NSW GOVERNMENT Education & Communities

# Numeracy continuum K–10

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## Counting sequences – verbal and written labels

ASPECT

### 1 Forward number word sequence

- Cannot count to 10.

- Counts to 10.
- Cannot say the number word just after a given number word in the range 1–10.
- Dropping back to one does not appear at this level.

**MAe - 4NA**

- Counts to 10.
- Says the number word just after a given number word but drops back to one when doing so.

**MAe - 4NA**

- Counts to 10.
- Says the number word just after a given number word in the range 1–10 without dropping back.

**MAe - 4NA**

- Counts to 30.
- Says the number word just after a given number word in the range 1–30 without dropping back.

**MAe - 4NA**

- Counts to 100.
- Says the number word just after a given number word in the range 1–100 without dropping back.

**MA1 - 4NA**

- Counts beyond 100.

**MA1 - 4NA, MA2 - 4NA**

### Backward number word sequence

- Cannot count backwards from 10–1.

- Counts backwards from 10–1.
- Cannot say the number word just before a given number word in the range 1–10.
- Dropping back to one does not appear at this level.

**MAe - 4NA**

- Counts backwards from 10–1.
- Says the number word just before a given number word in the range 1–10, but drops back to one when doing so.

**MAe - 4NA**

- Counts backwards from 10–1.
- Says the number word just before a given number word in the range 1–10 without dropping back.

**MAe - 4NA**

- Counts backwards from 30–1.
- Says the number word just before a given number word in the range 1–30 without dropping back.

**MAe - 4NA, MA1 - 4NA**

- Counts backwards from 100–1.
- Says the number word just before a given number word in the range 1–100 without dropping back.

**MA1 - 4NA**

- Counts backwards from any number.

**MA2 - 4NA**

### Numeral identification

The term 'identify' refers to stating the name of a displayed numeral.

- May identify some, but not all numerals in the range 1–10.

- Identifies all numerals in the range 1–10.

**MAe - 4NA**

- Identifies all numerals in the range 1–20.

**MAe - 4NA**

- Identifies numerals in the range 1–100.

**MA1 - 4NA**

- Identifies numerals in the range 1–1000.

**MA1 - 4NA**

- Identifies numerals in the range 1–10 000.

**MA2 - 4NA**

### Counting by 10s and 100s

- Counts forwards and backwards by 10s to 100, e.g. 10, 20, ... 100.
- Counts forwards and backwards by 100s to 1000, e.g. 100, 200, ... 1000.

**MA1 - 4NA**

- Counts forwards and backwards by 10s and 5s, off the decade to 100, e.g. 2, 12, 22 ... 92.

**MA1 - 4NA**

- Counts forwards and backwards by 10s, off the decade in the range 1–1000, e.g. 367, 377, 387, ...

**MA1 - 4NA**

- Counts forwards and backwards by 100s, off the 100, and on or off the decade to 10 000, e.g. 24, 124, 224, ... 924.

**MA2 - 4NA**

## Counting as a problem solving process – Early Arithmetical Strategies

### 2 Early arithmetical strategies (EAS)

EAS refers to the range of counting strategies that are used to solve addition and subtraction problems.

#### Emergent counting

- Cannot count visible items.
- Does not know the number words or cannot coordinate the number words to count items.

#### Perceptual counting

- Counts visible items to find the total count.
- Builds and subtracts numbers by using materials or fingers to represent each number.
- Objects or fingers remain constantly in view while counting.

**MAe - 5NA**

#### Figurative counting

- Visualises concealed items and determines the total by counting from one.
- May use fingers to represent the concealed items when the total of two screened parts is greater than ten.

**MA1 - 5NA**

#### Counting-on-and-back

- Counts on or back to solve problems.
- A number takes the place of a completed count.
- Counts on rather than counting from one to solve addition or missing addends tasks.
- Uses a count–down–from strategy, e.g. 17–3 as 16, 15, 14, answer 14, or a count–down–to strategy, e.g. 17–14 as 16, 15, 14, answer 3, to solve subtraction tasks.

