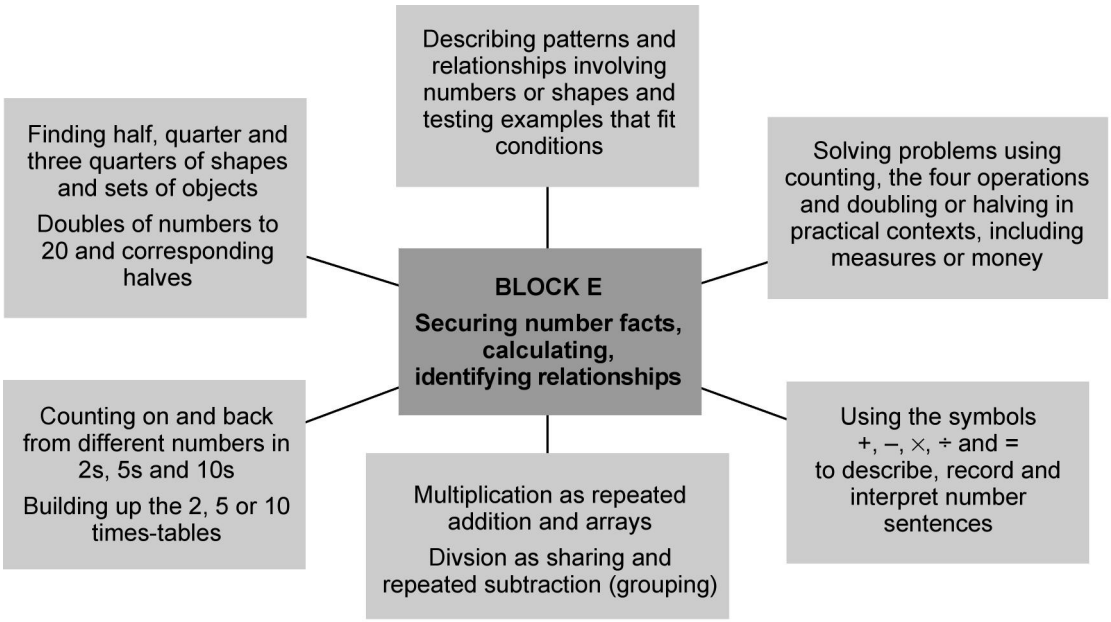
Year 2: Block E — Three 3-week units

Securing number facts, calculating, identifying relationships



Objectives End-of-year expectations (key objectives) are highlighted	Units 1	 2	 3
• Identify and record the information or calculation needed to solve a puzzle or problem; carry out the steps or calculations and check the solution in the context of the problem	✓	✓	✓
• Solve problems involving addition, subtraction, multiplication or division in contexts of numbers, measures or pounds and pence		✓	
• Present solutions to puzzles and problems in an organised way; explain decisions, methods and results in pictorial, spoken or written form, using mathematical language and number sentences			✓
• Represent repeated addition and arrays as multiplication, and sharing and repeated subtraction (grouping) as division; use practical and informal written methods and related vocabulary to support multiplication and division, including calculations with remainders	✓	✓	✓
• Use the symbols +, –, ×, ÷ and = to record and interpret number sentences involving all four operations; calculate the value of an unknown in a number sentence (e.g. ☐ ÷ 2 = 6, 30 – ☐ = 24)	✓	✓	✓
• Understand that halving is the inverse of doubling and derive and recall doubles of all numbers to 20, and the corresponding halves	✓	✓	✓
• Derive and recall multiplication facts for the 2, 5 and 10 times-tables and the related division facts; recognise multiples of 2, 5 and 10	✓	✓	✓
• Find one half, one quarter and three quarters of shapes and sets of objects	✓	✓	✓

Speaking and listening objectives for the block

Objectives	Units		
	1	2	3
• Listen to a talk by an adult, remember some specific points and identify what they have learned	✓	✓	
• Adopt appropriate roles in small or large groups and consider alternative courses of action			✓

Opportunities to apply mathematics in science

Activities		Units		
		1	2	3
2a	Health and growth: Count how many people like different foods. Work out the cost of buying an apple costing 8p for each of three children.	✓		
2b	Plants and animals in the local environment: Estimate numbers, for example of woodlice under a stone. Use a tally chart to count the number of birds visiting a bird table. Count in fives to work out total.		✓	✓

