Year 6

Maths Overview

ST. MARY'S ACADEMY TRUST

MathsHUBS White Rose

Year 6 Overview

	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14	Wk 15
Autumn	Number: Place value		Number: Four Operations (Addition, Subtraction, Multiplication & Division)				Number: Fractions				Number: Decimals		Number: Percentages		Opportunity to consolidate, revisit and reinforce
Spring	Measures		Number: Algebra		Number: Ratio & proportion		Statistics	Geometry: Properties of Shapes		Geometry: Position & direction					
Summer	SATS Revision					**Post SATs** • Consolidation & embedding of maths objectives • Project work									

Please note: The length of each unit has been given as a guide only. Use professional judgement to either extend or shorten units in line with the needs of pupils.

AUTUMN TERM														
Wk 1	**Wk 2**	**Wk 3**	**Wk 4**	**Wk 5**	**Wk 6**	**Wk 7**	**Wk 8**	**Wk 9**	**Wk 10**	**Wk 11**	**Wk 12**	**Wk 13**	**Wk 14**	**Wk 15**
Number: Place value Read numbers up to 10 000 000 and determine the value of each digit. Write numbers up to 10 000 000 and determine the value of each digit. Compare numbers up to 10 000 000 and determine the value of each digit. Order numbers up to 10 000 000 and determine the value of each digit. Round any whole number to a required degree of accuracy. Use negative numbers in context, and calculate intervals across zero. Solve number and practical problems that involve Y6 place value objectives		Number: Four operations (addition subtraction, multiplication and division) Perform mental calculations, including with mixed operations. Perform mental calculations, including with large numbers for all four operations. Use their knowledge of the order of operations to carry out calculations involving the four operations. Solve addition and subtraction multi step problems in contexts, deciding which operations and methods to use and why. Solve problems involving addition, subtraction, multiplication and division. Multiply multi-digit number up to 4 digits by a 2 digit number using the formal written method of long multiplication. Divide numbers up to 4 digits by a 2 digit whole number using the formal written method of long division Divide numbers up to 4 digits by a 2 digit number using the formal written method of short division Interpret remainders as whole number remainders, fractions or by rounding as appropriate for the context. Identify common factors Identify common multiples Identify prime numbers. Use estimation to check answers to calculations Determine, in the context of a problem, an appropriate degree of accuracy,				Number: Fractions Use common factors to simplify fractions; use common multiples to express fractions in the same denomination. Compare and order fractions, including fractions >1 Add fractions with different denominations and mixed numbers, using the concept of equivalent fractions. Subtract fractions with different denominations and mixed numbers, using the concept of equivalent fractions. Multiply simple pairs of proper fractions, writing the answer in its simplest form [for example 1/4 x 1/2 = 1/8] Divide proper fractions by whole numbers [for example 1/3 ÷ 2 = 1/6] Associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example 3/8]				Number: Decimals Identify the value of each digit in numbers given to 3 decimal places Multiply & divide numbers by 10, 100 and 1000 giving answers up to 3 decimal places Multiply one digit numbers with up to 2dp by whole numbers Use written division methods in cases where the answer has up to two decimal places. Solve problems which require answers to be rounded to specified degrees of accuracy.		Number: Percentages Solve problems involving the calculation of percentages [for example, of measures such as 15% of 360] and the use of percentages for comparison. *(Ratio and proportion)* Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.		Opportunity to consolidate, revisit and reinforce

SPRING TERM									
Wk 1	**Wk 2**	**Wk 3**	**Wk 4**	**Wk 5**	**Wk 6**	**Wk 7**	**Wk 8**	**Wk 9**	**Wk 10**
Measures Use, read, write and convert between standard units, converting measurements of **length** from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to 3dp. Convert between miles and kilometres. Use, read, write and convert between standard units, converting measurements of **mass** from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to 3dp. Use, read, write and convert between standard units, converting measurements of **volume** from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to 3dp. Use, read, write and convert between standard units, converting measurements of **time** from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to 3dp. Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate. Recognise that shapes with the same areas can have different perimeters and vice versa. Recognise when it is possible to use formulae for area and volume of shapes. Calculate the area of triangles Calculate the area of parallelograms Calculate, estimate and compare volume of cubes and cuboids using standard units, including cm^3, m^3 and extending to other units (mm^3, km^3).		Number: Algebra Use simple formulae Generate and describe linear number sequences (including with fractions). Express missing number problems algebraically. Find pairs of numbers that satisfy an equation with two unknowns. Enumerate possibilities of combinations of two variables.		Number: Ratio & proportion Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts. Solve problems involving similar shapes where the scale factor is known or can be found. Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.		Statistics Interpret and construct line graphs and use these to solve problems Interpret and construct pie charts and use these to solve problems Calculate and interpret the mean as an average.	Geometry: Properties of Shapes Draw 2D shapes using given dimensions and angles. Compare and classify geometric shapes based on their properties and sizes. Find unknown angles in any triangles, quadrilaterals and regular polygons. Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles. Recognise, describe and build simple 3D shapes based on their properties and sizes. Illustrate and name parts of circles, including radius, diameter and circumference; know that the diameter is twice the radius.		Geometry: Position & direction Describe positions on the full coordinate grid (all four quadrants). Draw and translate simple shapes on the coordinate plane. Reflect shapes in axes on full co-ordinates grid.

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Place Value	Read numbers up to 10,000,000 and determine the value of each digit. Write numbers up to 10,000,000 and determine the value of each digit. Compare numbers up to 10,000,000 and determine the value of each digit. Order numbers up to 10,000,000 and determine the value of each digit.	• Which is greater? Seventy six thousand, eight hundred and twenty six or 78626 • Write the following number in words: 23650118 • Put a number in the missing space below to make the sentence correct. 4_236460 > 46236460	• Put a number in the missing space below to make the sentence correct. 4_236460 > 46236460 Explain why it is true. • **Do, then explain** Show the value of the digit 6 in these numbers? 6787555 95467754 Explain how you know. • Put one number in each box so that the list of numbers is ordered largest to smallest. 1 1 3 1 2 4 1 2 5 1 5 6 1 3 0 1 1 5	• **Do, then explain** Find out the populations in five countries. Order the populations starting with the largest. Explain how you ordered the countries and their populations. • Miss Jones, the teacher has four cards. On each card is a number: 42350 43685 56995 56943 She gives one card to each pupil. They each look at them and say a clue. Alfie says, "My number is 57000 when rounded to the nearest 10." Ben says "My number has exactly 3 hundreds in it." Caleb says "My number is 44000 when rounded to the nearest thousand". Patrick says "My number is exactly 100 less than 57043." Can you solve who had which card and explain how you know this? • Claire is given the sum below to estimate an answer to 1912 + 1888 = Claire says "I will just double 1900 which is 3800". Why has Claire done that? Would you do anything differently?

<table>
<tr><th rowspan="2"></th><th rowspan="2">National Curriculum Statement</th><th colspan="3">All students</th></tr>
<tr><th>Fluency</th><th>Reasoning</th><th>Problem Solving</th></tr>
<tr><td>Place Value</td><td>Round any whole number to a required degree of accuracy.</td><td>• Round the following number to the nearest tenth:
0.286

• Work out the missing number.
362.29 rounded to nearest_____is 362

• A number rounded to the nearest 100 is 600. What is the smallest possible number it could be?</td><td>• Tim says “If I round 26.63 to the nearest 10, I do not need to look at the tenths or hundredths.” Do you agree? Explain your reasoning.

• Give an example of a six digit number which rounds to the same number when rounded to the nearest 10000 and 100000. Explain why this has happened.

• Spot the mistake!
Calvin rounded 215678 to the nearest ten thousand and wrote 220678. Can you explain to Calvin what mistake he has made and why he has done it?</td><td>• Two numbers each with two decimal places round to 41.3 to one decimal place. The total of the numbers is 82.6. What could the numbers be? How many different ways can you find?

• Mr Langfield gives out the following four cards:
<table><tr><td>59.96</td><td>59.94</td></tr><tr><td>60.26</td><td>62.32</td></tr></table>Four children each take a card and give a clue to what their number is:
Alice says “My number is 60 when rounded to the nearest 10.”
Beth says “My number has exactly 6 tens in it.”
Charlie says “My number is 59.9 to the nearest tenth.”
Daniel says “My number is 60 to the nearest tenth.”
Can you work out which child has which card? Explain your choices.

