National Centre for Excellence in the Teaching of Mathematics

MathsHUBS

Teaching for Mastery

Questions, tasks and activities to support assessment

Year 3

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Contents

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Introduction

In line with the curricula of many high performing jurisdictions, the National curriculum emphasises the importance of all pupils mastering the content taught each year and discourages the acceleration of pupils into content from subsequent years.

The current National curriculum document[1] says:

'The expectation is that the majority of pupils will move through the programmes of study at broadly the same pace. However, decisions about when to progress should always be based on the security of pupils' understanding and their readiness to progress to the next stage. Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.' (National curriculum page 3)

Progress in mathematics learning each year should be assessed according to the extent to which pupils are gaining a deep understanding of the content taught for that year, resulting in sustainable knowledge and skills. Key measures of this are the abilities to reason mathematically and to solve increasingly complex problems, doing so with fluency, as described in the aims of the National curriculum:

'The national curriculum for mathematics aims to ensure that all pupils:

- *become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately*
- ***reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language*
- *can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.'* (National curriculum page 3)

Assessment arrangements must complement the curriculum and so need to mirror these principles and offer a structure for assessing pupils' progress in developing mastery of the content laid out for each year. Schools, however, are only '*required to teach the relevant programme of study by the end of the key stage. Within each key stage, schools therefore have the flexibility to introduce content earlier or later than set out in the programme of study*' (National curriculum page 4). Schools should identify when they will teach the programmes of study and set out their school curriculum for mathematics on a year-by-year basis. The materials in this document reflect the arrangement of content as laid out in the National curriculum document (September 2013).

These *Teaching for Mastery: Questions, tasks and activities to support assessment* outline the key mathematical skills and concepts within each yearly programme and give examples of questions, tasks and practical classroom activities which support teaching, learning and assessment. The activities offered are not intended to address each and every programme of study statement in the National curriculum. Rather, they aim to highlight the key themes and big ideas for each year.

1. Mathematics programmes of study: key stages 1 and 2, National curriculum in England, September 2013, p3

Ongoing assessment as an integral part of teaching

The questions, tasks, and activities that are offered in the materials are intended to be a useful vehicle for assessing whether pupils have mastered the mathematics taught.

However, the best forms of ongoing, formative assessment arise from well-structured classroom activities involving interaction and dialogue (between teacher and pupils, and between pupils themselves). The materials are not intended to be used as a set of written test questions which the pupils answer in silence. They are offered to indicate valuable learning activities to be used as an integral part of teaching, providing rich and meaningful assessment information concerning what pupils know, understand and can do.

The tasks and activities need not necessarily be offered to pupils in written form. They may be presented orally, using equipment and/or as part of a group activity. The encouragement of discussion, debate and the sharing of ideas and strategies will often add to both the quality of the assessment information gained and the richness of the teaching and learning situation.

What do we mean by mastery?

The essential idea behind mastery is that ***all children***[2] need a ***deep*** understanding of the mathematics they are learning so that:

- future mathematical learning is built on solid foundations which do not need to be re-taught;
- there is no need for separate catch-up programmes due to some children falling behind;
- children who, under other teaching approaches, can often fall a long way behind, are better able to keep up with their peers, so that gaps in attainment are narrowed whilst the attainment of all is raised.

There are generally four ways in which the term mastery is being used in the current debate about raising standards in mathematics:

1. **A mastery approach**: a set of principles and beliefs. This includes a belief that all pupils are capable of understanding and doing mathematics, given sufficient time. Pupils are neither 'born with the maths gene' nor 'just no good at maths'. With good teaching, appropriate resources, effort and a 'can do' attitude all children can achieve in and enjoy mathematics.
2. **A mastery curriculum**: one set of mathematical concepts and big ideas for all. All pupils need access to these concepts and ideas and to the rich connections between them. There is no such thing as 'special needs mathematics' or 'gifted and talented mathematics'. Mathematics is mathematics and the key ideas and building blocks are important for everyone.
3. **Teaching for mastery**: a set of pedagogic practices that keep the class working together on the same topic, whilst at the same time addressing the need for all pupils to master the curriculum and for some to gain greater depth of proficiency and understanding. Challenge is provided by going deeper rather than accelerating into new

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2. Schools in England are required to adhere to the 0-25 years SEND Code of Practice 2015 when considering the provision for children with special educational needs and/or disability. Some of these pupils may have particular medical conditions that prevent them from reaching national expectations and will typically have a statement of Special Educational Needs/ Education Health Care Plan. Wherever possible children with special educational needs and/or a disability should work on the same curriculum content as their peers; however, it is recognised that a few children may need to work on earlier curriculum content than that designated for their age. The principle, however, of developing deep and sustainable learning of the content they are working on should be applied.

mathematical content. Teaching is focused, rigorous and thorough, to ensure that learning is sufficiently embedded and sustainable over time. Long term gaps in learning are prevented through speedy teacher intervention. More time is spent on teaching topics to allow for the development of depth and sufficient practice to embed learning. Carefully crafted lesson design provides a scaffolded, conceptual journey through the mathematics, engaging pupils in reasoning and the development of mathematical thinking.

4. **Achieving mastery of particular topics and areas of mathematics**. Mastery is not just being able to memorise key facts and procedures and answer test questions accurately and quickly. It involves knowing 'why' as well as knowing 'that' and knowing 'how'. It means being able to use one's knowledge appropriately, flexibly and creatively and to apply it in new and unfamiliar situations.[3] The materials provided seek to exemplify the types of skills, knowledge and understanding necessary for pupils to make good and sustainable progress in mastering the primary mathematics curriculum.

Mastery and the learning journey

Mastery of mathematics is not a fixed state but a continuum. At each stage of learning, pupils should acquire and demonstrate sufficient grasp of the mathematics relevant to their year group, so that their learning is sustainable over time and can be built upon in subsequent years. This requires development of depth through looking at concepts in detail using a variety of representations and contexts and committing key facts, such as number bonds and times tables, to memory.

Mastery of facts, procedures and concepts needs time: time to explore the concept in detail and time to allow for sufficient practice to develop fluency.

Practice is most effective when it is intelligent practice,[4] i.e. where *the teacher is advised to avoid mechanical repetition and to create an appropriate path for practising the thinking process with increasing creativity.* (Gu 2004[5]) The examples provided in the materials seek to exemplify this type of practice.

