Cambridge University Press
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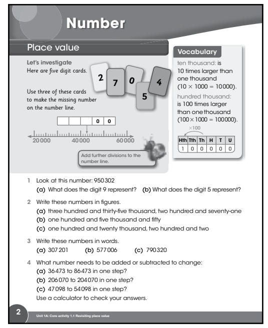
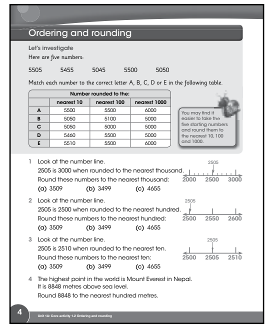
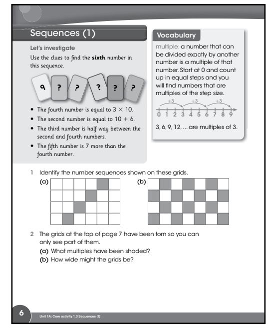
Excerpt
More information

1A 1 The number system (whole numbers)

Quick reference


Number
Place value


Ordering and rounding


Sequences (1)

Core activity 1.1: Revisiting place value (Learner's Book p2)
Learners consolidate previous learning and extend their understanding of the number system to include larger whole numbers. They use place value to partition numbers with up to six digits and use their understanding of place value to multiply and divide by 10 and 100.

Core activity 1.2: Ordering and rounding (Learner's Book p4)
Learners round numbers to the nearest 10, 100 or 1000 and compare and order whole numbers using the > and < signs.

Core activity 1.3: Sequences (1) (Learner's Book p6)
Learners work with different sequences which all have a constant 'jump' size.
They work with sequences presented as grid patterns and number sequences, and extend their understanding of multiples.

Prior learning

This chapter builds on work in Stage 4 with numbers with up to four digits:

- Ordering, rounding, partitioning and multiplying and dividing by 10 and 100.
- Counting on and back in steps of 1, 10, 100 and 1000.

Objectives* – please note that listed objectives might only be partially covered within any given chapter but are covered fully across the book when taken as a whole

1A: Number and the number system

- 5Nn1 – Count on and back in steps of constant size, extending beyond zero.
- 5Nn2 – Know what each digit represents in five- and six-digit numbers.
- 5Nn3 – Partition any number up to one million into thousands, hundreds, tens and units.
- 5Nn5 – Multiply and divide any number from 1 to 10 000 by 10 or 100 and understand the effect.
- 5Nn6 – Round four-digit numbers to the nearest 10, 100 or 1000.
- 5Nn8 – Order and compare numbers up to a million using the > and < signs.
- 5Nn12 – Recognise and extend number sequences.
- 5Nn13 – Recognise odd and even numbers and multiples of 5, 10, 25, 50 and 100 up to 1000.

1A: Problem solving (*Using understanding and strategies in solving problems*)

- 5Ps3 – Explore and solve number problems and puzzles.
- 5Ps8 – Investigate a simple general statement by finding examples which do or do not satisfy it.

*for NRICH activities mapped to the Cambridge Primary objectives, please visit www.cie.org.uk/cambridgeprimarymaths

Vocabulary

ten thousand • hundred thousand • multiple

Core activity 1.1: Revisiting place value

LB: p2

Resources: *Place value chart: 1–100 000* photocopy master (CD-ROM); prepare large version for class display. *Place value crossword* photocopy master (CD-ROM). Calculators. (Optional: 0–9 spinners (CD-ROM).)

Multiplying and dividing by 10

At the start of the session, briefly revise place value using the *Place value chart 1–100 000* photocopy master, making sure to cover the hundred thousand column. Ask learners what changes and what stays the same when you multiply 6 by 10. **(Answer: The digit 6 stays the same but the place value moves to the left.)**

Demonstrate this on the place value chart. Ensure that learners understand how zero can be used as a place holder by partitioning numbers of up to five digits. For example, 23 806 is 20 000 + 3000 + 800 + 6. In 23 806 the zero makes sure that the '8' and the '6' are in the correct place; without the zero we would read '2386', which is not correct.

