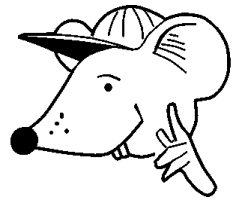




MATHEMATICS



N.S. Yr. 6 P.17

**Extend number sequences by
counting on and back**

Equipment

Paper, pencil, ruler.
Number squares.
Calculator.

MathSphere

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Concepts

Children should be able to understand, read and write the following terms:

Next, consecutive, sequence, predict, continue, rule, formula, classify, property.

They should be able to count on and back in regular steps of constant size, including steps of 11, 15, 19, 21, 25 etc. A 1 - 100 number line, or a number square, is really useful for this kind of work.

It is important that children learn to count on and back from different starting points i.e. do not always start counting from 1. It is not as easy as it sounds when the starting point is unfamiliar:

e.g. count on in 15s from 27

Constant practice out loud is very valuable!

The series of numbers should be recognised as a **SEQUENCE** which can be continued and further numbers in the sequence can be **PREDICTED**.

From this a **RULE** can be made for the sequence. At first this rule will be in words only. In later years these rules can be written in algebra as a **FORMULA**.

Revision: Many calculators can be made into an adding machine eg 'add 15 machine' by carrying out the following instructions:

Enter

15

+

+

=

Then enter the starting number eg

10

 and keep pressing

=

(Don't press anything else - no extra add signs or clear.)

The calculator can also be made into a subtraction machine eg 'subtract 20' in just the same way. It is a good idea to use the calculator and call out the next number before pressing the = sign, seeing how quickly counting on and counting back can be achieved.

(Note: this may not work for all calculators)

Number sequences**Fill in the missing numbers in these sequences:**

1. 34, 45, 56, 67, ,

2. 41, 56, 71, 86, ,

3. 9, 30, , 72, , 114

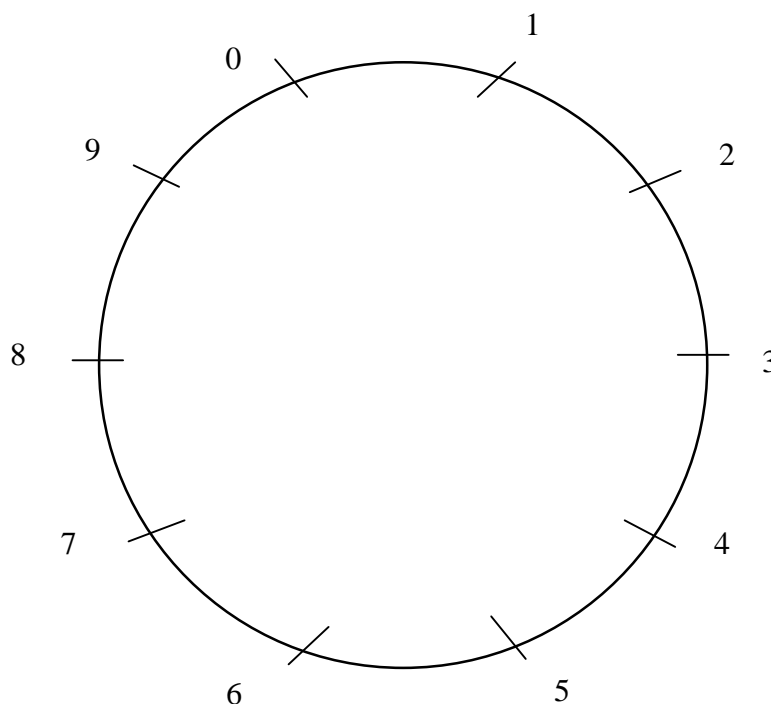
4. 27, 52, , ,

5. 67, 56, 45, , 23,

6. 99, 84, , 54, , 24

7. , 82, 63, 44, , 6

8. , , 78, 53, 28, 3



9. Add four, ten times. Look at the units digits - 4, 8, 2, etc Starting at 4 draw a line on the circle above to 8. Continue drawing lines, following the units pattern of the digits. What do you notice?
10. How does the pattern change if you start at 1 and then add four?