Mastery and mastery with greater depth

Integral to mastery of the curriculum is the development of deep rather than superficial conceptual understanding. '*The research for the review of the National Curriculum showed that it should focus on "fewer things in greater depth", in secure learning which persists, rather than relentless, over-rapid progression.*'[6] It is inevitable that some pupils will grasp concepts more rapidly than others and will need to be stimulated and challenged to ensure continued progression. However, research indicates that these pupils benefit more from enrichment and deepening of content, rather than acceleration into new content. Acceleration is likely to promote superficial understanding, rather than the true depth and rigour of knowledge that is a foundation for higher mathematics.[7]

Within the materials the terms *mastery* and *mastery with greater depth* are used to acknowledge that all pupils require depth in their learning, but some pupils will go deeper still in their learning and understanding.

Mastery of the curriculum requires that all pupils:

- use mathematical concepts, facts and procedures appropriately, flexibly and fluently;
- recall key number facts with speed and accuracy and use them to calculate and work out unknown facts;
- have sufficient depth of knowledge and understanding to reason and explain mathematical concepts and procedures and use them to solve a variety of problems.

3. Helen Drury asserts in 'Mastering Mathematics' (Oxford University Press, 2014, page 9) that: 'A mathematical concept or skill has been mastered when, through exploration, clarification, practice and application over time, a person can represent it in multiple ways, has the mathematical language to be able to communicate related ideas, and can think mathematically with the concept so that they can independently apply it to a totally new problem in an unfamiliar situation.'

4. Intelligent practice is a term used to describe practice exercises that integrate the development of fluency with the deepening of conceptual understanding. Attention is drawn to the mathematical structures and relationships to assist in the deepening of conceptual understanding, whilst at the same time developing fluency through practice.
5. Gu, L., Huang, R., & Marton, F. (2004). Teaching with variation: A Chinese way of promoting effective mathematics learning. In Lianghuo, F., Ngai-Ying, W., Jinfa, C., & Shiqi, L. (Eds.) How Chinese learn mathematics: Perspectives from insiders. Singapore: World Scientific Publishing Co. Pte. Ltd. page 315.
6. Living in a Levels-Free World, Tim Oates, published by the Department for Education https://www.tes.co.uk/teaching-resource/living-in-a-levels-free-world-by-tim-oates-6445426
7. This argument was advanced by the Advisory Committee for Mathematics Education on page 1 of its report: Raising the bar: developing able young mathematicians, December 2012.

A useful checklist for what to look out for when assessing a pupil's understanding might be:

A pupil really understands a mathematical concept, idea or technique if he or she can:

- describe it in his or her own words;
- represent it in a variety of ways (e.g. using concrete materials, pictures and symbols – the CPA approach)[8]
- explain it to someone else;
- make up his or her own examples (and non-examples) of it;
- see connections between it and other facts or ideas;
- recognise it in new situations and contexts;
- make use of it in various ways, including in new situations.[9]

Developing mastery with greater depth is characterised by pupils' ability to:

- solve problems of greater complexity (i.e. where the approach is not immediately obvious), demonstrating creativity and imagination;
- independently explore and investigate mathematical contexts and structures, communicate results clearly and systematically explain and generalise the mathematics.

The materials seek to exemplify what these two categories of *mastery* and *mastery with greater depth* might look like in terms of the type of tasks and activities pupils are able to tackle successfully. It should, however, be noted that the two categories are not intended to exemplify differentiation of activities/tasks. Teaching for mastery requires that all pupils are taught together and all access the same content as exemplified in the first column of questions, tasks and activities. The questions, tasks and activities exemplified in the second column might be used as deepening tasks for pupils who grasp concepts rapidly, but can also be used with the whole class where appropriate, giving all children the opportunity to think and reason more deeply.

8. The Concrete-Pictorial-Abstract (CPA) approach, based on Bruner's conception of the enactive, iconic and symbolic modes of representation, is a well-known instructional heuristic advocated by the Singapore Ministry of Education since the early 1980s. See https://www.ncetm.org.uk/resources/44565 (free registration required) for an introduction to this approach.

9. Adapted from a list in 'How Children Fail', John Holt, 1964.

National curriculum assessments

National assessment at the end of Key Stages 1 and 2 aims to assess pupils' mastery of both the content of the curriculum and the depth of their understanding and application of mathematics. This is exemplified through the content and cognitive domains of the test frameworks.[10] The content domain exemplifies the minimum content pupils are required to evidence in order to show mastery of the curriculum. The cognitive domain aims to measure the complexity of application and depth of pupils' understanding. The questions, tasks and activities provided in these materials seek to reflect this requirement to master content in terms of both skills and depth of understanding.

Final remarks

These resources are intended to assist teachers in teaching and assessing for mastery of the curriculum. In particular they seek to exemplify what depth looks like in terms of the types of mathematical tasks pupils are able to successfully complete and how some pupils can achieve even greater depth. A key aim is to encourage teachers to keep the class working together, spend more time on teaching topics and provide opportunities for all pupils to develop the depth and rigour they need to make secure and sustained progress over time.

10. 2016 Key stage 1 and 2 Mathematics test frameworks, Standards and Assessments Agency www.gov.uk/government/collections/national-curriculum-assessments-test-frameworks

The structure of the materials

The materials consist of PDF documents for each year group from Y1 to Y6. Each document adopts the same framework as outlined below.

The examples provided in the materials are only indicative and are designed to provide an insight into:

- How mastery of the curriculum might be developed and assessed;
- How to teach the same curriculum content to the whole class, challenging the rapid graspers by supporting them to go deeper rather than accelerating some pupils into new content.

The assessment activities presented in both columns are suitable for use with the whole class. Pupils who successfully answer the questions in the left-hand column (Mastery) show evidence of sufficient depth of knowledge and understanding. This indicates that learning is likely to be sustainable over time. Pupils who are also successful with answering questions in the right-hand column (Mastery with Greater Depth) show evidence of greater depth of understanding and progress in learning.

This section lists a selection of key National Curriculum programme of study statements. The development and assessment of these is supported through the questions, tasks and activities set out in the two columns below.

This section lists a selection of key ideas relevant to the selected programme of study statements.