Key aspects of learning: focus for the block

Enquiry	**Problem solving**	**Reasoning**	Creative thinking
Information processing	Evaluation	Self-awareness	Managing feeling
Social skills	Communication	**Motivation**	Empathy

Vocabulary

problem, solve, calculate, calculation, inverse, answer, method, explain, predict, pattern, order

place value, partition, ones, tens, hundreds, one-digit number, two-digit number, add, subtract, plus (+), minus (–), sign, equals (=), operation, symbol, number sentence, number line

count on, count back, lots of, groups of, equal groups of, grouping, array, row, column, multiply, multiplication, multiplied by (×), multiple, share equally, divide, division, divided by (÷), remainder, round up, round down, double, halve

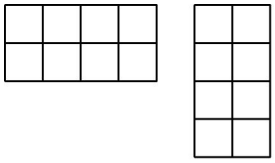
fraction, part, equal parts, one whole, parts of a whole, number of parts, left over, fraction, one half, one quarter, three quarters, one whole

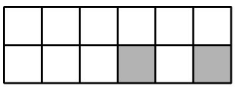
Building on previous learning

Check that children can already:

- solve problems involving doubling or halving, combining groups of 2, 5 or 10, or sharing into equal groups
- count on or back in ones, twos, fives and tens and use this knowledge to derive the multiples of 2, 5 and 10 to the tenth multiple
- recall the doubles of all numbers to at least 10
- use the vocabulary of halves and quarters in context

Unit 2E1 3 weeks

Objectives *Children's learning outcomes in italic*	**Assessment for learning**
• Identify and record the information or calculation needed to solve a puzzle or problem; carry out the steps or calculations and check the solution in the context of the problem *I know what information I need to use to solve a problem and can describe what I did step by step* *I can record it in a number sentence and check if my answer makes sense*	What do you think the problem or puzzle wants you to do? What information will you use? Explain how you recorded your solution. How could you work out the cost of 3 pencils each costing 5p? How could you write this in a number sentence? What does this mean? 2 + 2 + 2 + 2 + 2 + 2 Is there another way of recording this? Make up another problem like this and tell me how to work it out.
• Represent repeated addition and arrays as multiplication, and sharing and repeated subtraction (grouping) as division; use practical and informal written methods and related vocabulary to support multiplication and division, including calculations with remainders *I can use a number line to do multiplication and division and can work out remainders if there are any*	Look at these jumps on a number line. What does it show? How could you record that? Is there another way that you could record it? Show me on a number line how you could do: 3 × 4 2 × 6 Show me on a number line how you could do: 14 ÷ 2 15 ÷ 3 20 ÷ 5 Look at these diagrams:  Is 2 × 4 the same as 4 × 2? How do you know?
• Use the symbols +, –, ×, ÷ and = to record and interpret number sentences involving all four operations; calculate the value of an unknown in a number sentence (e.g. ☐ ÷ 2 = 6, 30 – ☐ = 24) *I know how to write number sentences for multiplication and division as well as addition and subtraction* *I can explain what my number sentence means*	Look at these problems. What number sentences could you write to record them? How many tens make 80? Jo's box is 5 cm wide. Mary's box is twice as wide as Jo's box. How wide is Mary's box? How many wheels are there on 3 cars?
• Understand that halving is the inverse of doubling and derive and recall doubles of all numbers to 20, and the corresponding halves *I know doubles of numbers up to 10 and I can use what I know to work out halves* *I understand the connection between doubling and halving*	Calculate quickly: Two fives 8 × 2 Double 7 Half of 20 Roll these two dice and add the numbers together. Now double your number. What score do you get? I'm thinking of a number. If I halve it my answer is 9. What number was I thinking of? Explain how you know. Two identical books cost £12. How much does one book cost? Write a number sentence that shows what you did. Make up some halving or doubling problems yourself.

