

Summary of learning goals

- The sequence has the potential to develop counting-on strategies and early addition skills and facts.
- To develop students' counting skills beyond 10.
- To understand that the numbers 11 to 19 can be represented as one group of 10 and some more ones.

Australian Curriculum: Mathematics (Foundation)

ACMNA001: Establish understanding of the language and processes of counting by naming numbers in sequences, initially to and from 20, moving from any starting point.

ACMNA002: Connect number names, numerals and quantities, including zero, initially up to 10 and then beyond.

Summary of lessons

Who is this sequence for?

- This sequence is designed for students towards the end of their Foundation year. It is expected that they will have developed one-to-one correspondence with numbers up to at least 20. Students must be very familiar with numbers from 1 to 10. The students will need to have an understanding of the composition of numbers; for example, 7 can be made by combining 1 and 6.
- This unit also relies on students unitising 10 as a group. For this purpose, it would be helpful for students to have used 10 as a group previously, such as participating in tasks that use models such as ten frames.
- This task requires students to keep count with static objects, which can be more complex than keeping track of the count using manipulatives.

Lesson 1: One is a Snail, Ten is a Crab

This task uses the book *One is a Snail, Ten is a Crab* to explore numbers up to 20. Students represent numbers using the number of legs on animals in the book and look at how one number can be represented in multiple ways. Students also explore the efficiency of different representations.

Lesson 2: One Crab + Some More

This task continues to use the book *One is a Snail, Ten is a Crab*. It introduces students to the patterns of our place-value system and the significance of 10. The key understanding of unitising is introduced by asking students to represent teen numbers using one crab, which is the same as using 1 ten. In doing so, students move from using 10 ones to 1 ten.

Reflection on this sequence

Rationale

Teen numbers are the first numbers beyond 10 that students encounter. The act of counting to 20 matches names with numbers, but in the process may obscure the structure of the teen number. This is exacerbated by the lack of obvious mathematical structure in the names eleven and twelve, and by naming the units before the group of 10 in the numbers thirteen to nineteen. This is 'back to front'; that is, it is the reverse of how they are written. Consider thirteen, or 13: thir- represents the 3 and -teen represents the 10. This is different to all other numbers in our base-10 system, where the tens are stated before the ones in the name (e.g. twenty-two, forty-five).

This sequence focuses on developing students' understanding of teen numbers as '10 and some more'. The sequence looks at different ways to make a number such as 13. This is a gentle introduction to the important mathematical concept of partitioning, an idea that reappears in many other reSolve resources.



reSolve mathematics is purposeful

- This sequence shows numbers in a real-world context through the use of the picture book *One is a Snail, Ten is a Crab*. This grounding gives students strong motivation to explore mathematical problems. It encourages students to explore a creative variety of solutions in a vivid real-world context. The lessons also give a meaningful introduction to place value.



reSolve tasks are inclusive and challenging

- The sequence begins with the shared experience of reading a picture book as a class. The sequence provides for a wide range of student ability: a low floor is created through the provision of concrete materials with which students can experiment to find several solutions; a high ceiling is created through the encouragement of conceptual thinking and asking students to find and justify all the different ways of making a given number.



reSolve classrooms have a knowledge-building culture

- Students share solutions and strategies with one another, and naturally gravitate to working together in groups to achieve common goals. There are a variety of ways to achieve the aims of the lessons, and students are encouraged to explain their thinking and trial each other's approaches to solve their own tasks.

Acknowledgements

Sayre AP, Sayre J & Cecil R, 2003, *One is a Snail, Ten is a Crab: A Counting by Feet Book*. Walker, London.

One is a Snail, Ten is a Crab

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About this lesson

This task uses the book *One is a Snail, Ten is a Crab* to explore numbers up to 20. Students represent numbers using the number of legs on animals in the book and look at how a number can be represented in multiple ways. Students also explore the efficiency of different representations.

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Mathematical purpose

- Students will apply counting strategies to connect numbers and quantities for numbers, particularly teen numbers.

Learning intention

- To represent numbers in different ways.



Time

A lesson of approximately 1 hour. It would be beneficial to read the book to the students prior to the lesson and allow students time to think on the way numbers have been made using the number of legs on animals.



Resources

- The book *One is a Snail, Ten is a Crab: A Counting by Feet Book* by AP Sayre and J Sayre
- reSolve PDF *1a One is a Snail Pictures*, cut to enable students to create numbers



Vocabulary

- teen numbers

Reading the book



Resources: Start the lesson by reading the book *One is a Snail, Ten is a Crab*.

Look at the way 6 has been made using an insect. Ask students: *What other ways could 6 be made using the animals in the book?*



Resources: Have students use pictures of the animals (as provided in the reSolve PDF *1a One is a Snail Pictures*) to create alternative representations of 6. Share and discuss the different ways that students have found.

Ask the students to think about what numbers are missing from the book. Focus on the fact that the teen numbers are not included.

