Addition and Subtraction Strategies

The hundreds board

We are learning to identify patterns in sets of numbers.

Exercise 1: Patterns with multiples

For this exercise you will need a hundreds board and a set of counters, and a sheet with miniature hundreds boards that you can cut and glue into your books.

What to do

1) Use your hundreds board and set of counters to show the pattern for each of the questions.
2) Once you have the pattern worked out, copy it onto a miniature hundreds board by shading the numbers that should be covered by counters all the way to 100. Glue this into your book.
3) Write a list of all the shaded numbers below each hundreds board. Say what these numbers are.

1) Cover all the even numbers. These are the multiples of 2.
2) Check you have followed the instructions above now you have finished working out the pattern to shade in
3) Apart from the pattern you shaded, did you notice anything interesting about the numbers while working with the multiples of 2 (the even numbers). If you did, write down what it was. Be prepared to talk about your discoveries with your group and your teacher.
4) Clear your hundreds board of counters. This time cover every third number. (So the first number that is covered is 3, then 6 and 9 and so on). These are the multiples of 3. Once you have the pattern worked out make sure you make a copy on a miniature board, glue it in your book and write a list of the multiples of 3 below it.
5) Do the same for the multiples of 4 (every fourth number, starting with 4 and 8)
6) Did you notice any patterns while working with the multiples of 4. If you did, write down what they are. Be prepared to talk about them with your group and your teacher
7) Repeat the process with the multiples of 5. What do you notice about the multiples of 5? (This is an important pattern you will need to remember).
8) Repeat the process for the multiples of ten. What do you spot about the multiples of 10? (This is another important and easy pattern you will need to remember).
9) Use your hundreds board to investigate the multiples of 9, 8, 11 and 6. Record anything interesting you notice about all the numbers in the pattern.
10) You have already listed the even numbers up to 100. Now look at the odd numbers. What do you notice about them?
Exercise 2: The sieve of Eratosthenes

For this exercise you will need a miniature hundreds board that you can cut and glue into your books. You may also want a calculator or a hundreds board and counters to work out the multiples that you do not have listed from exercise 1.

1) Cross out (or shade) all the multiples of 2 – except 2 (so cross out 4, 6, 8, … up to 100)
2) Now cross out (or shade) all the multiples of 3 except 3. (You will find some of them already crossed out, so it should be quicker)
3) The next number that is not crossed out is 5. Leave that one and cross out any other multiples of 5 that are not already crossed out. (There is a quick way to do this – can you remember your pattern from exercise 1?)
4) Look at the next number that is not crossed out. (It should be 7). Leave it but cross out all the other multiples of 7.
5) Look at the next number that is not crossed out. Leave it, but cross out all the other multiples that have not yet been crossed out.
6) Keep going like this until you get to 50. (You may want a calculator or a hundreds board to help you work out which numbers need to be crossed out.
7) Write a list of all of the numbers that are not crossed out

What you have done in this exercise is found a special set of numbers called the prime numbers. Find out what you can about the prime numbers, and make a wall display about what you have learned.

Exercise 3: Up and down

For this exercise you will need a hundreds board and a set of counters, and several miniature hundreds boards that you can paste into your books.

1) Put a counter on a square somewhere in the middle of the hundreds board. Now put counters on each number above your number (so you have a part of a column of numbers filled in).
2) Look at the numbers you have covered. Can you see any patterns?
3) Copy out the numbers into a column in your maths book
4) One way to look for patterns in numbers is to look at what is the same, and what is different. Look at your column for what changes about the numbers, and what is the same about the numbers. Explain what is the same and what is different about the numbers in your column.
5) Use your hundreds square to work out how many you are adding as you go from one number to the next.
6) Repeat this process twice more, with different starting numbers. What have you discovered? Explain your discovery clearly so someone in your group who was absent can learn from what you have done.
7) Be prepared to talk about your discoveries with your teacher and the rest of the group.
8) Now choose a number near the top of your page. This time you are going to be covering numbers below the number you have chosen. Can you predict what you will notice as a pattern?
9) Make a column of numbers by covering all the numbers below your number with counters.
10) Look for what is similar and what is different in the numbers, and explain what you have discovered.
11) Use your hundreds square to work out how many you are subtracting as you go from one number to the next.
12) Try to write a rule about how to subtract ten quickly, without counting.
13) By choosing several other numbers on your hundreds board, see if your subtracting rule will work with other numbers.
14) Write up your investigations from this exercise on refill paper. Explain what you have done, and what you have learned. Glue miniature hundreds boards into your work to help explain. Hand this in for marking.