Objectives *Children's learning outcomes in italic*	Assessment for learning
• Derive and recall multiplication facts for the 2, 5 and 10 times-tables and the related division facts; recognise multiples of 2, 5 and 10 *I can recognise some of the 2, 5 and 10 times-tables and can explain the patterns I see* *I can use these patterns to see if other numbers belong to the sequence*	Look at the numbers in the 5 times-table. What do you notice? If we carried on, what do you think the next number would be? If we carried on, do you think the pattern would continue? How do you know? Think of a number bigger than 100 that would be in the 5 times-table if we carried on. Why do you think that number would be in the table?
• Find one half, one quarter and three quarters of shapes and sets of objects *I can use my knowledge of halving numbers to help me to work out half and a quarter of a set of objects or a shape* *I can also work out three quarters*	Explain how we could find one quarter of this set of 12 pencils? What about three quarters? Shade more squares so that exactly half of the shape is shaded.  How could we give someone half of 20p if we had one 20p coin? What about half of 12p if we had one 10p and two 1p coins? In PE, can you turn through a quarter turn clockwise and anticlockwise? Now make a three quarter turn. How could we work out half of three equal strips of paper? Make up some problems of this sort for your group to solve.
• Listen to a talk by an adult, remember some specific points and identify what they have learned *I can remember how to work out one quarter by halving one half*	Tell me how to find one quarter of a piece of paper. Listen carefully while I show you how to find one quarter of these cubes.

Learning overview

Children extend their understanding of **counting on and back in steps of 1, 2, 5 and 10** from various start numbers. They **record sequences** and **describe patterns** in the numbers, including recognising odd and even numbers. In particular, they explain the patterns from counting in twos, fives and tens when starting from zero. They find missing numbers from sequences such as:

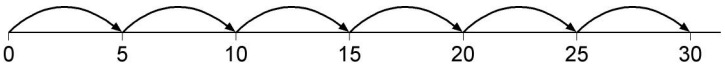
30, 40, ☐, 60, ☐ and 55, 50, ☐, 40, 35, ☐, 25, 20

Children work with others to explain their reasoning and to listen to the reasoning of others. They consolidate counting on from zero in steps of 2, 5 and 10 and build up these times-tables, **describing what they notice** about numbers in the tables. They use this to **predict** some other numbers that would be in the count and to answer questions such as:

What are four fives? How many twos make 18?

They use counting, practical equipment, diagrams or a number line to support, record or explain their answers.

Using practical equipment or objects as a starting point, children understand that **repeated addition** can be represented using the **multiplication symbol.** For example, they record four lots of five fingers as 5 + 5 + 5 + 5 and use the multiplication sentence 5 × 4 to record this. They understand that 'multiplied by 4' or '× 4' means 'add the number four times'. They use a number line to support repeated addition, recording the **equal jumps** on the line and writing the repeated **addition statement** and the matching **multiplication statement.** They become familiar with different ways of describing a multiplication:



5 + 5 + 5 + 5 + 5 + 5 = 30

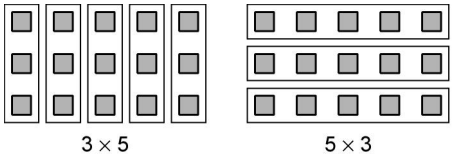
5 × 6 = 30

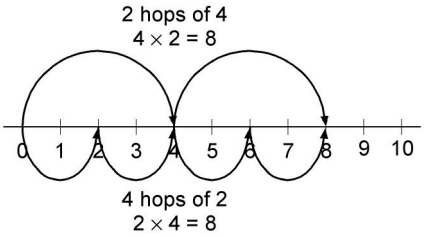
5 multiplied by 6 equals 30

6 groups of 5 make 30

6 hops of 5 make 30

For a given multiplication such as 2 × 6, children explain how jumps can be made on a number line. They point to the numbers as they make the jumps and provide a 'commentary' of what they are doing as they go along, explaining why this shows 2 × 6. They use arrays of pegs in pegboards, patterns on squared paper or hops on a number line to show that 3 × 5 = 5 × 3 or that 4 × 2 = 2 × 4.





