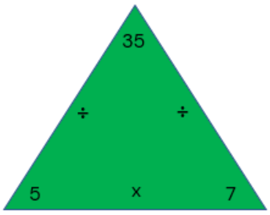
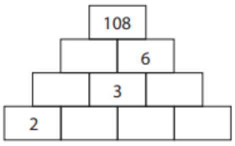
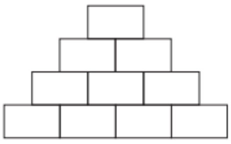
Planning Overview
Year 5 Multiplication and Division

Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers
Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers
Establish whether a number up to 100 is prime and recall prime numbers up to 19
Multiply numbers up to 4 digits by a one or two-digit number using a formal written method, including long multiplication for two-digit numbers
Multiply and divide numbers mentally drawing upon known facts
Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context
Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000
Recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3})
Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes
Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign
Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple ratio.

5NF–1 Secure fluency in multiplication table facts, and corresponding division facts, through continued practice
5NF–2 Apply place-value knowledge to known additive and multiplicative number facts (scaling facts by 1 tenth or 1 hundredth)
5MD–1 Multiply and divide numbers by 10 and 100; understand this as equivalent to making a number 10 or 100 times the size, or 1 tenth or 1 hundredth times the size.
5MD–2 Find factors and multiples of positive whole numbers, including common factors and common multiples, and express a given number as a product of 2 or 3 factors.
5MD–3 Multiply any whole number with up to 4 digits by any one-digit number using a formal written method.
5MD–4 Divide a number with up to 4 digits by a one-digit number using a formal written method and interpret remainders appropriately for the context.

	Teaching and Learning
Introduction/ Times Tables	Discuss times tables with the children, they worked so hard in Y4 to become secure with their times tables, are they important in Y5? List all the things that they will learn this year that require understanding of times tables and add to working wall. Tell the children that you will be using a range of games/songs/activities throughout the year to ensure that they can retain their facts and apply them to the different contexts.

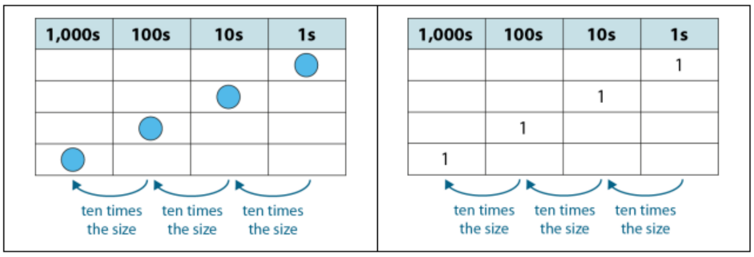
Multiply and divide numbers mentally drawing upon known facts – Related Facts	Children will have created fact families and applied to scaled number facts and missing number calculations in Year 4 e.g.  5 x 7 = 35 7 x 5 = 35 35 ÷ 5 = 7 35 ÷ 7 = 5 9 x ? = 108 120 ÷ ? = 20 ? ÷ 8 = 15 ? x 60 = 240 Ensure that children have retained this understanding and then apply to the Year 5 Mastery and Greater Depth questions below. **Mastery** Fill in the missing numbers in this multiplication pyramid.  **Mastery with Greater Depth** Put the numbers 1, 2, 3 and 4 in the bottom row of this multiplication pyramid in any order you like. What different numbers can you get on the top of the number pyramid? How can you make the largest number? Explain your reasoning.  Give children the calculation 6 x 4 = 24 and ask them to systematically find a range of known multiplication and division facts. Do they work their way up to answers such as 6000 x 40 = 240,000? Solve missing number calculations 800 x ? = 32,000 Use the known fact 5 x 6 = 30 to find 6 different ways of completing the calculation below. ? x ? = 30,000
Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000	**Human Moving Digits** Give children large digits to hold and create a "Human Number" by standing in a line. Where should they move if multiplying by 10? 100? Dividing by 1000? How many places? Emphasise that all children stick together – only the decimal point can come between you and we never separate two digits with a zero, but we may add a place holder at the beginning or end of a number (One or more children can be Zero the hero)

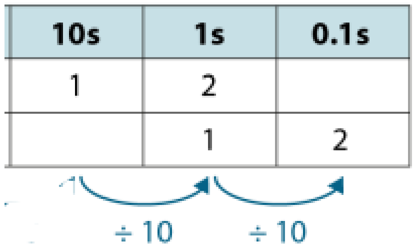
*This learning will be revisited again during the Decimals unit, however children will have covered tenths and hundredths in Year 4 so will understand these values if the numbers move into decimals while exploring dividing by 10, 100 and 1000.