Fill in the missing numbers in these sequences:

1. 21, 32, 43, 54, ,

2. 5, 20, 35, 50, ,

3. 17, 36, 74, , 112

4. 35, 86, 137, 188, ,

5. 9, 30, 51, , 93,

6. 91, 80, , 58, , 36

7. , 62, 51, 40, , 18

8. , 83, 58, 33, 8

9. Take a 10 x10 square. Starting at 1 count on in elevens. Circle or colour the squares. What do you notice?

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

10. If you started at 3 and counted on in elevens would you get a similar pattern? How is it different?

Number sequences

Predict the next two numbers in these sequences. Then say what the rule is for the sequence. Take care - watch for negative numbers!

Example: 16, 27, 38, 49, 60 71

Rule: *The numbers are going up in elevens*

1. 10, 25, 40, 55,

Rule.....

2. -32, -11, 10, 31,

Rule.....

3. 34, 53, 72, 91,

Rule.....

4. 93, 78, 63, 48,

Rule.....

5. 65, 40, 15, -10,

Rule.....

6. -61, -42, -23, -4,

Rule.....

7. 119, 100, 81, 62

Rule.....

8. 66, 41, 16, -9

Rule

Number sequences

Predict the next two numbers in these sequences. Then say what the rule is for the sequence. Take care - some might go into negative numbers!

Example: 5, 36, 67, 98,

129

160

Rule: *The numbers are going up in thirty ones.*

1. 16, 31, 46, 61,

Rule.....

2. 19, 38, 57, 76,

Rule.....

3. 53, 94, 135, 176,

Rule.....

4. 91, 80, 69, 58,

Rule.....

5. 102, 81, 60, 39,

Rule.....

6. 13, 2, -9, -20

Rule.....

7. 31, 6, -19, -44,

Rule.....

8. 259, 208, 157, 106,

Rule.....

Patterns from a multiplication square

1	2	3	4	5	6	7	8	9	10
2	4	6	8	10	12	14	16	18	20
3	6	9	12	15	18	21	24	27	30
4	8	12	16	20	24	28	32	36	40
5	10	15	20	25	30	35	40	45	50
6	12	18	24	30	36	42	48	54	60
7	14	21	28	35	42	49	56	63	70
8	16	24	32	40	48	56	64	72	80
9	18	27	36	45	54	63	72	81	90
10	20	30	40	50	60	70	80	90	100

1. On a 1- 100 tables square start at 1 x1 and shade in each of the square numbers in turn. (ie. 2 x 2, 3 x 3, 4 x 4 etc)
2. What do you notice? Is there a pattern? Describe the pattern.
3. Learn these square numbers, off by heart.
4. Find other patterns in the multiplication square. Write down the patterns.
5. Write the rule for these patterns.

More number patterns

1. Look at this sequence of numbers:

1, 1, 2, 3, 5, 8, 13

Can you see how this sequence of numbers is formed? Write down how the next number is formed.

The next number in the sequence is made by adding the two previous numbers eg

$$1 + 1 = 2 \quad 1 + 2 = 3 \quad 2 + 3 = 5$$

2. Continue this sequence for at least ten more numbers.

This sequence or pattern is known as the **Fibonacci sequence**.

Find out more about the Fibonacci sequence - it comes up in all sorts of amazing places, on the stems of plants, on the backs of tortoises and even in works of Art!

Find out who **Fibonacci** was.

3. Look at this sequence of numbers:

1, 3, 6, 10, 15, 21

Can you see how this sequence of numbers is formed? Write down how the next number is formed.

4. Continue the sequence for another ten numbers.

These numbers are called triangular numbers.

5. Find out more about triangular numbers - why do you think they are called triangular?

For this work you will need a calculator.

Enter

98 may well come up - ignore this - do not press anything!

Then enter the starting number and keep pressing

(Don't press anything else - no extra add signs or clear.)

1. Write down the answers that you get, up to 400.
2. Write, in words, what is happening as the sequence goes on.
3. Predict and write down what the next three numbers in the sequence, after 400, will be. Write them down. Check on the calculator to see if you are correct.
4. Clear the calculator and repeat the above, but enter 51 instead of 49.

i.e. Enter

Then enter the starting number and keep pressing

5. Write down the answers that you get, up to 409.
6. Write in words what is happening as the sequence goes on.
7. Predict and write down what the next three numbers in the sequence, after 409, will be. Write them down. Check on the calculator to see if you are correct.
8. Make your calculator into an add 11 machine. Start at 0 and keep pressing sign until you reach over 200. Write down each number in the sequence.

