

Unit 8
Counting, properties of numbers and reasoning about numbers

Five daily lessons

Primary
National Strategy

Year 2
Spring term

This Unit Plan is designed to guide your teaching.

You will need to adapt it to meet the needs of your class.

Unit Objectives
Year 2

?? **Describe and extend simple number sequences: count on or back in ones or tens, starting from any two-digit number;** count in hundreds from and back to zero; count on in twos from and back to zero or any small number, **and recognise odd and even numbers** to at least 30; count on in steps of 3, 4 or 5 to at least 30, from and back to zero, then from and back to any given small number.

?? Solve mathematical problems or puzzles, recognise simple patterns and relationships, generalise and predict. Suggest extensions by asking ‘What if ...?’ or ‘What could I try next?’.

?? Investigate a general statement about familiar numbers or shapes by finding examples that satisfy it.

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Resources needed to teach this unit:

- ?? Resource sheet 8.1*
- ?? Resource sheet 8.2
- ?? Activity sheet 8.1
- ?? Activity sheet 8.2
- ?? Activity sheet 8.3
- ?? OHT 8.1
- ?? A large dice
- ?? Hundred square
- ?? Hoop
- ?? Bucket
- ?? Three different coloured beanbags
- ?? Strips of paper to cover parts of the hundred square
- ?? Bead string
- ?? Mega money (large coins)
- ?? Number fans
- ?? Whiteboards

*Taken from *Mathematical challenges for more able pupils in Key Stages 1 and 2* (NNS publication)

Also see table of Problem Solving Strategies.

Link Objectives

Year 1

Year 3

?? Describe and extend number sequences: **count on and back in ones from any small number, and in tens from and back to zero;** count on in twos from zero, then one, and begin to recognise odd or even numbers to about 20 as ‘every other number’; count in steps of 5 from zero to 20 or more, then back again; begin to count in steps of 3 from zero.

?? Solve mathematical problems or puzzles; recognise and predict from simple patterns and relationships. Suggest extensions by asking ‘What if ...?’ or ‘What could I try next?’.

?? Investigate a general statement about familiar numbers or shapes by finding examples that satisfy it.

?? Describe and extend simple number sequences: **count on or back in tens or hundreds, starting from any two- or three-digit number;** count on or back in twos starting from any two-digit number, and recognise odd and even numbers to at least 100; count on in steps of 3, 4 and 5 from any small number to at least 50, then back again.

?? Solve mathematical problems or puzzles, recognise simple patterns and relationships, generalise and predict. Suggest extensions by asking ‘What if ...?’.

?? Investigate a general statement about familiar numbers or shapes by finding examples that satisfy it.

(Key objectives in bold)

