

The background of the slide is a dense field of 3D-rendered numbers in various shades of blue and white. The numbers are scattered across the frame, creating a sense of depth and movement. Some numbers are larger and more prominent, while others are smaller and recede into the background. The overall effect is a vibrant, data-oriented aesthetic.

Fluency with Basic Facts

Theresa Shellshear

CMA Conference 2024

Warm-up: I have... Who has ...?

<p>I have 6.</p> <p>Who has the 'Friend' of 5?</p>
<p>I have 5.</p> <p>Who has the 'Friend' of 3?</p>

Need: set of ten cards

1. Distribute the cards;
 2. Nominate the first player to read their card out aloud;
 3. Player with the answer reads their card out aloud;
 4. Continue until the loop is completed.
- How did you feel during this task?

Learning Facts for 10 – Your school days!!

How fluent are we with the facts for 10?

How were we taught at school?

Why is it important that students are fluent with these facts?

- Early number sense predicts school success more than other measures of cognition;
- Frees up working memory;
- Used in mental computation strategies;

Who benefits from ‘Speed & Accuracy’ tasks?

ACM:V9 – FLUENCY

Mathematics provides opportunities for students to **develop, practise and consolidate skills**; choose appropriate procedures; carry out procedures flexibly, accurately, efficiently and appropriately; and apply knowledge and understanding of concepts readily. Students are **fluent** when they **connect their conceptual understanding to learned strategies and procedures, choose and use computational strategies efficiently**; when they recognise robust ways of answering questions; when they choose appropriate representations and approximations; when they understand and regularly apply definitions, facts and theorems; and when they can manipulate mathematical objects, expressions, relations and equations to find solutions to problems.

V9 Mathematics – Foundation

AC9MFN04) Partition and combine collections up to 10 using part-part-whole relationships and subitising to recognise and name the parts

- **Recognising** numbers represented in physical or virtual 10-frames, and describing their reasoning: “It’s 7 because there is 5 and there are 2 more.”
- **Partitioning** collections of up to 10 objects in different ways and saying the part-part-whole relationship; for example partitioning a collection of six counters into 4 counters and 2 counters and saying “6 is 4 and 2 more; it’s 2 and 4”, then partitioning the same collection into 5 and 1 or 3 and 3;
- **Representing part-part-whole** relationships in numbers up to 10 using physical or virtual materials: for example identifying numbers represented by dots on standard number configurations such as dominoes and dice by recognising parts that form the whole

Developmental Phases

Baroody, 2006) cited in Van de Walle et al. p.219

Phase 1: Counting strategies

- Using object counting or verbal counting to determine the answer
- Includes 'Counting on'

Phase 2: Reasoning Strategies

- Using known information to logically determine an unknown combination

Phase 3: Mastery

- Producing answers efficiently (quickly and accurately)
- 'I just know it.'

Phase 1: Examples

- Counting objects and fingers
- Counting abstractly
- All/ first/ largest

Phase 2: Examples

- Commutative $4+7 = 7+4$
- Known fact derivations e.g. doubles plus 1
- Redistributed derived facts [partitioning and combining] $7+5=7+(3+4)$

Phase 3: Examples

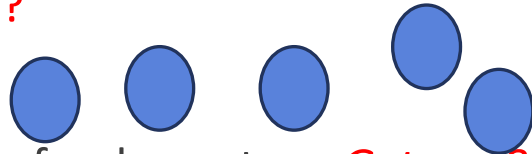
- Retrieval from long-term memory

SENA 1 Questions 47, 48, 49

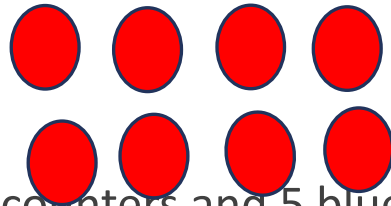
Count Me in Too

Counting

(47) Put out 5 blue counters. *How many blue counters are there?*



(48) Put out a pile of red counters. *Get me 8 red counters.*



(49) Put out 8 red counters and 5 blue counters in two groups.

How many counters altogether?

HOW DID YOU WORK IT OUT?

Which phase does the student demonstrate if they:

Q47: Count each item by ones

Subitise 5

Q48: Count out each item by ones

Count out each item by twos

Q49: Count each item by ones

Count on from 5 by ones

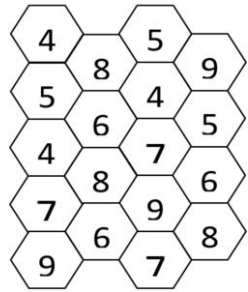
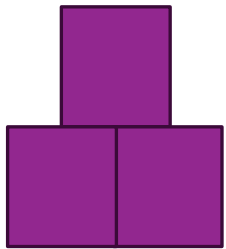
Count on from 8 by ones

Partition 5 in 2 and 3 and verbalise total

Knows the fact

Resources for 10

5



Adapted by T. Strahlman from 'Maths Investigations through Games' Kirby, G. & Sharp G. (1993)



3
7
4
9
1
5
0
6
8
2



$6+4=10$



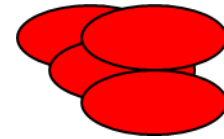
$5+3+2=10$

Make ten

Numbers that add to make a total of 10

Make 10 (A)

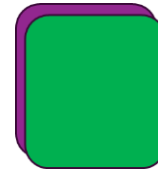
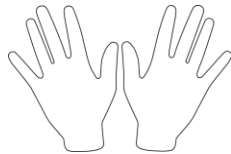
2	4	7	5	8
9	5	2	3	1
4	4	5	3	6
7	2	1	8	8
9	7	6	3	5



1
4
7
2
5
8
3
6
9

x	x	x			

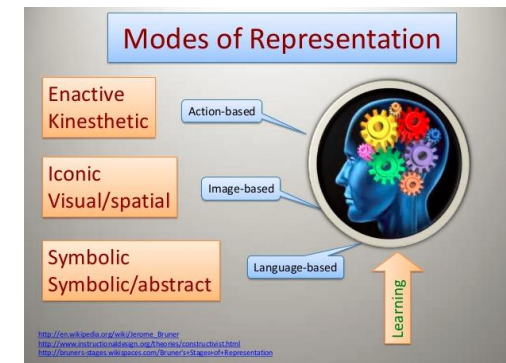
Have	Need
3	7



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

Enactive, Iconic, Symbolic –

Jerome Bruner (1915-2016)



1. Present specific strategies in the form of actions on **objects**,
2. These in turn lead to **mental images** and mental models which can be operated on mentally,
3. These mental images in turn are often eventually replaced by actions on **symbols** without recourse to images.
4. MC M2 p.8

Consolidate facts for 5 using fingers and five-frames;

Fingers for 10: Using both hands

Show me fingers for 5

How many up?

