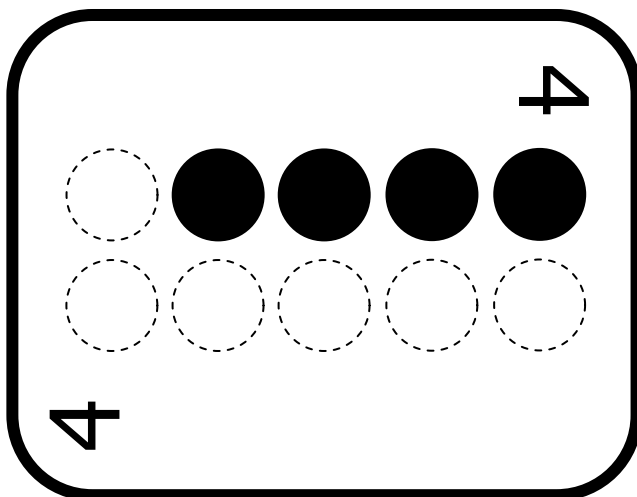
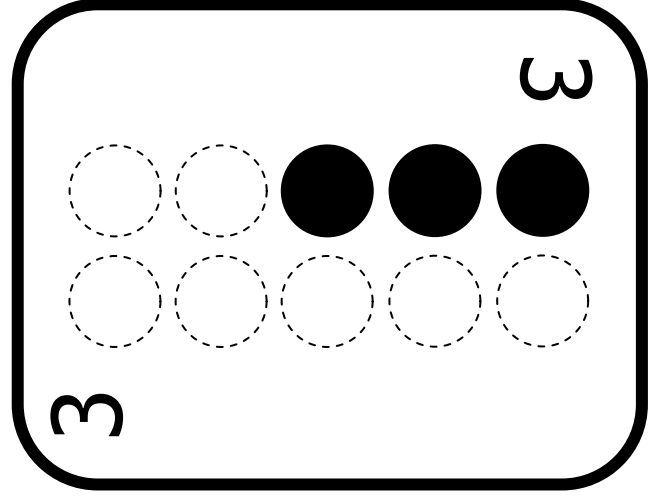
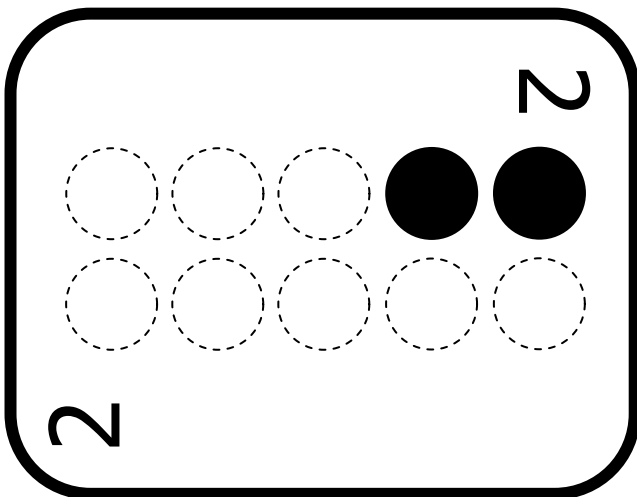
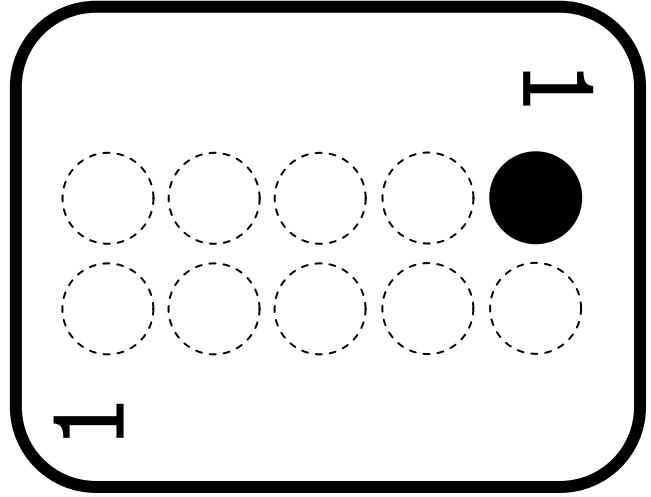
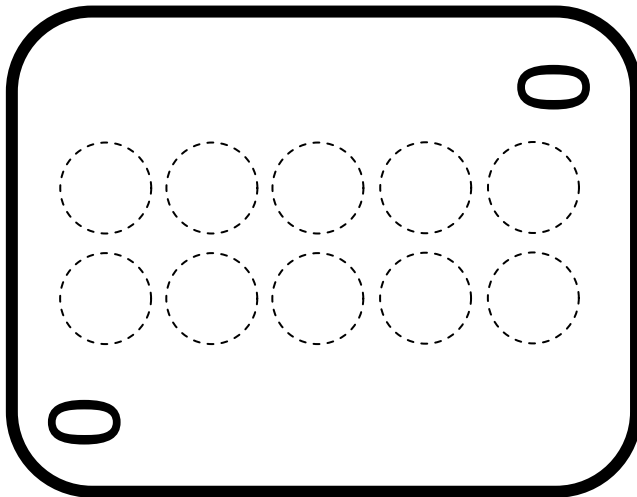
Number of players: 2-4