How many times did you have to press the sign?

For this work you will need a calculator.

Enter

25

-

-

=

0 may well come up - ignore this - do not press anything!

Then enter the starting number

499

 and keep pressing

=

(Don't press anything else - no extra add signs or clear.)

1. Write down the answers that you get, down to 199.
2. Write, in words, what is happening as the sequence goes on.
3. Predict and write down what the next three numbers in the sequence, after 199, will be. Write them down. Check on the calculator to see if you are correct.
4. Clear the calculator and repeat the above, but enter 19 instead of 25.

i.e. Enter

19

-

-

=

Then enter the starting number

200

 and keep pressing

=

5. Write down the answers that you get, down to 48.
6. Write in words what is happening as the sequence goes on.
7. Predict and write down what the next three numbers in the sequence, after 48, will be. Write them down. Check on the calculator to see if you are correct.
8. Make your calculator into a subtract 11 machine. Start at 36 and keep pressing the

=

 sign six times .

What number did you reach. What will the next two numbers be?

9. Try counting up and down with your calculator from other starting numbers. How good are you at predicting the next number?

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

1	2	3	4	5	6	7	8	9	10
2	4	6	8	10	12	14	16	18	20
3	6	9	12	15	18	21	24	27	30
4	8	12	16	20	24	28	32	36	40
5	10	15	20	25	30	35	40	45	50
6	12	18	24	30	36	42	48	54	60
7	14	21	28	35	42	49	56	63	70
8	16	24	32	40	48	56	64	72	80
9	18	27	36	45	54	63	72	81	90
10	20	30	40	50	60	70	80	90	100

Answers**Page 3**

1. 78, 89 2. 101, 116 3. 51, 93 4. 77, 102, 127 5. 34, 12 6. 69, 39
 7. 101, 25 8. 128, 103 9. star shape formed. 10. Same shape, different position.

Page 4

1. 65, 76 2. 65, 80 3. 55, 93 4. 239, 290 5. 72, 114 6. 69, 47
 7. 73, 29 8. 133, 108
 9. Diagonal, left to right. Digits the same.
 10. Yes, but next to last line has no number shaded.

Page 5

1. 70, 85 numbers going up in 15s 2. 52, 73 numbers going up in 21s
 3. 110, 129 numbers going up in 19s 4. 33, 18 numbers going down in 15s
 5. 35, 60 numbers going down in 25s 6. 15, 34 numbers going up in 19s
 7. 43, 24 numbers going down in 19s 8. 34, 59 numbers going down in 25s

Page 6

1. 76, 91 numbers going up in 15s 2. 95, 114 numbers going up in 19s
 3. 217, 258 numbers going up in 41s 4. 47, 36 numbers going down in 11s
 5. 18, 3 numbers going down in 21s 6. 31, 42 numbers going down in 11s
 7. 69, 94 numbers going down in 25s 8. 55, 4 numbers going down in 51s

Page 7

1. 1, 4, 9, 16, 25, 36, 49, 64, 81, 100
 2. Diagonal across from left to right. 3. Open ended task.

Page 8

1. adding two previous numbers or similar
 2. 21, 34, 55, 89, 144, 233, 377, 610, 987, 1597
 3. The differences increase by one each time.
 4. 28, 36, 45, 55, 66, 78, 91, 105, 120, 136
 5. Open ended task.

Page 9

1. 57, 106, 155, 204, 253, 302, 351, 400 2. numbers going up in 49s etc
 3. 449, 498, 547 5. 52, 103, 154, 205, 256, 307, 358, 409
 6. numbers going up in 51s. 7. 460, 511, 562
 8. 0, 11, 22, 33, 44, 55, 66, 77, 88, 99, 110, 121, 132, 143, 154, 165, 176, 187, 198, 209 19 times

Page 10

1. 474, 449, 424, 399, 374, 349, 324, 299, 274, 249, 224, 199
 2. Going down in 25s (tens and units digits repeat.) 3. 174, 149, 124
 5. 181, 162, 143, 124, 105, 86, 67, 48
 6. Going down in 19s. tens go down 2, units go up 1. 7. 29, 10, 9
 8. 30, 41, 52