• Two numbers when added together make 100 but when rounded one number rounds to 0 and the other rounds to 100. How many different combinations of numbers can you find?</td></tr>
</table>

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Place Value	Use negative numbers in context, and calculate intervals across zero.	• Fill in the missing numbers. 152, 102, 52, 2,____,____, • Filip had £17.50 in bank account. He paid for a jumper that was £30. How much did he have in his bank account after? • In a Science experiment, a class videoed a thermometer overnight. At 02:30 it read -12°c and it was 15°c at 13:00. What was the difference in temperatures?	• **Spot the mistake:** -75, -15, 35, 105 What is wrong with this sequence of numbers? • **True or false?** When I count backwards in 50s from 10 I will say -150. Explain how you know. • A company decided to build offices underground as well as over ground. The manager says "If we build from 100 down to -100 then we will have 200 floors." Was he right? Convince me.	• The temperature is -6°c. It gets 5 degrees warmer. **True or false** – it is now -11°c. Explain your answer using a drawing e.g. number line. • Here are some number cards: 3 3 | -8 | -6 -4 | 2 | -7 Use the cards to complete the sums below. ___ +____= ____ ___ -____= ____ • **Connect 3** The first to complete a row of three is the winner. Each time a player rolls they then choose if they would like to add or subtract the numbers either way round: ___ +/-____= | | -5 | -4 | -3 | -2 | | -1 | 0 | 1 | 2 | 3 | | 4 | 5 | 6 | 7 | 8 | | 9 | 10 | 11 | 12 |

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Four Operations	Solve addition and subtraction multi step problems in contexts, deciding which operations and methods to use and why.	• Work out the missing number: 3210 + 2564 = 9836 - _____ 2678 +_____= 9305 – 3789 • The council planted 1500 new flowers on Monday. On Tuesday they doubled what they had planted the day before and on Wednesday they planted half of what they planted on Monday. How many flowers were planted altogether? • 7208 females attended a concert as well as 8963 males. There were originally 20000 seats on sale. How many empty seats were there at the concert?	• Abdul says "If I add any two 4 digit numbers together is will make a 5 digit number." Do you agree? Explain why. • Katie was given the sum below 47326 – 1900 = She said "I will just take off 2000 then subtract another 100 so my answer is 45126." Is she correct? Would you use her method? Explain your answer. • Nancy is using the inverse operation to solve sums. She is completing the sum below: _____ - 3291 = 5382 She says "I can turn the sum around to get the correct answer." She does the following: 5382 – 3291 = Is she correct? Why?	• Three pandas are eating bamboo sticks. There are 51 altogether. They all eat an odd number of sticks. How many bamboo sticks did they each eat? How many different ways can you do it?  • 10 people from different countries meet at an international peace ceremony. Each person shakes the hand of each other person. How many handshakes are there altogether?  • Javid has six white mice, three males and three females. Each of the three couples has 7 female baby mice. The each of these females has 8 babies. One night Javid's little sister Aisha leaves the mice cage open and 47 escape. How many mice does Javid have left?

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Four Operations	Multiply multi-digit number up to 4 digits by a 2 digit number using the formal written method of long multiplication.	• Work out 3678 x 23 • Abby planted 573 bulbs. The packet showed each flower should have 13 petals. How many petals should there be altogether? • What is the missing number below? Explain how you know. 80 x_____= 560000	• Find the mistake in the calculation below. Correct it and explain what you have done. 4629 x 12 108 24 72 36 204 • Amy is given the sum 5413 x 600. She says "I can do this without a written method." Write down the mental steps you think Amy could do. • Miss Brown estimates the following: 4999 x 40 = 200000 Do you think she was right to that? Explain your reasons.	• Craig says "250 ends in a zero therefore, when multiplying, I can only make 250 by multiplying by 5 or 10." Do you agree? How many ways can you find to disprove this? • **Countdown** What is the closest you can get to any given number e.g. 256 using only multiplication and a list of numbers given e.g. 10, 7, 6, 2, 25, 4? How do you know this is the closest? What strategy did you use? • A class are solving multiplication problems using counters. One child arranges their counters like the diagram below. The question is 23 x 3 =  Is this the only way to represent this sum? How many ways can you find?

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Four Operations	Divide numbers up to 4 digits by a 2 digit whole number using the formal written method of long division Interpret remainders as whole number remainders, fractions or by rounding as appropriate for the context.	• 2538 people applied to be in a T.V. show audience. 14 people were invited to each show. How many shows did they make with full audiences and how many people were not invited? • Work out 5834 ÷ 26 • Work out the missing number: 5792 ÷ 16 =	• Harry says “Without doing a written method I know 7350 ÷ 7 will not have a remainder.” Is he correct? Convince me. • Belle divides 8541 by 8. She says “I know there will be a remainder before I start.” Is she correct? Explain how you know. • Megan divides 500 by 8 and gets the answer 62r4. She re writes it as 62 r $\frac{1}{2}$. Is she right? Explain your answer.	• A class were using place value counter to complete the sum 112 ÷4. One child arranged her counters like this.  What mistake has she made? Can you show me how to do it correctly? • Using the number 4236, how many numbers up to 20 does it divide by without a remainder? Is there a pattern? What can you say about these numbers? • Estimate how many people are in the picture below. At half time, a member of the crowd won £9284 in the raffle. They kindly offered to share it equally between the crowd and kept any money left over for themselves. How much would each person get from your estimate? 

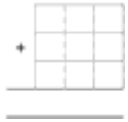
	National Curriculum Statement	All students		
		Fluency	Reasoning	Problem Solving
Four Operations	Divide numbers up to 4 digits by a 2 digit number using the formal written method of short division. Interpret remainders as whole number remainders, fractions or by rounding as appropriate for the context.	Covered above	Covered above	Covered above

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Four Operations	Perform mental calculations, including with mixed operations. Perform mental calculations, including with large numbers for all four operations.	• Work out the missing number: 5419 + 2000 = 9836 - ____ • Work out the missing number: 200 x____= 750 + ____ • Alfie had 70 socks that needed putting into pairs. He bought 5 more packs that each had 6 pairs in. How many pairs of socks did he have altogether?	• Anwar says “If I know all of my times tables up to 12 x 12 then I can solve any numbers that are powers of 10 too e.g. 700 x 8 =” Is he correct? Explain why. • The following problem was given to the class. ____ + 50 =_____- 25 Shellie says “Whatever digits we put in those boxes they will always be positive numbers.” Do you agree? Explain your reason. • When multiplying whole numbers, decimals and fractions, you will always get a positive, whole number. Is the statement sometimes true, always true or never true? Explain your answer.	• Brian had 15 pennies. He divided them into 4 bags. He then knew he could pay any sum of money from 1p to 15p exact without opening them. How much did he put in each bag? • Imagine you have 25 beads. You have to make a 3 digit number on an abacus. You must use all 25 beads each time you make a number. How many different 3 digit numbers can you make? • Peter paid £21 for 5 presents. For A and B he paid a total of £6. For B and C he paid a total of £10. For C and D he paid a total of £7. For D and E he paid a total of £9. How much did Peter pay for each present? 

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Four Operations	Identify common factors Identify common multiples Identify prime numbers.	• List the first 5 multiples of 7 • Write down all the factors of 24 • What is the highest common factor of 24 and 36?	• Stefi says “The only prime number between 30 and 40 is 37”. Is he correct? Prove it. • Explain why a multiple of 80 is also a multiple of 8. • Amber works out the HCF of 6 and 8. Here is her working out: 6: 6, 12, 18, **24**, 32, 40 8: 8, 16, **24**, 32, 50 The HCF is 24. Is she correct? How do you know?	• Nancy is double her sister’s age. They are both older than 20 and younger than 50. They are both multiples of 7. How old are they? • Clare’s age is a multiple of 7 and 3 less than a multiple of 8. How old is Clare? • Which number is the odd one out? Explain why. 12, 30, 54, 42, 32, 48

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Four Operations	Use their knowledge of the order of operations to carry out calculations involving the four operations.	• 4(72 ÷ 9) x (1923 -382) • Add brackets to make this calculation correct; 25 + 10 – 3 × 20 – 15 = 20 • Sarah had 7 bags with 5 sweets in each. She added one more to each bag. Circle the calculation below that shows the correct working out. 7 (5 + 1)= 42 7 x 5 + 1 = 36 7 x 5 + 1 = 42	• Choose operations to go in the boxes to make the number sentences true: 5 ■ 3 ■ 8 = 23 5 ■ 3 ■ 8 = 29 • Daniel completed the following sum and got the answer 168 2(30 ÷ 5) + 14 = 168 Can you explain what he did and where he made the mistake? • Amy says “In BODMAS you can do multiplication and division either way round. This is the same for addition and subtraction.” Is she correct? Can you include a sum to support your answer?	• **Countdown** Ask children to choose 1 or 2 numbers from the ‘top’ (25/50/75/100) and 4 or 5 numbers from the ‘bottom’ 1-10. Children make a target number. • Write different number sentences using the digits 3, 4, 5 and 8 before the equals sign that use: -one operation - two operations, no brackets - two operations, brackets • Can you write a number sentence using the digits 3, 4, 5 and 8 before the equals sign, which has the same answer as another number sentence using the digits 3, 4, 5 and 8 but which is a different sentence?