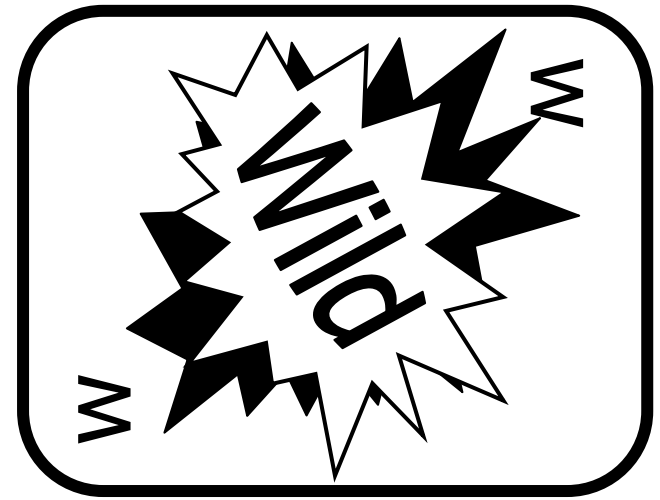
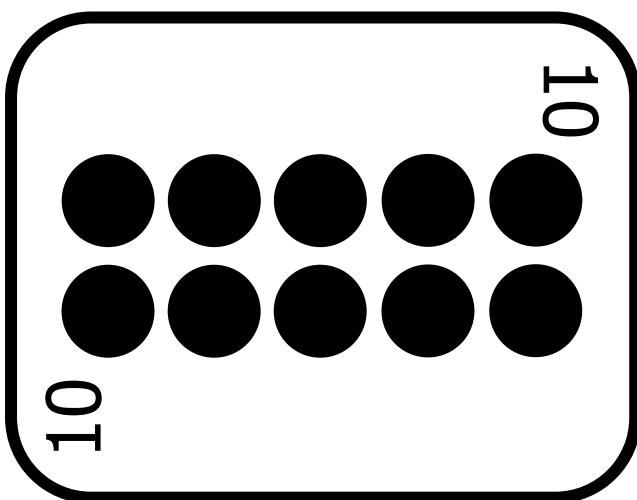
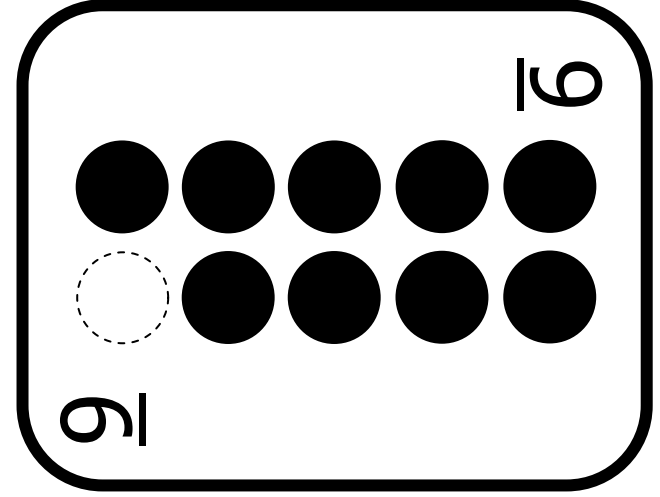
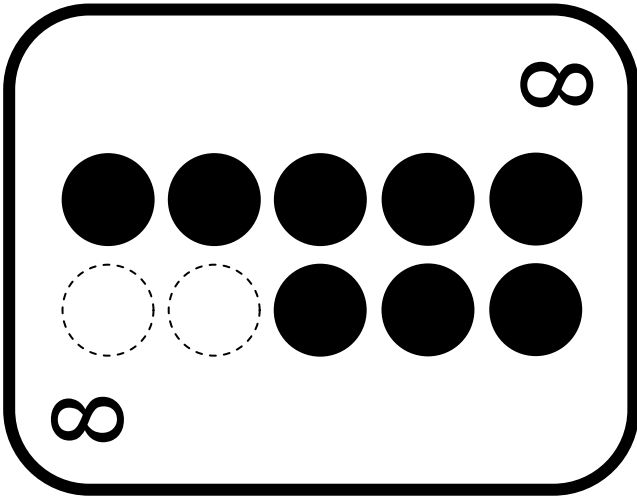
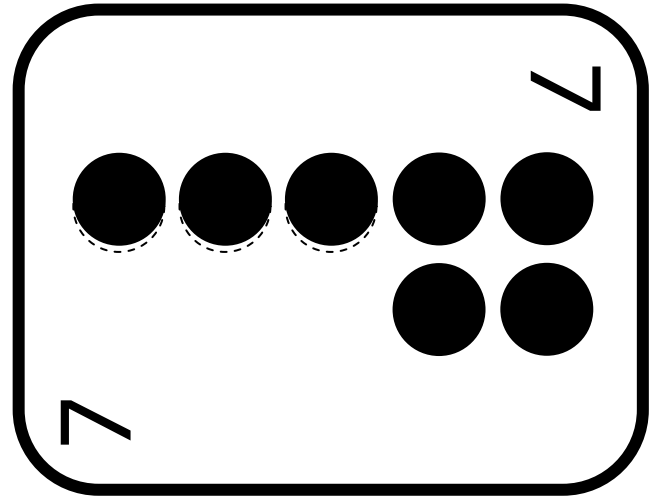
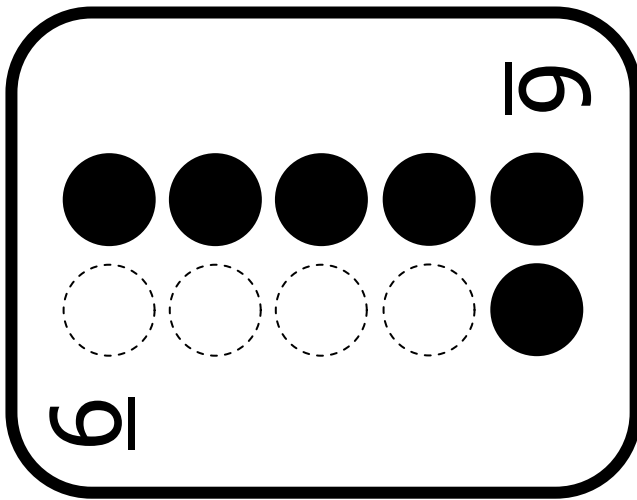
Directions:

- 1) Shuffle the operation cards. Deal out 7 cards to each player. Remaining cards face down in middle with one card face-up beside deck. Players put out any doubles or triples.
- 2) Players in turn pick up a card (either the top face-up card or face-down card) and place a card face-up on the face-up pile. Doubles and triples are put out as they are formed.
- 3) The winner is the first player to put out all their cards as doubles and triples.
- 4) Note: Can introduce other gin rummy rules.