Number and Place Value

Selected National Curriculum Programme of Study Statements

Pupils should be taught to:

- count from 0 in multiples of 4, 8, 50 and 100
- work out if a given number is greater or less than 10 or 100
- recognise the place value of each digit in a 3-digit number (hundreds, tens, and ones)
- solve number problems and practical problems involving these ideas

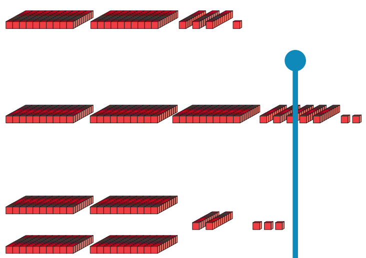
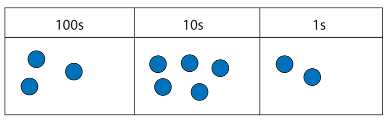
The Big Ideas

The value of a digit is determined by its position in a number.

Place value is based on unitising, treating a group of things as one 'unit'. This generalises to 3 units + 2 units = 5 units (where the units are the same size).

Mastery Check

Please note that the following columns provide indicative examples of the sorts of tasks and questions that provide evidence for mastery and mastery with greater depth of the selected programme of study statements. Pupils may be able to carry out certain procedures and answer questions like the ones outlined but the teacher will need to check that pupils really understand the idea by asking questions such as 'Why?', 'What happens if …?', and checking that pupils can use the procedures or skills to solve a variety of problems.

Mastery	Mastery with Greater Depth
What number is represented in each set? 	What is the value of the number represented by the counters in the place value grid?  Using all of the counters, how many different numbers can you make? Have you made all the possible numbers? Explain how you know.

This section reminds teachers to check pupils' understanding by asking questions such as 'Why', 'What happens if …', and checking that pupils can use the procedures or skills to solve a variety of problems.

This section contains examples of assessment questions, tasks and teaching activities that might support a teacher in assessing and evidencing progress of those pupils who have developed a sufficient grasp and depth of understanding so that learning is likely to be sustained over time.

This section contains examples of assessment questions, tasks and teaching activities that might support a teacher in assessing and evidencing progress of those pupils who have developed a stronger grasp and greater depth of understanding than that outlined in the first column.

Number and Place Value

Selected National Curriculum Programme of Study Statements

Pupils should be taught to:

- count from 0 in multiples of 4, 8, 50 and 100
- work out if a given number is greater or less than 10 or 100
- recognise the place value of each digit in a 3-digit number (hundreds, tens, and ones)
- solve number problems and practical problems involving these ideas

The Big Ideas

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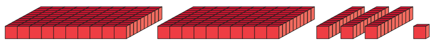
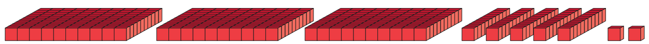
Mastery Check

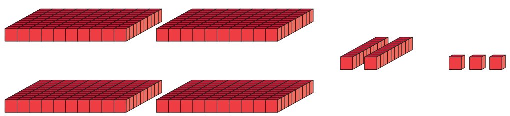
Please note that the following columns provide indicative examples of the sorts of tasks and questions that provide evidence for mastery and mastery with greater depth of the selected programme of study statements. Pupils may be able to carry out certain procedures and answer questions like the ones outlined but the teacher will need to check that pupils really understand the idea by asking questions such as 'Why?', 'What happens if …?', and checking that pupils can use the procedures or skills to solve a variety of problems.

Mastery

What number is represented in each set?

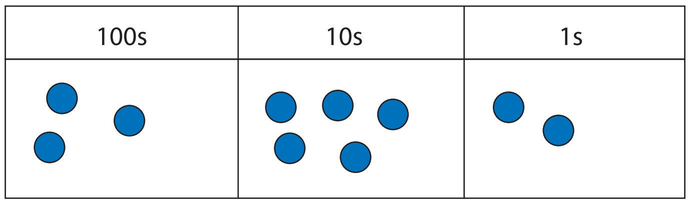






Mastery with Greater Depth

What is the value of the number represented by the counters in the place value grid?



Using all of the counters, how many different numbers can you make?

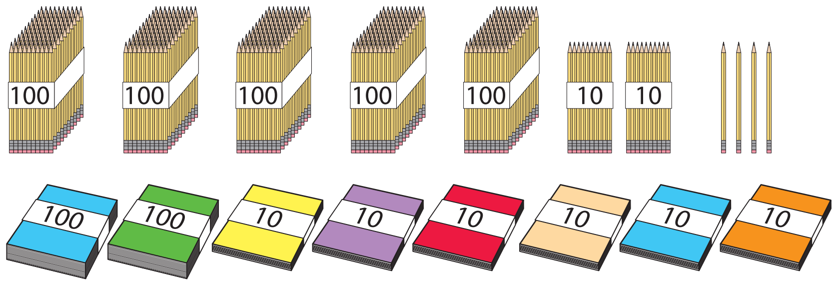
Have you made all the possible numbers?

Explain how you know.

Mastery

Find the number of pencils.

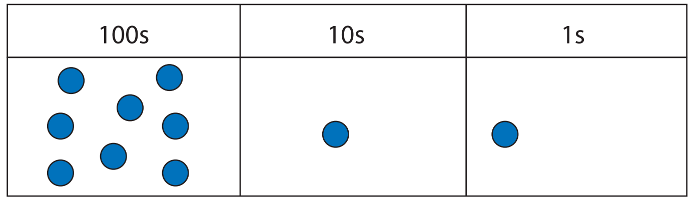
Find the number of exercise books.



Guide pupils to use practical equipment to deepen their understanding of place value and apply their knowledge of place value in mental and written calculation.

Mastery with Greater Depth

Captain Conjecture says 'The number in the place value grid is the largest 3-digit number you can make using all 10 counters'.



Do you agree?

Explain your reasoning.

Mastery

- 8 hundreds, 3 tens and 6 ones together make ☐.
- 457 is made of ☐ hundreds, ☐ tens and ☐ ones.
- 250 is made of ☐ hundreds and ☐ tens.

Mastery with Greater Depth

674 is made of 6 hundreds, 7 tens and 4 ones.

674 is also made of 67 tens and 4 ones.

674 is also made of 6 hundreds and 74 ones.