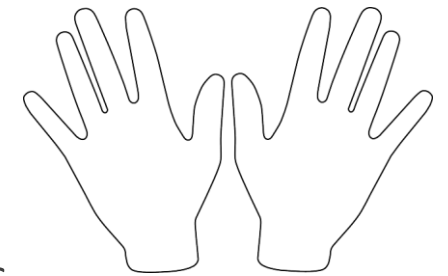
How many down?

Repeat using random numbers

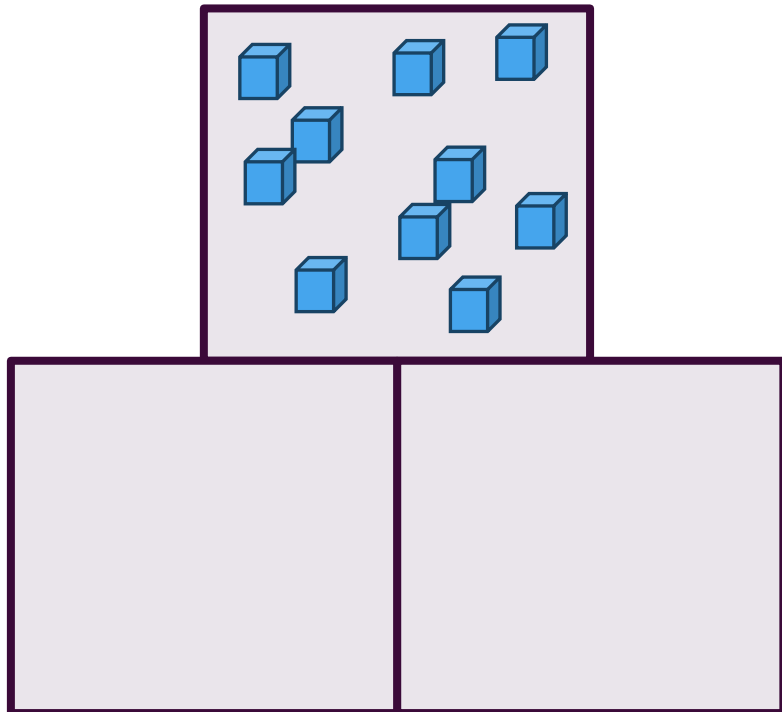
Note which students are still counting by ones;

Rabbits Ears: DENS 1 p. 103

Same structure but with hands held above their head.



Partitioning 10



Need: baseboard; 10 Unifix; 6-sided die

1. Place 10 single Unifix in the top square;
2. Roll the die;
3. Move that number of Unifix to the bottom left square and the remainder to the bottom right square;
4. Verbalise the combination;

Variation: scribe the number sentence e.g.

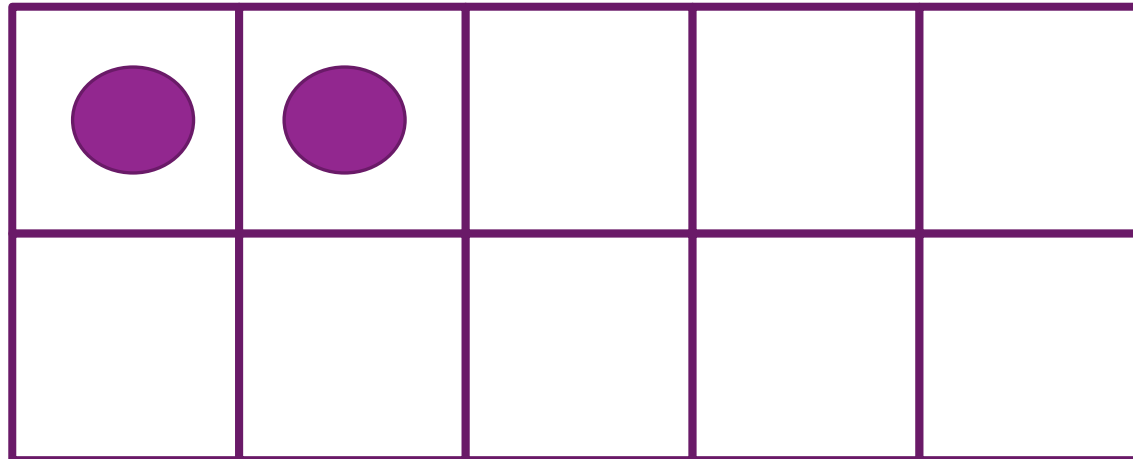
$$10 = 3 + 7$$

Building Ten-frames

DENS 1 p. 113

Standard patterns.