AC3 – Card Deck

(Photocopy two pages 4 times on different coloured paper to make 48 cards in total – 4 “suits” of 12 cards each)



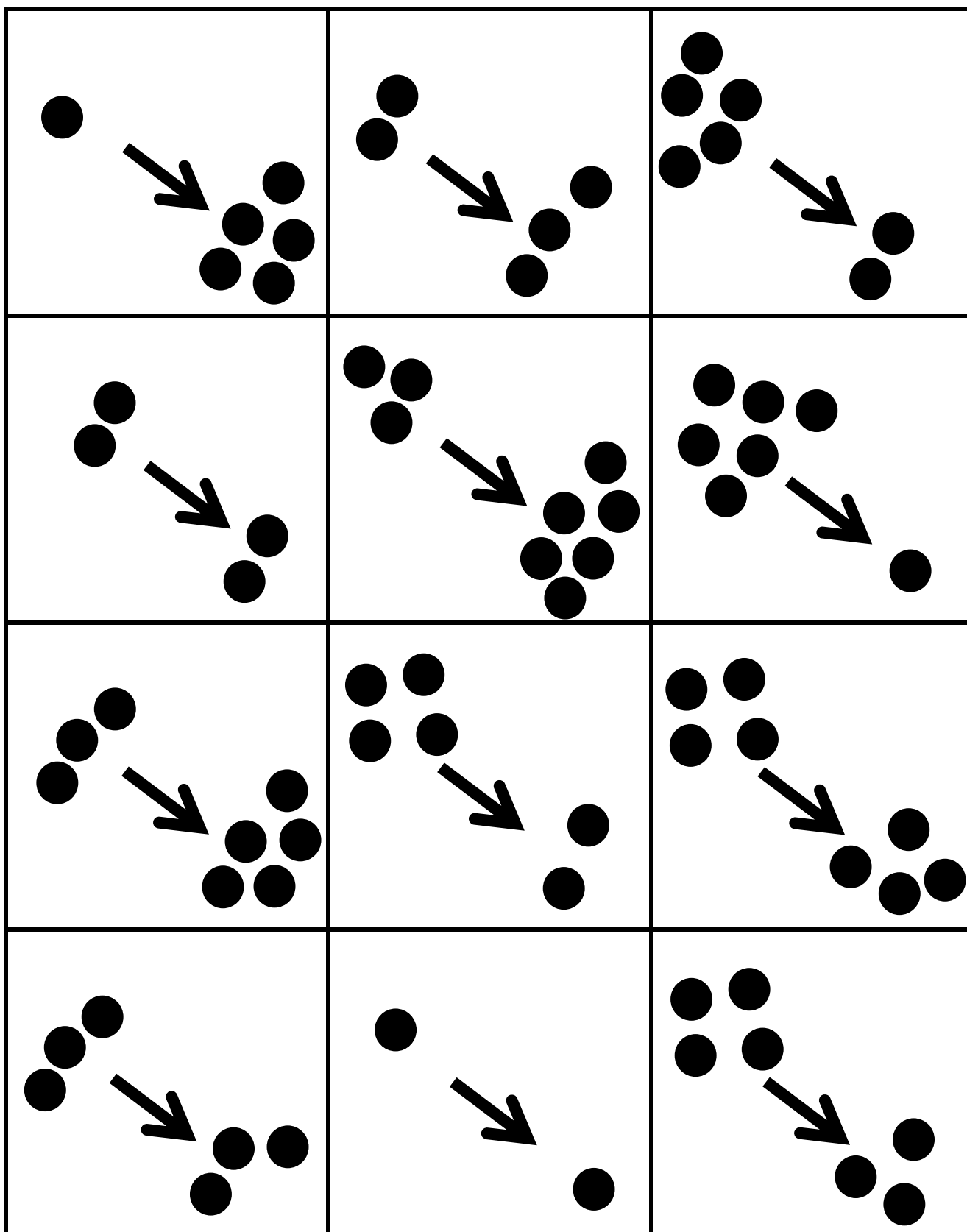


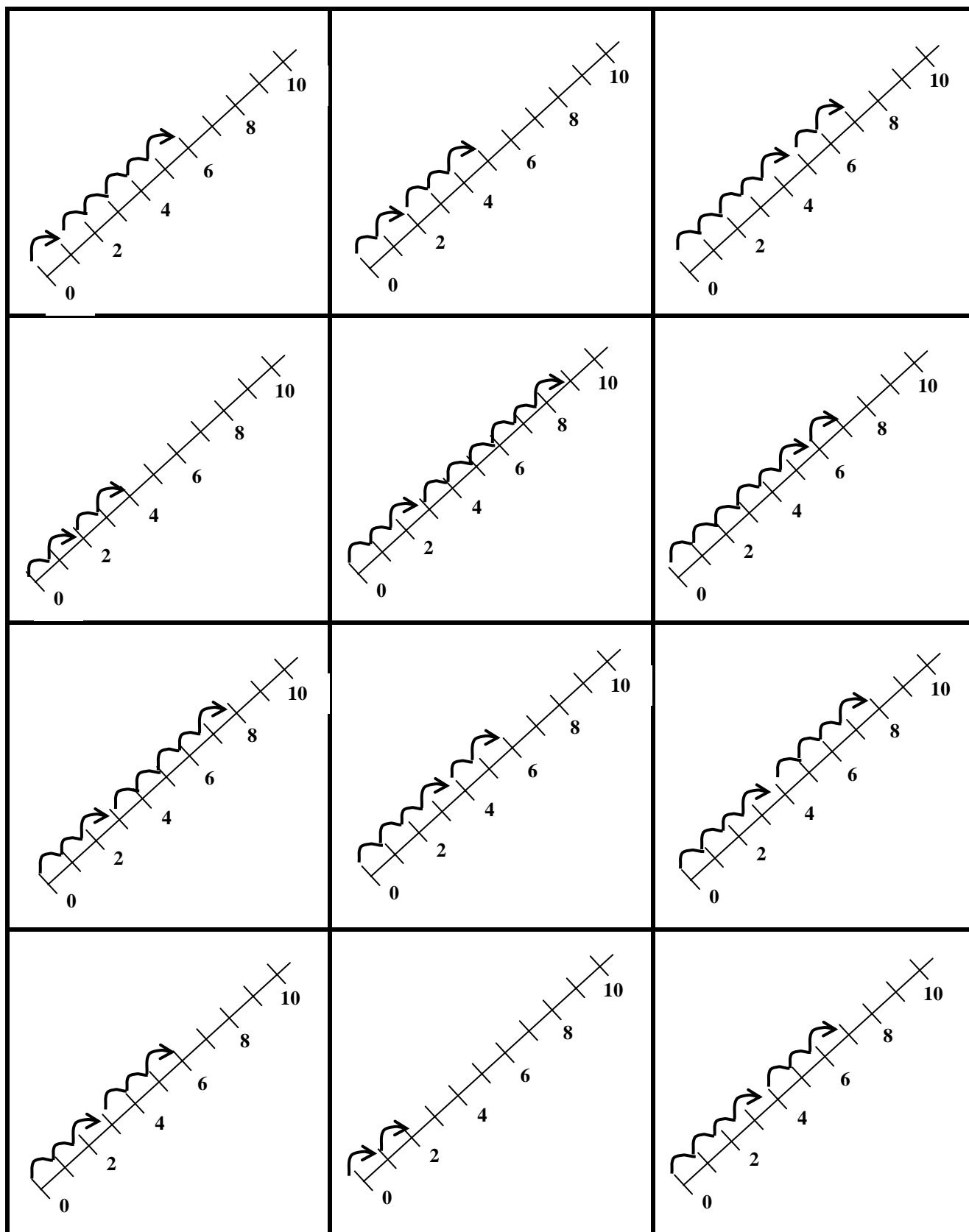
AC3 – Addition Big and Small Racetrack Board