Use a Gattegno Chart or Place Value chart to explain the effect of multiplying and dividing by 10/100/1000

Gattegno chart:

1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09





NCETM PD Materials

Patterns

Look at patterns to help children notice relationships within the place value system.

2 x 10 = 20

2 x 100 = 200

2 x 1,000 = 2,000

What would the division pattern look like? How is it different to multiplication?

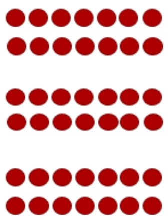
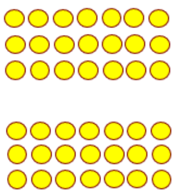
Children to use place value charts as a model and image to help them write some ‘top tips’ to another child who is trying to learn how to x and divide by 10 and 100.

True or false

34 x 100 = 340 x 10

654 x 10 < 654 x 100

Multiply and divide numbers mentally drawing upon known facts – Relationship between doubling and halving	Build an array. Ask children to pick up half of the array and use it to double the other side. E.g. start with 6 x 4, halve the 4 rows of 6 and add underneath to  create 8 rows of 3. 6 x 4 has now become 3 x 8. We halved one side and doubled the other. Can the children understand that there are the same amount of counters overall but the way in which we have organised them is different? Revert to 6 x 4, this time halve the array horizontally to create 2 rows of 12. This could be repeated to create 1 row of 24. Repeat with a range of calculations, explore when this works. We would always need an even number within the calculation to ensure that we could halve one side. 19 x 5 could not be completed using this method. Could we solve 18 x 5? Or 9 x 20? Or 240 x 20 using this method? Is this the most efficient way of completing these calculations? Allow the children to reason about their preferred method e.g. for 9 x 20 they may prefer to calculate 9 x 2 and multiply by 10 or 9 x 10 and double. Extend this method to multiplying by 50 and 25. If we were completing the calculation 24 x 50, we could halve 24 and double 50 to get an equivalent calculation of 12 x 100 = 1,200. 24 x 50 = 12 x 100 = 1,200 If we were completing 72 x 25 we could complete the doubling and halving twice to get an equivalent calculation of 18 x 100 = 1,800. 72 x 25 36 x 50 18 x 100 = 1,800 Another strategy for multiplying by 25 and 50 is to multiply by 100 and then halve your answer to find x 50 or halve your answer twice to find x 25. Which do the children prefer? e.g. 24 x 50 = 24 x 100 = 2,400 2,400 ÷ 2 = 1,200 72 x 25 = 72 x 100 = 7,200 7,200 ÷ 2 = 3,600 3,600 ÷ 2 = 1,800

	Children to practice a range of calculations multiplying by 25 and 50. When does doubling and halving work best? When does x100 and half work best? **Division** Look at the calculation 8 ÷ 2 and 16 ÷ 4 with the children. What do you notice? Extend to 32 ÷ 8. How is this different to multiplication? Why do we have to double both sides with division? E.g. We are sharing with double the amount of people so we would need double the quantity to each receive the same amount. Give the children a range of calculations to sort into those that they could solve using doubling and halving and those that would be more efficiently solved using a different method. e.g. 28 x 50, 63 x 20 and 46 x 5 could all be solved by doubling one side and halving the other.
Multiply and divide numbers mentally drawing upon known facts – Associative Law	Ask the children to create an array of 7 x 6. What is the total? Ask the children to split the array into 7 x 2, 3 times. This array represents 7 x 2 x 3  Now ask the children to split their array into 7 x 3, twice. This represents 7 x 3 x 2  Discuss which arrangement is easier to calculate the total 14 x 3 is not as easy as 21 x 2 Ask children to think about other calculations where a different order would make the calculation easier. Include decimals and larger numbers. e.g. e.g. 15 x 2 x 3 = 8 x 6 x 5 = 8 x 3 x 0.5 Provide the children with a range of calculations, ask them to evaluate which ones need the order changing and which are already in the most efficient order.