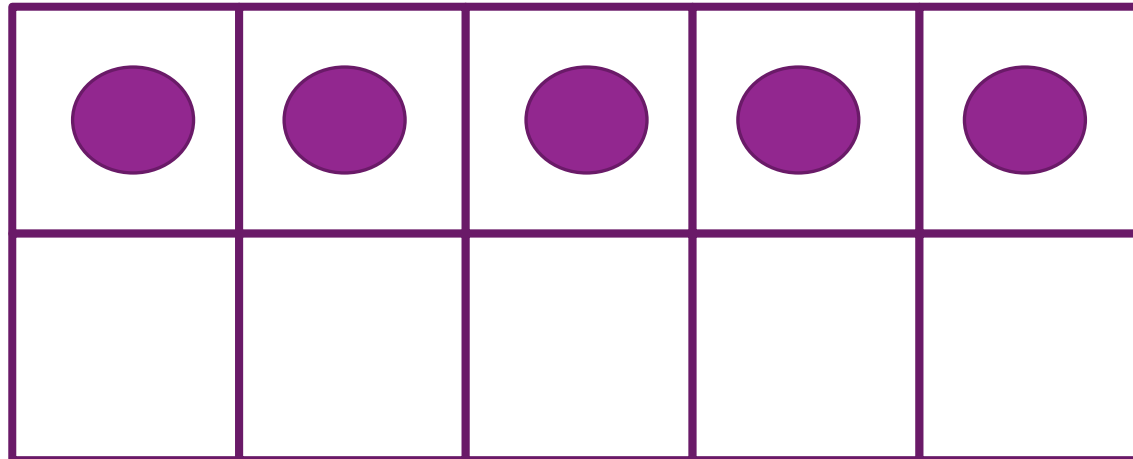
Start top left corner. [Reading direction]



How many full?

Building Ten-frames

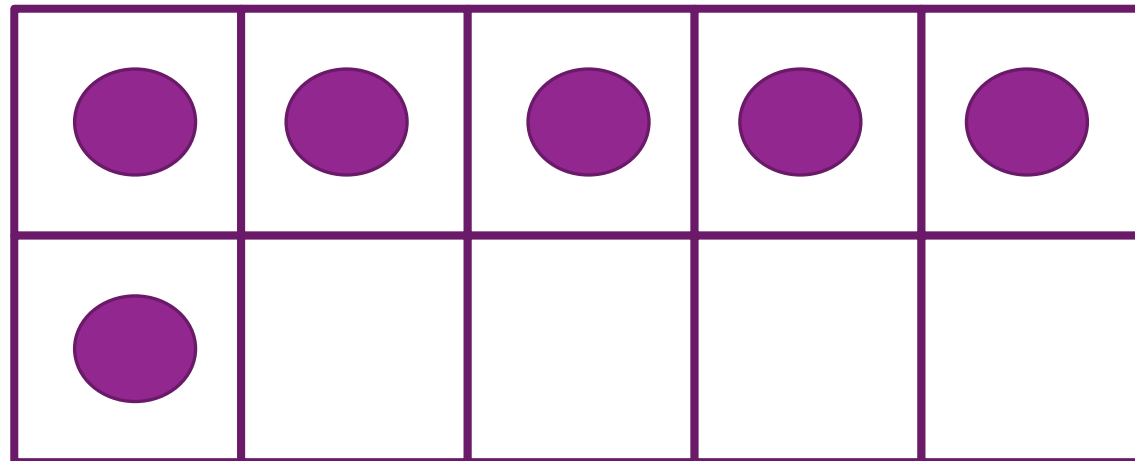
Start top left corner.



How many full?

How many more to make 10?

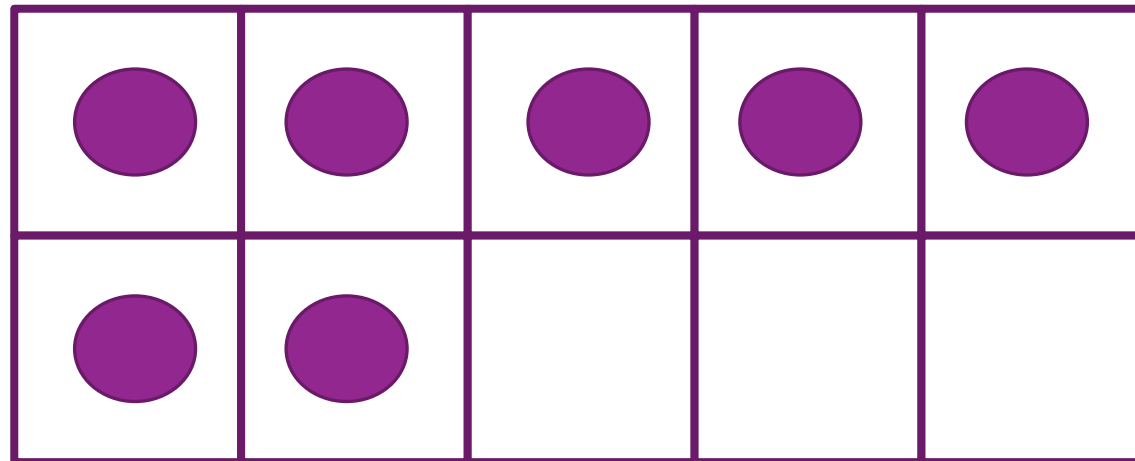
Building Ten-frames



How many full?

How many more to make 10?

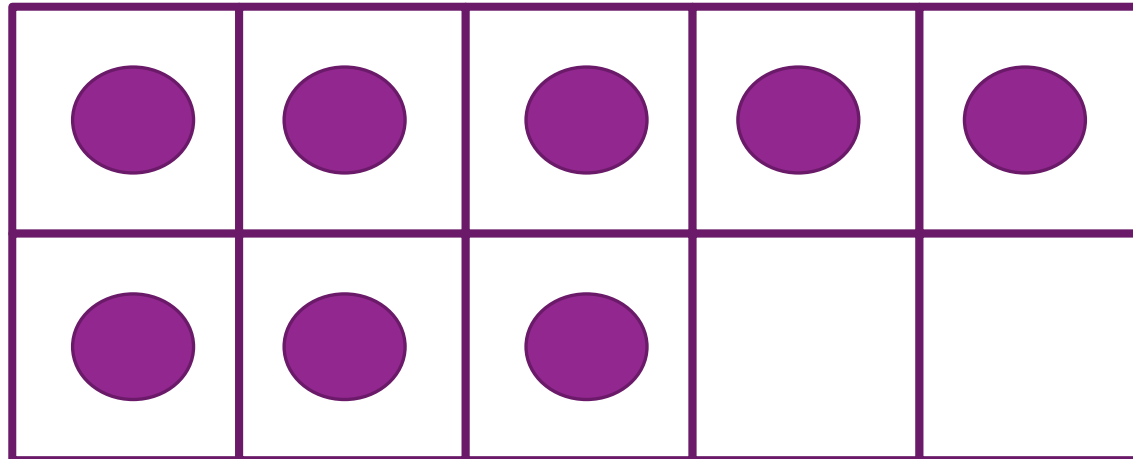
Building Ten-frames



How many full?