Start	Start	Start
Finish	Finish	Finish

AC3 – Addition Cards (language)

1 plus 5	2 plus 3	5 plus 2
2 add 2	3 plus 6	6 add 1
3 add 5	4 plus 2	4 add 4
3 plus 3	1 add 1	4 add 3

AC3 – Addition Cards (set model)

AC3 – Addition Cards (number line model)

ACTIVITY AC4

[Addition problem \leftrightarrow addition symbols]

Materials: Counters, pen, paper, 8 objects (pens, shells, etc.)

Directions:

1. Tell a story, acting it out with imaginary people as you go. *Jack had 3 (objects), Fred gave him 5 more. How many does Jack have?*
2. Recap how to act this out with counters, draw it with circles or other shapes, and say it with language.
3. Ask the students to write the story in symbols. If difficulty, ask: *How many did Jack have?* [3] *Write this number down.* Ask: *How many did Fred give him?* [5]. *Write this number under the 3.* Ask: *How do we write the numbers are joined?* [+]. *Write this symbol beside (on left of) the 5.* Ask: *How many in total?* [8] *Put a line under the 5 and then the 8 under that line.* Point where the line and the 8 are to go.
4. Tell a new story: *Jack walked 4 blocks. Then he walked 6 more blocks. How many blocks did Jack walk?* Recap how to act it on a number track, draw it, and say it with language. Ask the students to write the story in symbols.
5. Show an addition in symbols. Act this out with unifix and draw a drawing for it. Ask: *Make up a story that gives this sum.*
6. Repeat this but use a number track not unifix to act it out (get track from AC2). Again, ask: *Make up a story that gives this sum.*
7. Play the following addition activities and games:
 - Addition Snap and Addition Rummy (see AC3) - extra symbol cards added so can have quadruples as well as doubles/triples (and not allow doubles, if wish)
 - Addition Mix & Match
 - Addition Cover the Board
 - Addition Bingo

$$\begin{array}{r} 7 \\ + 1 \\ \hline 8 \end{array}$$

$$\begin{array}{r} 3 \\ + 6 \\ \hline 9 \end{array}$$

AC4 – Addition Snap and Rummy**Addition Cards (symbols)**

$\begin{array}{r} 1 \\ + 5 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ + 3 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ + 2 \\ \hline \end{array}$
$\begin{array}{r} 2 \\ + 2 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ + 6 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ + 1 \\ \hline \end{array}$
$\begin{array}{r} 3 \\ + 5 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ + 2 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ + 4 \\ \hline \end{array}$
$\begin{array}{r} 3 \\ + 3 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ + 1 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ + 3 \\ \hline \end{array}$

AC4 – Addition Mix & Match cards

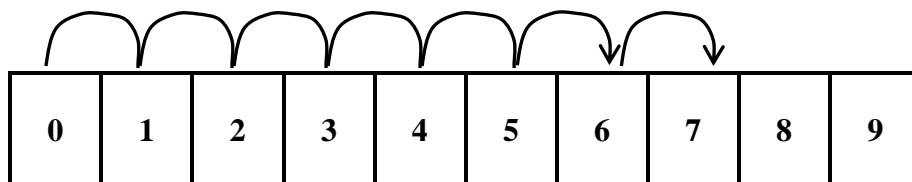
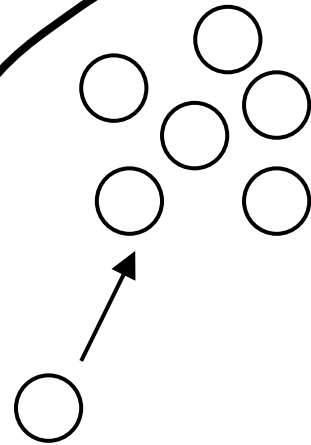
Materials: For each operation, 5 sets of cards
(Print all cards the same colour).

Directions:

- 1) Cut cards along lines into pieces
- 2) Mix pieces together
- 3) Students put pieces back together to form cards.

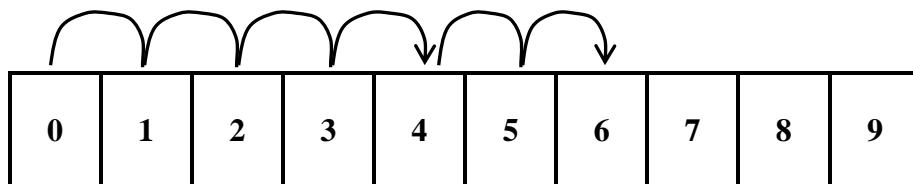
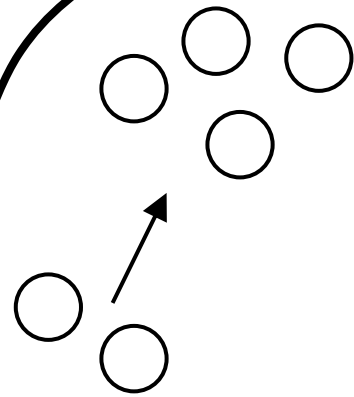
6 cars were parked. 1 more
drove in. How many cars
altogether?