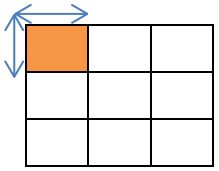
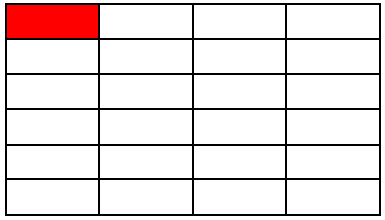
	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Four Operations	Solve problems involving addition, subtraction, multiplication and division.	Covered above Jessica is rowing along the coast to Sunshine Cove. Each day she rows less because she gets more tired. On the first day she covers 38 kilometres, on the second day 35 kilometres, on the third day 32 kilometres and on the fourth day 29 kilometres. How many days will is take her to cover the distance of 203 kilometres to Sunshine Cove?	Covered above My way! Give a group of four a list of sums e.g. 19 x 24 198 + 997 Half of 57.6 3841 – 665.3 5.2 ÷ 4 101 x 16 x 4 Each child must work out the answers mentally but think about the strategies they are using. After, explain their strategy and discuss why you used it.	Covered above Letter challenge Can you solve these calculations by using 0,1,2,3,4,5,6,7,8 & 9 E X F = HA I X H = D A X B = B J X D = IG C X C = EC You have been asked to bury some bags of money on an island. The money has been divided into nine separate bags containing these amounts: £21, £20, £19, £12, £11, £10, £3, £2, £1. You must bury the money in a three by three grid so that each row and column, horizontal, vertical and diagonal has £33.

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Four Operations	Use estimation to check answers to calculations. Determine in the context of a problem, an appropriate degree of accuracy.	• Circle the odd one out: 345 + 452 ≈800 691 + 113 ≈800 368 + 482 ≈800 • Hannah goes to the shop. She has got a £5.00 note. As she goes round the shop she estimates how much she has spent to make sure she has enough money. Below is a list of what Hannah bought- estimate what she has spent- has she got enough? Chocolate bar- 79p Can of pop- 65p Magazine- £1.50 Crisps- 45p Puzzle book - £1.80 Would it be better for Hannah to overestimate or underestimate her answer? Explain why.	• Do the following estimates sound about right? Explain your reasoning. 1. Last month the energy costs in my lab were £560. I estimate that my energy costs per year will be £7000. 2. Today I ate a 30g packet of crisps at morning break time, as I always do, so I estimate that I eat almost 11kg of crisps a year. 3. My round trip to work each day is about 22 miles, but I can claim mileage from work. I estimate that I can claim for 8000 miles each year.	• Play a game in pairs. Use the addition grid, the aim is to make a total as close to 1000 as possible.  Take turns to throw the dice and decide which of your cells to fill. This can be done in two ways: either fill in each cell as you throw the dice, or collect all your numbers and then decide where to place them. Whoever has the sum closest to 1000 wins.

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Fractions	Use common factors to simplify fractions; use common multiples to express fractions in the same denomination.	• Simplify the following fraction to its lowest form. $\frac{48}{54}$ • Convert these fractions to the same denominator. $\frac{2}{7}$ $\frac{3}{8}$ • Which is greater? $\frac{2}{3}$ or $\frac{4}{7}$	• Is the following statement, always, sometimes or never true? 'To simplify a fraction you divide the numerator and denominator by 2 over and over." Explain your answer using examples. • Amy thinks that $\frac{2}{5}$ in its simplest terms is $\frac{1}{2.5}$ Do you agree? Convince me. • Sara and her friend are adding fractions. Her friend is trying to put the following fractions into the same denominator. Sara tells her she doesn't need because the answer is 1. Is she right? Explain why. $\frac{12}{24}\frac{14}{28}$	• A charity was asking for people to volunteer to help in their shop each day. Samantha said she would do $\frac{3}{8}$ of Monday. Betty said she would do $\frac{6}{12}$ of Monday. Who did more hours and by how many? • Find 3 fractions that can simplified 5 times. • What fraction has a denominator of 30 and when it is simplified it becomes $\frac{2}{5}$?

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Fractions	Compare and order fractions, including fractions > 1	• Order these fractions from smallest to largest $\frac{1}{2}\ \frac{3}{7}\ \frac{4}{5}\ \frac{9}{10}$ • Which is greater? $2\frac{4}{5}$ or $2\frac{3}{8}$ • Write down 3 fractions that are larger than $\frac{2}{5}$ • Use diagrams to show the difference in fractions.  	• Sallie insists she had more pizza than her sister because she had $\frac{6}{8}$ of hers and her sister had $\frac{5}{6}$. Is she correct? Explain how you know. • Kayleigh says "All fractions are less than one". Do you agree? Convince me. • Tom says "I have the fraction $4\frac{2}{5}$ so to make it 1 whole I need to add $5\frac{3}{5}$" Do you agree? Explain your reasoning.	• Three friends went shopping. Steve spent $\frac{3}{7}$ of his money. Alfie spent $\frac{4}{12}$ of his money. Becky spent half of what Alfie spent. Order them from smallest to largest by what they spent. • A family were eating tea. The dad ate everything on his plate; the mum ate half of what Dad ate. The sister ate a quarter of what Mum ate and the brother ate a half of what the sister ate. What fraction of their food did each person eat? • From 1 pizza, Michael ate $\frac{3}{8}$ and Kelsey ate $\frac{1}{7}$. How much pizza was left over?

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Fractions	Add fractions with different denominations and mixed numbers, using the concept of equivalent fractions. Subtract fractions with different denominations and mixed numbers, using the concept of equivalent fractions.	• A jug contains some milk. Josh pours $\frac{1}{2}$ of the milk into a glass. Josh pours $\frac{3}{10}$ of the milk into another glass. What fraction of the milk is left? • Work out: $5\frac{3}{7} - 2\frac{6}{5}$ • Use diagrams to represent a sum.	• Bashir says "I do not need to do any written calculations to solve $\frac{4}{8} + \frac{2}{4}$" Do you agree? Explain how you know. • Emily says "When you add fractions together the answer is actually smaller because when the numerator is a bigger number the piece is actually smaller." What mistake has Emily made? Explain your answer using a diagram. • Rajesh doesn't understand why the denominator doesn't change when adding fractions but the numerator does. Can you explain why?	• If the answer to a word problem involving subtracting fractions with different denominators is $\frac{14}{32}$, what could the question be? • Katie subtracted $\frac{3}{5}$ away from a fraction and her answer was $\frac{8}{45}$. What was the original question? • Think of 3 questions for adding fractions with different denominators where the answer is $\frac{15}{17}$. Could you do it? Why? Why not?

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Fractions	Multiply simple pairs of proper fractions, writing the answer in its simplest form [for example $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$]	• Work out $\frac{1}{8} \; x \frac{1}{5}$ • Use diagrams to represent multiplying fractions. 1/3 x 1/3 = 1/9  • What is 1 ninth multiplied by 1 seventh?	• Ginny is multiplying the following sum: $\frac{1}{5}$ x $\frac{1}{6}$. The answer she gets is $\frac{2}{30}$. Explain what she has done. • Megan sees that when she multiplies 2 fractions together she ends up with a smaller fraction. She thinks she will eventually have a decimal fraction. Do you agree? Explain your answer. • Draw a diagram to represent the sum below. Explain what you have drawn and why. $\frac{1}{6}$x $\frac{1}{8}$	• Hanna has half a pizza. She cuts it into 4 slices. What fraction of the original pizza is each slice? • The shaded square in the grid below is the answer to a multiplying fractions question. If that is the answer, what is the question?  • If $\frac{1}{4}$ x $\frac{1}{2}$ = $\frac{1}{8}$ is $\frac{2}{8}$ x $\frac{2}{4}$ = $\frac{2}{16}$? Explain your answer.

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Fractions	Divide proper fractions by whole numbers [for example $\frac{1}{3} \div 2 = \frac{1}{6}$]	• Work out $\frac{4}{7} \div 5$ • Solve one seventh divided by six. • Alfie has $\frac{4}{6}$ of a pizza left. He shares it between 4 people. How much do they each get?	• Roman says "When dividing fractions by a whole number, I just ignore the numerator." Do you agree? Explain why. • Betty says "When you divide a fraction by a whole number the answer is bigger than the original fraction." Is she correct? Convince me! • Solve the following sums: $\frac{1}{3} \div 2 =$ _ $\frac{1}{4} \div 2 =$ _ $\frac{1}{5} \div 2 =$ _ $\frac{1}{6} \div 2 =$ _ What do you notice? Explain why the pattern has formed.	• Look at the sum below. Work out the missing parts. _ ÷ _ = $\frac{4}{36}$ How many different ways can you find? • Becky's mum ordered a pizza for her and her friends. By the time they arrived home there was only $\frac{7}{12}$ of it left. When she shared it among her friends they each got $\frac{7}{72}$. How many friends did Becky have with her? • Think of 3 questions for dividing fractions by a whole number where the answer is $\frac{1}{20}$. Could you do it? Why? Why not?

<table>
<tr><th rowspan="2"></th><th rowspan="2">National Curriculum Statement</th><th colspan="3">All students</th></tr>
<tr><th>Fluency</th><th>Reasoning</th><th>Problem Solving</th></tr>
<tr>
<td>Fractions</td>
<td>Associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example $\frac{3}{8}$]</td>
<td>
Complete the table.
<table>
<tr><td>1/8</td><td>2/8</td><td></td></tr>
<tr><td>0.125</td><td></td><td>0.375</td></tr>
</table>
Charlie divided 1 pizza into 5 pieces. If he ate 2 pieces, what decimal fraction of the pizza did he eat?
Use a 1 place value counter. I want to divide this into 2? How can I do it? Exchange your 1 for ten tenths, now I can divide ten tenths into 2 which equals 0.5. So therefore 1 divided by 2 is 0.5 which is why ½ =

0.5.