How many more to make 10?

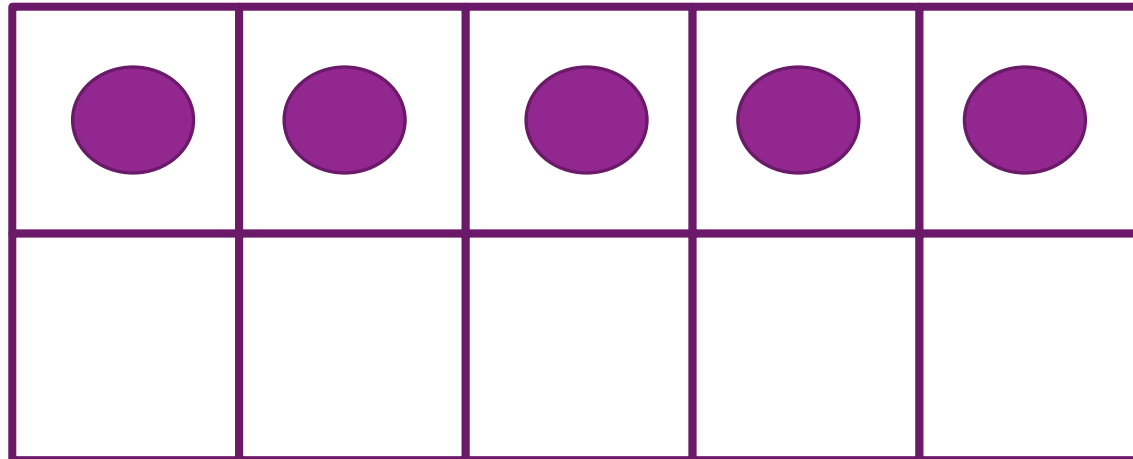
Building Ten-frames



How many full?

How many more to make 10?

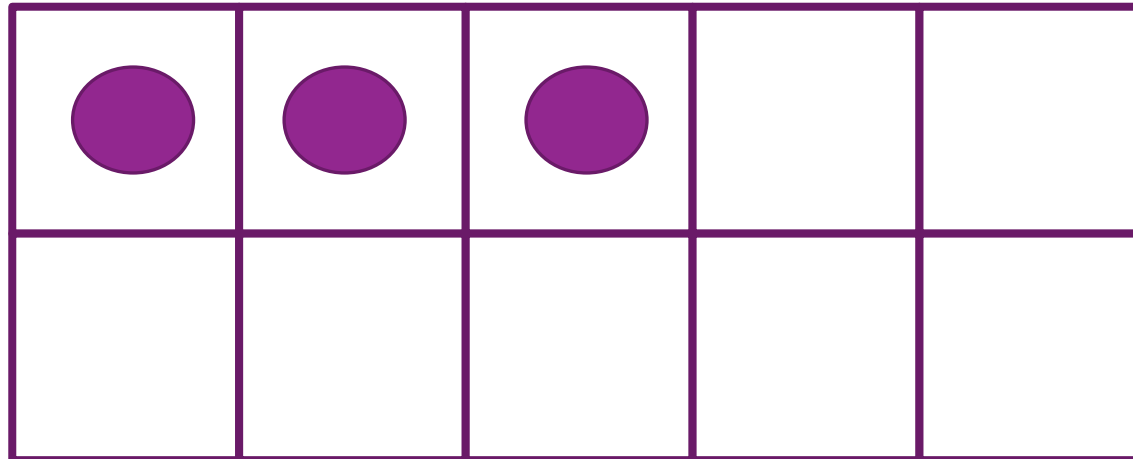
Subitise



How many full?

How many more to make 10?

Subitise



How many full?

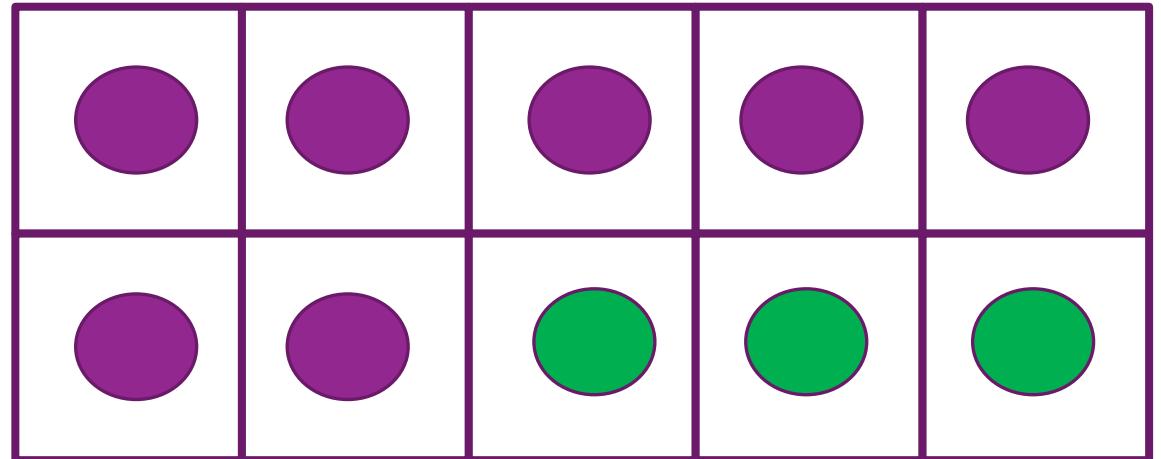
How many more to make 10?