$$\begin{array}{r} 6 \\ + 1 \\ \hline \end{array}$$



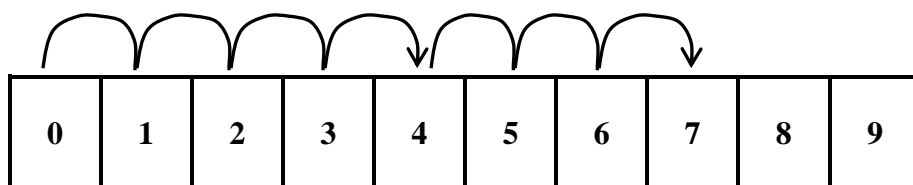
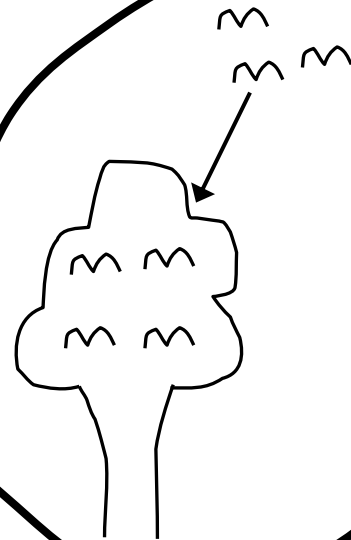
Mum baked 4 pies. Then she baked another 2 pies. How many pies altogether?

$$\begin{array}{r} 4 \\ + 2 \\ \hline \end{array}$$



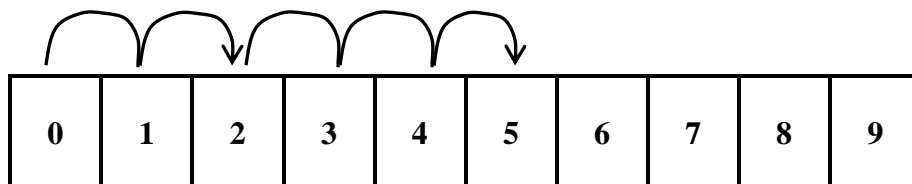
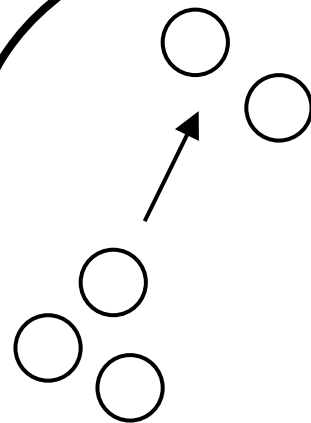
4 birds were in a tree. 3 more
flew down to join them. How
many in the tree?

$$\begin{array}{r} 4 \\ + 3 \\ \hline \end{array}$$



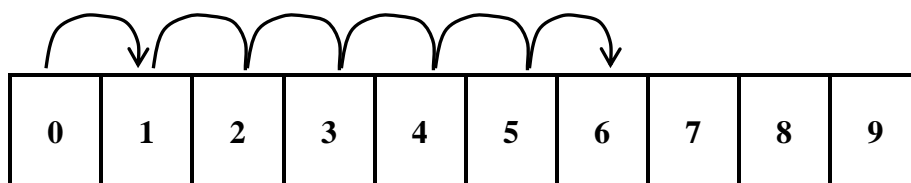
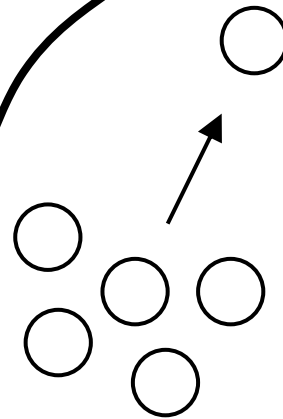
I ran 2 blocks, then I ran 3 more blocks. How many blocks in total did I run?

$$\begin{array}{r} 2 \\ + 3 \\ \hline \end{array}$$



1 child was playing on the
oval. 5 more children joined
in. How many children in
total?

$$\begin{array}{r} 1 \\ + 5 \\ \hline \end{array}$$



AC4 – Addition Cover the Board

Materials: For each operation – 1 base board, 3 sets of 12 cards

Number of players: 2-3

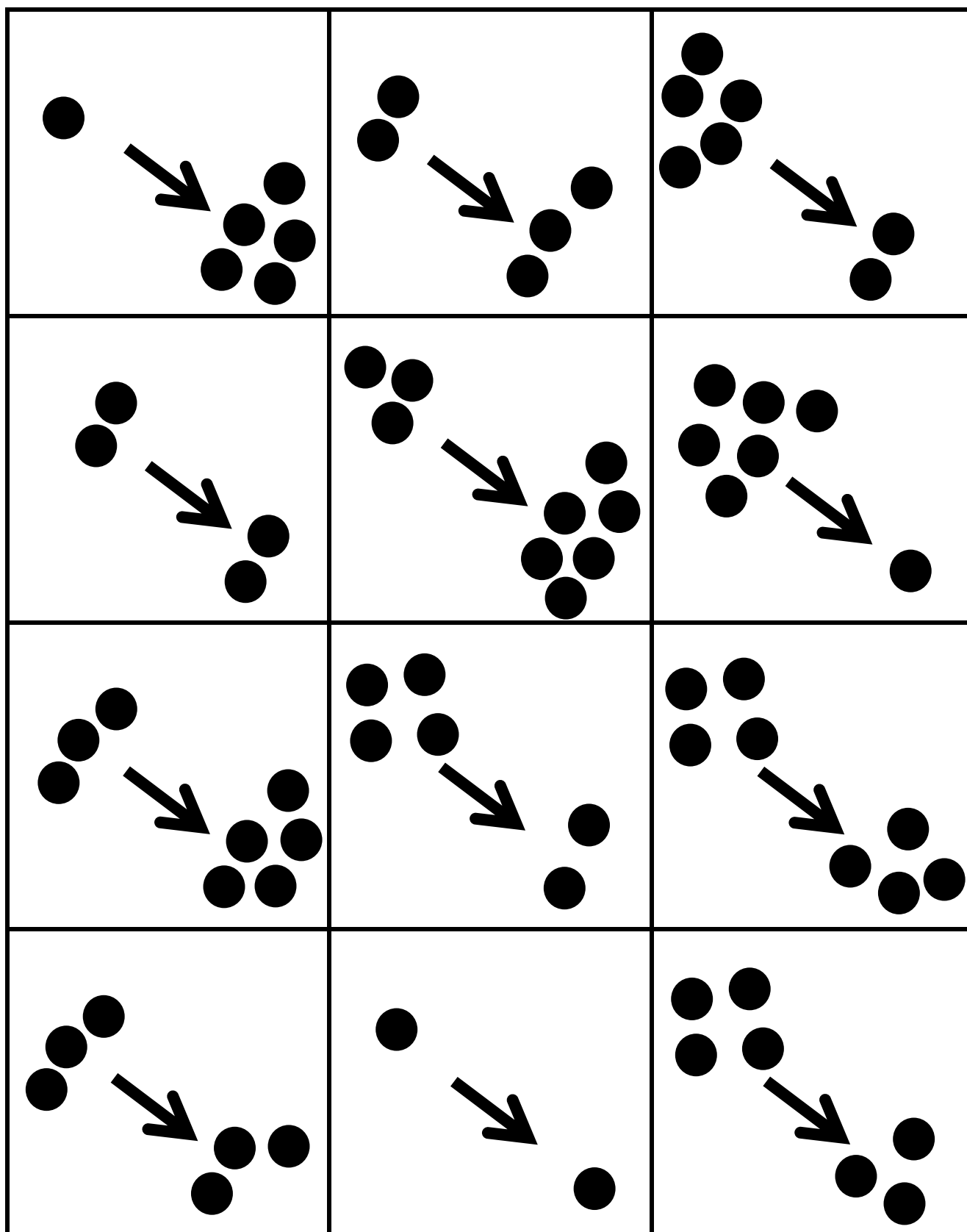
Directions:

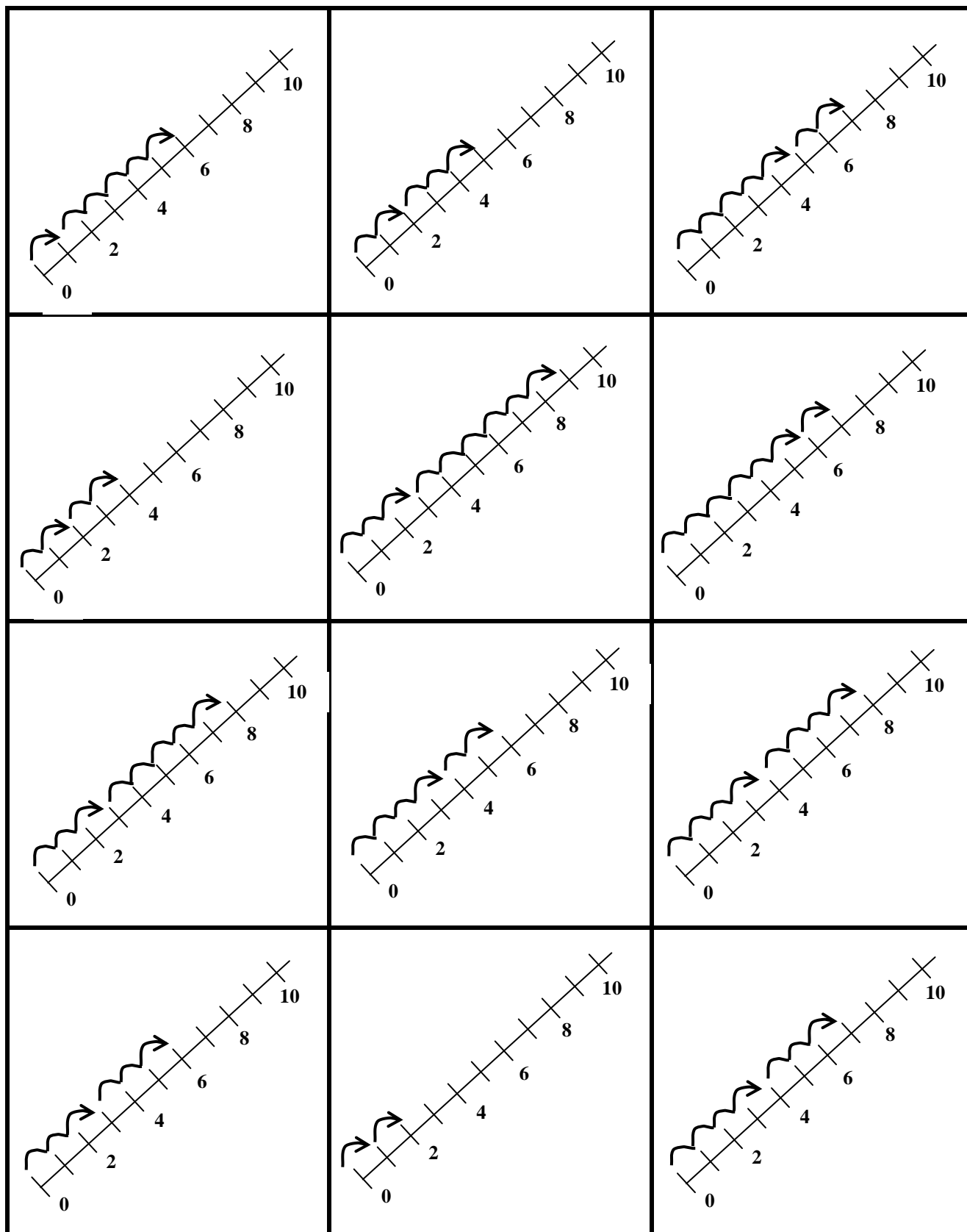
- 1) Print the following four pages, each on different colour paper or light cards (laminates if possible).
- 2) Use the symbols as a base board.
- 3) Cut the other pages into 12 cards each.
- 4) 3 players each get a set of cards.
- 5) In turn, each player places a card correctly on base board (card and board have to have same operation) or on top of another card already placed.
- 6) At the end, player with most cards on top wins.