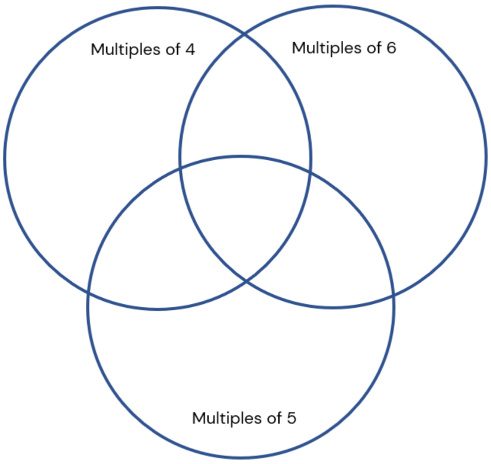
Multiply and divide numbers mentally drawing upon known facts – Distributive Law	Ensure that children have retained their ability to partition and recombine numbers to multiply a 2-digit number by a single digit mentally: For 23 x 3: 20 x 3 = 60 3 x 3 = 9 60 + 9 = 69 Children should be able to manipulate numbers to quickly work about facts that they cannot recall e.g. 7 x 8 This can be seen as 7 x 5 and 7 x 3 35 and 21 = 56 What other pairs of multiplication facts would give the answer to 7 x 8? Which is the easiest pair? Move on to exploring how this idea can help with division. e.g. 84 ÷ 7 In this calculation, partitioning by place value will not help because neither 80 or 4 will divide by 7. We can split 84 into two multiples of 7 e.g. 70 and 14 and divide each part separately before recombining their quotients (answers) 84 = 70 + 14 70 ÷ 7 = 10 14 ÷ 7 = 2 10 + 2 = 12
Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers	*NC objectives require children to identify common factors of two numbers. Ready to Progress criteria require children to identify common factors and common multiples of positive whole numbers, **Multiples** Numbers are 'multiples of a number' if they appear in the times table for that number. Ask the children what common multiple might mean. Can they give an example? On a 100 square, shade the first 9 multiples of 6 and then the first 7 multiples of 8. What do you notice? Find the first 3 common multiples of these pairs of numbers. 3 and 5 2 and 6 8 and 12 Tom and Sam swim regularly. Tom swims once every 4 days and Sam swims once every 6 days. In a fortnight, how many times will they swim on the same day?

Always, Sometimes or Never
To find common multiples of numbers, you multiply the two numbers together.

Exploring common multiples
Complete the Venn Diagram so that there is at least one number in each section.

Which sections show common multiples?

What can you say about the numbers in the middle of the diagram?



Factors
Remind the children that factors are whole numbers that divide exactly into another number without leaving a remainder.

Mastery					
8	is a multiple of	4	and a factor of	16
6	is a multiple of	3	and a factor of	
	is a multiple of	5	and a factor of	
	is a multiple of		and a factor of	

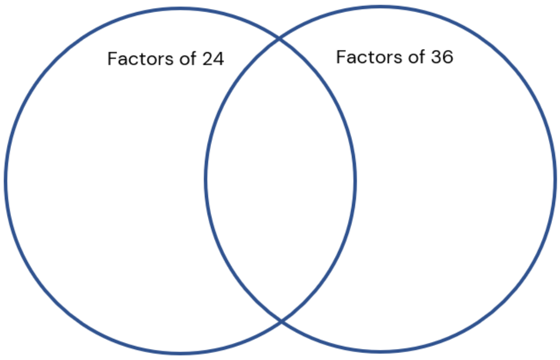
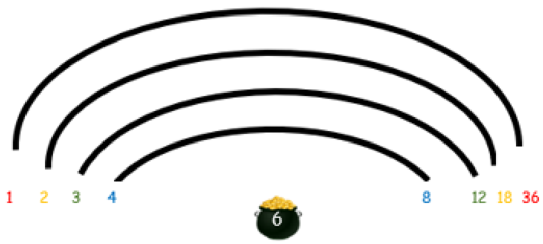
Ask children what they think a common factor might be.
5 is a common factor of 15 and 40 because 5 is a multiple of any number that ends with a 5 or a 0.