Exercise 4: Up and down

Work out the answers to these problems without counting. You may like to use a hundreds board (moving up and down) to check the answers:

1) 35 + 10  
2) 49 – 10  
3) 16 + 10

4) 67 + 10  
5) 94 – 10  
6) 21 + 10

7) 56 – 10  
8) 36 + 10  
9) 87 – 10

10) 34 + 10  
11) 76 – 10  
12) 72 - 10

13) What do you think will be the answer to 135 + 10? Explain your answer.

14) Without counting, predict the answers to the following:
(a) 139 + 10  
(b) 345 – 10  
(c) 457 + 10
(d) 649 – 10  
(e) 488 + 10  
(f) 721 - 10

15) These ones relate to adding and subtracting 10 at the edges of the hundreds board. Predict what you think the answers will be, then add another row to your board to check if you are right:
(a) 96 + 10  
(b) 109 – 10  
(c) 91 + 10
(d) 104 – 10  
(e) 99 + 10  
(f) 100 - 10

16) What do you think will be the answer to 45 + 20? (If you are not sure, explore how to do this with your hundreds board). Explain your answer.

17) Without counting, predict the answers to these questions:
(a) 39 + 20  
(b) 35 – 20  
(c) 57 + 20
(d) 49 – 20  
(e) 48 + 20  
(f) 21 – 20
(g) 78 – 20  
(h) 17 + 20  
(i) 47 – 20
(j) 24 + 30  
(k) 56 – 30  
(l) 31 + 40
Exercise 5: Arrows

In this exercise, you may need a hundreds board and a set of counters.
Remember that:

• \( \rightarrow \) to mean move across 1 (to add 1)
• \( \uparrow \) to mean move up 1 row (to add 10)
• \( \leftarrow \) to mean move back 1 (to subtract 1)
• \( \downarrow \) to mean move down 1 row (to subtract 10)

1) 32↑↑↑  
2) 54↓↓↓  
3) 27→→→

4) 31←←←←  
5) 37↓↓←←  
6) 79←↑→↓

7) 44←←↑↑  
8) 56↑↑→↑→  
9) 81←←←

10) 99→→→  
11) 26←←←  
12) 34←↑←

13) 42↑↑→→↑  
14) 77↓↓←←↑  
15) 23←←↑←←

16) 39→↑↑→↑→  
17) 18↓→→↑→  
18) 50←↑↑→↑

19) 87↓←←↑↑  
20) 98↑→→→→  
21) 49→↑→↓←

22) 66↑→←←↑  
23) 23←←↓←↓  
24) 89↑↑→↑

25) Make up 6 of your own problems, then try them out on a partner and see if you both agree with the answer

Extra for experts

The following ones require a bit more thought. You may like to check them by using and extending a hundreds board.

26) 2←←←  
27) 10↓↓↓  
28) 6↓↓↓

Ones with the hundred arrow

29) 44←←↑⇒  
30) 72↓↓←⇒  
31) 81⇒⇒⇒

32) 29↑⇒⇒  
33) 36↓⇒↓←←  
34) 59↑↑⇒↑→

35) 24↓←←←↑↑  
36) 43↑↑⇒↑⇒  
37) 76⇒←←↑←←

38) Make up 5 of your own using the hundreds arrow as well. Try them out on a partner and see if you both agree with the answer

39) Here are some new symbols 🏓 🏆 🏳️ 🅿️. Think of your hundreds board and make up a meaning for these that others could understand if they looked at the hundreds board. Make up 10 problems of your own using the new arrows as well as the old ones. Try them out on a partner and see if you both agree with the answer
Challenge
Explore what happens if you start at a number in the bottom row and try to subtract ten. What
numbers do you think are below zero? What happens to the pattern of adding ten if you try this?
Be prepared to discuss your ideas and answers with your teacher.

Answer these problems
40) 3 – 10          (41) 1 – 10          (42) 9 – 10
43) Can you work out what the answer to -5 – 10 might be? Explain your answer by drawing an
extended hundreds board in your book and showing what you think the answer is.
(Hints: Is the answer bigger or smaller than zero? Why should this be?)

Exercise 6: Nines
For this exercise you will need a hundreds board and a set of counters, and a
sheet with miniature hundreds boards that you can cut and glue into your
books.