AC4 – Addition Cover the Board boards and cards

$\begin{array}{r} 1 \\ + 5 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ + 3 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ + 2 \\ \hline \end{array}$
$\begin{array}{r} 2 \\ + 2 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ + 6 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ + 1 \\ \hline \end{array}$
$\begin{array}{r} 3 \\ + 5 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ + 2 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ + 4 \\ \hline \end{array}$
$\begin{array}{r} 3 \\ + 3 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ + 1 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ + 3 \\ \hline \end{array}$

1 plus 5	2 plus 3	5 plus 2
2 add 2	3 plus 6	6 add 1
3 add 5	4 plus 2	4 add 4
3 plus 3	1 add 1	4 add 3





AC4 – Addition Bingo

Materials: For each operation – 1 base board, 3 sets of 12 cards

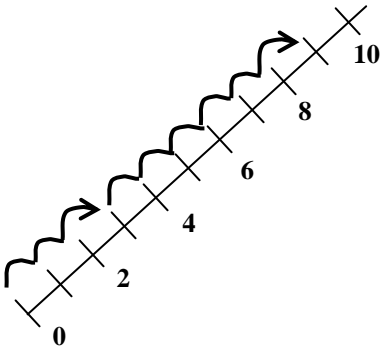
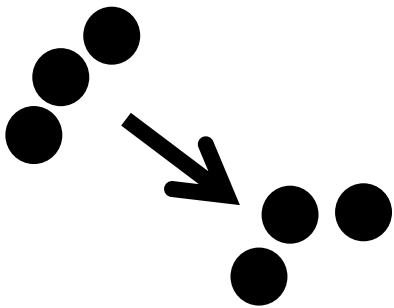
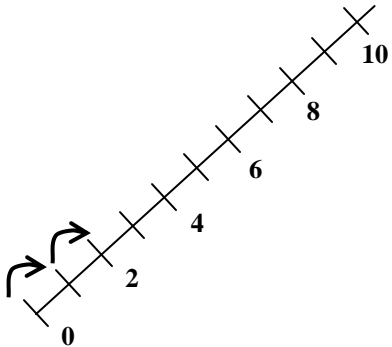
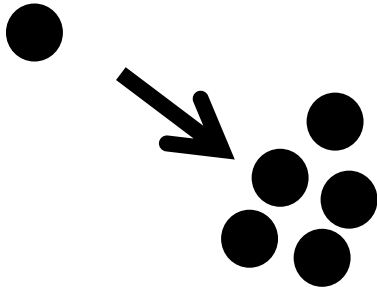
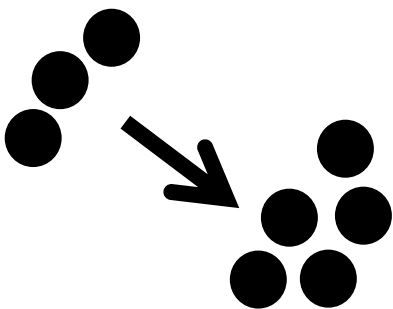
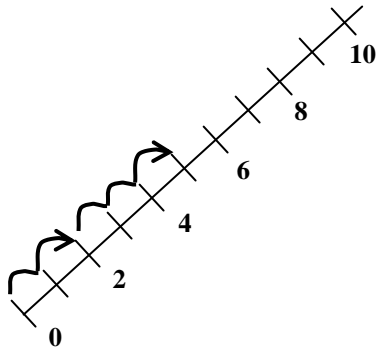
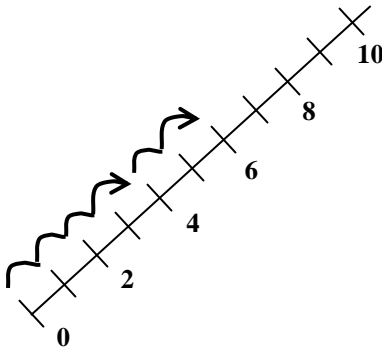
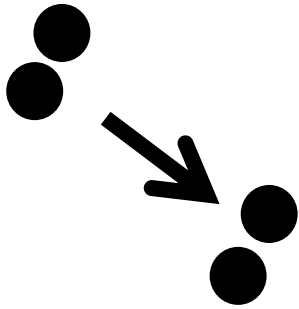
Number of players: 2-3

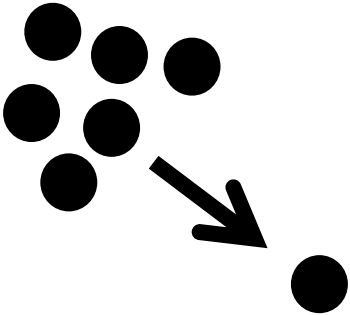
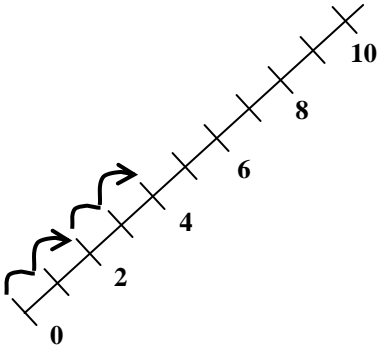
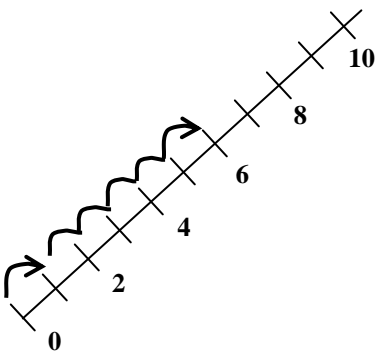
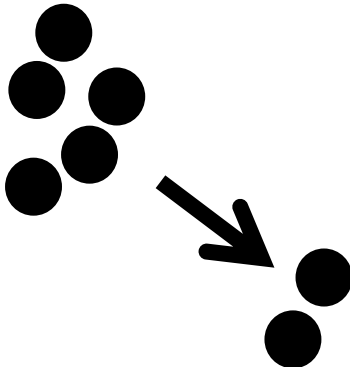
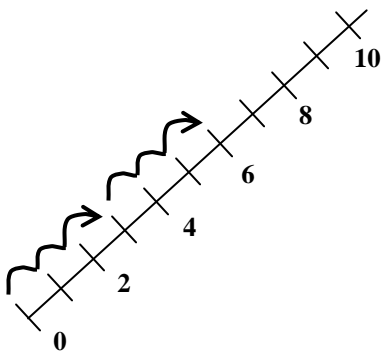
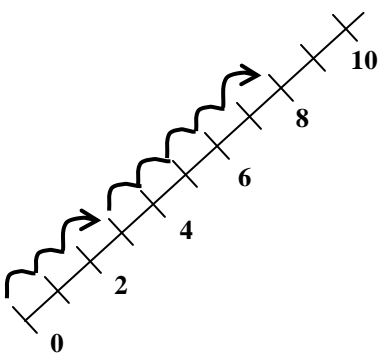
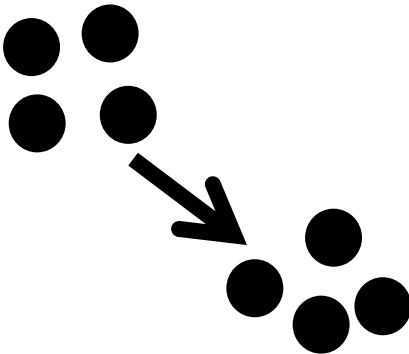
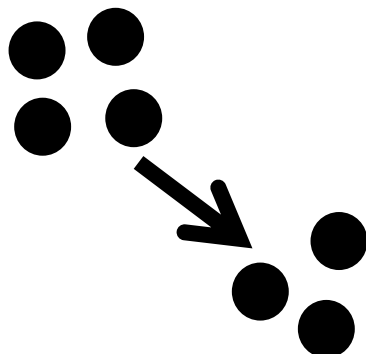
Materials: Three boards (12 squares on each A4 page)
Flash cards (2 on each A4 page)