Planning sheet	Day One (page 1 of 2)	Unit 8 <i>Counting, properties of numbers and reasoning about numbers</i>	Term: <i>Spring</i>	Year Group: 2
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/ Focus Questions
<p>Recall addition facts for each number to at least 10.</p> <p>VOCABULARY addition fact number sentence 'how many more?'</p> <p>RESOURCES Number fans 1 large dice</p>	<p>?? Invite two children each to throw a large dice. Ask the children to add the numbers and show the answers using fans. Repeat.</p> <p>?? Ask a child to throw the dice once. Ask the children to think of the number which added to the number on the dice makes 10 and to show the answer using fans. Write the corresponding number sentence on the board e.g.</p> <p>$4 + \square = 10$</p> <p>Ask the child to fill in the empty box after everyone has shown the answer using their fans.</p> <p>?? Repeat throwing the dice and asking children to record number sentences.</p> <p>?? Repeat, this time asking the children to think of the number to make the total up to 20 e.g.</p> <p>$4 + \square = 20$</p> <p>Remind them that they could think of this as $4 + 6 + 10 = 20$.</p>	<p>Solve mathematical problems or puzzles, recognise simple patterns and relationships, generalise and predict.</p> <p>VOCABULARY record number sentence investigate</p> <p>RESOURCES Resource sheet 8.1 enlarged or on OHT with A4 copies for each child Whiteboards</p>	<p>?? Show Resource sheet 8.1, and ask the children in pairs to write an answer to the first question on their whiteboards. Collect the answers.</p> <p>Q Have we got some answers that are the same?</p> <p>Q Have we got all ten answers between us?</p> <p>?? Tell the children that it helps to record the answers in order so that we don't miss any or repeat any.</p> <p>Ask them to talk to their partner about how we could do this and where we would start. Collect answers and suggest that one way would be to find all the possible ways of making 12 if the first card is zero.</p> <p>Q If we have to find three numbers which total 12 and one is zero, what must our two remaining numbers total?</p> <p>Ask the children to work in pairs to find the pairs to 12 and remind them to put them in order. Collect answers: $9 + 3$, $8 + 4$, $7 + 5$ and then write them on the board putting the zero first.</p> <p>$0 + 9 + 3 = 12$ $0 + 8 + 4 = 12$ $0 + 7 + 5 = 12$</p> <p>Q Is $0 + 5 + 7 = 12$ a different answer? Why don't we need this?</p> <p>Q Why haven't we used 1 or 2 with zero? Why haven't we used 6 and 6?</p> <p>Ensure that the children understand that if one card is 0 and another is 1, the other card would have to be 11 and we don't have that card. Also emphasise that there is only one of each card.</p> <p>Q What number shall we start with next?</p> <p>Ask the children to find a total of 12 using 1 as the first card and record it in number sentences on the whiteboards. Collect and record answers on the board following on from the set beginning with zero.</p> <p>$1 + 9 + 2 = 12$ $1 + 8 + 3 = 12$ $1 + 7 + 4 = 12$ $1 + 6 + 5 = 12$</p> <p>Q Can you see any patterns?</p> <p>Discuss the pattern 9, 8, 7, 6 and 2, 3, 4, 5.</p> <p>Q Which number shall we use as our first card now?</p>	<p>?? Ask pairs of children to share their answers to questions with another pair and see if their answers were the same.</p> <p>Collect the answers to question 2 on the board.</p> <p>Q How many different ways would there be if the 0 card was not there?</p> <p>Point out that if they have recorded systematically this is easy to find out.</p> <p>?? Write $\square + \square + 3 = 11$ on the board.</p> <p>Say that the boxes represent the same number. Ask children to work it out in pairs and explain to each other how they did it.</p> <p>By the end of the lesson, children should be able to:</p> <p>?? have a system for finding the possibilities, e.g. start with the smallest number;</p> <p>?? solve puzzles and problems such as writing as many different ways as you can of finding a given total.</p> <p>(Refer to supplement of examples, section 5, page 63 and Problem Solving Strategies table.)</p>

Planning sheet	Day One (page 2 of 2)	Unit 8 <i>Counting, properties of numbers and reasoning about numbers</i>	Term: <i>Spring</i>	Year Group: 2
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/ Focus Questions
			<p data-bbox="875 277 1827 331">Q If we have to find three numbers which total 12 and one is 2, what must our two remaining numbers total?</p> <p data-bbox="909 355 1715 379">Ask children to record answers as before, collect responses and record on the board:</p> <p data-bbox="909 403 1043 427">$2 + 9 + 1 = 12$</p> <p data-bbox="909 429 1043 453">$2 + 7 + 3 = 12$</p> <p data-bbox="909 454 1043 478">$2 + 6 + 4 = 12$</p> <p data-bbox="875 502 1765 526">Q Can you see a set of three numbers that we have already used?</p> <p data-bbox="909 550 1805 604">Agree that $2 + 9 + 1$ and $1 + 9 + 2$ are the same and explain that as you don't want any repeats you will cross out $2 + 9 + 1$.</p> <p data-bbox="875 628 1794 683">?? Ask the children to start with 3 and record as before. Collect answers and help the children to see that the only new answer is $3 + 4 + 5 = 12$.</p> <p data-bbox="875 707 1827 802">?? Ask the children to start with 4 and see if this gives any new answers. Agree that it does not as the other two cards will have a total of 8 and all pairs with a total of 8 have been used. Say that starting with higher numbers will also only give answers we already have and so we don't need to go any further. Check that you have ten answers as it suggests in the question.</p> <p data-bbox="875 826 1827 903">?? Ask the children to work in pairs to look at question 2 on Resource sheet 8.1. Remind them that we have been learning to record systematically and they should do the same. If there is time, the children should move on to answer question 3.</p>	