What to do
1) Use your hundreds board and set of counters to show the pattern for each
of the questions.
2) Once you have the pattern worked out, copy it onto a miniature hundreds
board by shading the numbers that should be covered by counters all the
way to 100. Glue this into your book.
3) Write a list of all the shaded numbers below each hundreds board. Say
what these numbers are.

1) Put a counter on the number 56. Put another counter on the number that is 9 more, then
another counter on the number that is 9 more than this, and so on.
2) Copy the numbers you have covered onto a miniature hundreds board, and glue this into
your book. Write a list of the numbers underneath.
3) Look for patterns in the numbers. When adding 9, what happened to the tens digit? What
happened to the ones digit? Write down the pattern if you can see it.
4) Choose a number of your choice and cover it with a counter. Add nine to it, and cover with
a counter, add another one and so on. Did the pattern you found above still work?
5) Try 2 more starting numbers and see if it still works
6) Write an explanation of how to add 9 more quickly than just counting on 9. Show how it
works on some examples
7) Can your rule for adding nine be changed to make a rule for subtracting nine? Use your
hundreds board and counters to work out what the shortcut for subtracting 9 will be, then
explain in writing how it works.
8) William reckons he can also make your “adding 9” trick work for adding 8. Investigate
whether or not it will work. Write this up properly as an investigation in your books.

Challenge
Investigate using your hundreds board and counters if you can invent a quick rule for how to add
11. If you find one, write down what it is and how it works, and be prepared to explain it to your
teacher.
Exercise 7:
In this exercise you may want to use a hundreds board and a counter. Remember that:
- R to mean move across 1 (to add 1)
- U to mean move up 1 row (to add 10)
- L to mean move back 1 (to subtract 1)
- D to mean move down 1 row (to subtract 10)

1) 20, LDL  
(2) 15, URUR  
(3) 21, URUL

4) 35, ULUL  
(5) 47, ULDR  
(6) 52, LDLDL

7) 49, ULURU  
(8) 71, DLDRD  
(9) 43, RDLDU

Exercise 8:
In this exercise you may want to use a hundreds board and a counter. Remember that 2D means to move down 2 rows, that is subtract 20

1) 24, 2D + R  
(2) 43, D + 3R  
(3) 87, 3D + L

4) 62, L + 2D + 2R  
(5) 47, R + U + 2D  
(6) 55, 4D + 2R

7) 37, L + U + 2L  
(8) 43, D + R + 2D  
(9) 89, U + 2R + U

10) 51, L + D + L + D  
(11) 29, R + 2U + R + U  
(12) 65, 2D + L + 2D + R

13) 49, 3R + D + U + D  
(14) 83, 2U + R + U  
(15) 34, L + D + R + 2D

16) 18, 3U + R  
(17) 31, 5U  
(18) 57, 4D

19) 77, 4D + 3R  
(20) 89, 6D + R + U  
(21) 71, 3L + 5D

22) 67, 4U + 3R  
(23) 23, 10U  
(24) 56, 10U + R

25) 90, L + 3D  
(26) 70, 3L + 4D + L  
(27) 80, L + 2U + L

28) 100, 2U + 3R  
(29) 100, L + 2U  
(30) 100, 3R + 3U

31) Make up 10 questions of your own and try them with a partner to check that you both get the same answer.
The hundreds board

Answers

Exercise 1
2) 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52,
54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100
3) The pattern on the hundreds board shows that all numbers that end in 2 or 4 or 6 or 8 or 0
are even numbers. Every other column is shaded in
4) 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 63, 66, 69, 72, 75,
78, 81, 84, 87, 90, 93, 96, 99
5) 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 76, 80, 84, 88, 92, 96, 100
6) The multiples of 4 are also all multiples of 2.
7) 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100
Numbers in the fives times tables all end in a 5 or a zero.
8) 10, 20, 30, 40, 50, 60, 70, 80, 90, 100
The multiples of ten all end in a zero
9) Multiples of 9 are 9, 18, 27, 36, 45, 54, 63, 72, 81, 90, 99
Did you notice that up to 90, if you add up the digits, you always get 9?
Multiples of 8 are 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96
Multiples of 11 are 11, 22, 33, 44, 55, 66, 77, 88, 99 – which is an easy pattern to spot!
Multiples of 6 are 6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72, 78, 84, 90, 96
10) Odd numbers always end in a 1, 3, 5, 7 or 9

Exercise 2
The numbers that are not crossed out are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59,
61, 67, 71, 73, 79, 83, 89, and 97 (giving 25 numbers in all)