Ten-frames – Swap

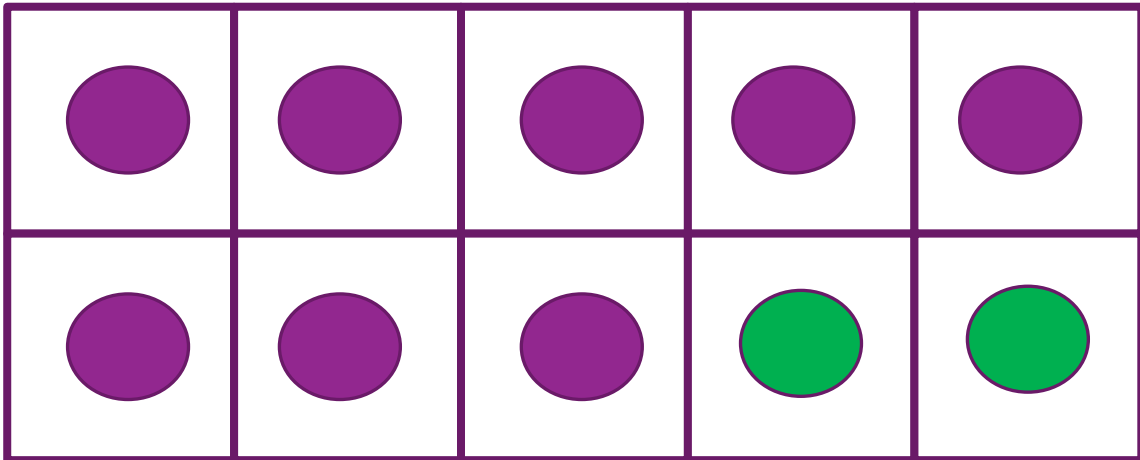
Need: ten-frames; 6-sided die;

Unifix – 2 different colours; Play with a partner;

1. Each player has ten Unifix;
2. Roll the die;
3. Take that number of Unifix and give it to your partner;
4. Verbalise the combination for 10;
5. Return Unifix to partner and repeat.



Ten-frames – Turn Around

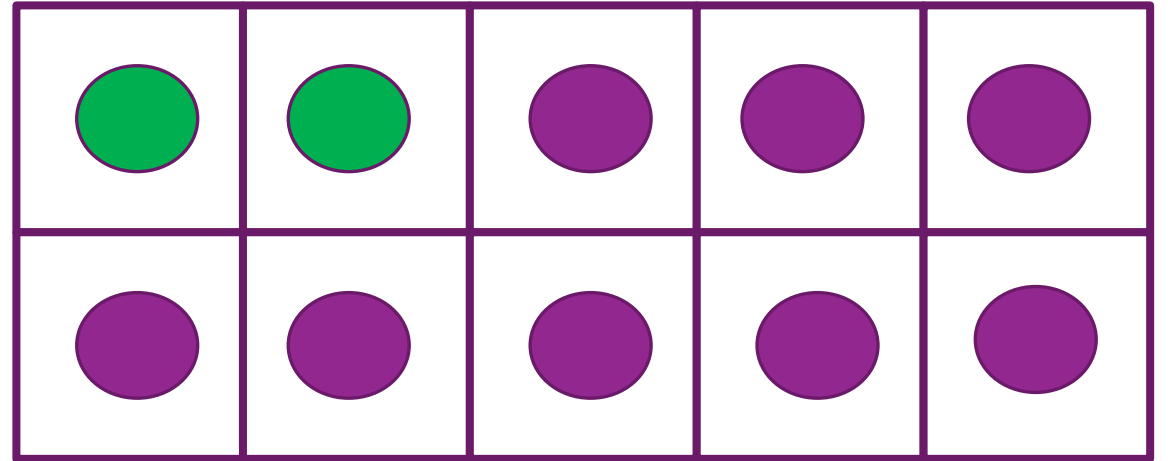
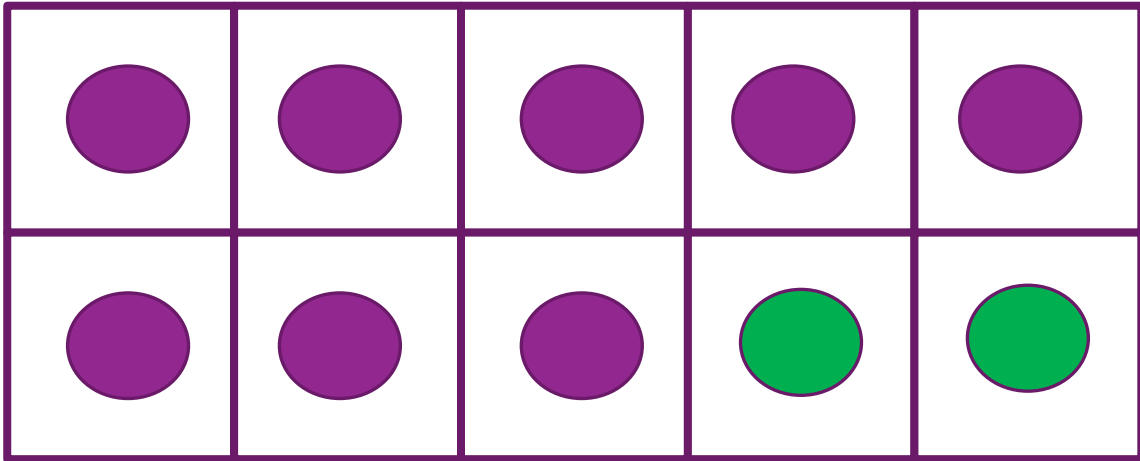


Need: ten-frames; 6-sided die;