Find different ways of expressing:

- 630
- 704
- 867

www.mathshubs.org.uk
www.ncetm.org.uk
www.oxfordowl.co.uk

Mastery

Megan has made a 3-digit number with these cards.

6	7	5

What other 3-digit numbers can she make with these cards?

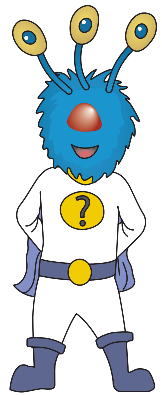
6	7	5				

What is the largest number she can make?

Consider whether or not children are working systematically.

Mastery with Greater Depth

Captain Conjecture says, 'If you add 6 to a number ending in 7 you will always get a number ending in 3.' Is he correct?



Explain your answer.

Mastery	Mastery with Greater Depth
Join each number to the set that it belongs to. 463 163 999 99 349 1 to 100 101 to 200 201 to 300 301 to 400 401 to 500 greater than 500	Insert a digit into each box so that the numbers are in order from smallest to largest. □4 6 □3 2 3□1 □6 6 □5□ Which digits can you place in the boxes to create the largest interval between any two consecutive numbers?

Addition and Subtraction

Selected National Curriculum Programme of Study Statements

Pupils should be taught to:

- add and subtract numbers mentally, including:
  - a 3-digit number and ones
  - a 3-digit number and tens
  - a 3-digit number and hundreds
- add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction

The Big Ideas

Relating numbers to 5 and 10 helps develop knowledge of the number bonds within 20. For example, given 8 + 7, thinking of 7 as 2 + 5, and adding the 2 and 8 to make 10, then the 5 to 15. This should then be applied when calculating with larger numbers.

Subtraction bonds can be thought of in terms of addition: for example, in answering 15 – 8, thinking what needs to be added to 8 to make 15. Counting on for subtraction is a useful strategy that can also be applied to larger numbers.

Mastery Check

Please note that the following columns provide indicative examples of the sorts of tasks and questions that provide evidence for mastery and mastery with greater depth of the selected programme of study statements. Pupils may be able to carry out certain procedures and answer questions like the ones outlined but the teacher will need to check that pupils really understand the idea by asking questions such as 'Why?', 'What happens if …?', and checking that pupils can use the procedures or skills to solve a variety of problems.

Mastery

What do you notice?

Is there a relationship between the calculations?

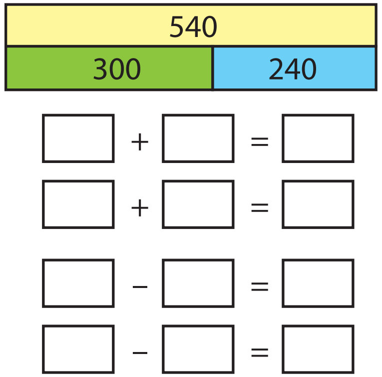
500 + 400 =	523 + 400 =	523 + 28 =
400 + 500 =	423 + 500 =	423 + 28 =
300 + 600 =	323 + 600 =	323 + 28 =
200 + 700 =	223 + 700 =	223 + 28 =
100 + 800 =	123 + 800 =	123 + 48 =

Mastery with Greater Depth

For positive integers are the following statements always, sometimes or never true?

- The sum of 2 odd numbers is even.
- The sum of 3 odd numbers is even.
- Adding 5 to a number ending in 6 will sum to a number ending in 1.
- Adding 8 to a number ending in 2 will always sum to a multiple of 10.

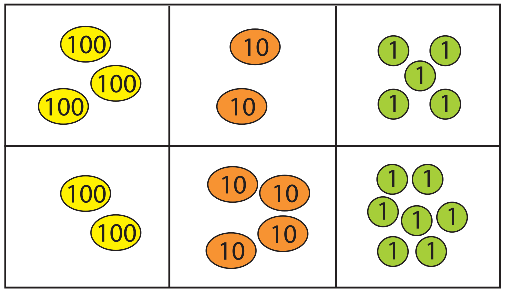
Explain why in each case.

Mastery	Mastery with Greater Depth
Write the four number facts that this bar model shows. 	Flo and Jim are answering a problem: Danny has read 62 pages of the class book, Jack has read 43. How many more pages has Danny read than Jack? Flo does the calculation 62 + 43. Jim does the calculation 62–43. Who is correct? Explain how you know. *Pupils might demonstrate using a bar model to explain their reasoning.*
Using coins, find three ways to make £1.	Sophie has five coins in her pocket. How much money might she have? What is the greatest amount she can have? What is the least amount she can have? If all the coins are different: What is the greatest amount she can have? What is the least amount she can have?

Mastery

Solve calculations using a place value grid and equipment alongside a column method to demonstrate understanding.

Hundreds place | Tens place | Ones place




```
  325
+ 247
_____
```

Sam has completed these calculations, but he is incorrect.
Explain the errors he has made.

```
  325        355
+ 247      - 247
  581        112
```

Complete these calculations. What do you notice?

3 + 7 =	8 + 2 =	6 + 4 =
30 + 70 =	80 + 20 =	60 + 40 =
33 + 7 =	88 + 2 =	66 + 4 =
333 + 7 =	888 + 2 =	666 + 4 =
300 + 700 =	800 + 200 =	600 + 400 =

Mastery with Greater Depth

There are six 3-digit addition calculations shown below.

```
a)   124     b)   644     c)   366
   + 233        + 172        + 277

d)   579     e)   791     f)   567
   + 221        + 163        + 233
```

Which calculations have no carry digits?
Which calculations have a carrying digit only once?
Which calculations have a carrying digit twice?
Which calculation has the largest answer?
Which calculation has the smallest answer?

Check that children are looking at the numbers involved, rather than doing the calculations.

☐ ☐ ☐ + ☐ ☐ ☐ =

Throw a 1 to 6 dice and each time record the digit in one of the place holders. The aim is to get the sum as low as possible. Repeat to find different answers.

Could you have done it in a different way?

Compete against a friend and compare your answers.