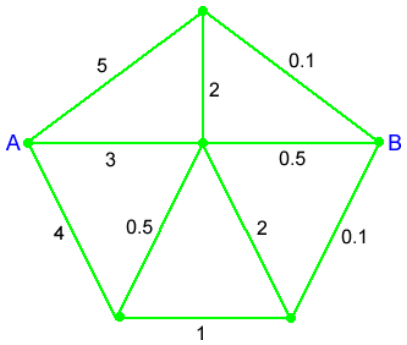
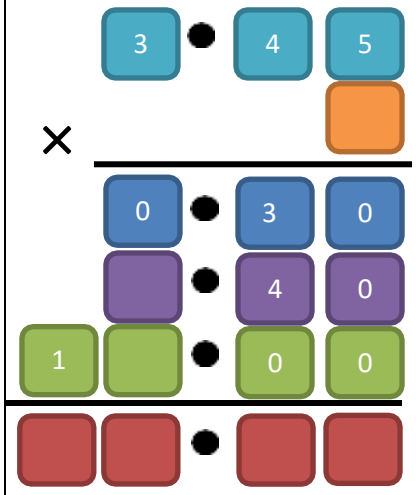
Can you divide 1 by 4? What equivalence between fractions and decimal fractions does this show?
</td>
<td>
Harry says ½ is equivalent to 1.2. Is he correct? Explain your answer.
True or False

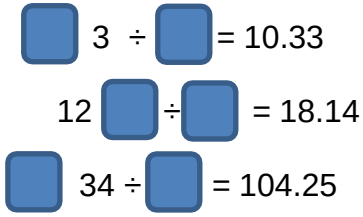
0.3 is bigger than ¼.
Explain your reasoning.

Hannah says ‘If I divide 2 by 8, I get the same answer as if I divide 1 by 4’ Do you agree? Explain your answer using diagrams or counters.
</td>
<td>
Write a unit fraction which has a value of less than 0.5. Can you find 20 different unit fractions?
Curtis used 1/3 of a can of paint to cover 3·5 square metres of wall.
How much wall will one whole can of paint cover?
Pete shares 6 bananas between some friends. Each friend gets 0·75 of a banana.
How many friends does he share the bananas with?
</td>
</tr>
</table>

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Fractions	Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.	• What fraction (in its simplest form) and percentage are equal to 0.65? • Tom and Sam shared equally one third of a chocolate bar. What fraction of the chocolate bar did each child get? • Last month Kira saved $\frac{3}{5}$ of her £10 pocket money. She also saved 15% of her £20 birthday money. How much did she save altogether?	• Which is the odd one out? Explain why. $\frac{2}{5}$ $\frac{4}{10}$ $\frac{3}{6}$ $\frac{6}{15}$ 0.4 • Put the following numbers into groups: $\frac{3}{4}$, $\frac{3}{2}$, 0·5, 1·25, $\frac{3}{8}$, 0·125. Explain your choices. • Shafi says "All you do when converting percentages to decimals is put '0.' in front of the number e.g. 78% is 0.78." Do you agree? Prove it!	• Three friends were competing in a race. Billy completed half of the race. Harrison completed 50% of what Billy completed and Charlotte completed 0.25 of what Billy completed. What fraction of the race did they each complete? • Write decimal and percentages on flash cards and have them face down. In pairs, turn one over at a time. The first person to write down 5 equivalent fractions to the decimal/percentage wins a point. • **Snap!** Play the game snap but with equivalent decimals, percentages and fractions.

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Decimals	Identify the value of each digit in numbers given to three decimal places Multiply & divide numbers by 10, 100 and 1000 giving answers up to 3dp.	• What is the value of the underlined digit in the following numbers? 3.<u>4</u>2 4.56<u>2</u> 34.6<u>2</u>1 54.3<u>6</u> • Fill in the table. • Find the value of the ▲ in each statement. 0.5 x ▲ = 500 37.2 ÷ 100 = ▲ 8.4 ÷ ▲ = 0.084	• Ali says, Do you agree with Ali? Explain your thinking. • **True or False?** In all of the numbers below, the digit 6 is worth more than 6 hundredths. 3.6 3.063 3.006 6.23 7.761 If it is false, can you change some of the numbers so it is true? • Kayleigh says; *"The more decimal places a number has, the smaller the number is."* Do you agree? Explain why.	• Four children are thinking of four different numbers. Yvonne: "*My number has four hundredths.*" Alex: "*My number has the same amount of ones, tenths and hundredths.*" Louise: "*My number has more tenths and hundredths than ones.*" Emily: "*My number has 2 decimal places.*" Can you match each number to the correct child?

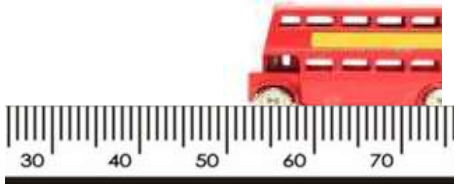
	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Decimals	Multiply one digit numbers with up to 2dp by whole numbers.	• Solve: 4.32 x 5 = 6.72 x 8 = 9 x 4.35 = 7 x 5.21 = • Idrees has to walk 1.5km to get to school. How far will he have to walk over 4 days to get to school and back? • Katie is saving money. Her mum says, "Whatever you save, I will give you five times the amount." a) If Katie saves £4.82, how much money will her mum give her? b) If Katie saves £7.73, how much money will her mum give her?	• Tanya is using the grid method to multiply decimals. 4.56 x 7 [redacted] | 7 4 | 28 0.5 | 3.5 0.06 | 4.2 After adding up, Tanya says her answer is 35.7. Is Tanya correct? Explain your reasoning. • **True or False?** When you multiply a number with 2 decimal places by a whole number, the answer always has more than 2 decimal places. Prove it.	• You need to travel from Point A to Point B. You can only travel through each point once.  What is the largest product you can make from A to B? What is the smallest product you can make from A to B? • Fill in the empty boxes 

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Decimals	Use written division methods in cases where the answer has up to two decimal places.	• Solve: 25 ÷ 4 = 237 ÷ 4 = 9462 ÷ 8 = • Jasper has £453 pounds. He splits his money between four different bank accounts. How much does he put in each bank account? • Sort the divisions below into the table. <table><tr><td>Answers with 1dp</td><td>Answers with 2dp</td></tr><tr><td></td><td></td></tr></table> 127 ÷ 2 947 ÷ 4 236 ÷ 5 846 ÷ 4 236 ÷ 8 457 ÷ 5 Can you add one more division sentence to each box?	• Stefan and Tilly are both calculating the answer to 147 ÷ 4 Stefan says, “The answer is 36 remainder 3” Tilly says, “The answer is 36.75” Who do you agree with? Explain your answer. • **True or False** The only number that divides to give an answer with 1 decimal place is 2. Prove it. • **True or False** The only numbers that divide to give an answer with 2 decimal places are 4 and 8. Justify your answer.	• Find the smallest number that can be added to 92.7 to make it exactly divisible by 7. How about 8? • Each division sentence can be completed using the digits below. If there is more than one digit missing from the division it must be filled with the same digit. e.g. 44 ÷ 5 = 8.8  

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Decimals	Solve problems which require answers to be rounded to specified degrees of accuracy.	• 437 children are going on a school trip. a) 1 adult is needed for every 12 children. How many adults must go on the trip? b) Each coach can seat up to 52 people. How many coaches are needed? • There are 1145 pupils at a school. Each classroom has enough desks for 32 pupils. What is the smallest number of classrooms needed for the pupils? • Calculate and round to 1 decimal place: 127 ÷ 6 345 ÷ 8	• Yasmin and Henry are solving this problem. Ian is building a wall measuring 74m. He wants to divide the wall into 7 sections. How long will each section be? Give your answer to 1dp. Yasmin has written the answer 10.5 Henry has written the answer 10.6 Who is correct? Explain your reasoning. • Would it be more accurate to give your answer to the nearest whole pound or ten pence in the question below? (£34.56 + £2.24 + £54.43 + £14.67) ÷ 2 Explain your answer. Is this always the case?	• 245 people attend a coffee morning. 536 cups of coffee and 324 cups of tea are drunk at the coffee morning. On average, how many cups does each person drink? Round your answer to the nearest half cup. • Each cup holds approximately 0.35 litres of liquid. How much coffee and tea is drunk in ml? Give your answer to 1 decimal place. • At the same coffee morning, 56 chocolate cakes are cut into eighths and 37 strawberry cakes are cut into sixths. How many slices does each person eat to the nearest whole slice? 