Planning sheet	Day Two	Unit 8 <i>Counting, properties of numbers and reasoning about numbers</i>	Term: <i>Spring</i>	Year Group: 2
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/ Focus Questions
<p>Count on or back in tens, starting from any two-digit number.</p> <p>Count in steps of 5 to at least 30.</p> <p>VOCABULARY count in fives count in tens multiple of 5 two-digit number less than greater than between odd even</p> <p>RESOURCES Hundred square</p>	<p>?? Count on in tens from zero to 150, and back again.</p> <p>?? Ask the children for a two-digit odd number less than 30. Count on from that number in tens.</p> <p>?? Ask the children for a two-digit even number greater than 80. Count back from that number in tens.</p> <p>?? Count on in fives starting at zero in fives to 50. Ring the numbers said on the hundred square.</p> <p>?? Choose other multiples of 5 from which to start the count by making requests such as 'Give me a two-digit number that is a multiple of 5, between 10 and 20.'</p> <p>Q What do you notice about the multiples of 5?</p> <p>Agree that they end in 0 or 5.</p> <p>Q Is 23 a multiple of 5? Why not?</p> <p>Agree that it cannot be as it does not end in 0 or 5.</p> <p>Q What is a multiple of 5 that is close to 23?</p>	<p>Count in steps of 5 to at least 30.</p> <p>Give examples to match a general statement.</p> <p>VOCABULARY number sentence work out record total</p> <p>RESOURCES Hoop Three different coloured beanbags Bucket Resource sheet 8.2 Activity sheet 8.1 Whiteboards</p>	<p>?? Remind the children of the work done yesterday.</p> <p>Q What was important about how we recorded our work?</p> <p>Remind the children of the importance of being systematic to ensure all the answers are found.</p> <p>?? Put a bucket inside a hoop. Ask a child to throw three different coloured beanbags into the hoop or bucket one at a time. If the beanbag goes in the bucket, the score is 10 and if it goes into the hoop the score is 5. If it goes in neither, the child throws again.</p> <p>Record the score on the board, e.g. 5 + 5 + 10.</p> <p>Q What is the total score?</p> <p>Agree that it is 20.</p> <p>Q What do you think the largest score could be? Why?</p> <p>Agree that this will be 30 as the biggest score is 10 + 10 + 10.</p> <p>Q What do you think the smallest score could be? Why?</p> <p>Agree that this is 15 made from 5 + 5 + 5.</p> <p>?? Tell the children to work in pairs, and find all the possible scores with the totals. Remind them to record in order in their books.</p> <p>?? Collect children's responses and agree that the possible totals are 15, 20, 25 and 30. Ask for the ways that 25 can be made. (10 + 10 + 5; 10 + 5 + 10; 5 + 10 + 10). Point out that the total is the same; the order they are shown in does not matter.</p> <p>?? Read Resource sheet 8.2 and point out that this time there are four beanbags. Ask them to work in pairs to find all the possible totals. Suggest that they start with largest or smallest total first.</p>	<p>?? Ask each pair of children to share their answers with another pair and see if the answers are the same.</p> <p>?? Ask if anyone had a way of finding the answers in order and ask a child to explain how they did this. If anyone did it differently discuss this.</p> <p>For example, starting with the biggest answer 10 + 10 + 10 + 10, then the next biggest 10 + 10 + 10 + 5 and so on.</p> <p>Q How did you know that you had all the scores?</p> <p>Q What do you notice about the possible scores?</p> <p>Discuss the fact that they are all multiples of 5 and some are multiples of 10.</p> <p>Q Could Chris have scored 18? Why not?</p> <p>Ask the children to write on their whiteboards another score that Chris could not have got.</p> <p>Q How many different totals are there?</p> <p>Agree that the five totals are: 5 + 5 + 5 + 5 5 + 5 + 5 + 10 5 + 5 + 10 + 10 5 + 10 + 10 + 10 10 + 10 + 10 + 10 and that the second, third and fourth totals could be scored in different orders, e.g. 5 + 10 + 5 + 5</p> <p>HOMEWORK – Give out Activity sheet 8.1 and read the question together. Discuss how it is possible to record the answer in order, for example starting with using two 10p pieces, then one 10p piece and then no 10p pieces.</p> <p>By the end of the lesson, children should be able to: ?? have a system for finding the possibilities, e.g. start with the smallest number; ?? know when all the possibilities have been found; ?? find different answers using given numbers. (Refer to supplement of examples, section 5, page 63 and table of problem solving strategies.)</p>