**MA1 - 5NA**

#### Facile (flexible)

- Uses known facts, number structure and other non–count–by–one strategies to solve problems (involving one or two digits).

**MA1 - 5NA, MA2 - 5NA**

## Pattern and number structure

### 3 Pattern and number structure

The identification of pattern associated with the structure of numbers.

#### Emergent

- Cannot effortlessly and immediately identify small quantities (subitise).

#### Instant

- Subitises small numbers.

**MAe - 4NA**

#### Repeated

- Recognises, describes and continues a repeated pattern.

**MAe - 8NA**

#### Multiple

- Creates a pattern of repeated units of a specified size.

**MAe - 8NA**

#### Part-whole to 10

- Uses part–whole knowledge to ten. Knows number combinations to ten and how many more are needed to make ten.

**MA1 - 5NA, MA1 - 8NA**

#### Part-whole to 20

- Knows or easily derives number combinations to 20. For example, 7 + 8 might be instantly recalled or treated as one more or less than a double. Partitions numbers to 20 in both standard and non–standard form.

**MA1 - 5NA, MA1 - 8NA**

#### Number properties

- Understands the structural properties of numbers including how to regroup when operating with numbers. For example,
  9 x 6 = 6 x 6 + 3 x 6, 27 + 38 + 3 = (27 + 3) + 38.

**MA2 - 8NA, MA3 - 8NA, MA3 - 6NA, MA4 - 4NA**

## Place value

### 4 Place value

Students should be at least at the Counting–on–and–back stage to be placed on the Place value framework.

#### Ten as a count

- Counts on but uses single units of one or ten in counting strategies.
- Knows the sequence of multiples of ten, i.e. 10, 20, 30 ... as a sequenced count.
- Treats ten as something constructed of ten *ones*, but one *ten* and ten *ones* do not exist for the student at the same time.

**MA1 - 5NA**

#### Ten as a unit

- Counts by tens and ones from the middle of the decade to find the total or difference of two 2–digit numbers where one of the numbers is represented by materials.
- Treats ten as a single unit while still recognising that it contains ten *ones* (abstract composite unit).

**MA1 - 5NA**

#### Tens and ones

**2a: Jump method**

- Treats ten as a unit that can be repeatedly constructed in place of ten individual counts. Tens and ones are flexibly regrouped.
- Counts forwards or backwards firstly by tens and then by ones.

**2b: Split method**

- Treats ten as an abstract composite unit.
- Solves addition and subtraction problems mentally by separating the tens from the ones, then adding or subtracting each separately before combining.
- Uses non–standard decomposition of two–digit numbers, e.g. 76 = 60 + 16.

**MA1 - 5NA, MA2 - 5NA**

#### Hundreds, tens and ones

**3a: Jump method**

- Uses hundreds, tens and ones in standard decomposition, e.g. 326 as three groups of 100, two groups of 10 and six *ones*.
- Increments by hundreds and tens to add mentally.
- Determines the number of tens in 621 without counting by ten.

**3b: Split method**

- Adds and subtracts mentally combinations of numbers to 1000.
- Uses the positional value of numbers flexibly in regrouping without a need to rely on incrementing by tens or hundreds.
- Uses a part–whole knowledge of numbers to 1000.

**MA2 - 5NA**

#### Decimal place value

- Uses tenths and hundredths to represent fractional parts with an understanding of the positional value of decimals, e.g. 0.8 is larger than 0.75 because of the positional value of the digits.
- Interchanges tenths and hundredths, e.g. 0.75 may be thought of as seven *tenths* and five *hundredths*.

**MA2-7NA**

#### System place value

- Recognises that the place value system can be extended indefinitely in two directions—to the left and right of the decimal point.
- Recognises the relationship between values of adjacent places (units) in a numeral.

**MA3 - 4NA, MA3 - 7NA, MA4 - 5NA**

## Multiplication and division

### 5 Multiplication and division

Using equal groups in multiplication as well as two different types of divison.

#### Forming equal groups

- Uses perceptual counting and sharing to form groups of specified sizes.
- Does not see the groups as composite units and counts each individual item.