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Percentages	Solve problems involving the calculation of percentages [for example, of measures and such as 15% of 360] and the use of percentages for comparison.	• Calculate: 10% of 60 25% of 300 45% of 460 • Find: 20% of £340 35% of 6m 75% of £1340 20% of 2 hours • Daniel has spent 30 minutes doing his homework so far this week. This is 25% of the time he has to spend on his homework. How much longer must he spend on his homework this week?	• Isla says, "To find 10% you divide by 10, to find 20% you divide by 20" Do you agree? Explain your reasoning. • Danyaal is saving money. His dad offers him two lots of money. 60% of £35 45% of £48 Which should he take? Show your reasoning. • Would you rather: Be given 60% of two cakes or 26% of 5 cakes. Be surrounded by 25% of 40 snakes or 40% of 25 snakes? Explain your reasons clearly for each choice. Can you make up some of your own '*Would you rather*?' questions?	• A golf club has 200 members. 58% of the members are male. 50% of the female members are children. a) How many male members are in the golf club? b) How many female children are in the golf club? • Jack and Tara both have a string of beads. They have red beads, blue beads, white beads and purple beads. They both count how many of each colour they have. Jack's beads are 50% blue, 35% red, 10% white and 5% purple. Tara's beads are 40% blue, 32% red, 20% white and 8% purple beads. They have the smallest amount of beads possible with those percentages. How many beads did Jack have? How many beads did Tara have? If we know that Jack and Tara have 10 purple beads between them, how many beads do they have altogether?

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Percentages	Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.	• Fill in the table. | Fraction	Decimal	Percentage
---	---	---
	0.375	
$\frac{2}{5}$		
		75% | • Order from smallest to largest: 40% , $\frac{3}{5}$, 0.45, 54%, $\frac{5}{10}$, 0.05 • Four friends share a pizza. Tyrone eats 35% of the pizza, Jasmine eats 0.4 of the pizza, Imran eats 12.5% of the pizza and Oliver eats 0.125 of the pizza. Can you write the amount each child ate as a fraction? Who ate the most? Who ate the least? Is there any of the pizza left?	• In a Geography test, Sam scored 62% and Hamza scored $\frac{3}{5}$ Who got the highest score? Explain your answer. • Jack says: "To change a decimal to a percentage, multiply the decimal by 100." Do you agree? Explain your reasoning. • Dan wants to solve a problem using $\frac{1}{4}$ on his calculator. How could he type this into his calculator? Explain your thinking.	• Use the digits 1, 2 and 3 to fill in the missing digits below. $\frac{\square}{8}$ = 0.$\square$25 = $\square$2.5% $\frac{\square}{5}$ = 0.$\square$ = 20% $\frac{\square}{8}$ = 0.$\square$75 = $\square$ 7.5% • In January, Rahima saves $\frac{3}{5}$ of her £20 pocket money. In February, she saves 0.4 of £10 pocket money. In March, she saves 45% of her £40 pocket money. How much does she save altogether? How much more does she need to save £100? What fraction/percentage/decimal of £100 does she have already?

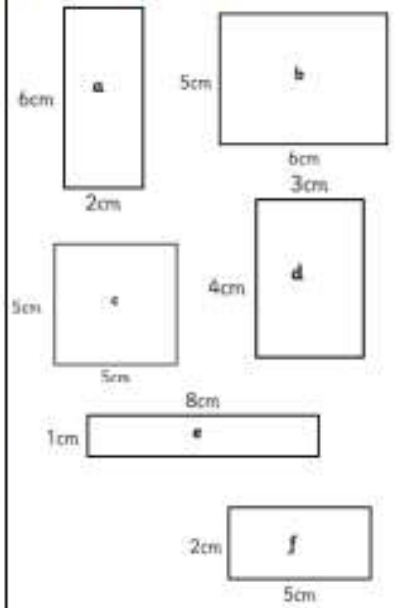
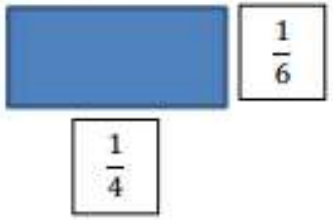
	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Measures	Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate.	• Josh is trying to run 10 kilometres in one week. Here are the distances he runs on the first three days: **Day 1:** 1.6 kilometres **Day 2:** 850 metres **Day 3:** 2.12 kilometres How much further does he have to run? • Work out how many kilometres are in: 2568 metres + 2 miles + 1.8 kilometres • Miss Brown is making a packed lunch for each child in her class. They each receive: *A 200g sandwich* *A 35g packet of crisps* *A 72g cookie* *A 43g apple* She has 32 children in her class. What is the total weight of the classes packed lunches?	• **True or false?** If you convert any amount of grams into kilograms then it will never have an amount in the units e.g. 76g = 0.076kg • Jenny travels 652 miles to go on holiday. Abbie thinks she travels further because she travels 1412 kilometres. Is Abbie right? Explain why. • A shop sells litre bottles of water for 99p each but has an offer for 8x300ml bottles for £2 If he wants to buy 12L of water, which should he buy and why?	• Three athletes (Ben, Greg and Sam) jumped a total of 34.77m in a long jump competition. Greg jumped exactly 2 metres further than Ben. Sam jumped exactly 2 metres further than Greg. What distance did they all jump? • Part of a ruler and a toy bus are shown below. The whole bus is 4 times the length that is shown. How long would 8 buses be in cm?  • Conversion bingo! Choose units to convert between [e.g. grams and kilograms] and ask children to write down 6 amounts. The first to mark all 6 is the winner!

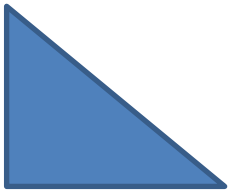
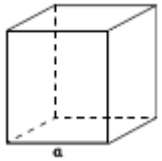
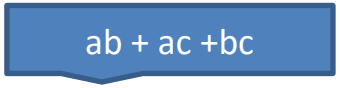
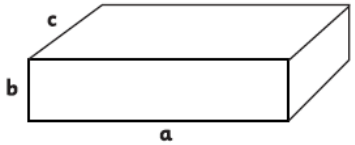
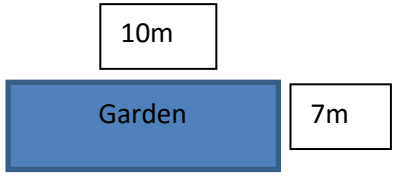
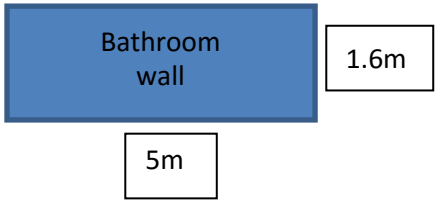
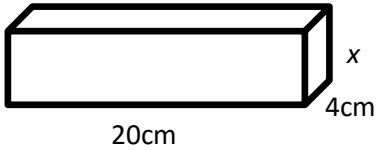
	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Measures	Use, read, write and convert between standard units, converting measurements of **length** from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to 3dp. Use, read, write and convert between standard units, converting measurements of **mass** from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to 3dp. Use, read, write and convert between standard units, converting measurements of **volume** from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to 3dp. Use, read, write and convert between standard units, converting measurements of **time** from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to 3dp.	• Fill in the blanks 149 hours = _____days _____hours 784 minutes = _____hours _____minutes • Louisa drinks a pint of milk with her breakfast, 1.3 litres of water throughout the day and 450 ml of juice before bed. How much liquid does she drink altogether in the day? Give your answer in litres. • Use **<**, **>** or **=** to make the statements correct. 19 feet ☐ 7 yards 3 gallons ☐ 23 pints 42 ounces ☐ 2 pounds	• Caitlyn thinks 11.38 litres is the same as 20 pints. Do you agree? Prove it. • Here are three amounts: 4.5 pints 3.65 litres 1875 millilitres If you wanted to work out the total amount, what unit of measurement would you convert them all to? Explain why. • Alyson says, "To work out how many seconds are in one hour you do 60 cubed (60^3)." Do you agree? Prove it.	• Here is a train time table showing the arrival times of the same trains to Halifax and Leeds Halifax / Leeds 07:33 / 08:09 07:49 / 08:37 07:52 / 08:51 An announcement states all trains will arrive – of an hour late. Which train will get into Leeds the closest to 09:07? • To bake buns for a party, Keeley used these ingredients: *600g caster sugar* *0.6kg butter* *18 eggs =792g* *–kg self-raising flour* *10g baking powder* What weight, in kilograms, did the unbaked products come to?

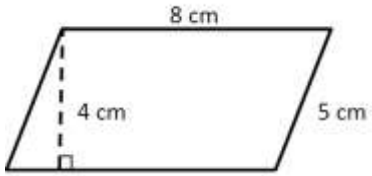
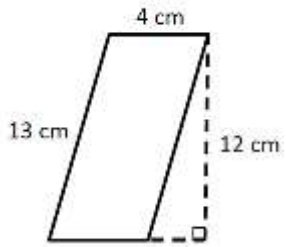
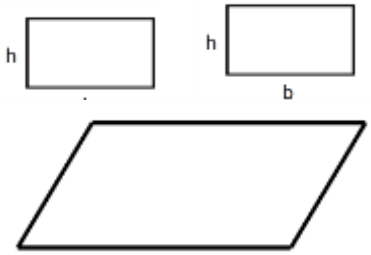
	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Measures	Convert between miles and kilometres.	• Complete the statements: **a)** 5 miles is approximately …… km. **b)** 40 kilometres is approximately …… miles. • Convert between miles and kilometres rounding to the nearest whole number: • The distance from Edinburgh to Glasgow is approximately 80km. What is this in miles to the nearest whole number?	• **Agree or disagree?** It is easier to convert from miles to kilometres rather than kilometres to miles. Explain your answer. • **Always, sometimes, never** When converting from miles to kilometres, it is easier to multiply by 1.5 then add the extra tenths on at the end. • Michael ran the London Marathon which was 26.2miles. Shafi ran 42 kilometres in a charity race over 3 days. Who ran the furthest?	• The tally chart below shows the number of miles different drivers did in a day. • When Stefan's miles are added to it the whole amount of kilometres driven can be rounded to 50 when rounded to the nearest 10. How many miles did Stefan drive? Have you found all the possibilities? • Miles and his 6 friends take part in a 5km charity race. Between them, how many miles do they run altogether?