Multiplication and Division

Selected National Curriculum Programme of Study Statements

Pupils should be taught to:

- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including 2-digit numbers times 1-digit numbers, using mental and progressing to formal written methods
- solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which *n* objects are connected to *m* objects

The Big Ideas

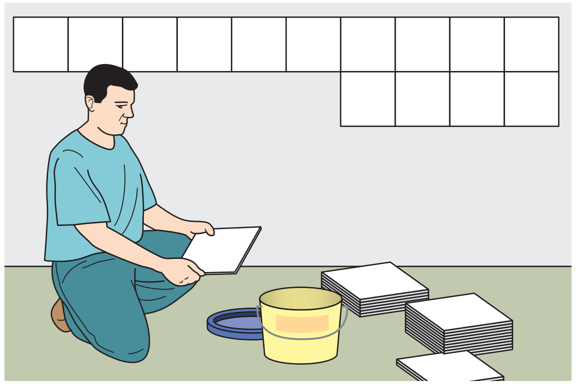
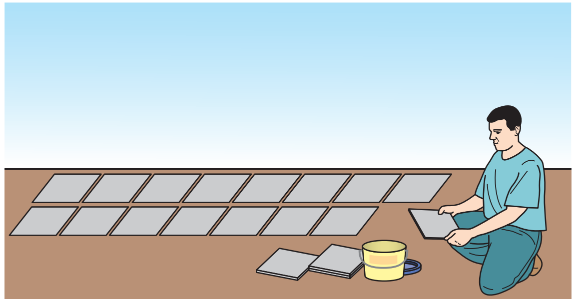
It is important for children not just to be able to chant their multiplication tables but also to understand what the facts in them mean, to be able to use these facts to figure out others and to use in problems. It is also important for children to be able to link facts within the tables (e.g. 5× is half of 10×).

They understand what multiplication means, see division as both grouping and sharing, and see division as the inverse of multiplication.

Mastery Check

Please note that the following columns provide indicative examples of the sorts of tasks and questions that provide evidence for mastery and mastery with greater depth of the selected programme of study statements. Pupils may be able to carry out certain procedures and answer questions like the ones outlined but the teacher will need to check that pupils really understand the idea by asking questions such as 'Why?', 'What happens if …?', and checking that pupils can use the procedures or skills to solve a variety of problems.

Mastery	Mastery with Greater Depth
What is the relationship between these calculations? 3 × 4 4 × 8 4 × 3 8 × 4 *Children should understand that multiplication is commutative.*	What is the relationship between these calculations? 2 × 3 4 × 3 2 × 30 4 × 30 20 × 3 40 × 3 20 × 3 × 10 40 × 3 × 10 *Children should use their knowledge of place value to mentally calculate by multiples of 10.*
What do you notice about the following calculations? 3 × 4 3 × 8 4 × 4 4 × 8 3 × 5 3 × 10	Write these addition statements as multiplication statements: 2 + 2 + 2 + 2 + 4 3 + 3 + 3 + 2 + 4

Mastery	Mastery with Greater Depth
What is 3×4? What is 13×4? *Asking 'How did you get that?' can help you decide whether children are working efficiently with questions like 13×4 by, for example, calculating 10×4 and adding 3×4, and that 3×4 is not obtained by counting in 1s.*	Make up a problem for 13×4 and solve it. Write a story for $18 \div 3$.
 Roger is laying tiles. He has 84 tiles altogether. How many complete rows of tiles can he make?	 Roger has 96 patio slabs. Using all of the slabs find three different ways that he can arrange the slabs to form a rectangular patio.
Complete the following: $3 \times \square = 12$ $4 \times \square = 20$ $\square \times 3 = 15$ $8 \times \square = 24$	$\square\square \times \square = ?$ Putting the digits 1, 2 and 3 in the empty boxes, how many different calculations can you make? Which one gives the largest answer? Which one gives the smallest answer?
Use a column method to calculate the following: 123×3 324×4 234×8	Find the missing digits. $2\square \times 8 = 176$ $2\square \times \square = 112$ $1\square4 \times \square = 736$

Mastery	Mastery with Greater Depth
The following problems can be solved by using the calculation 8 ÷ 2. True or false? ■ There are 2 bags of bread rolls that have 8 rolls in each bag. How many rolls are there altogether? ■ A boat holds 2 people. How many boats are needed for 8 people? ■ I have 8 pencils and give 2 pencils to each person. How many people receive pencils? ■ I have 8 pencils and give 2 away. How many do I have left?	Sam is planting onions in the vegetable plot in his garden. He arranges the onions into rows of 4 and has two left over. He then arranges them into rows of 3 and has none left over. How many onions might he have had? Explain your reasoning.

Fractions

Selected National Curriculum Programme of Study Statements

Pupils should be taught to:

- count up and down in tenths; recognise that tenths arise from dividing an object into ten equal parts and in dividing 1-digit numbers or quantities by ten
- recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators
- recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators
- recognise and show, using diagrams, equivalent fractions with small denominators
- add and subtract fractions with the same denominator within one whole (for example, $\frac{5}{7}+\frac{1}{7}=\frac{6}{7}$)
- compare and order unit fractions, and fractions with the same denominators
- solve problems that involve all of the above

The Big Ideas

Fractions are equal parts of a whole.

Equal parts of shapes do not need to be congruent but need to be equal in area.

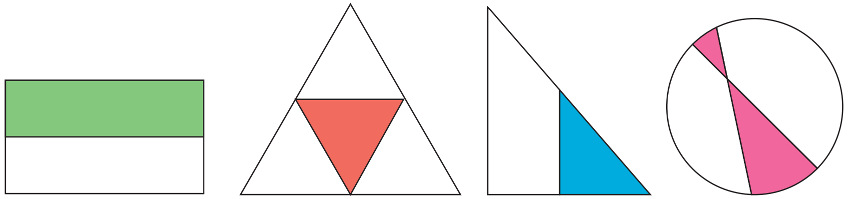
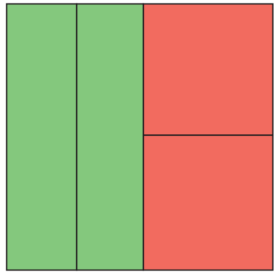
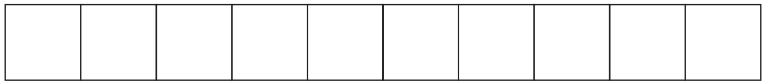
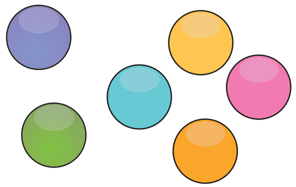
Decimal fractions are linked to other fractions.