Planning sheet	Day Three	Unit 8 <i>Counting, properties of numbers and reasoning about numbers</i>	Term: <i>Spring</i>	Year Group: 2
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/ Focus Questions
<p>Read and write in words and figures numbers to 100.</p> <p>VOCABULARY pattern odd even multiple of ten</p> <p>RESOURCES Hundred square Strips of paper to cover single numbers on the hundred square and larger strips to cover more than one number including L-shapes and crosses. Whiteboards</p>	<p>?? Look at the homework.</p> <p>Q How many ways were there to pay for the fruit bar?</p> <p>Ask the children to share answers with a partner.</p> <p>Collect and discuss the ways of totalling 25p.</p> <p>Q How did you start the problem? How did you know that you had all the possible answers?</p> <p>Discuss children's methods.</p> <p>?? Cover a number on the hundred square. Ask the children to write the number on their whiteboards in words and figures. When they have, ask them to tell their partner one fact about the number e.g. it is odd; it is a multiple of ten. Collect answers and discuss them.</p> <p>?? Repeat with a variety of numbers.</p> <p>?? Cover up three or four numbers on the square in a strip or L-shape. Ask the children to write the numbers on their whiteboards in figures.</p> <p>Ask them to tell their partner if there is a pattern in the numbers e.g. each number is 10 more than the previous one. Collect answers and discuss the patterns as a whole class.</p>	<p>Count in steps of 5 to at least 30 from any given small number.</p> <p>VOCABULARY patterns digit sequence</p> <p>RESOURCES Activity sheet 8.2 Hundred square</p>	<p>??Count in tens starting at 2. Ring each number on the hundred square.</p> <p>Q What do you notice?</p> <p>Draw out that each number ends in 2.</p> <p>??Start at 2 and count on in fives. Use a different colour and ring each number on the hundred square.</p> <p>Q What do you notice? Is there a pattern?</p> <p>Draw out that each number ends in 2 or 7.</p> <p>Q Will there always be a pattern when we count in 5s whatever number we start at? Collect children's responses.</p> <p>??Write on the board: <i>When I count in 5s from any number, the number always ends in one of two digits and one digit is the same as in the start number.</i></p> <p>Tell the children that this was true when we started counting from 2 as the numbers all ended in 2 or 7.</p> <p>Q Will it be true if we start counting on from another number?</p> <p>??Give out Activity sheet 8.2. Ask the children to choose a number to count on from in fives. Ask them to record their numbers by ringing the numbers on hundred squares as you did when you started counting on in fives from 2.</p> <p>?? When they have finished discuss the patterns they have found.</p> <p>Q Do all the numbers end in one of two digits? Ask for some examples e.g. 3, 8, 13, 18... Point out that the last digit is either 3 or 8.</p> <p>??Now ask the children to do the same but start with a two-digit number.</p> <p>When they have all finished one, discuss the patterns they have found.</p> <p>Q Do all the numbers end in one of two digits?</p> <p>Ask for some examples e.g. 11, 16, 21, 26... Point out that the last digit is either 1 or 6.</p> <p>??If they started with an even number, ask them to find a pair who started at an odd number to see if the rule still applied and compare their answers.</p>	<p>?? Ask the children to count in fives starting at 0, then 1, then 2 and so on. Record these on the board in a table.</p> <p>0, 5, 10, 15, 20, 25... 1, 6, 11, 16, 21, 26... 2, 7, 12, 17, 22, 27... 3, 8, 13, 18, 23, 28... 4, 9, 14, 19, 24, 29... 5, 10, 15, 20, 25... 6, 11, 16, 21, 26... Stop here.</p> <p>Q Do we have to do any more?</p> <p>Draw out that 5, 10, 15... is part of the same sequence which starts 0, 5, 10, 15. When we start at 6 it is the same pattern as when we start at 1.</p> <p>?? Say that you are going to start at 29 and count in fives.</p> <p>Q What do you think the last digits will be? Will we get to 47? Will we say 49?</p> <p>Collect children's responses and discuss them.</p> <p>By the end of the lesson, children should be able to: ??count on from any small number in steps of 5; ??predict the next few terms in a sequence to test the rule; ??use a rule to decide whether a given number will be in the sequence.</p> <p>(Refer to supplement of examples, section 5, page 7 and Problem Solving Strategies table.)</p>