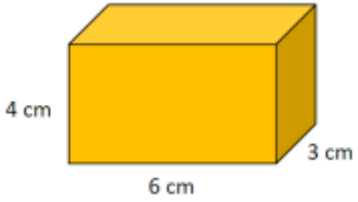
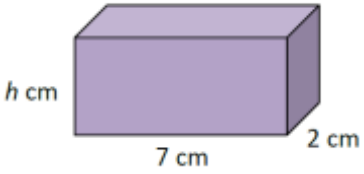
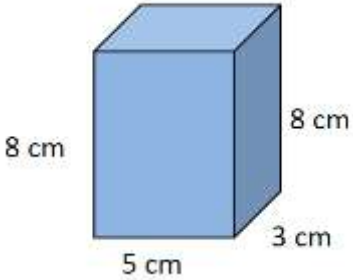
Miles	Kilometres
	1.6km
2 miles	
	4.8km
5 miles	
	16km
20 miles	

Mihal	𝍸 |||
David	|||
Abdul	𝍸 |||| 𝍸 ||
Claire	𝍸

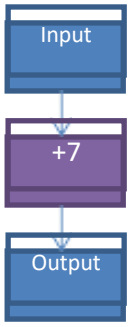
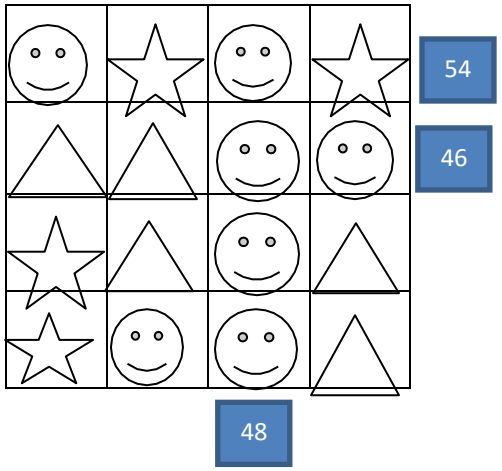
	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Measures	Recognise that shapes with the same areas can have different perimeters and vice versa.	• Look at the shapes below.  • Which two shapes have the same area? • Which two shapes have the same perimeter? • Draw two different rectangles that have an area of $12cm^2$. • Draw two different rectangles that have a perimeter of 20cm.	• **True or false?** Two rectangles with the same area can have different perimeters. Explain your answer. • A quadrilateral has an area of $24cm^2$ Sophie says, "The perimeter is 6,6,6,6" Ben says, "That's not true. It's 8,8,3,3" Who is correct? Explain why.	• The shape below has an area of $\frac{1}{24}$  How many shapes can you draw with the area $\frac{1}{24}$? What are the perimeters of these shapes? Is there a pattern/do you notice anything? • Three children are given the same shape to draw. They each give a clue. Kate says, "The smallest length is 4cm." Lucy says, "The area is less than $30cm^2$." Ash says, "The perimeter is 22cm." What are the lengths of the quadrilateral?

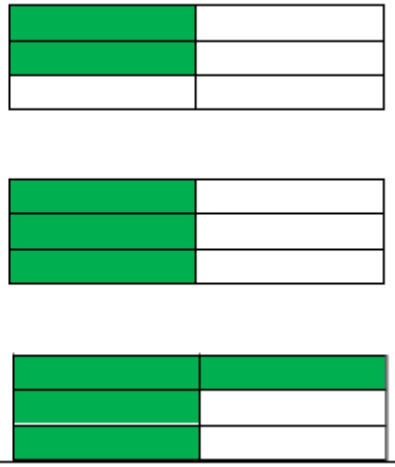
	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Measures	Recognise when it is possible to use formulae for area and volume of shapes.	• Which formula below would calculate the area of the right angled triangle?  a) a + b x 2 b) ab × 0.5 c) a + b + c d) ab × 2 • Look at the cube below.  a) Write the formula for the surface area of the cube. b) Write the formula that could be used to calculate the volume of this cube.	• Sidra writes the formula for the surface area of the cuboid.   Do you agree with Sidra? Explain your reasoning. • Anna is calculating the area of a triangle. She says, “I only need two of the side lengths to work out the area.” Do you agree with Anna? Explain why.	• This is a drawing of David’s garden.  He is planting seeds in it. It costs £2 per $5m^2$ of the garden. How much does he spend to plant seeds in half of his garden? • Bob is tiling his bathroom wall. It costs £1.50 per $4cm^2$. How much will it cost to tile the whole wall?  • Calculate the missing length: 

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Measures	Calculate the area of parallelograms Calculate the area of triangles.	• Calculate the area of the parallelograms:   • Calculate the area of the triangles:	• An isosceles triangle has a perimeter of 20cm. One of its sides is 6cm long. What could the other two lengths be? Explain your answer. • The area of a rectangle is given by A = b × h. Use the diagrams below to show two different ways in which it can be demonstrated that the area of a triangle is given by A = $\frac{1}{2}$ × b × h.  • Knowing the formula of a rectangle, show why the formula of a parallelogram is also a = b x h.	• Kara has a piece of fabric in the shape of a parallelogram. Its height is 12m and its base is 18m. She cuts the fabric into four equal parallelograms by cutting the base and the height in half. What is the area of each new parallelogram? • Maria's classroom is shaped like a parallelogram. The height of the parallelogram is x metres and the corresponding base is 7 metres longer than the parallelogram's height. How can Maria write an expression that shows her classroom's area in terms of x?

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Measures	Calculate, estimate and compare volume of cubes and cuboids using standard units, including cm^3, m^3 and extending to other units (mm^3, km^3).	• Find the volume of the cuboid.  • This cuboid has a volume of $70cm^3$. Calculate the height of the cuboid.  • A cube has a volume of $125cm^3$. Calculate the length, height and width of the cube.	• Clare is calculating the volume of this cuboid.  She has written the answer: $960cm^3$. Do you agree with Clare? Can you work out what she has done and help her solve the problem? • The volume of a cube is $64cm^3$. The volume of a cuboid is also $64cm^3$. Harry says, "I can definitely tell you the height, width and length of the cube but I can't definitely tell you the height, width and length of the cuboid." Explain Harry's answer.	• A box of matches measures 1cm by 4cm by 5cm. Boxes of matches are placed in a cardboard box measuring 15cm by 32cm by 40cm. How many boxes of matches fit into cardboard box?  • Georgia is making cuboids using 24 cubes. How many different cuboids can she make? Show your different cuboids using volume = length x width x height • A book is 19cm wide, 26cm long and 2.5cm thick. There are 8 similar books placed on the top of each other. What is the volume taken up by them? 

Number: Algebra

National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**
Use simple formulae.	• Calculate the value of the letter in each equation. 3a = 15 — a = 5b = 10 — b = 63 = 9c — c = 12d = 48 — d = • Calculate the value of the letter in each equation. 20 = 4a + 4 — a = 3b + 5 = 11 — b = 14 = 6c – 4 — c = 2d – 5 = 5 — d = • A function machine adds 7 to any number that is inputted. What is the output when the input is: a) 15 b) 12 What is the input when the output is: a) 25 b) 42 	• If **a** stands for a number, complete the table below: **a** — 4**a** — 4**a** + 2 12 — — — — 36 — — — 102 If the largest number in the table above was 894. What would the largest total of **a** be? • Helen says, "If there is a number before a letter, you multiply. Eg 5b If there is a number after a letter, you divide. Eg 6^2" Is Helen correct? Explain your reasoning. • Kat substitutes b = 3 into the formula 4b + 5. She gets the answer 17. Is she correct? Explain your answer.	• Find the totals of the missing rows and columns.  • 7 pears and 1 banana cost 57p. 3 bananas, 1 pear and 2 apples cost 41p. 1 pear, 2 apples and 2 bananas cost 33p. How much does 1 piece of each fruit cost? Can you write each of the sentences above as a formula?

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Number: Algebra	Generate and describe linear number sequences (including with fractions)	• A rule for a sequence is -6. It starts at 49. What term would be the first negative number? • Work out the missing fractions in the sequence below. $\frac{5}{7}, 1, \frac{\quad}{7}, -\frac{4}{7}$ • Complete a sequence using a diagram e.g. 	• Here is the start of a sequence: 1, 2, 4 Katie says the next term is 7 but Dan says the next term is 8. They could both be right. Explain why. • A sequence starts: 7, 12, 17, 22, 27 Could 724 be in the sequence? Explain how you know. • Abdul says "My rule is -50 x 2 if I start at 162, I will never get a negative number even though I am subtracting." Is he correct? Explain why.	• In a group of 4, each think of a digit between 1- 100 and write it on a post it note. Share them with the group. Can we create a sequence and a rule? • Give pairs a rule e.g. x3 – 1 Taking turns, each child picks a number from the grid and works out the first 5 terms. If they are correct they can place a counter over that number. The first to get three in a row wins. 21 69 102 13 56 140 26 64 40 34 29 41 38 123 63 49 • Write out 3 sequences, each with 5 terms. Cut them up and mix them up. Give the children the 3 different rules and ask them to work out which go together to make a sequence.