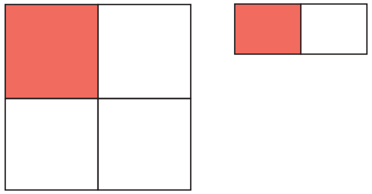
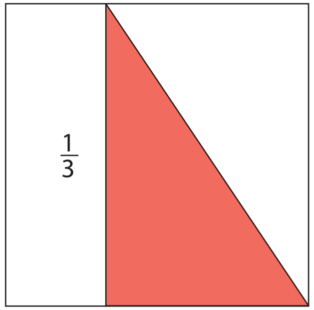
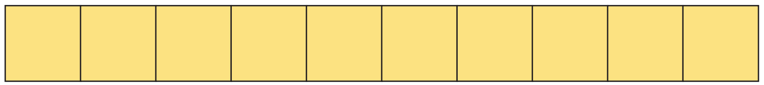
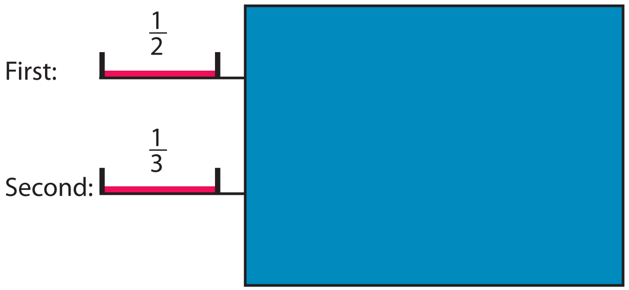
The number line is a useful representation that helps children to think about fractions as numbers.

Mastery Check

Please note that the following columns provide indicative examples of the sorts of tasks and questions that provide evidence for mastery and mastery with greater depth of the selected programme of study statements. Pupils may be able to carry out certain procedures and answer questions like the ones outlined but the teacher will need to check that pupils really understand the idea by asking questions such as 'Why?', 'What happens if …?', and checking that pupils can use the procedures or skills to solve a variety of problems.

Mastery	Mastery with Greater Depth
Six girls share three bars of chocolate equally. Four boys share two bars of chocolate equally. Does each girl get more chocolate, less chocolate or the same amount of chocolate as each boy? Draw a picture to show that your reasoning is correct.	Jo ate $\frac{1}{4}$ of a pizza and Sam ate $\frac{1}{2}$ of what was left. Mike ate the rest of the pizza. Draw a diagram to show how much pizza Jo, Sam and Mike each ate.

Mastery	Mastery with Greater Depth
True or false? Explain why.  $\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{2}$ $\frac{1}{4}$	The shape is divided into 4 equal parts. Do you agree? Explain why. 
Shade in 0·7 of this rectangle. 	This is 0·4 or $\frac{2}{5}$ of a bag of marbles. How many marbles are in a full bag? 
Fill in the numerators to make the answer less than 1. Find three different ways to complete the calculation. $\frac{}{8} + \frac{}{8} =$	Fill in the numerators to make the calculation correct. How many ways can you do it? Explain how you know you have found them all. $\frac{}{8} + \frac{}{8} = 1$

Mastery	Mastery with Greater Depth
On a number line labelled 0 to 1, mark $\frac{1}{5}$, $\frac{2}{5}$ and $\frac{4}{5}$. On a number line labelled 0 to 1, mark $\frac{1}{6}$, $\frac{1}{3}$ and $\frac{1}{2}$.	On a number line labelled 0 to 1, mark $\frac{1}{6}$, $\frac{1}{3}$ and $\frac{1}{2}$. How big is the interval from $\frac{1}{6}$ to $\frac{1}{3}$? How big is the interval from $\frac{1}{6}$ to $\frac{1}{2}$?
Hamsa says the diagrams below show that $\frac{1}{4} > \frac{1}{2}$. Do you agree? Explain why. 	What fraction of the square is shaded? Explain your reasoning. 
What fraction of the bar does each section represent?  Draw two more bars of the same size and divide one into eighths and the other into sixths. Which number is greater, a tenth, an eighth or a sixth? How do the bars help you to explain your reasoning?	Only a fraction of each line is shown. The rest is hidden behind the blue screen. Which whole line is the longer? Explain your reasoning. 

Measurement

Selected National Curriculum Programme of Study Statements

Pupils should be taught to:

- measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml)
- add and subtract amounts of money to give change, using both £ and p in practical contexts
- tell and write the time from an analogue clock, and 12 and 24-hour clock

The Big Ideas

Developing benchmarks to support estimation skills is important as pupils become confident in their use of standard measures. The height of a door frame, for example, is approximately 2 metres, and a bag of sugar weighs approximately 1 kilogram.

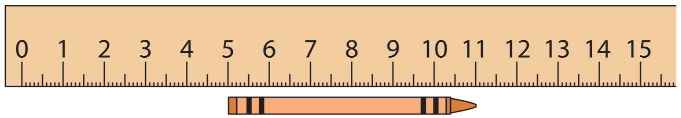
Mastery Check

Please note that the following columns provide indicative examples of the sorts of tasks and questions that provide evidence for mastery and mastery with greater depth of the selected programme of study statements. Pupils may be able to carry out certain procedures and answer questions like the ones outlined but the teacher will need to check that pupils really understand the idea by asking questions such as 'Why?', 'What happens if …?', and checking that pupils can use the procedures or skills to solve a variety of problems.

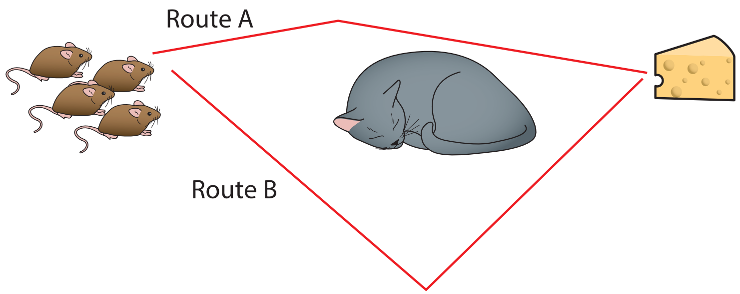
Mastery

I have 2 m of ribbon. How many 60 cm lengths can I cut from it?