**MAe - 6NA**

#### Perceptual multiples

- Uses groups or multiples in perceptual counting and sharing, e.g. rhythmic or skip counting.
- Cannot deal with concealed items.

**MAe - 6NA**

#### Figurative units

- Uses equal grouping and counting without individual items visible.
- Relies on perceptual markers to represent each group.
- Needs to represent the groups before determining the total.

**MA1 - 6NA**

#### Repeated abstract units

- Uses composite units in repeated addition and subtraction using the unit a specified number of times.
- May use skip counting or a double count.
- May use fingers to keep track of the number or groups but as the counting occurs.
- Is not dependent upon perceptual markers to represent groups.

**MA1 - 6NA**

#### Multiplication and division as operations

- Coordinates two composite units as an operation, e.g. 6 times 3 is 18; 18 ÷ 6 = 3.
- Uses multiplication and division as inverse operations flexibly in problem solving tasks.

**MA2 - 6NA, MA3 - 6NA**

## Fraction units

### 6 Fractions

Developing a quantitative sense of fractions, relies on forming partitions, relating the part to the whole, and recognising the need for equal wholes.

#### Emergent partitioning

- Attempts to halve by splitting without attention to equality of the parts.

#### Halving

- Forms halves and quarters by repeated halving.
- Can use distributive dealing to share.

**MAe - 7NA, MA1 - 7NA**

#### Equal partitions

- Verifies continuous and discrete linear arrangements have been partitioned into thirds or fifths by iterating one part to form the whole or checking the equality and number of parts forming the whole.

**MA2 - 7NA**

#### Reforms the whole

- When iterating a fraction part such as one-third beyond the whole, re-forms the whole.

**MA3 - 7NA**

#### Multiplicative partitioning

- Coordinates composition of partitioning (i.e. can find one-third of one-half to create one-sixth).
- Creates equivalent fractions using equivalent equal wholes. Coordinates units at three levels to move between equivalent fraction forms.

**MA4 - 5NA**

#### Fractions as numbers

- Identifies the need to have equal wholes to compare fractional parts. Uses fractions as numbers, i.e. $\frac{1}{3} > \frac{1}{4}$, including improper fractions.

**MA4 - 5NA**

## Unit structure of length, area and volume

### 7 Measurement

Knowledge of the structure of units in length, area and volume.

#### Emergent structure

- Attempts direct comparison without attending to alignment.
- May attempt to measure indirectly without attending to gaps of overlaps.

#### Direct alignment

- Directly compares the size of two objects (alignment).

**MAe - 9MG, MAe - 10MG, MAe - 11MG**

#### Transitive comparison

- Directly compares the size of three or more objects (transitivity).
- Uses indirect comparison by copying the size of one of the objects.

**MAe - 9MG, MA1 - 10MG, MAe - 11MG, MA1 - 11MG**

#### Multiple units

- Uses multiple units of the same size to measure an object (without gaps and overlap).
- Chooses and uses a selection of the same size and type of units to measure an object (without gaps and overlap).

**MA1 - 9MG, MA1 - 10MG, MA1 - 11MG**

#### Indirect comparison

- States the qualitative relationship between the size and number of units (i.e. with bigger units you need fewer of them).
- Chooses and uses a selection of the same size and type of units to measure by indirect comparison.

**MA1 - 9MG, MA1 - 10MG, MA1 - 11MG**

#### Iterates the unit

- Uses a single unit repeatedly (iterating) to measure or construct length.
- Make a multi-unit ruler by iterating a single unit and quantifying accumulated distance.
- Identifies the quantitative relationship between length and number of units (i.e. if you halve the size of the units you will have twice as many units in the measure).

**MA1 - 9MG, MA2 - 9MG**

#### Composite area

- Creates the row-column structure of the iterated composite unit of area.
- Uses the row-column structure to find the number of units to measure area.

**MA2 - 10MG**

#### Repeated layers

- Creates the row-column-layer structure of the iterated layers when measuring volume.
- Uses the row-column-layer structure to find the number of units to measure volume.

**MA2 - 11MG, MA3 - 12MG**