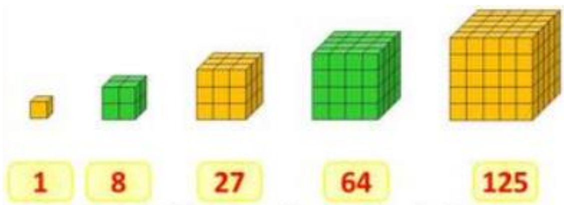
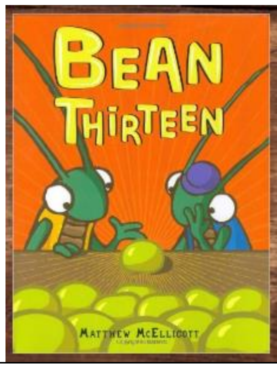
Find the common factors of these pairs of numbers:
24 and 36
20 and 30
28 and 45

Which number is the odd one out?
12, 30, 54, 42, 32, 48

Explain why using the words common factor in your answer.

Two numbers have common factors of 4 and 9.
Give three examples of what these numbers could be.

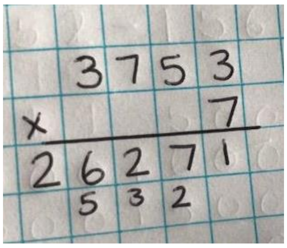
	Sort the following numbers onto the Venn diagram. 1 2 3 4 5 6 7 8 9 10 11 12  Can you add one more number into each section of the Venn Diagram
Recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3})	Using the same model and image from the previous factors objective explore how some numbers make a tail on their factor bug and some have a pot of gold under the rainbow. E.g. 36 What is special about these numbers?  Ask the children to build an array for the pot of gold or for the tail – what shape does this array describe? A square. 36 is a square number because when we divide 36 into rows of 6, we end up with 6 rows of 6, which results in a square array. What other square numbers can the children find? Can they create the rainbow or factor bug and then explain why the number is a square number? **Mastery with Greater Depth** Captain Conjecture says, 'Factors come in pairs so all numbers have an even number of factors.' Do you agree? Explain your reasoning. 

	NRICH – Cycling Squares In the circle of numbers below each adjoining pair adds to make a square number: 14 2 7 9 16 20 29 35 For example, $14+2=16, 2+7=9, 7+9=16$ and so on. Can you make a similar - but larger - cycle of pairs that each add to make a square number, using all the numbers in the box below, once and once only? 2, 3, 4, 5, 6, 8, 10, 11, 12, 13, 14, 15, 17, 19, 21, 28, 30, 34.
Recognise and use square numbers and cube numbers, and the notation for squared (²) and cubed (³)	Model how cube numbers are made? Can we make the pattern?  Each cube has the same length, width and height. Children to record the dimensions of each of the cubes that they build $2 \times 2 \times 2 = 8cm^3$ Why do we record a cube number as cm^3?
Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers **Establish whether a number up to 100 is prime and recall prime numbers up to 19**	Using the same model and image from previous factors work explore rainbows that have only one arch or bugs that have only one set of legs. What factors do these bugs/rainbows have? 1 and itself Children investigate and find more prime numbers. Encourage children to use generalisations around times tables to help them investigate factor pairs. To recap prime numbers, read and explore the story 'Bean Thirteen'. What other numbers could be unlucky numbers? https://www.youtube.com/watch?v=0-oGdOCcYBg 

Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers

Prior to teaching written methods, you may want to revisit the estimation strategies that were covered in the addition and subtraction unit. We can use our rounding and known facts to support us with making sensible estimations. E.g. 4528 x 9 could be estimated as 4500 x 10, 42 x 37 could be estimated as 40 x 40. The children will have covered multiplying a 3-digit number by a 1-digit number in Year 4. Assess and track back as needed.

Children extend their learning from Year 4 to explore multiplying a 4-digit number by a 1-digit number. If they are not secure with the compact method you may want to track back to methods they would have used in Year 4, in line with your calculation policy, e.g. grid/expanded method.



Extend to missing box problems and word problems.