<table>
<tr><th rowspan="2"></th><th rowspan="2">National Curriculum Statement</th><th colspan="3">All students</th></tr>
<tr><th>Fluency</th><th>Reasoning</th><th>Problem Solving</th></tr>
<tr>
<td>Number: Algebra</td>
<td>Generate and describe linear number sequences (including with fractions)</td>
<td>
Fill in the first two terms in this sequence.
___,_____, 55, 63, 71

Can you write a formula to describe the sequence?

7 is the first term in this sequence. What is the 7th term?
7, 12, 17,

The formula 4n+1 can be used to generate the numbers in this sequence. Fill in the table below:
<table>
<tr><th>Term</th><th>Calculation</th><th>Value</th></tr>
<tr><td>1st</td><td>4 × 1 + 1</td><td>5</td></tr>
<tr><td>5th</td><td></td><td></td></tr>
<tr><td>10th</td><td></td><td>41</td></tr>
<tr><td>20th</td><td>4 × 20 + 1</td><td></td></tr>
</table>
</td>
<td>
Write a formula for the 10th, 100th and nth terms of the sequences below.
4, 8, 12, 16 ……

0.4, 0.8, 1.2, 1.6, ……..

Here is a sequence:
3, 8, 13, 18, 23

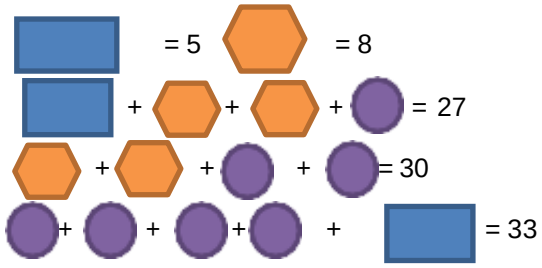
Circle the formula that describes the sequence.

4n - 1
5n - 2
3n + 5

Explain your reasoning.
</td>
<td>
Write three sequences where the rule to find the next term is ‘add 3’
1)
2)
3)

Write two different linear sequences where the second number is 5
1)
2)

Ramesh is exploring three sequence-generating rules.
Rule A is: ‘Start at 30, and then add on 7, and another 7, and another 7, and so on.’
Rule B is: ‘Write out the numbers that are in the seven times table, and then add 2 to each number.’
Rule C is: ‘Start at 51, and then add on 4, and another 4, and another 4, and so on.’
What’s the same and what’s different about the sequences generated by these three rules?
Explain why any common patterns occur.
</td>
</tr>
</table>

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Number: Algebra	Express missing number problems algebraically.	• Which of the following algebraic statements correctly describes the following problem? *"Four times a number and add 5 to get the answer 17"* $4n + 5 = 17$ $5n + 4 = 17$ $n^4 + 5 = 17$ $4(n + 5) = 17$ • An electrician charges £15 for every job that he attends and then £8 an hour for every hour he works. Tick the formula that could be used to calculate how much the electrician would charge for a job. h stands for hours: 9h – 16 16h + 9 9h + 16 • A plumber charges £9 an hour. She is currently offering a £5 discount for all jobs. Write a formula to calculate how much money she should charge her customers.	• A taxi driver charges £3 at the start of each journey. For every mile covered another 25p is added to the fare.  The driver writes the following formula. Cost of journey = 3 + number of miles x 25 Is the formula correct? Prove it. • James and Kelsey are using the following formula to work out what they should charge for three hours work. Cost in pounds = 40 + 20 x number of hours: James writes down £180 Kelsey writes down £100 Who do you agree with? Why?	• Find the value of the circle in each of the following problems. It is worth a different value in each question.  Can you write each of the number sentences above algebraically? • Kyra has 92p. She buys yoyos (y) costing 11p and lollies (l) cost 4p. Can you write a formula to solve her problem? Can you find more than one set of numbers to solve her problem? 

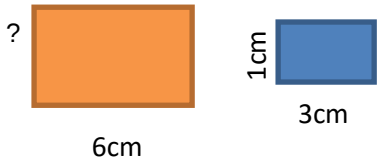
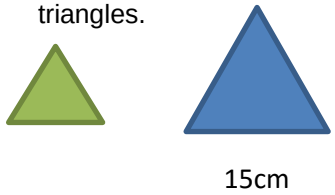
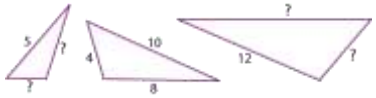
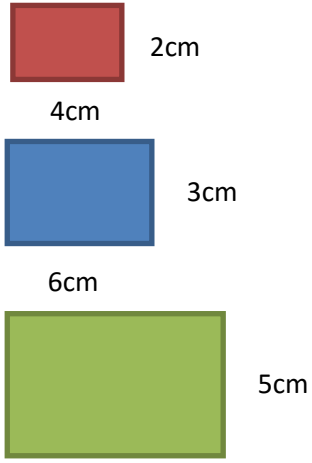
	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Number: Algebra	Find pairs of numbers that satisfy an equation with two unknowns.	• X and Y are whole numbers. X is a one digit number. Y is a two digit number. X + Y = 25. Find all the possible pairs of numbers that satisfy the equation. • a and b are variables: a + b = 6 Find 5 different possibilities for a and b. a | b |---|---| | | | | | | | | | | | | | | | • Find 3 different possible pairs of values for a and b: ab= 18 1) a= b= 2) a= b= 3) a= b=	• Rhian is solving the equation a + b = 18 a and b are both positive whole numbers. Rhian says, "a and b must both always be less than 18." Do you agree? Explain your reasoning. • Toby is finding a pair of numbers to fit the equation: 2a + b = 15 Both letters represent whole numbers. Toby says, "One of the numbers must be odd and one must be even," Do you agree with Toby? Show your reasoning.	• a and b stand for whole numbers. a + b = 1000 and a is 150 greater than b. Work out the values of a and b. • A rectangle has the area $24cm^2$. This is expressed through the equation l ×w = $24cm^2$. What could l and w stand for? Draw the rectangles to prove that the area is $24cm^2$. • x and y are both whole positive numbers. When multiplied together they make an odd number under 20 What could x and y be?

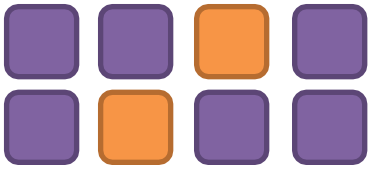
	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Number: Algebra	Enumerate possibilities of combinations of two variables.	• In this equation, a and b are both whole numbers which are less than 12. 2a=b Write the calculations that would show all the possible values for a and b. • Use the equation to fill in the missing values in the table below. 7x + 4 = y Value of x / Value of y •	• ab = 9 Deanna says, "a and b must both be odd numbers" Do you agree? Prove it. • The bar model below shows the equation 2g + w=10  Can you draw a bar model to represent the following equations: 3f + g = 20 7a + 3b = 40 What could the letters represent?	• Lollipops come in bags of 5 and chocolate bars come in packs of 4. Mr Smith needs to buy 79 individual sweets in total. How many different combinations of lollipops and chocolate bars could he buy? Can you write the equation that shows this problem? • The volume of a cuboid is 152cm^3. The length of the cuboid is 8cm. What could the width and depth of the cuboid be?  8cm

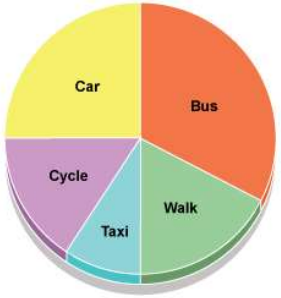
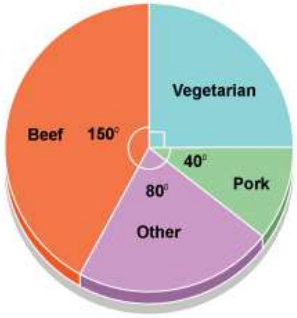
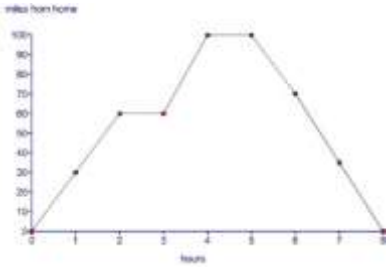
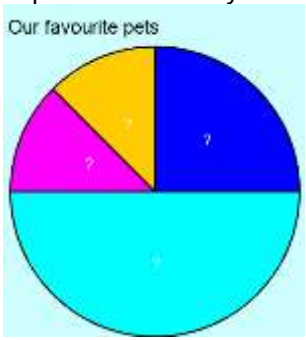
Number: Ratio & Proportion