Planning sheet	Day Four	Unit 8 Counting, properties of numbers and reasoning about numbers	Term: Spring	Year Group: 2
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/ Focus Questions
<p>Count in steps of 5 to at least 30 and back to zero, then from and back to any given small number.</p> <p>VOCABULARY count on count back greater than multiple of 5 pattern</p> <p>RESOURCES Hundred square</p>	<p>?? Count on in fives from 0 to 100 and back again.</p> <p>Ask the children to give you a number which is greater than 30 and also a multiple of 5. Count back from this number in fives.</p> <p>Repeat with other multiples of 5 counting both forwards and backwards.</p> <p>?? Remind the children that they counted on in fives starting at any number yesterday.</p> <p>Q Was there a pattern?</p> <p>Ask for a number between 2 and 5 and count on from the number in fives.</p> <p>Q What are the two digits that these numbers ended in?</p> <p>?? Now ask the children to start at the number they finished with and count back to their starting number. Remind them that the pattern in the ones digits will help them. Ring the numbers on the hundred square as they say them. Quickly count forwards and backwards emphasising the pattern.</p> <p>?? Repeat with other starting numbers.</p>	<p>Give examples to match a general statement.</p> <p>VOCABULARY calculation ones digit</p> <p>RESOURCES Bead string Mega money (large coins)</p>	<p>?? Write on the board <i>When I subtract 10 from a number the ones digit stays the same.</i> Explain that we are going to find examples to test whether this statement is correct.</p> <p>?? Write on the board $12 - 10 = \square$ Ask the children to work out the answer.</p> <p>Q How did you work it out?</p> <p>Collect methods. Point to 12 and 2 on the hundred square and ask:</p> <p>Q Why does moving up one square give the answer?</p> <p>Check that they realise that this is the same as counting back 10 squares from 12 to 2.</p> <p>Show the 12 beads on the bead string and move 10 back. Draw attention to the pattern as you do so. Record $12 - 10 = 2$.</p> <p>Q Did the ones digit stay the same?</p> <p>?? Agree that it did. Write on the board $24 - 10 = \square$</p> <p>Ask the children to work out the answer.</p> <p>Q How did you work it out?</p> <p>Collect methods. Repeat the demonstration of subtracting 10 using the hundred square and bead string. Record $24 - 10 = 14$.</p> <p>Q Did the ones digit stay the same?</p> <p>Ask the children to think of another calculation where subtracting 10 will give the same ones digit. Collect their suggestions.</p> <p>Q Do you think this will always work?</p> <p>?? Discuss the fact that we cannot test every number.</p> <p>Q Which numbers should we choose to test?</p> <p>Collect ideas such as odd numbers, even numbers, two-digit numbers, three-digit numbers, multiples of ten.</p> <p>Q How many of each sort of number should we try, to convince ourselves that it is true?</p> <p>Ask the children to try three of each, working in pairs.</p>	<p>?? Take examples and write them on the board.</p> <p>Q Do all these examples match our general statement?</p> <p>Q Can you find an example that doesn't?</p> <p>Agree that you can't. Point to one column on the hundred square and draw attention to the last digit when you subtract 10.</p> <p>?? Ask a question involving subtracting 10 which was not one of those above.</p> <p>Q What is $97 - 10$? How do you know?</p> <p>?? Ask similar questions to establish that they have understood that the ones digit stays the same when you subtract ten.</p> <p>?? Give the children this problem. 1 had 47p and I spent 10p. How much was left?</p> <p>Show this with coins: 10p, 10p, 10p, 10p, 5p, 2p. Take a 10p away and show what is left. Repeat, and point out only 10p coins are removed and the 7p is untouched. Ask other money problems involving subtracting 10p.</p> <p>By the end of the lesson, children should be able to:</p> <p>?? give examples to match statements such as: <i>When I subtract 10 from a number the ones digit stays the same.</i></p> <p>(Refer to supplement of examples, section 5, pages 65.)</p>