Explain that, so far, they have learned about numbers up to tens of thousands. "*Now we are going to look at hundreds of thousands, which is 10 times larger than tens of thousands, or a hundred times larger than a thousand.*" Ask learners to write a single-digit number in the centre of a sheet of paper. Tell them to keep multiplying their chosen number by 10 and to record the result they get each time in words and figures. Learners should stop multiplying when they have generated a **six-digit number**. Explain that a number with six digits has a size of hundreds of thousands.

Ensure that learners understand that multiplying by 100 is equivalent to multiplying by 10 and then by 10 again. Extend the work to dividing by 10 and 100. Use the *Place value chart 1–100 000* photocopy master, with the hundred thousand column visible, to demonstrate that when dividing by 10 each digit moves **one place to the right**, and when dividing by 100 each digit moves **two places to the right**.

Hundreds of thousands

Write the number 985 432 on the board and ask:

- "*What does the digit 9 represent?*" **(Answer: 9 hundred thousand)**
- "*What does the digit 8 represent?*" **(Answer: 8 ten thousands (or 80 thousand))**
- "*What does the digit 2 represent?*" **(Answer: 2 units (or ones))**

Vocabulary

ten thousand: ten thousand is 10 times larger than a thousand (10 × 1000).

hundred thousand: hundred thousand is 100 times larger than a thousand (100 × 1000).

hundred thousand	ten thousand	thousand	hundred	ten	unit
HTh	TTh	Th	H	T	U
1	0	0	0	0	0
	1	0	0	0	0
		1	0	0	0

× 10

× 100

Example: multiplying 7 by 10 to generate a six-digit number.

seven	7
seventy	70
seven hundred	700
seven thousand	7000
seventy thousand	70 000
seven hundred thousand	700 000

Practise partitioning numbers up to one million into thousands, hundreds, tens and units in this way until learners are comfortable with the larger numbers.

Ask these additional questions to give learners more practice in working with numbers with up to six digits. Learners may use a calculator to check their answers.

- "*What number needs to be added or subtracted to change 35 873 to 95 873 in one step?*" **Answer: 60 000 needs to be added)**
- "*What needs to be added or subtracted to change 209 050 to 202 050 in one step?*" **(Answer: 7000 needs to be subtracted)**
- "*If we partition 305 469 into expanded form, what number must go in each box? How do you know?*" 305 469 = □ + 5000 + □ + □ + 9

(Answer: 300 000, 400, 60; partitioning a number gives a single digit and zeros to give the correct place value, starting with the largest place value)

Set learners a challenge. Ask:

- "*Does anyone know what I mean by one million? How do you write one million in figures?*" (Learners might be unfamiliar with this terminology, or recognise it as 1 and 6 zeros; the correct answer is one thousand thousands.)
- *How do you write half a million in figures?* **(Answer: 500 000)**
- *How do you say this number?* **(Answer: five hundred thousand)**

Look out for!

Learners who say, 'To multiply by 10 add a 0.' *This 'rule' does not extend to decimals and should not be used. Instead, insist that learners use the rule: 'To multiply by 10, each digit moves one place value to the left.'*

Summary

Learners have extended their knowledge of the number system and can work with whole numbers with up to six digits.

Notes on the Learner's Book

Place value (p2): consolidates previous learning and extends learners' understanding of the number system to include larger whole numbers. Give learners a copy of the *Place value crossword* photocopy master for question 7.

Check up!

- "*Why do 3000 × 100 and 30 000 × 10 give the same answer?*"
- "*I have the number 456 000 showing on my calculator. What single calculation can I do to make 956 000?*"
- "*How can I change 456 000 to 416 000 in one step?*"

More activities

<u>Target 100 000</u> (class)

You will need a 0–9 dice or a 0–9 spinner (CD-ROM).

Generate six digits and write them for the whole class to see. Learners use these digits to make two three-digit numbers. For example: 3, 5, 9, 2, 4 and 1 can be used to make 921 and 543. Learners write down their chosen numbers and then decide whether to multiply each number by 10 or 100. The aim is to get a total that is as close to 100 000 as possible when the two products are added together. For example: 921 × 100 = 92 100 and 543 × 10 = 5430; 92 100 + 5430 = 97 530 and 100 000 − 97 530 = 2470. Remind learners that the number pairs for 10 are useful here because they can be used to estimate number pairs to 100 000. The learner(s) whose total is closest to 100 000 scores one point. Generate a new set of numbers and continue the game.