How long is the crayon?



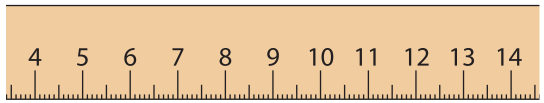
Find the total length of route A. Find the total length of route B. How much longer is route A than route B?



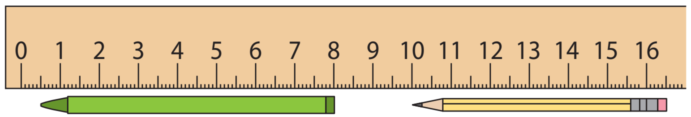
Mastery with Greater Depth

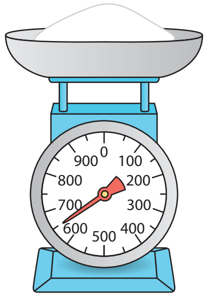
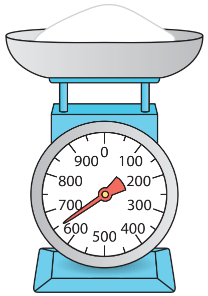
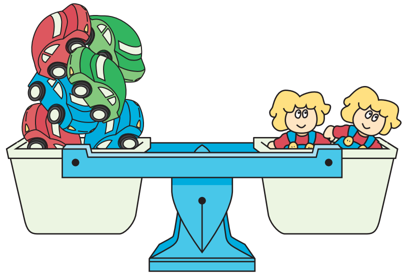
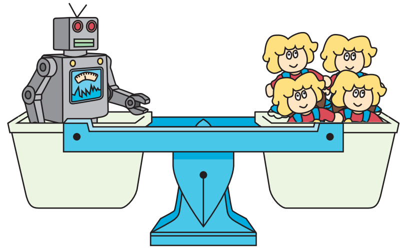
A crocodile is 3 times as long as a pig. An elephant is 1·2 m longer than the crocodile. The elephant is 4·2 m long. How long is the pig?

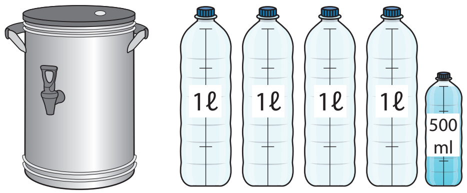
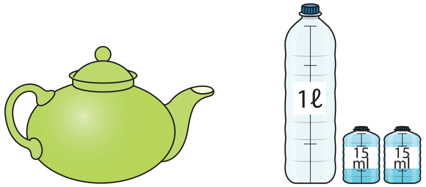
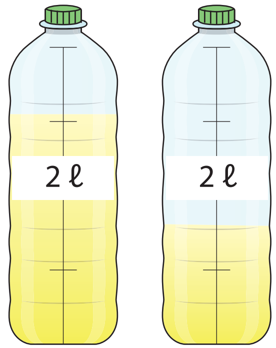
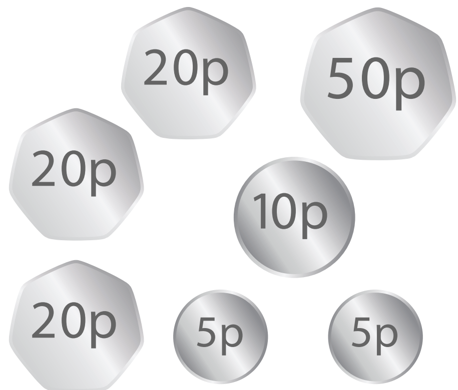
Ahmed's ruler is broken. Explain how he can still use it to measure things in the classroom.

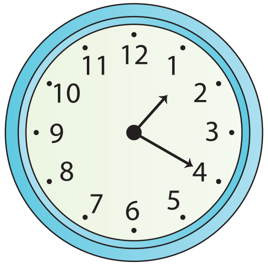
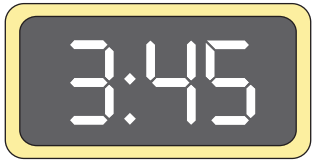
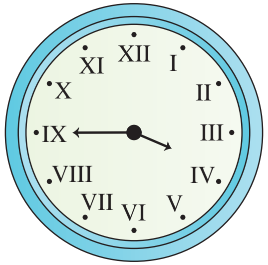
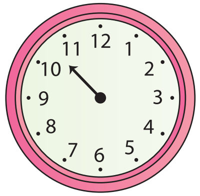


What is the difference in length between the pen and the pencil?



Mastery	Mastery with Greater Depth
What is the mass of flour on the scales?  I need $\frac{3}{4}$ kg of flour to make a cake. How much more flour do I need to add to the scales?  	6 toy cars balance 2 dolls. 4 dolls balance 1 toy robot.   If the robot weighs 3 kg, what does each toy car weigh?

Mastery	Mastery with Greater Depth
There is a tea urn and a teapot. The bottles next to them show their capacity.   How much more water does the urn hold than the teapot?	These lemonade bottles each have a capacity of 2 litres. One of them is $\frac{3}{4}$ full, and one of them contains $\frac{3}{4}$ of a litre of water. Which is which?  How much water is in the bottle which is $\frac{3}{4}$ full? What fraction of the bottle is full in the bottle which contains $\frac{3}{4}$ of a litre?
£2·60 + ☐ = £5·00 If I buy a sandwich for £2·20 and a drink for 90p, how much change do I get from £5? Ellie buys 2 pencils. She pays with a £2 coin and gets 70p change. How much did each pencil cost?	Sophie and Ravi have saved some money. Altogether they have saved £35. Sophie has saved £4 more than Ravi. How much have they each saved? Sam and Tom share this money equally. Divide the coins into two equal groups. Could three friends share the money equally? Explain your reasoning. 

Mastery	Mastery with Greater Depth
Match the two clocks that show the same time.    	These clocks have only one hand, but can you suggest a time that each could be showing? A  B  C  Explain your reasoning.