Children experience **division as grouping**. They use practical equipment or objects to answer questions such as: *How many 2s make 12?* They relate this to the division 12 ÷ 2. They use objects or a number line to support, record or explain this. For example, starting from 12, they jump back in steps of 2, or starting with 12 counters, they keep on taking away 2 counters. They record this as **repeated subtraction** and as **division**:

12 – 2 – 2 – 2 – 2 – 2 – 2 = 0

12 ÷ 2 = 6

12 divided by 2 equals 6

Children explain how they use equipment, objects or a number line to carry out division.

Throughout the unit, children find **doubles** of numbers to 10 using practical resources or drawings to consolidate their understanding of doubling. They record using repeated addition and multiplication and find **inverse operations**, knowing, for example, that if double 7 is 14 then half of 14 is 7.

Children **find halves of shapes** by folding. They recognise that each part of the shape on either side of the fold line is **one half** so that the whole shape is made up of two identical halves. They explore different ways of finding half of shapes, for example folding squares in half in as many different ways as possible. They reinforce their understanding that the halves **must be of equal size**. They relate this to line symmetry.

Children fold shapes in half and then half again to make **quarters**. They know that four quarters make one whole and that each quarter must be the same size.

Children consolidate **finding halves and quarters of a group of objects**, by giving an **equal number of objects** to each of two or four people by sharing out the objects equally among the people. They reinforce this idea in practical situations such as:

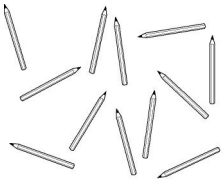
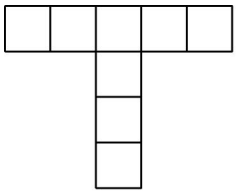
placing 14 dots on a ladybird so that the same number of dots is on each half;

placing 12 'tomatoes' on four plates so that each plate has the same number of tomatoes.

In a group, children sort a set of numbers into those that can be halved exactly and those that cannot. They discuss their findings and discover that when they halve a set of objects there may be one left over. They relate this finding to even and odd numbers, noticing that the numbers that can be halved exactly are those that they land on when they count in twos from zero along the number line.

Unit 2E2 3 weeks

Objectives *Children's learning outcomes in italic*	**Assessment for learning**
• Identify and record the information or calculation needed to solve a puzzle or problem; carry out the steps or calculations and check the solution in the context of the problem *I know what I need to do to help me solve a problem and then I can work out the answer* *I can show how I solved a problem or puzzle and explain steps in my working*	What do you need to find out? How do you know that you need to add/multiply/double/halve? What helped you to decide how to do this calculation? Could you do it another way? Tell me how you solved the puzzle. Why did you write that number sentence? Is there another way you could write it? Write as many different ways as you can of making 12. Record your working so that a friend can follow it. How could you check that you have found all the possibilities?
• Solve problems involving addition, subtraction, multiplication or division in contexts of numbers, measures or pounds and pence *I can use calculations to solve problems and I know which calculation to use*	How did you know it was a multiplication/division? How did you work it out? If you had three 5p coins, how much money would you have? How could you write that down? What sort of calculation is it? What if, instead of three 5p coins, you had four 5p coins. How would your number sentence change? How would the answer change? Make up a story that would mean that you need to work out: 15 + 24, 18 ÷ 3, 9 × 5.
• Represent repeated addition and arrays as multiplication, and sharing and repeated subtraction (grouping) as division; use practical and informal written methods and related vocabulary to support multiplication and division, including calculations with remainders *I can use sharing to work out divisions and can explain what I did*	Suppose 15 pencils were to be shared out between three children. How many pencils would each child get? Explain to me how you could work it out. Explain to me how you would work out 20p divided equally among five people. How could you write it down? What about 18 sweets between two people? How many more sweets would you need to give them 10 sweets each? How many £2 coins do you get for £20? How do you know?
• Use the symbols +, –, ×, ÷ and = to record and interpret number sentences involving all four operations; calculate the value of an unknown in a number sentence (e.g. ☐ ÷ 2 = 6, 30 – ☐ = 24) *I know how to write number sentences for multiplication and for division* *I can explain what different number sentences mean*	Show me on the number line what 3 × 8 would look like. What about 5 × 8? How different would 8 × 5 look on a number line? I have 20 counters here. Show me what 20 ÷ 5 means with these counters. Explain how you worked out the missing number in this number sentence: 24 ÷ ☐ = 6 Make up some 'missing-number' problems for others to solve
• Understand that halving is the inverse of doubling and derive and recall doubles of all numbers to 20, and the corresponding halves *I know some of my doubles up to 20* *I can work out the rest and some others too*	Which doubles do you just know? What number must I double to get 10? 16? 22? I double a number and get 20. What number did I start with? You know that double 15 is 30. How could you use this to work out double 16? What about double 17? What about double 14?