Games Book (ISBN 9781107667815)

Remove a digit (p6) is a game for two players. It encourages learners to consider the position, and therefore the value, of each digit in a whole number with up to six digits.

Core activity 1.2: Ordering and rounding

LB: p4

Resources: A large sheet of paper big enough to create a poster. (Optional: 0–9 spinners (CD-ROM).)

Rounding to the nearest thousand

Remind learners of the rules of rounding from Stage 4 (Unit 1A, chapter 1): to round a number to the nearest hundred look at the tens digit, if it is less than 5 the hundreds digit remains unchanged and the number is rounded down to the nearest hundred, if it is 5 or more round up. (Look at the digit in the place value to the right of the chosen place value when determining to round up or down).

Write the numbers shown in the column to the right, for the whole class to see. Ask, "*Which number do you think is closest to 2549 rounded to the nearest hundred?*"

Give learners time to discuss the question in pairs. Take feedback.
(Answer: 2549 is 2500 when rounded to the nearest hundred)

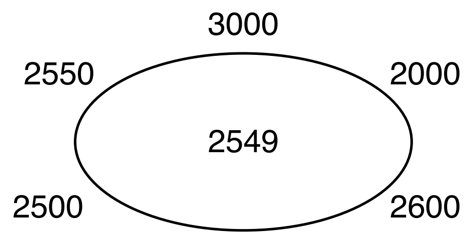
Discuss that 2549 could also be rounded in different ways, for example:
- 2549 is 2550 when rounded to the nearest ten
- 2549 is 3000 when rounded to the nearest thousand.

Learners should understand, from what they know about rounding to the nearest 10 or 100, that to round a number to the nearest thousand they need to look at the hundreds digit. If it is 5 or more, round up. If it is less than 5, the thousands digit remains unchanged.

Still displaying the circled numbers from the start of the session, ask learners to imagine a reporter writing about the attendance at the match for a newspaper. "*Which number would they use, the actual attendance figure or a rounded number? Why?*" There is no correct answer but suggestions might include that in this kind of report an exact number probably isn't important and a rounded number might be easier to visualise. Also, the reporter might choose to use a rounded number to make the attendance appear bigger in order to make the article more dramatic.

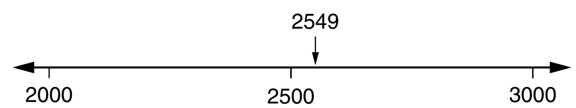
Ask learners to round the following numbers to the nearest thousand and then put the rounded numbers in order from largest to smallest:
3990, 4500, 3495, 4090, 9550 **(Answer: 10000, 5000, 4000, 4000, 3000)**

"*What do you notice about two of the rounded numbers?*" **(Answer: 3990 and 4010 both round to 4000 to the nearest thousand)**



Remind learners how to round using a number line to show that 2549 rounded to the nearest thousand is 3000.

Example: 2549 is closer to 3000 than 2000.



Opportunity for display

Collect examples from newspapers and magazines of numbers that are likely to be rounded.

Ordering six-digit numbers

The review of place value in Core activity 1.1 should help learners order six-digit numbers. Make sure that they understand that the first digit represents the largest part of the number. Inform learners that they can partition the number first if they need to. Invite learners to order these six numbers, starting with the smallest:

250 000   260 000   300 000   254 900   255 000   200 000

Prompt them to realise that the answer can be written using the less than (<) symbol, as shown here:
(Answer: 200 000 < 250 000 < 254 900 < 255 000 < 260 000 < 300 000)

Summary

- Learners can confidently round numbers to the nearest 10, 100 and 1000; and order and compare numbers using the < and > signs.
- Learners can order and compare numbers up to one million.

Notes on the Learner's Book

Ordering and rounding (p4): provides practice in rounding numbers to the nearest 10, 100 and 1000. Learners are given some facts about five famous mathematicians. They are asked to draw a time line and arrange the mathematicians' dates of birth and death on it. Encourage learners to investigate the famous mathematicians listed. Help them to display the information they find in the form of a time line.

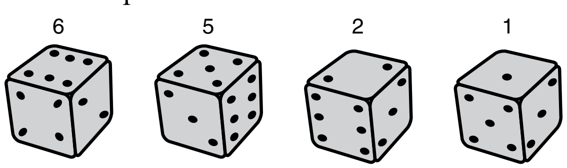
Check up!