Exploring missing teen numbers

Ask students to choose a teen number and represent the number using animals from the story.

Questions to direct the investigation and challenge students' thinking and reasoning:

- *How do you know you have represented your number?*
 - ◊ Most students will use one-to-one counting to show the total. Counting-on and addition strategies demonstrate more developed skills.
- *How many animals did you use to represent your number? Can you make it with more animals? Can you make it with fewer animals?*
 - ◊ Representing the number with all snails would use the most animals.
 - ◊ Asking students to find the least possible number of animals required to represent a teen number encourages them to use a crab.



Teacher note:

- Avoid prompting students to use crabs in their representation — this is the focus of Lesson 2 in the sequence. The emphasis at this stage is on experimenting with different numbers, not on understanding teen numbers as '10 and some ones'.



Extending prompt:

- *Can you find a way to use one representation of a number to make a new representation of the same number?*
 - ◊ This prompt encourages students to look at multiple ways of representing their number. Look at strategies that students use, such as substitution; for example, substituting two snails for a person or two people for a dog. There will be many ways to represent each number.

Conclusion

Create a display of the 'missing' numbers and order them as a class.

Look at the different ways that the same number has been represented. Ask students: *Is it still the same number even though it has been represented differently?* Students should appreciate that the same number can be represented in different ways.

Discuss why some representations used a large number of animals and some used a small number. Look at how substitution can be used to vary the number of animals in a representation.

Where to next?

Lesson 2: One Crab + Some More takes a closer look at the significance of 10 and the patterns of the place-value system.

One Crab + Some More

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About this lesson

This task continues to use the book *One is a Snail, Ten is a Crab*. It introduces students to the patterns of the place-value system and the significance of 10. The key understanding of unitising is introduced by asking students to represent teen numbers using one crab, which is the same as using 1 ten. In doing so, students move from using 10 ones to 1 ten.

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Mathematical purpose

- Students will understand that all teen numbers are made up of one group of 10 and some ones.

Learning intention

- To explore patterns in our number system.



Time

A lesson of approximately 1 hour.



Vocabulary

- number
- ones
- partition
- teen
- tens



Resources

- The book *One is a Snail, Ten is a Crab: A Counting by Feet Book* by AP Sayre and J Sayre
- reSolve PowerPoint *One is a Snail Patterns*
- reSolve PDF *1a One is a Snail Pictures*

Looking for patterns



Resources: Re-read the book *One is a Snail, Ten is a Crab* by Sayre and Sayre. Look at the patterns used in the book (see reSolve PowerPoint *One is a Snail Patterns*).
Some patterns to note:

- Every second one-digit number uses a snail. This can lead to an interesting discussion around odd and even numbers: even numbers can be made with pairs of legs and odd numbers need pairs plus one more.
- All of the larger numbers can be made using multiple crabs. The number of crabs needed corresponds to the digit at the start of the number; for example, 30 can be made with three crabs.
- The even multiples of 10 (20, 40, 60 and 80) are made of 2, 4, 6 or 8 crabs (2, 4, 6 or 8 lots of 10) or 10 animals with 2, 4, 6 or 8 legs (10 lots of 2, 4, 6 or 8).
- Every odd multiple of 10 is one crab more than the even multiple of 10 before it; for example, 50 is 10 dogs and a crab.

Pose the questions: *Which animals appear most in the book? Why do you think this is so?*

- 100 snails are used to represent 100 and so it is the most common animal.
- The crab is the second-most used animal. Look at the fact that a crab can be used to represent every number 10 or greater.

Pose the question: *If you could choose just one animal to make every number in the book, which would it be?*

- The snail can be used to represent any number in the book.

Pose the challenge: *Can you make all the teen numbers using one crab and some other animals?*

Exploring teen numbers

Allow students to independently explore how some different 'teen' numbers can be represented using a crab and some other animals; that is, representing the number as 10 plus some more ones.



Resources: Use the images given in the reSolve PDF *1a One is a Snail Pictures*.

Encourage students to work together to represent all the teen numbers. To promote systematic thinking, ask students: *How will you know you've done all the numbers? How will you keep track?*

Ask students to look at how the numbers 1 to 9 are made.

Pose the question: *How can the pattern of numbers from 1 to 9 help to represent all the teen numbers?*

Reflection

Ask some of the students who used a pattern to represent their numbers to share their work with the class. Refer back to the patterns shown in the reSolve PowerPoint *One is a Snail Patterns*. Compare the similarities and differences between the two groups of numbers. Students should see that the teen sequence is similar to the sequence for 1 to 10, the only difference being that a crab is included each time. Students should make the connection that the '1' digit at the front of the number indicates the crab (one group of 10).

Further activities

Activity 1

Explore other numbers beyond 20 and look at how the patterns continue.

Pose the questions: *How might we make 20? What about 21, 22 and 23?*

Create these numbers as a class, continuing the pattern.