Exercise 3
2 and 4) The pattern you should see is the digit (number) in the tens column goes up by one
each time, but the digit (number) in the ones column stays the same.
5) You add ten when going from one number in the column to the next
6) What you have hopefully worked out is that to add ten, a quick way is the change the
number in the tens column by 1. For example, 21 + 10 = 31
8) When going up a row (adding 10), the numbers in the tens column go up by one, so when
going down a row (subtracting 10) the numbers in the tens column should go down by 1
10) See question 8
11) Subtract 10 as you go from one line to the next
12) To subtract 10 from a number, reduce the digit in the tens column by 1
13) This rule works when subtracting ten from any number you choose

Exercise 4
1) 35 + 10 = 45 (2) 49 – 10 = 39 (3) 16 + 10 = 26
4) 67 + 10 = 77 (5) 94 – 10 = 84 (6) 21 + 10 = 31
7) 56 – 10 = 46 (8) 36 + 10 = 46 (9) 87 – 10 = 77
10) 34 + 10 = 44 (11) 76 – 10 = 66 (12) 72 – 10 = 62
13) 135 + 10 = 145. When adding ten, the number (digit) in the tens column goes up by 1
14) (a) 139 + 10 = 149  (b) 345 – 10 = 335  (c) 457 + 10 = 467  
(d) 649 – 10 = 639  (e) 488 + 10 = 498  (f) 721 – 10 = 711  
15) (a) 96 + 10 = 106  (c) 109 – 10 = 99  (c) 91 + 10 = 101  
(d) 104 – 10 = 94  (e) 99 + 10 = 109  (f) 100 – 10 = 90  
16) 45 + 20 = 65. By adding 20 you are going up 2 rows on the hundreds board, so the number 
(digit) in the tens column goes up by 2.  
17) (a) 39 + 20 = 59  (b) 35 – 20 = 15  (c) 57 + 20 = 77  
(d) 49 – 20 = 29  (e) 48 + 20 = 68  (f) 21 – 20 = 1  
(g) 78 – 20 = 58  (h) 17 + 20 = 37  (i) 47 – 20 = 27  
(j) 24 + 30 = 54  (k) 56 – 30 = 26  (l) 31 + 40 = 71  

Exercise 5

1) 62  (2) 24  (3) 30  (4) 27  
5) 15  (6) 79  (7) 72  (8) 88  
9) 78  (10) 102  (11) 4  (12) 62  
13) 74  (14) 65  (15) 39  (16) 72  
17) 21  (18) 80  (19) 95  (20) 111  
21) 50  (22) 97  (23) 0  (24) 121  
25) 6 of your own to work through with a partner  
26) -1  (27) -20  (28) -24  (29) 142  
30) 151  (31) 381  (32) 141  (33) 114  
34) 190  (35) 132  (36) 273  (37) 153  
38) 5 of your own with the hundreds arrow to work through with a partner  
39) By looking at the hundreds board, should mean ‘add 9’, add 11, subtract 9 and subtract 11. 
10 of your own that include the new arrows to work through with a partner  

Challenge

When you subtract 10 you ‘run out of numbers’ on the hundreds board, so need some more. You 
should already have met the idea that negative numbers are below zero, perhaps from watching the 
weather. By putting on another row and counting back 10 spaces you can work out what the answer 
is – but the answers for the next questions are to be discussed with your teacher. 

Exercise 6

2) 56, 65, 74, 83, 92  
3) The tens digit goes up by 1. The ones digit goes down by 1  
4 and 5) The pattern works for most numbers you choose. For example, 77, 86, 95 or 61, 70 
It does not always work however. For example, 60 + 9 = 69, so it does not work for tidy numbers (numbers ending in zero)  
6) Most of the time, to add nine make the tens digit 1 bigger and the ones digit 1 smaller. For 
tidy numbers, just put a 9 in the ones column  
7) To subtract 9, mostly you can just make the tens digit 1 smaller, and the ones digit 1 bigger. 
For example, 57, 46, 35, 26, 17, 8  
This does not work when you have a 9 in the ones column. For example, 69 – 9 = 60  
8) Adding 8 can work the same way. For example, 34 + 8 = 42, 

Challenge

To add 11, you can make the tens digit one bigger, and the ones digit one bigger. 34, 45, 56, 67, 78. 
The numbers don’t work when you are at the end of a row. For example, 49 + 11 = 60
### Exercise 7

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31) 10 questions of your own to work through with a partner