- *Round 3568 to the nearest 10, 100 and 1000.* **(Answer: 3570, 3600, 4000)**
- *Round 9384 to the nearest 10. Is it less than or more than 9379 to the nearest ten?* (**Answer: they are equal)**
- "*Put the following numbers in size order, using the* '*less than*' *or* '*more than*' *symbol: 3647, 9540, 234, 9990*" **(Answer: 234 < 3647 < 9540 < 9990; or 9990 > 9540 > 3647 > 234)**
- *What is bigger, 999 800 or 998 900?* **(Answer: 999 800)**
- "*A newspaper reported that 5000 people attended the match. The organisers said that 4672 people were there. Explain the difference in numbers.*"

More activities

Nearest hundred (pairs)

You will need a 0–9 dice or 0–9 spinner (CD-ROM). Each player rolls the dice or spins the spinner four times. Players record the digits in the order that they are generated to make one four-digit number. Each player then rounds their number to the nearest 100 and scores that number of points for the round. For example:



to the nearest hundred

6521 → 6500

6500 is 65 hundreds, so scores 65 points

The player with the most points after 10 rounds is the winner. You can adapt the game to rounding numbers to the nearest 10 or the nearest 1000.

Core activity 1.3: Sequences (1)

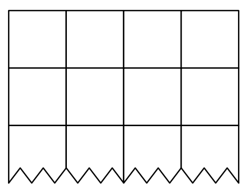
LB: p6

Resources: *Number sequences* photocopy master (p9). 1 cm² square paper (or use *Square paper* photocopy master (CD-ROM)). *Check up!* photocopy master (p10). (Optional: *Sequence cards* photocopy master (CD-ROM).)

Ask learners to imagine a grid of squares that is four squares wide. The number 1 is in the top left-hand corner, 2 is next to 1, and the numbers continue in order.

Now ask:

- "*Where would 5 be?*" **(Answer: first square in the second row)**
- "*What about 7? How did you work it out?*" **(Answer: third square in the second row)**



Choose other numbers, encouraging learners to explain each time how they worked out the number's position in the grid. Possible suggestions might include counting the squares from left to right; or using multiples of the first digit in a column to fill the rest of the column.

"*Imagine that the numbers in the 2× table are shaded on the grid. What pattern would they make?*" (**Answer: a vertical strip pattern**)

Give learners the following general statement: 'All grids produce a strip pattern for multiples of 2'. Ask them to investigate if this general statement is true. If necessary, prompt learners by asking, "*What if the grid was a different width?*" (Link to work on general statements from Stage 4 (Unit 2A, chapter 9)). Allow time for feedback. The learners should agree that the general statement is not true; they should show the understanding that grids with an odd number of columns will not give a strip pattern for multiples of 2.

Now invite learners to imagine a grid of squares that is six squares wide. They should imagine colouring in numbers that are multiples of 3 (i.e. numbers in the 3× table). Ask:

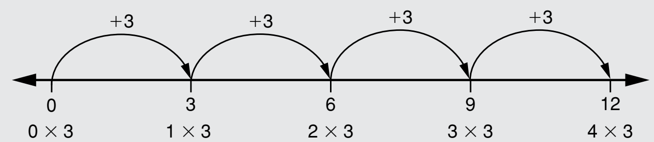
- "*What pattern do you get?*" **(Answer: a vertical strip pattern)**
- "*How did you work it out?*"

Invite learners to draw the grids for themselves if they cannot visualise the pattern easily. Compare the patterns for the multiples of 2 and 3, "*What do you notice?*" Establish that there is one square between each shaded square in a row for the multiples of 2, and two squares

Vocabulary

multiple: the result of multiplying a number by a positive whole number. Start at zero and count up in steps of the same size and you will find numbers that are multiples of the step size.

For example:



3, 6, 9, 12 . . . are all multiples of 3 between shaded squares for the multiples of 3. Learners should realise that they need to check the number of squares between two shaded squares on a row to determine the multiple. The multiple is one more than the number of blank squares between shaded squares in a row.