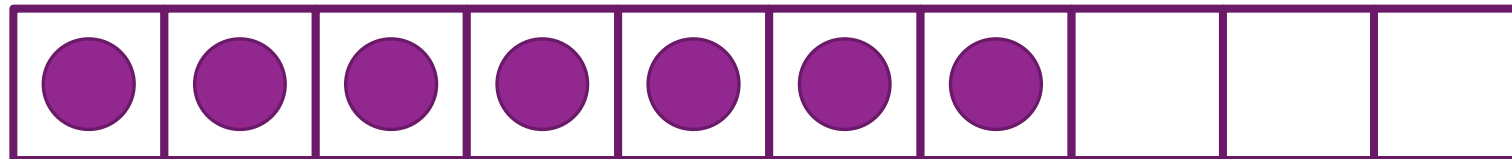
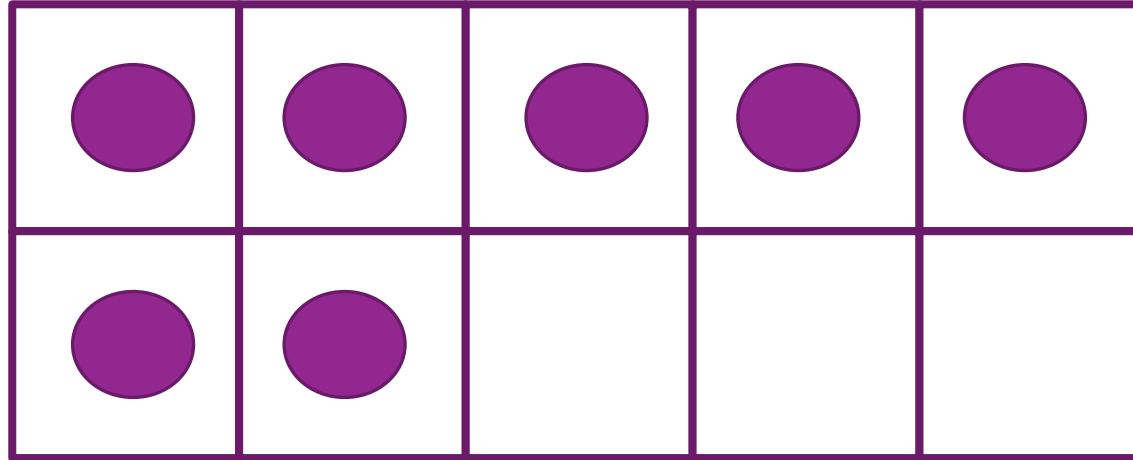
Unifix – 2 different colours;

1. Play with a partner; Each player has ten Unifix;
2. Roll the die;
3. Take that number of Unifix and give it to your partner;
4. Verbalise the combination for 10;
5. Rotate 180° and verbalise the Turn Around

Ten-frames – Turn Around



Ten-frames become Ten strips



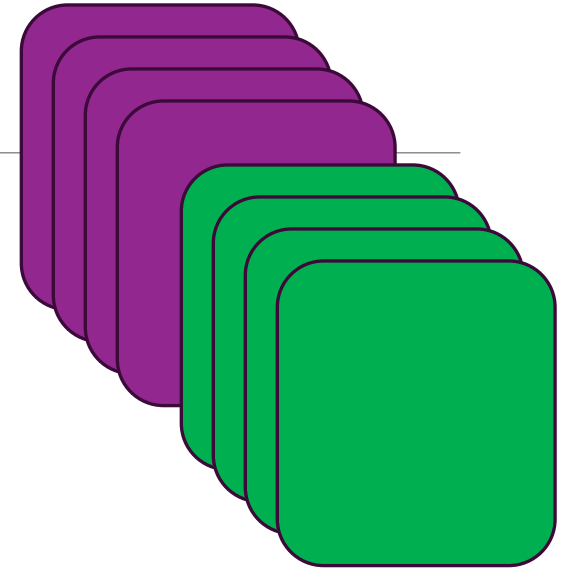
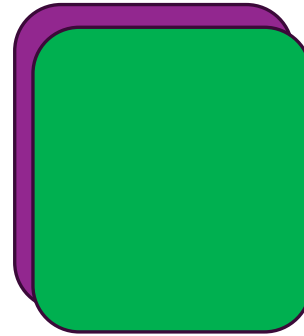
How many full?

How many more to make 10?

Chuck 10

Need: 10 two-sided squares [pot scrubbers stapled]

1. Students stand in a circle;
2. Student 1 tosses squares in the air;
3. Student 2 verbalises the compatible numbers;
4. Student 2 tosses squares in the air;
5. Student 3 verbalises the compatible numbers;
6. Continue around the circle; a student can PASS if they don't know the answer.



Variation: Students scribe the sum on the mini whiteboards

Ups and Downs for 10

Need: 10 bottle tops [all of one colour; place a coloured sticker inside]

1. Students stand in a circle;
2. Student 1 tosses tops in the air;
3. Student 2 verbalises the compatible numbers;
4. Student 2 tosses tops in the air;
5. Student 3 verbalises the compatible numbers;
6. Continue around the circle; a student can **PASS** if they don't know the answer.



Variation: Students scribe the sum on the mini whiteboards

Drop 10

Need: 10 2-sided counters per student; small seal bag; play with a partner

1. Student 1 drops counters on to the desk;
2. Student 2 verbalises the compatible numbers;
3. Student 2 drops counters on to the desk;
4. Student 1 verbalises the compatible numbers;

Variation: Students scribe the sum on the mini whiteboards



Magic Beans

Need: 10 Lima beans per student [spray one side of the beans]; small seal bag;

1. Students work with a partner;
2. Student 1 tosses beans in the air;
3. Student 2 verbalises the compatible numbers;
4. Student 2 tosses beans in the air;
5. Student 1 verbalises the compatible numbers;

Variation: Students scribe the sum on the mini whiteboards



Ten-frames – Build 10 -> Record HM

					Have		Need
					3		7
x	x	x					

Need: Baseboard; 6-sided wooden die [1,2,3,1,2,3]; markers

1. Roll the die;
2. Cross off that many on the ten frame;
3. Record how many are crossed off and how many needed to make ten;
4. Continue till the ten-frame is full.