Planning sheet	Day Five	Unit 8 <i>Counting, properties of numbers and reasoning about numbers</i>	Term: <i>Spring</i>	Year Group: 2
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/ Focus Questions
<p>Count in steps of 5 to at least 30 and back to zero, then from and back to any given small number.</p> <p>VOCABULARY count in fives predict</p> <p>RESOURCES Hundred square OHT 8.1</p>	<p>?? Count back in fives from various numbers between 20 and 30.</p> <p>?? Cover up OHT 8.1. Reveal each line one at a time.</p> <p>Q If I carry on counting back which number will I end with?</p> <p>Q How do you know which number I will end with?</p> <p>Q What do you know about counting in fives?</p> <p>Q Would you be able to predict the end number if the pattern was counting on?</p> <p>Draw out that on the sheet we are counting back and so know when we will stop counting (because we are not using negative numbers). If we were counting forward there would not be an end number.</p>	<p>Give examples to match a general statement.</p> <p>VOCABULARY two-digit numbers odd even</p> <p>RESOURCES Activity sheet 8.3 Whiteboards</p>	<p>?? Write on the board <i>It doesn't matter which order you add numbers together because the answer will always be the same.</i></p> <p>?? In pairs ask the children to show their partner examples that show this is true. They can use their whiteboards.</p> <p>Collect examples.</p> <p>Q Do you think it will always be true?</p> <p>Q Have we tried enough different numbers to convince us?</p> <p>Q Would it make any difference if we were adding with amounts of money?</p> <p>?? Give out Activity sheet 8.3. Ask the children to find the pairs of calculations and work out the answers.</p> <p>?? When they have finished they should share their answers with a partner and see if they all show the statement to be true. Ask them to say what kind of numbers have been used in each pair e.g. two two-digit numbers, two odd numbers.</p>	<p>?? Write on the board $7 + 8 + 6 =$ <input type="text"/> Ask for the answer.</p> <p>Write $8 + 6 + 7 =$ <input type="text"/> and ask for the answer.</p> <p>Q Are the answers the same? Is the statement true when we add three numbers?</p> <p>Q Is the statement that addition can be done in any order still true if there are three numbers?</p> <p>Ask the children to try adding three numbers using their whiteboards. Ask them to try different numbers as they have been doing in the lesson.</p> <p>Q Can addition of three numbers be done in any order? Why is this so useful to us?</p> <p>Draw out the importance of looking at three numbers and either adding the largest first or a double or a pair to 10 or 20 first. Ask the children to think of an addition of three numbers that includes a double or a pair to 20. e.g. $3 + 4 + 17$</p> <p>By the end of the lesson, children should be able to:</p> <p>?? give examples to match statements.</p> <p>(Refer to supplement of examples, section 5, pages 65.)</p>