Now consider different sizes of grid. Can the same vertical strip pattern be formed on a different size grid? Give learners time to experiment with drawing and colouring different sized grids. Encourage learners to realise that the width of the grid can vary and still produce the same pattern, provided the width of the grid is a multiple of the number being coloured. For example, for multiples of 3, grids of squares that are 3, 6, 9, etc. squares wide will produce the vertical strip pattern.

Explain to learners that the patterns they have been looking at form number sequences. If necessary, remind them that a sequence is a list/pattern of numbers arranged according to a rule. The sequences they have looked at so far have the following rules to determine what square to colour next:
– multiples of 2, or counting on in twos starting at 2
– multiples of 3, or counting on in threes starting at 3.

Ask learners to investigate the grids on the *Number sequences* photocopy master. Learners can either write their answers on the sheet or in their notebooks.

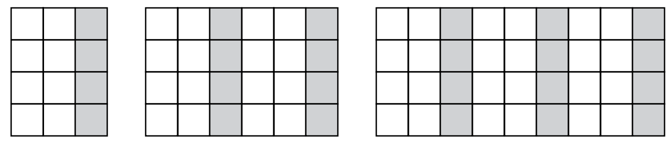
Take feedback on learners' results. Remind learners again that number patterns such as these are called sequences.

Recap, "*In all the number sequences we have looked at so far we have:*
- *counted in steps of equal size*
- *started the count at a multiple.*"

Establish that we do not always start the count in this way. We could have steps of 4 but start counting from a number which is not a multiple of 4. For example:
3, 7, 11, 15, 19… (counting on in 4s)
15, 11, 3, 3, −1… (counting back in 4s)
Give similar sequences and ask learners to find the next number in the sequence.

Extend to counting on or back in multiples of larger numbers. For example:
50, 100, 150, 200, 250…
300, 200, 100, 0, −100…
Give similar sequences and ask learners to find the next number in the sequence.

Example: multiples of 3 will form a vertical strip pattern on different grids, for example:



Note: The space between the shaded squares on a row is two squares (one less than the multiple).

<u>*Number sequences* photocopy master answers</u>

1. (a) Multiples of 6
(b) Multiples of 3
(c) Multiples of 4
(d) Multiples of 5
(e) Multiples of 3
2. (a) Grid 1: multiples of 4; Grid 2: multiples of 5
(b) Grid 1: width of grid could be 9, 13, 17… squares;
Grid 2: width of grid could be 6, 11, 16…squares

Summary

- Learners are able to explore patterns of multiples.
- They can count on and back in steps of constant size from any start number, including working with negative numbers.

Notes on the Learner's Book

Sequences (1) (p6): gives the opportunity to work with different sequences which all have a constant 'jump' size. Many of the questions also provide valuable tables practice.

Check up!

- "*Noura writes down a sequence of numbers starting with 100. She subtracts 55 each time. What are the next two numbers in the sequence?*"
- Display the *Check up!* photocopy master (p10) and say, "*This grid has been torn so you can see only part of it. What multiples have been shaded?*" *How wide might the grid be?*"

More activities

Sequence cards (for individuals or pairs)

You will need a set of sequence cards from the *Sequence cards* photocopy master (CD-ROM); per learner or pairs of learners.

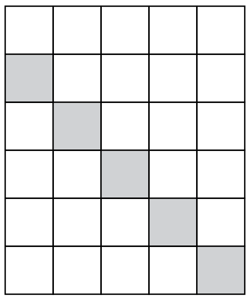
Learners sort the cards into four sets. Each set shows a different part of the sequence (the 'jump' size is the same but the starting number is different). Learners give the rule for the sequence.

(Answers: Sequence A – counting back in 2s; Sequence B – counting on in 5s; Sequence C – counting on in 3s; Sequence D – counting on in 25s)

Number sequences

1. Look at the grids and identify the number sequences.

(a)



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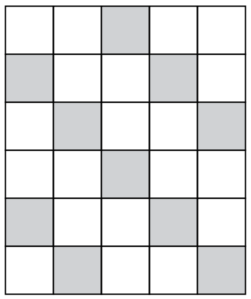
(b)



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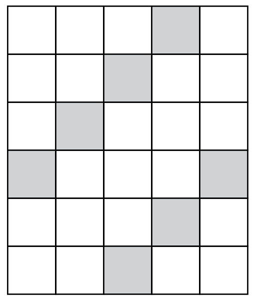
(c)