Multiplying by a 2-digit number

This will be the first time children will have explored multiplying by a 2-digit number so the use of realistic contexts, manipulatives. arrays and expanded methods will develop children's understanding of the steps involved.

e.g. Stickers come in rows of 14. I have 16 rows. How many stickers do I have? Ask children how they can group the stickers to make the calculation easier. Guide them towards using their knowledge of place value to make smaller, easier steps

i.e. 10 + 4 and 10 + 6

X	**10**	**4**
10	100	40
6	60	24

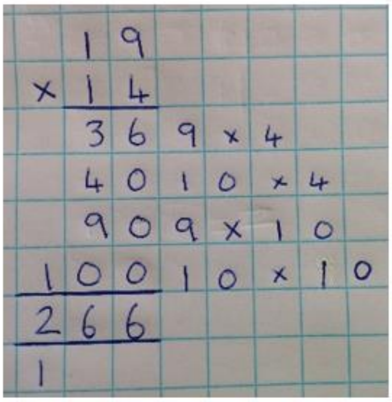
10 x 10 = 100
4 x 10 = 40
10 x 6 = 60
4 x 6 = 24
224

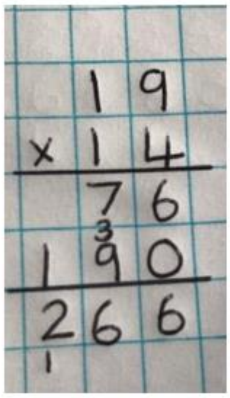
Relate this to the content of the grid. Where did the numbers come from? Ask children what four calculations they did to help them find the answer. Encourage them to record these as an expanded method.

Allow children to become confident with the sections of the grid and then extend to expanded and compact methods in line with your calculation policy.

Introduce each stage alongside the previous stage as this enables the children to become confident with the calculations involved and can support them in identifying where they have gone wrong if they end up with an incorrect answer.

X	**10**	**9**
10	100	40
4	40	36





Can children explain what's the same and what's different about the 3 different methods and the answers within the different sections?

Zero as a place holder

Encourage children to recognise the importance of the zero when multiplying by the tens digit – have they noticed that this answer always ends in zero? Why? What do they notice about the other digits.

If children make mistakes in their methods write these up as your mistakes for children to explore during the next lesson. Ask them where you have gone wrong and what to look out for next time. What top tips can they write for children in a Year 5 class in another school?

Once children are confident, apply to missing digit calculations and word problems.

34 x 197

Sam Andrew thinks the answer to this calculation will be about 6000. Do you agree? Explain your reason.

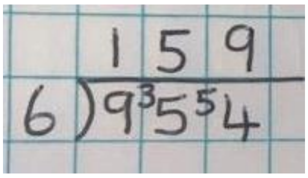
Choose a 4-digit target number. Roll the dice 4 times to generate 4 digits. Use them to make two 2-digit numbers and multiply them. Play against a partner... Who can get the closest product to the target number?

<table>
<tr>
<td>Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context</td>
<td>

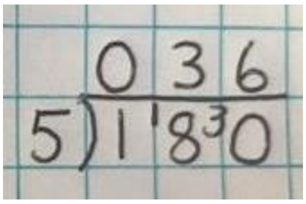
Children may have secured their understanding of short divison in Year 3, however written division is not a specific objective in Year 4. Assess retention and track back as appropriate.

Language of division
Introduce the language of division early and use it consistently when modelling with apparatus and across a range of strategies:
Dividend – number to be divided
Divisor – number of groups the dividend will be divided by
Quotient – size of each group (result of division)
Make the language of divison part of your classroom's working wall.

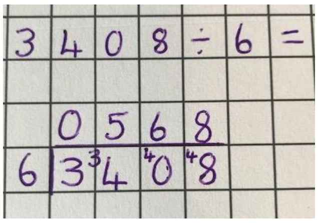
If children have not retained their understanding of short division from Year 3, consider using Place Value Counters to support the children's understanding.



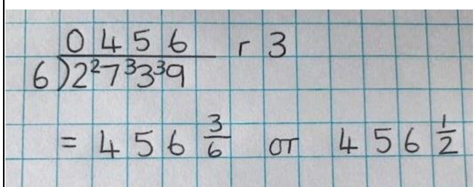
Children should become confident with a 3-digit dividend and then move onto a 4-digit dividend.