Geometry

Selected National Curriculum Programme of Study Statements

Pupils should be taught to:

- draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them
- recognise angles as a property of shape or a description of a turn
- identify right angles, recognise that two right angles make a half-turn, three make three quarters of a turn and four a complete turn; identify whether angles are greater than or less than a right angle
- identify horizontal and vertical lines, and pairs of perpendicular and parallel lines

The Big Ideas

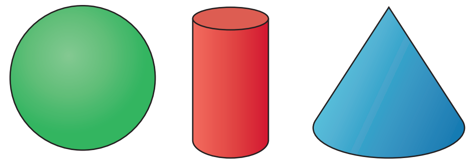
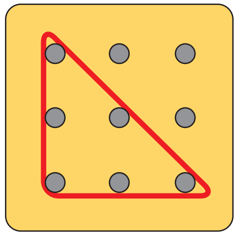
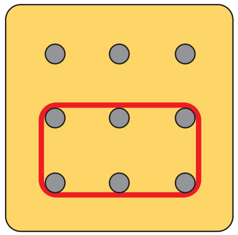
During this year there is an increasing range of shapes that pupils are familiar with. The introduction of symmetrical and non-symmetrical polygons and the requirement that pupils should be able to draw them will give rise to discussions about lengths of sides and sizes of angles. Pupils need to appreciate these features as properties of shapes as well as the number of sides and vertices.

Pupils recognise that angles are about the amount of turn – the lengths of the lines used to represent angles do not affect the size of the angle.

Pupils recognise that relationships are at the heart of properties of shapes, not particular measurements. For example, the opposite sides of any rectangle will always be equal, not that rectangles have a pair of long sides and a pair of short sides.

Mastery Check

Please note that the following columns provide indicative examples of the sorts of tasks and questions that provide evidence for mastery and mastery with greater depth of the selected programme of study statements. Pupils may be able to carry out certain procedures and answer questions like the ones outlined but the teacher will need to check that pupils really understand the idea by asking questions such as 'Why?', 'What happens if …?', and checking that pupils can use the procedures or skills to solve a variety of problems.

Mastery	Mastery with Greater Depth
Have a range of 3-D shapes in a 'feely bag'. Can you feel for the cube, the cuboid, the pyramid, the cylinder and the cone? Explain how you know. Describe what you are feeling to your classmates and see if they guess what the shape is.	True or false? The shape of a cross section of a sphere is always a circle. The shape of a cross section of a cylinder is always a circle. The shape of a cross section of a cone is always a circle.  sphere cylinder cone Explain your reasoning. Can you identify a 3-D shape where the cross section is always a square?
Can you draw a triangle with: ■ 1 right angle? ■ 2 right angles? Can you draw a quadrilateral with: ■ 1 right angle? ■ 2 right angles? ■ 5 right angles? ■ No right angle? If some of these are impossible, can you explain why?	How many different triangles can you find on a 3×3 pin geoboard? How do you decide that they are different?  How many different quadrilaterals can you find on a 3×3 pin geoboard? How do you decide that they are different? 

Statistics

Selected National curriculum Programme of Study Statements

Pupils should be taught to:

- interpret and present data using bar charts, pictograms and tables
- solve one-step and two-step questions [for example, 'How many more?' and 'How many fewer?'] using information presented in scaled bar charts and pictograms, and tables

The Big Ideas

Data needs to be collected with a question or purpose in mind.

Tally charts are used to collect data over time (cars passing the school, birds on the bird table). They can also be used to keep track of counting.

Mastery Check

Please note that the following columns provide indicative examples of the sorts of tasks and questions that provide evidence for mastery and mastery with greater depth of the selected programme of study statements. Pupils may be able to carry out certain procedures and answer questions like the ones outlined but the teacher will need to check that pupils really understand the idea by asking questions such as 'Why?', 'What happens if …?', and checking that pupils can use the procedures or skills to solve a variety of problems.

Mastery

Class	Weekly awards for a tidy classroom  = 3 awards
Reception	
Year 1	 +1
Year 2	
Year 3	 +2
Year 4	
Year 5	
Year 6	 +1

Mastery with Greater Depth

Create two separate pictograms to display the following information. The symbol used in each should have a value of more than 1.

Which value will you choose for each pictogram?

Explain your decisions.

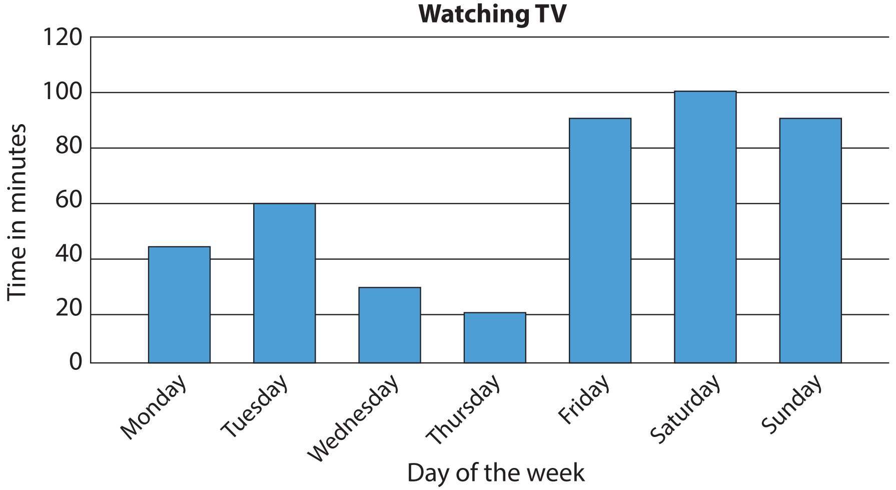
Class	Number of merits awarded	
	Hard work	Good behaviour
YR	42	32
Y1	39	18
Y2	24	27
Y3	30	33
Y4	18	24
Y5	30	24
Y6	39	36

Mastery	Mastery with Greater Depth
Transfer the information from the weekly awards table to the table below. [table below] Present the information in a bar graph.	
The graph shows how many minutes Sam spent watching TV at home last week. [graph below]	Work with two friends to collect data on how many hours each of you watch TV for a week. Decide how you will combine and present the data using just one graph.

Class	**Number of awards**
YR	
Y1	
Y2	6
Y3	
Y4	
Y5	
Y6	

Present the information in a bar graph.

The graph shows how many minutes Sam spent watching TV at home last week.



On which day did Sam watch the most TV?
How many minutes of TV did Sam watch on Wednesday?
How many more minutes did Sam watch on Friday than on Tuesday?
How many fewer minutes did Sam watch on Thursday compared to Sunday?