Objectives *Children's learning outcomes in italic*	Assessment for learning
• Derive and recall multiplication facts for the 2, 5 and 10 times-tables and the related division facts; recognise multiples of 2, 5 and 10 *I know some of my times-tables for 2, 5 and 10* *I can use counting or other strategies for those I don't know* *I know that multiples of 5 end in 5 or 0*	What tips would you give someone who had forgotten the 10 times-table? How could you use a 10 times-table fact such as 10 × 6 = 60 to work out a 5 times-table fact such as 5 × 6 = 30?
• Find one half, one quarter and three quarters of shapes and sets of objects *I can find a half or a quarter of a set of objects* *I can fold a piece of paper into halves or quarters*	How could you find one quarter of a piece of string? What about a quarter of two pieces of string? Here is a set of 12 pencils. How many is a quarter of the set?  Shade one quarter of this shape. 
• Listen to a talk by an adult, remember some specific points and identify what they have learned *I can remember how to work out a sharing problem*	When we share a number of cherries equally among several people, we give out the cherries one by one, saying 'one for you, one for you', and so on, until the cherries are all used up. Sometimes there are some cherries left over, because there are not enough to go round once more. Explain to your partner how you would share 13 cherries equally among four people. How many cherries would be left over?

Learning overview

Children know doubles of numbers to 10 and the related halves. They record calculations using × 2 and ÷ 2. They use these facts to find doubles of numbers to 20 using partitioning. For example, they double 15p, using 10p and 5p coins, and matching each coin with an identical coin.

They halve amounts of money in a similar way, replacing two coins of the same kind by one coin. If there is only one coin of a particular type, they replace it with smaller coins of equivalent value, for example replacing a 20p coin with two 10p coins.

Children recognise and write the **fraction notation** for $\frac{1}{2}$ and $\frac{1}{4}$. They fold shapes in half and then in half again to make quarters. They know that **four quarters make one whole** and that **each quarter must be the same size**.

Children consolidate finding half of a set of objects and recognise that finding half of a number is **the same as dividing it by 2**. They **find a quarter of a set of objects** by sharing them equally among four. For example, they share a set of objects equally among four children and establish that each

child has one quarter, or they share 12 'tomatoes' equally onto the quarters of a 'pizza' and count what one quarter of 12 is. They use the appropriate vocabulary related to halves and quarters.

Children establish multiplication and division facts for the **2, 5 and 10 times-tables** by counting in twos, fives and tens. If necessary, they use practical apparatus, counting or drawing to support them. They respond to questions such as:

Count on seven twos. Where do you finish?

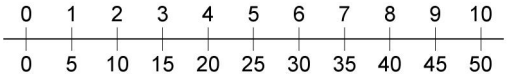
What are eight fives?

They use **patterns and relationships** to support their learning of these facts. For example, they remember that all numbers in the 2 times-table are even and that numbers in the 5 times-table must end in 0 or 5. Children chant the tables in unison, using rhythm and the patterns of words to help them to commit facts to memory. They say:

One five is five.
Two fives are ten.
Three fives are fifteen …

so that the answer to *How many 5s make 30?* relates closely to the wording.

Chanting of tables is supported with a counting stick or number line. This helps to establish the relationship between the increasing steps and corresponding products.



Occasional chanting of division tables can help to establish both the knowledge of division facts in their own right and the use of the phrase 'divided by'. For example:

Five divided by five is one.
Ten divided by five is two …

Children **relate division to multiplication**. For example, they recognise that one way to understand 30 ÷ 5 is as: *How many 5s make 30?* and use the 5 times-table to answer this.

Children use their knowledge of multiplication and division facts to answer **simple word problems** such as

Seven pairs of socks go in the wash. How many socks is this?

How many 5p coins are needed to make 45p?