CREATE THE FACT STRIP FOR 10

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

Ten-frames – Build 10 -> Record Sums

$3 + 7$				
x	x	x		

Need: Baseboard; 6-sided wooden die [1,2,3,1,2,3]; markers

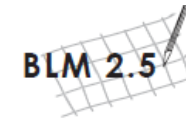
1. Roll the die;
2. Cross off that many on the ten frame;
3. Record the sum represented by how many are crossed off and how many needed to make ten;
4. Continue till the ten-frame is full.

Make 10 Compatibles

Mental computation – a strategy approach

Need: Baseboard; 12 counters of 2 colours; Play with a partner;

1. Take turns to find, verbalise and cover two numbers that total 10;
3. Continue till all possible combinations are covered.
4. What is the secret number?



Make 10 (A)

2	4	7	5	8
9	5	2	3	1
4	4	5	3	6
7	2	1	8	8
9	7	6	3	5

Roll and Take your Compatible

Need: digit cards or numbered bottle tops;
10-sided die; Play with a partner;

1. Arrange digit cards face up;
2. Take turns to roll the die and take the compatible number from the cards;
3. If you roll a zero, miss a turn;
4. If the card has already been taken, miss a turn;
5. Player with the most cards, wins.

Variation: Double set of digit cards

1 2 3
4 5 6
7 8 9



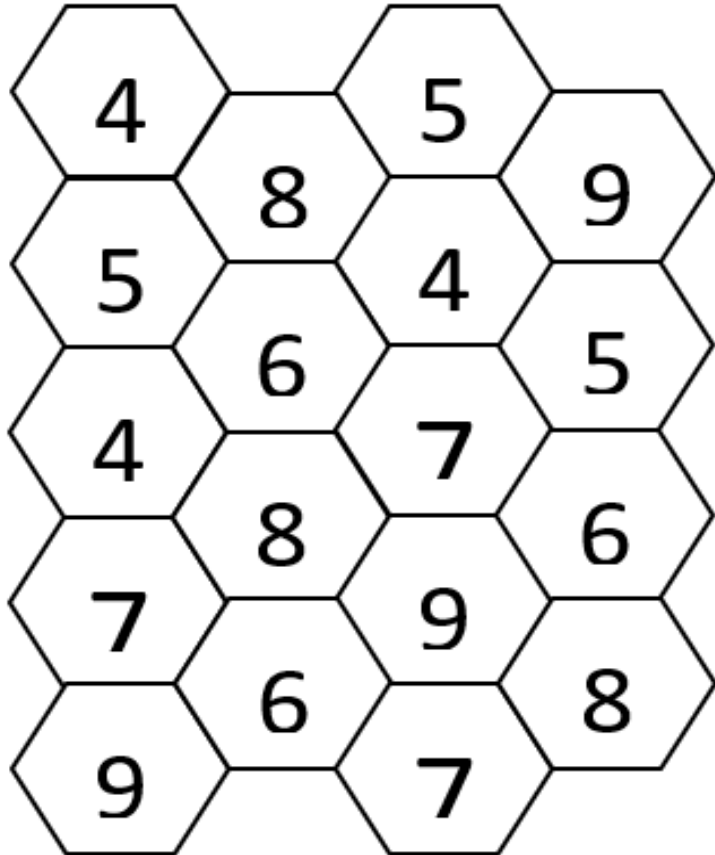
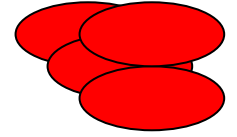
Compatible for 10 Bingo

6	3	1
4	7	2
5	8	9

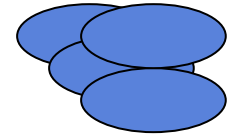
Need: digit cards 1-9; 3x3 grid; digit cards 1-9 or 10-sided die; groups of 4

1. Place cards randomly on 3x3 grid;
2. A digit card is turned over or the die is rolled and number verbalised [If zero, roll again;
3. Players pick up the compatible number for 10 from their grid;
4. First to get 3 in a row – vertically, horizontally or diagonally, wins and turns over the digit cards or rolls the die for the next round.

Take It Away



Need: Baseboard; counters of two different colours; 6-sided die; Play with a partner;



1. Take turns to roll the die;
2. Find the compatible number for 10;
3. Cover the number with your counter;
4. If not available, miss a turn;
5. Player with the most counters, wins.

Floor Walking for 10 DENS 1 p.101

Need: separate place mats with all digits randomly placed on the floor. Whole class. One student is the 'walker'. All other students are the audience, sitting in a circle.

1. One student, the walker, stands on the first mat and verbalised the compatible number for 10;
2. If they make an error as they move along, the audience members place their hands on their shoulders;
3. The walker can self-correct or ask for help by raising one hand or two hands to ask for another student to take their place.

3
7
4
9
1
5
0
6
8
2

Finger Crawl for 10

Need: digits cards randomly placed on the desk.

Work with a partner;

1. Partner 1 moves fingers next to the first card and verbalised the compatible number for 10 as they move along;
2. If they make an error as they move along, partner 2 places their hands on their shoulders;
3. Partner 1 can self-correct or ask for help by raising one hand or can ask partner 2 to take their place.