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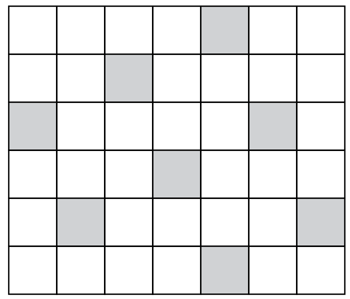
(d)



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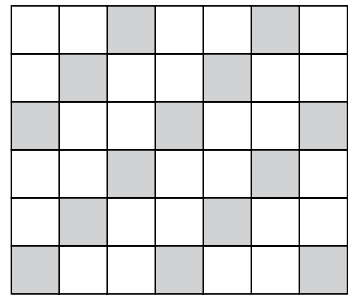
(e)



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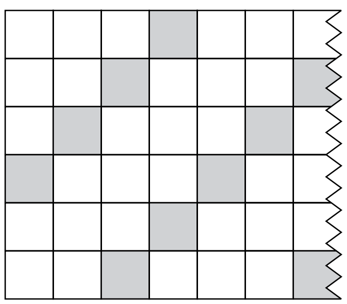
2. These grids have been torn so you can see only part of the grid.

   (a) What multiples have been shaded?

   (b) How wide might the grids be?

Grid 1



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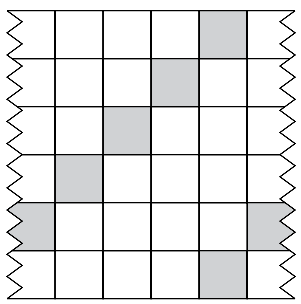
Grid 2



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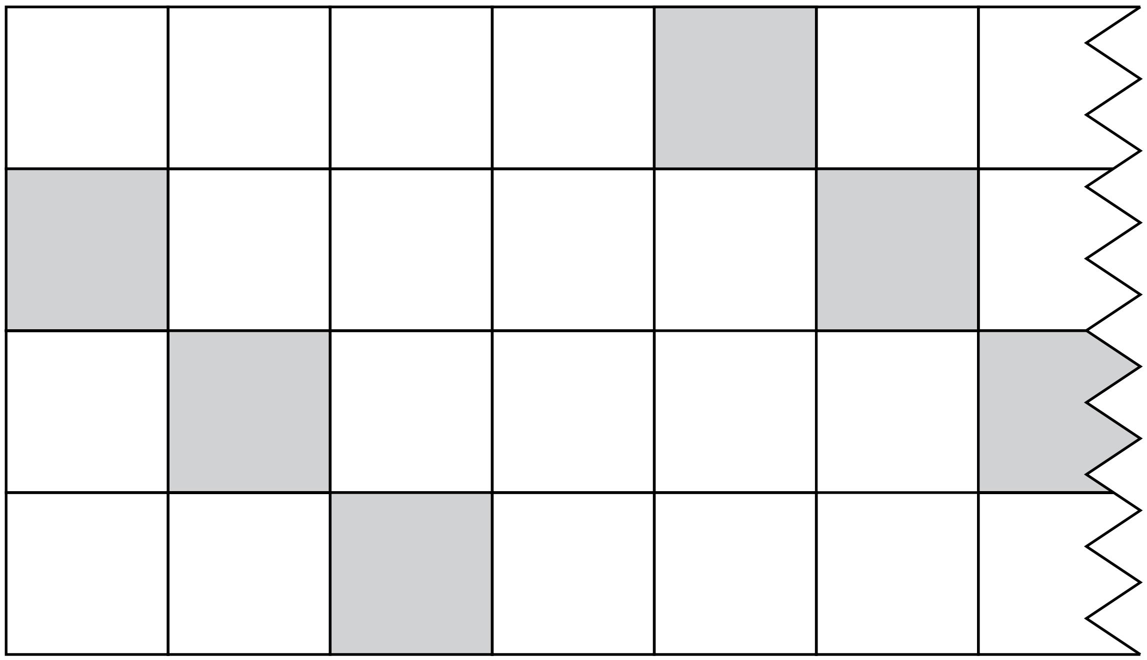
Instructions on page 7

Check up!



Instructions on page 8