What is the next multiple of 5 after 25?

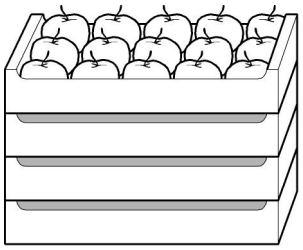
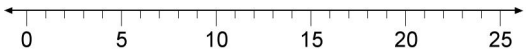
They **record the necessary calculation** using the appropriate symbols.

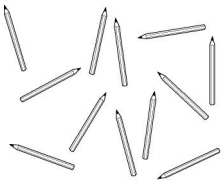
Children use **sharing** to answer division questions; for example, they find 24 ÷ 3 by sharing 24 counters equally into 3 pots. They experience divisions that give rise to remainders, such as:

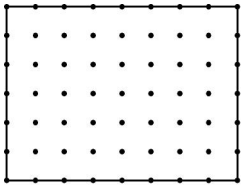
Three friends share 16 marbles equally. How many marbles does each friend get? How many marbles are left over?

Children **tell division and multiplication stories** to accompany calculations such as 20 ÷ 5, 4 × 10.

Unit 2E3 3 weeks

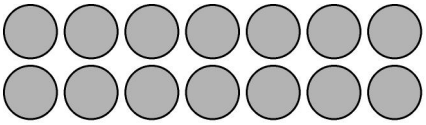
Objectives *Children's learning outcomes in italic*	**Assessment for learning**
• Identify and record the information or calculation needed to solve a puzzle or problem; carry out the steps or calculations and check the solution in the context of the problem *When I have worked out the answer to a problem I can look again at the problem and then check that the answer makes sense*	Sam goes to the shop for some buttons. There are two red buttons and four blue buttons on each card of buttons. How many buttons are there on ten cards? What do you need to find out? What was the question that you were asked? So does your answer make sense? How do you know? Could 20 be the answer? Or 40? How do you know? There are 15 apples in a tray. Ling has 4 trays of apples.  How many apples does Ling have altogether? Show how you work it out.
• Present solutions to puzzles and problems in an organised way; explain decisions, methods and results in pictorial, spoken or written form, using mathematical language and number sentences *I can explain how I worked out the answer to a problem and can show the working I did*	Kiz worked out the answer to 7 × 3 on a number line. Show how Kiz could have worked out the answer on this number line.  Mr Bell had three pots with four crayons in each pot. How many crayons did be have altogether? Which one of these would you use to work out the answer to the question? A 4 + 4 B 3 + 3 C 4 × 3 D 3 + 4 Sita worked out the correct answer to 9 × 5. Her answer was 45. Show how she could have worked out her answer. Harry worked out the correct answer to 20 ÷ 5. His answer was 4. Show how he could have worked out his answer.
• Represent repeated addition and arrays as multiplication, and sharing and repeated subtraction (grouping) as division; use practical and informal written methods and related vocabulary to support multiplication and division, including calculations with remainders *I can use arrays to help me work out multiplication* *I can do multiplication and division in different ways and show how I do them*	Explain how you work out how many dots there are without counting them all. Here are 20 counters. How could you arrange them in equal rows? How could you use a number sentence to show your arrangement? 4 + 4 + 4 + 4 + 4 = 20 Write this addition fact as a multiplication fact. ☐ × ☐ = ☐