When they are gaining in confidence include a dividend that results in having a zero in the first column of the quotient (answer)



Children are then introduced to examples that have remainders within the final answer. Children should be given the opportunity, to consider the meaning of the remainder and how it should be expressed (i.e. as a fraction or as a rounded number, depending on the context of the problem)



Can children sort a range of word problems into those that would be need to be rounded up or down before they solve them?

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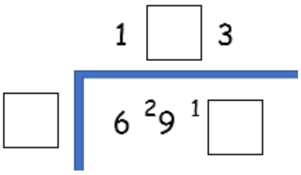
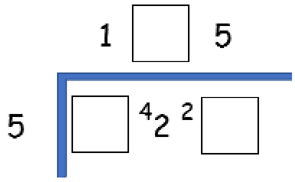
<td>Encourage the children to consider when a mental method is more appropriate, however many digits there are in a calculation. e.g. when presented with a calculation like 6240 ÷ 6, do they recognise the multiples of 6 within the dividend and know that there will be no remainder?

Use the digits 2, 4 and 7 to complete the calculation



What are the missing digits?



Use the digits 2, 3, 4, 5 and 6 to make a division calculation with a 4-digit dividend and a single digit divisor. What is the closest quotient you can make to 150?</td>
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<tr>
<td>Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign

Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple ratio.</td>
<td>Provide children with a range of word problems/problems linked to multiplication and division (e.g. SATs questions). Encourage children to use the bar model to support them if necessary and then reflect on whether they have chosen the most appropriate method to solve each problem.

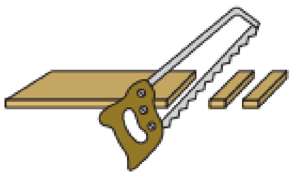
Mastery

Sally's book is 92 pages long.

If she reads seven pages each day, how long will she take to finish her book?

A 50 cm length of wood is cut into 4 cm pieces.

How many 4 cm pieces are cut and how much wood is left over?



Fill in the blanks to represent the problem as division:
□ ÷ □ = □ remainder □

Fill in the blanks to represent the problem as multiplication:
□ × □ + □ = 50</td>
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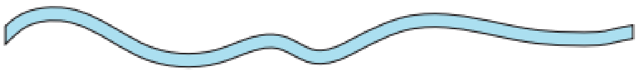
Greater Depth

A 1 m piece of ribbon is cut into equal pieces and a piece measuring 4 cm remains.

What might the lengths of the equal parts be?

In how many different ways can the ribbon be cut into equal pieces?



A 5p coin has a thickness of 1·7 mm. Ahmed makes a tower of 5p coins worth 50p.

Write down the calculation you would use to find the height of the tower.

Sample SATs questions

In this sequence, the rule to get the next number is

Multiply by 2, and then add 3

Write the missing numbers.

	25	53	

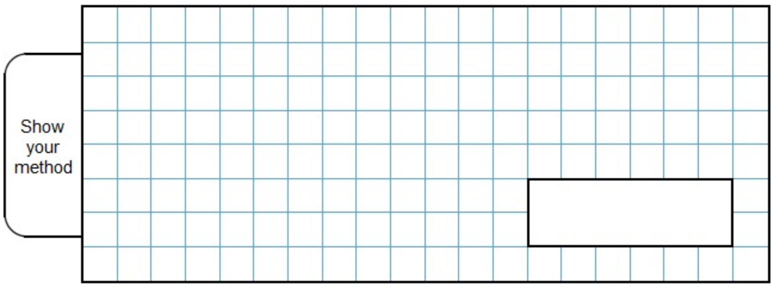
Jack chose a number.

He multiplied the number by 7

Then he added 85

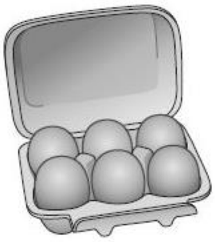
His answer was 953

What number did Jack choose?



A farmer is packing eggs.

Each box holds **six** eggs.



The farmer has 980 eggs to pack.

How many boxes can the farmer **fill** using 980 eggs?

	full boxes

How many eggs will be left over?

	left over

Write the missing number in each calculation.

25 ÷ $\boxed{}$ = 3 remainder 4

35 ÷ $\boxed{}$ = 4 remainder 3