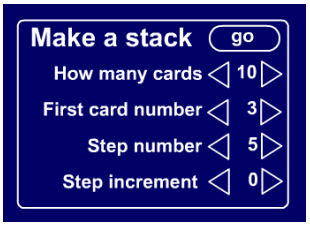
Teaching and learning activities using 20 cards ITP

Familiarise yourself with how to use the *20 cards* ITP using the ITP guide .

Looking for patterns and making general statements

- Select the Make a stack menu button: 
- Make a stack for a sequence of ten cards with a first card of number 3 and a step number of five (without children seeing the instructions).
- Deal the cards into a line using this button: 
- Turn over the first five cards:



Q: What number do you predict will be next? Explain how you know. Discuss with your partner your predictions for the rest of the cards.

Ask children to choose a card to turn over, predicting what it will show and explaining how they know. Reveal all the cards.

Q: What patterns do you notice? Will these patterns continue if the sequence continues? How do you know?

Take feedback.

Q: Agree with your partner some statements that are true for all the numbers in the sequence.

Collect as many different statements as children can offer. Ask children to comment on the suggestions of others and to challenge them if they don't agree.

Investigate other sequences in a similar way, for example using a step of four or a step of nine. Enter negative steps to create descending sequences. Ensure that children make and test generalised statements.

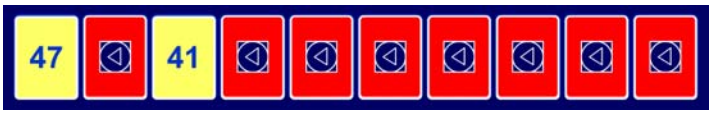
Identifying rules and using them to find missing terms

- Make a stack for a sequence with a constant step (without the children seeing).
- Turn over the first card.

Explain that this is a sequence with a constant step.

Q: You have to find the rule and use it to continue the sequence. Which additional card would you choose to turn over? How would this help you?

Take feedback. Explain that you are going to choose a card, and reveal the third card.



Q: Can you use this information to find the rule for this sequence? How?

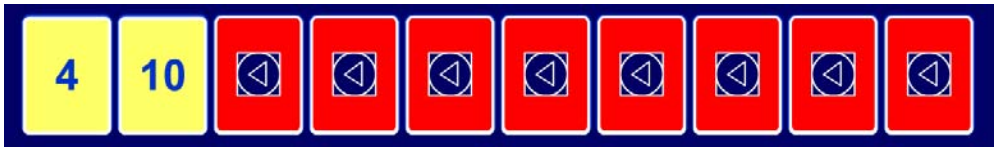
Compare children's ideas.

Q: How could we check whether your ideas are correct?

Encourage children to use their rule to make predictions, and turn over cards to check.

Repeat for other sequences with constant step, initially revealing two cards in each sequence, for example the second and fifth cards or the third and ninth cards.

- Make a stack for a sequence with a constant step.
- Turn over the first and second cards.



Explain that this is a sequence with a constant step.

Q: Work out what the tenth term will be. Compare your method with your partner's.

Check the answer by turning over the tenth card and take feedback on methods used. Explain that you might want to find the hundredth term of a sequence.

Q: Would any of your methods work well if you had to find the hundredth term of the sequence or the thousandth? If not, can we think of a method that would be more efficient?

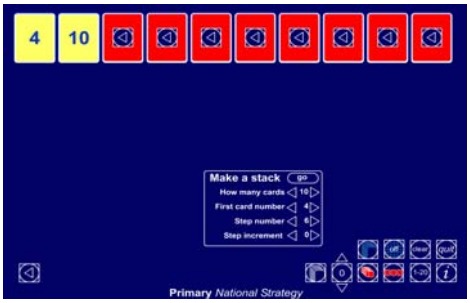
If the children do not suggest using the step size, then ask the following questions:

Q: What is the rule for this sequence? What must be added to the start number to get the second term? What must be added to the start number to get the third term? Why? What must be added to the start number to get the fourth term? Why? What about the tenth term? What about the hundredth term?

Repeat for other sequences with constant step, initially revealing the first two cards.

Give children the first two numbers of some constant step sequences and ask them to use this method to find the tenth and twentieth terms of each sequence. To check their answers children could use the 'constant function' facility on a calculator.

Creating sequences



Children need to work in pairs at computers for this activity. Explain that they are going to create sequences using the program. Demonstrate how to use the 'Make a stack' instruction box to create a sequence. Initially, ask children to ignore the 'Step increment' function.

One child in each pair should create a sequence without their partner seeing the instructions. They should turn over two cards and ask their partner to predict the value of a chosen card, explaining their method. The card can be turned over to check the prediction. Then children should swap roles.

Write up some sequences to create using *20 cards* ITP. Pairs should work together, discussing how to complete the 'Make a stack' instructions to create the given sequence. Include sequences where several terms are missing, for example

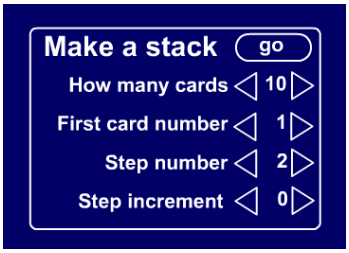
25, 22, 19, 16, 13, ...

8, 15, 22, 29, ...

10, _,28, _, _,55, ...

_, 57, 51, _, _,33, _, ...

Then explain that you are going to investigate the 'Step increment' function to explore what it does. Ask children to create the 'Make a stack' instructions for a sequence of ten cards with a first card of number 1 and a step number of 2:



Q: What sequence would this produce?

Establish that this would produce the sequence 1, 3, 5, ...

- Then change the 'Step increment' function to 1, and create the sequence.

Q: What do you think the first number will be?

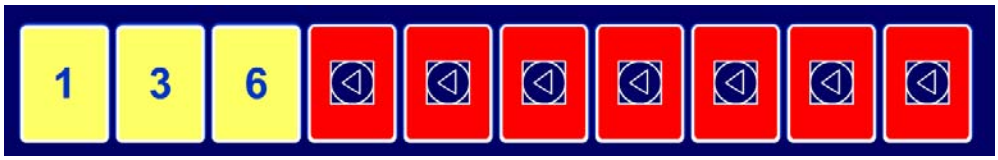
Check by turning it over.

Q: What do you think the second number will be?

Take suggestions, then turn it over.

Q: What was the step? What do you predict the third number will be?

Take suggestions, then turn it over.



Q: What was the step between the second and third term? Why?

Repeat for other terms. Record steps between subsequent terms. Establish that the 'Step increment' function changes the step by the chosen amount each time. These instructions generate the triangular numbers.

Ask children in pairs to choose settings for the 'Make a stack' instructions that include a 'Step increment'. They should then predict the first five terms of the sequence before producing the cards to check.

Extension challenge: Find the settings for the 'Make a stack' box to produce the sequence of square numbers 1, 4, 9, 16, ...