Objectives *Children's learning outcomes in italic*	**Assessment for learning**
• Use the symbols +, –, ×, ÷ and = to record and interpret number sentences involving all four operations; calculate the value of an unknown in a number sentence (e.g. ☐ ÷ 2 = 6, 30 – ☐ = 24) *I can work out the missing numbers in number sentences* *When I think I have the answer, I can put it in the number sentence and check whether it is correct*	What could the missing numbers be? ☐ × ◇ = 20 ☐ ÷ ◇ = 5 How can you record the solution to this problem? I am thinking of a number. I divide it by 5 and the answer is 3. What is my number? Make up some 'missing-number' problems for others to solve.
• Understand that halving is the inverse of doubling and derive and recall doubles of all numbers to 20, and the corresponding halves *I can double all numbers up to 20 and can find matching halves*	I'm thinking of a number. I've halved it and the answer is 15. What number was I thinking of? I'm thinking of a number. I doubled it and the answer is 28. What number was I thinking of? Explain how you know. Write the missing numbers. 5 → double and add 3 → ☐ 8 → double and add 3 → ☐ There are 30 children in a classroom. Half of them are girls. How many are boys? Mina has 32 stickers. She gives half to her brother. How many stickers does she give him?
• Derive and recall multiplication facts for the 2, 5 and 10 times-tables and the related division facts; recognise multiples of 2, 5 and 10 *I know my 2, 5 and 10 times-tables* *I can work out divisions that go with the tables*	Write the missing numbers in the boxes. 5 × 4 = 10 × ☐ ☐ × 5 = 50 Write the answer: 45 ÷ 5 = ☐ Draw rings around all the multiples of 5. 45 20 54 17 40
• Find one half, one quarter and three quarters of shapes and sets of objects *I can find three quarters of a set of objects or of a shape*	Take 20 counters. Can you show me one quarter? Two quarters? Three quarters? Four quarters? What do you notice? Can you write that down in some way? Here is a set of 12 pencils. How many is a quarter of the set? How many is three quarters?  Find three quarters of 20 biscuits. Three quarters of 24 buttons. How will you find one quarter of that rectangle? Three quarters? If one quarter of a set of shells is 2, how many shells are in the set? Here is a pizza cut into eight equal pieces. How many pieces are needed for three quarters of the pizza? What is half of this amount? 

Objectives *Children's learning outcomes in italic*	Assessment for learning
• Adopt appropriate roles in small or large groups and consider alternative courses of action *I can work in a group and help the group to think about different ways to do things*	There is plenty of squared dotty paper. In your group, discuss how divide this shape into four equal parts. 

Learning overview

Children understand and use arrays to represent **repeated addition/multiplication**. They use counters on a grid to represent '7 lots of 2' and use this to find the answer of 14.



They use pegboards to create arrays where rows/columns are in different colours. They record the calculation this represents using repeated addition and multiplication. They explain how an array helps to show multiplication, pointing to the rows and/or columns to describe how they work out the total number of dots/counters to find the answer to the multiplication.

Children derive and **learn to recall multiplication and division facts for the 2, 5 and 10 times-tables**. They use these facts to respond to oral and written questions such as

40 ÷ 5

What is double 8?

How many 10s make 90?

Half of a number is 6. What is the number?

They become more proficient with using multiplication and division facts to calculate the missing number in number sentences such as:

☐ × 2 = 18

3 × ☐ = 15

20 ÷ ☐ = 10

Children find **doubles of numbers to 20 and corresponding halves** and explain their method. They secure their understanding of finding half and quarter of shapes and sets of objects. They count the quarters 'one quarter, two quarters, three quarters, four quarters', and use this to recognise that four quarters are the same as one whole and that **two quarters are the same as one half.** They shade three quarters of shapes, recognising and **recording the fraction notation** $^{3}/_{4}$.

Children **find halves and quarters of groups of objects** using practical apparatus or diagrams or using knowledge of doubling/halving facts. They find quarters of groups of objects by, for example, sharing objects fairly into the quarters of a circle and use this to find the **number of objects in three quarters**.

Children **solve problems involving multiplication and division**, representing the information using apparatus or diagrams. They record the calculation using appropriate symbols. For example:

Patti bought five stickers and paid 30p. The stickers were all the same price. How much did each sticker cost?

A bus ticket costs 25p. How much will five of these tickets cost?

It costs 75p for a child to go swimming. How much does it cost for two children?

Ella's dad washes some cars. He uses 12 buckets of water. Each bucket has 5 litres of water. How many litres of water does he use altogether?

Ten children can sit at one table. There are 43 children. How many tables are needed so that each child can sit at a table?

A carton of orange fills 6 cups. Mrs Green wants to fill 50 cups with orange. How many cartons of orange does she need to buy?

They also **solve puzzles** such as:

I have only one sort of coin in my purse. I have 20p. Find different ways that this is possible.

What is the least number of coins that you need to make 97p?

Children identify the operation(s) needed to solve the problem and **explain reasoning**. They relate the answer found back to the situation and **check that it makes sense**.