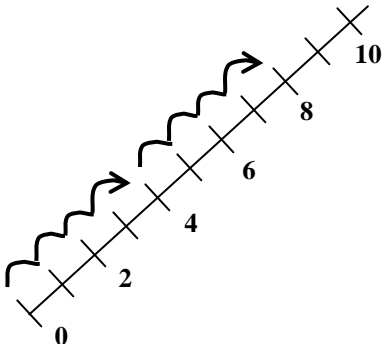
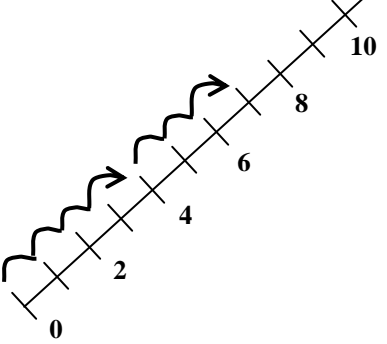
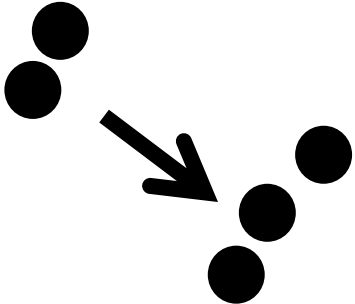
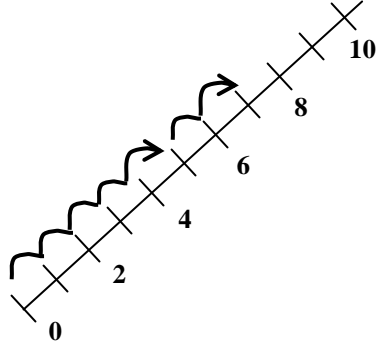
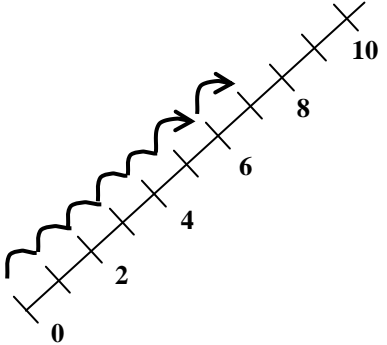
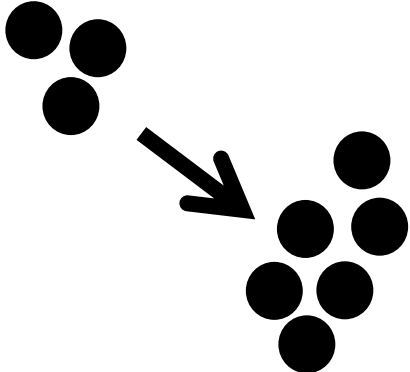
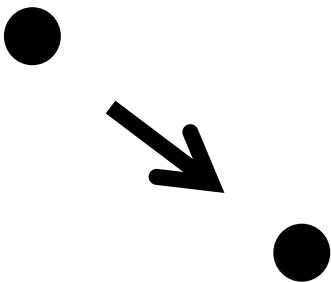
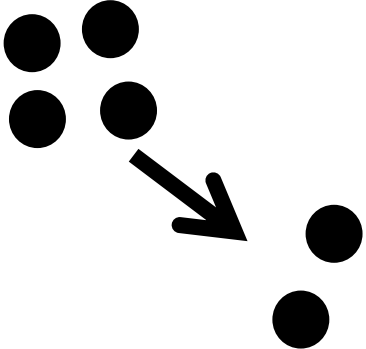
Directions:

- 1) Print the following three boards, each on different coloured paper or card (laminates if possible).
- 2) Print the flash cards on paper or card of a fourth colour (or white) and laminate if possible.
- 3) Cut up flash cards and shuffle.
- 4) Displayer shows cards one at a time.
- 5) Players cover same operation on board with counter.
- 6) First player to get 3 in a row (across, down or diagonal) is the winner.

AC4 – Addition Bingo boards

5 add 2		
	6 add 1	
		
4 plus 3		4 plus 4

		<p>1 add 1</p>
		
<p>4 add 2</p>		<p>2 plus 3</p>
	<p>3 add 6</p>	

		
<p>3 add 5</p>		<p>3 add 3</p>
	<p>1 add 5</p>	
		<p>2 plus 2</p>

AC4 – Addition Bingo Flash Cards

$$\begin{array}{r} 5 \\ + 2 \\ \hline \end{array}$$

$$\begin{array}{r} 2 \\ + 2 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ + 5 \\ \hline \end{array}$$

$$\begin{array}{r} 2 \\ + 3 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ + 1 \\ \hline \end{array}$$

$$\begin{array}{r} 4 \\ + 3 \\ \hline \end{array}$$

$$\begin{array}{r} 4 \\ + 4 \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ + 3 \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ + 5 \\ \hline \end{array}$$

$$\begin{array}{r} 4 \\ + 2 \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ + 6 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \\ + 1 \\ \hline \end{array}$$