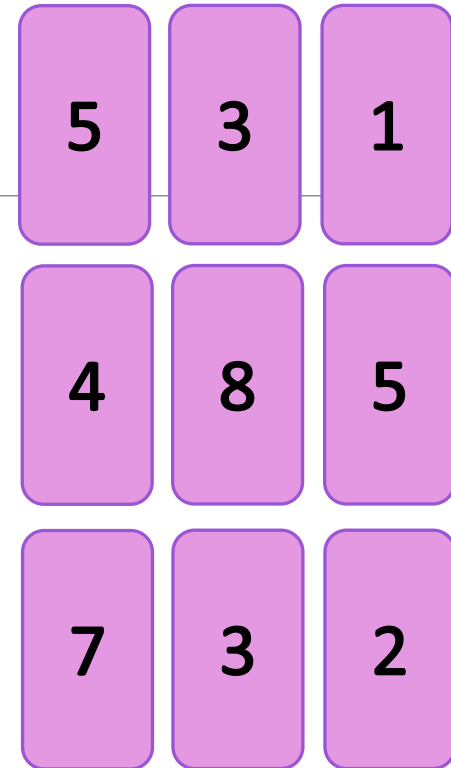
3
7
4
9
1
5
0
6
8
2

Nine Piles

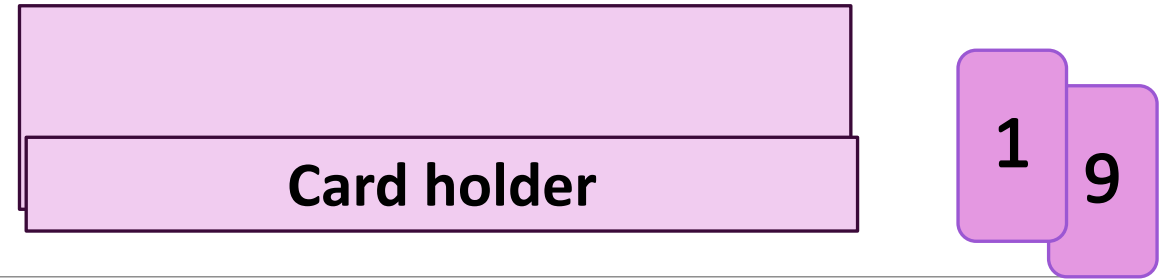
DENS 2 p.56

Need: Pack of playing cards (remove 10's and face cards);
or digit cards [1-9] x 4; Play with a partner;

1. Arrange **all** cards face up in 3x3 array. [4 cards per pile]
2. Take turns to select two cards that add together to **make ten**. Verbalise the sum.
3. Ensure the 3x3 array remains – move cards to fill the space.
4. Player with most cards, wins

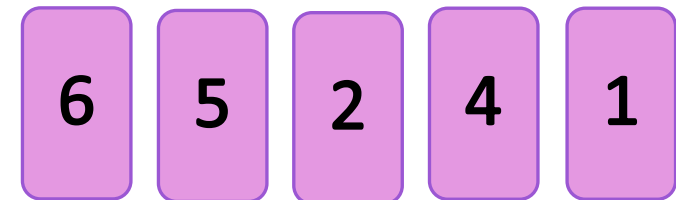
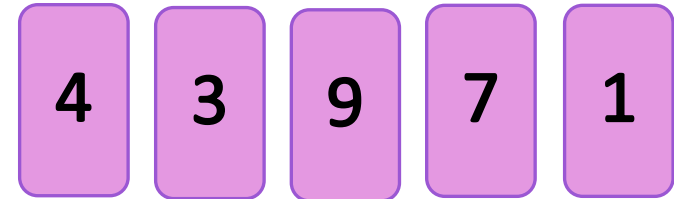


Fish for 10



Need: Pack of playing cards (remove 10's and face cards); or digit cards [1-9] x 4; card holder; Play with a partner;

1. Shuffle cards well; Deal 5 cards to each player and the remainder of the deck is placed face down in centre.
2. Each player sorts their cards into pairs that total 10, verbalises their number sentence and discards them face up.
3. Player 1 asks for a card to make a pair with one of the remaining cards in their hand so the cards will total 10.
4. If there is no card, **'FISH'** from the centre.
5. When ALL your cards are gone, take another 5 cards from the pack and continue the game.
6. The player with the most **10s** wins.



Warm-up: I have... Who has ...?

<p>I have 6.</p> <p>Who has the 'Friend' of 5?</p>
<p>I have 5.</p> <p>Who has the 'Friend' of 3?</p>

Need: set of ten cards

1. Distribute the cards;
 2. Nominate the first player to read their card out aloud;
 3. Player with the answer reads their card out aloud;
 4. Continue until the loop is completed.
- How did you feel during this task?

Fact Remediation

Students who have not mastered their addition facts by the end of third grade are in need of intervention. **More drill is not intervention!**

Students who do not know the facts may be stuck back in **Phase 1** and likely lack number sense and reasoning strategies - **Phase 2**.

Effective remediation requires:

- **figuring out which facts a student knows and which ones they do not.**
- **a focus on the three phases – determining whether the student is and explicitly teaching reasoning strategies Phase 2 in order to reach mastery Phase 3.**

Explicitly teach reasoning strategies; Provide hope; Inventory of the known and unknown facts; Build in success; Provide engaging activities

Dos

1. Ask students to self-monitor
2. Focus on self-improvement
3. Limit practice to short time segments
4. Work on facts over time
5. Involve families
6. Make fact practice enjoyable
7. Use technology
8. Emphasise the importance of knowing the facts

Don'ts

1. Don't use timed tests
2. Don't use public comparisons of mastery
3. Don't proceed to facts in order from 0 to 9
4. Don't work on all facts at once
5. Don't expect quick recall too soon
6. Don't use fact is a barrier to good mathematics
7. Don't use fact mastery as a prerequisite for calculator use

Plenary

1. List three things you learned today;
2. Tell a partner which activity was your favourite and why;
3. If you could teach one of these activities to a friend which one would you chose?

Relevant Sources

Mental Computation: A strategies approach: Alistair McIntosh & Shelley Dole [2004]

- Module 2 Basic facts addition and subtraction

***Count Me In Too* NSW DET**

- Schedule for Early Number Assessment
- Developing Efficient Numeracy Strategies: Stage 1/Stage 2

***Counting On* NSW DET**

Elementary and Middle School Mathematics – Teaching Developmentally

John Van de Wale, Karen Karp & Jennifer Bay-Williams (2017)

Dr Paul Swan [Ten Frame Demo \(drpaulswan.com.au\)](http://drpaulswan.com.au)

[Make to Ten Rollercoaster \(drpaulswan.com.au\)](http://drpaulswan.com.au) ?