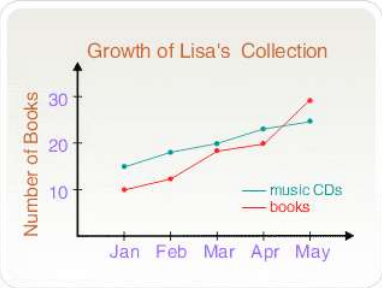
National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**
Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts.	• In 1 week I eat 2 ice creams.  How many ice creams will I eat in: a) 2 weeks? b) 4 weeks? c) 8 weeks? d) 14 weeks? • For every 2 apples Sally eats, she eats 1 banana.  Fill in the missing numbers in the sentences below. For every 4 apples, Sally eats ____ bananas. For every____apples, Sally eats 8 bananas.	• 1:2 and 3:6 are equivalent ratios. Circle the ratios below that are also equivalent to 1:2 and 3:6 4:5 8:16 4:8 3:9 2:6 Explain how you know. • Finish the sequence of ratios: 3:4, 6:8, 8:12,_____, _____ Explain how you found the missing numbers. What is the rule for the sequence? • Orange paint is made from red and yellow paint in the ratio of 3:5 To make 40 litres of orange paint how much would I need of each colour? Explain your thinking.	• I measured my stride when walking and found it to be 80cm. If I walk for 16m, how many strides do I take? • Idina is making buns. Can you fill in the missing quantities in the table below? • In Year 6, there are 36 children with blonde hair and 48 children with brown hair. There are half as many children with black hair as there are with blonde hair. What is the overall ratio for blonde to brown to black hair in Year 6? Can you simplify this ratio?

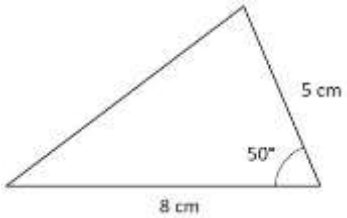
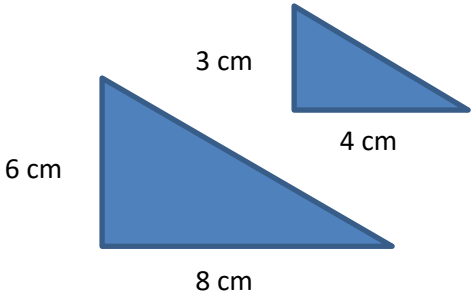
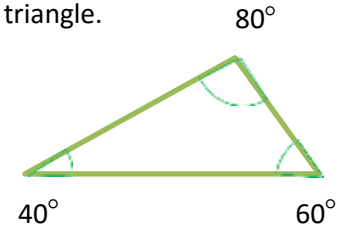
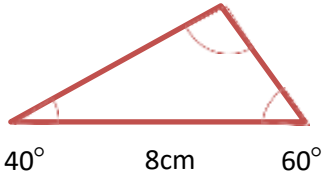
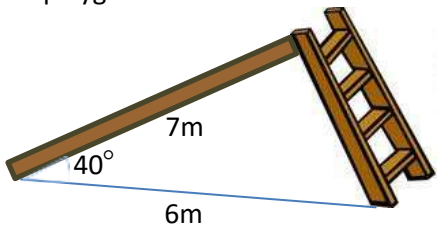
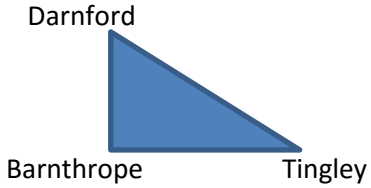
	Butter	Sugar	Eggs	Flour
12 buns	120g		2	
24 buns		200g		
30 buns				375g
84 buns				

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Number: Ratio & Proportion	Solve problems involving similar shapes where the scale factor is known or can be found.	• These 2 rectangles are similar. Can you find the missing lengths?  • The rectangles in the table below are similar. Fill in the missing lengths and widths. Rectangle / Length / Width A / 5cm / 2cm B / / 4cm C / 25cm / / D / / 18cm • Here are two equilateral triangles. The blue triangle is three times larger than the green triangle. Find the perimeter of both triangles.  	• Find the missing lengths.  Can you explain how you found each of the missing lengths? • Tom says these three rectangles are similar.  Do you agree? Explain your reasoning.	• One rectangle has a perimeter of 16cm. Another similar rectangle has a perimeter of 24cm. The length of the smaller rectangle is 6cm. Draw both rectangles. • Draw 3 rectangles with the same area where the length increases by the scale factor 2. Can you find more than one way of doing this?

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Number: Ratio & Proportion	Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.	• Look at the set of shapes. Circle the statements that are true.  1. There are two orange squares for every six purple squares. 2. There are three purple squares for every orange square. 3. The ratio of orange to purple is 1:3 4. The ratio of purple to orange is two to six. • Complete the sentences to describe the set of objects.  There are 3_____for every 5 _____. There are_____for every _____.	• Danyal makes a necklace using green and orange beads. He makes a repeating pattern of 2 green beads and 3 orange beads.  If he has 14 green beads and 25 orange beads, can he make a necklace without any beads being left over? Explain your answer. • Sarah makes a necklace using the repeating pattern shown below:  Which of the following statements is true? 1. If Sarah uses 12 green beads, she will use more than 30 orange beads. 2. If Sarah uses 12 green beads, she will use exactly 30 orange beads. 3. If Sarah uses 12 green beads, she will use less than 30 orange beads. Explain your reasoning.	• A coach holds 50 people. Most of the seats are taken. Junior tickets cost £13 and Adult tickets cost £23 The total amount paid for tickets is approximately £900 How many people on the coach were adults and how many were juniors? Can you find more than one option?  • A shopkeeper spent exactly £10 on 100 eggs for her shop. Large eggs cost 50p each. Medium eggs cost 10p each. Small eggs cost 5p each. For two of the sizes, the shopkeeper bought the same number of eggs. How many of each size did the shopkeeper buy? 

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Statistics	Interpret and construct line graphs and use these to solve problems Interpret and construct bar charts and use these to solve problems	• Construct a line graph to show the average rainfall over the year. • The pie chart shows how different people got to school. What percentage travelled by car?  • If 23 people are vegetarian, how many people took part in the survey?  	• Susie wants to show the difference in temperatures inside and outside at the same times during the day. Is this possible to do on one graph? Prove it. • Look at the following line graph.  The data did not change from 2-3 hours. Why could this be?	• 96 people took part in this survey.  Dogs Horses Cats Hamsters How many people voted for cats? – of the people who voted for dogs were male. How many females voted for dogs?

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Statistics	Calculate and interpret the mean as an average.	• Calculate the mean of these sets of numbers: a) 3, 6, 8, 2, 4, 12 b) 7, 13, 16, 9, 8 • Hassan is his school's cricket team's top batsman. His scores over the year are: 134, 60, 17, 63, 38, 84, 11 Calculate the mean number of runs Hassan scored. • Four children have taken two tests, one English and one Maths. **NAME** / **MATHS** / **ENGLISH** **Ali** 67 59 **Sid** 53 61 **Pam** 66 57 **John** 72 75 Calculate the mean: a) Maths score b) English score c) score overall d) score for each child over both tests	• Six children have taken a mental maths test. The mean score was 15 out of 20 Can you find the missing score in the list of scores below? 18 16 17 13 12 ?? • Sam uses a calculator to find the mean of 9, 7, 5, 9 and 13 He writes the answer 43 Is Sam correct? If not, can you work out where he has gone wrong? • Jasmine says, "The mean average is always a whole number." Do you agree? Prove it.	• Can you make up a set of five numbers which have a mean of 3.6? Can you find more than one combination of five numbers? • Here is a line graph. Can you write three different ways someone could find the mean from the graph?  Using the questions you wrote about the mean, could you write a mark scheme for teachers marking the questions giving them all the correct answers? • A gym has two sets of weights; 3kg and 8kg. Two 3kg weights and three 8kg weights have a mean weight of 6kg. Can you find any other combinations of 3kg and 8kg weights that have a mean weight of 6kg?

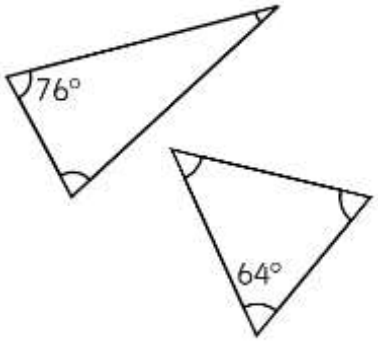
	National Curriculum Statement	All Students		
		Fluency	**Reasoning**	**Problem Solving**
Geometry: Properties of shapes	Draw 2D shapes using given dimensions and angles.	• Here is a sketch of a triangle:  Draw an accurate full size diagram of the triangle. • Draw these two triangles accurately.  Measure the two other angles. What do you notice? Measure the other side. What do you notice about the sides?	• **Always, sometimes, never** A triangle has three acute angles. Draw triangles to scale to prove your answer. • Five people are told to draw this triangle.  Do they all draw it exactly the same?  Is the answer the same for this triangle?	• Mr Buckton is designing a slide for the playground.  Use a scale of 1cm to represent 1m. Make an accurate drawing of the side of the slide. How long must Mr Buckton make the ladder? • Darnford is 6km due North of Barnthrope. Tingley is 8km due East of Barnthrope.  Use a scale of 1cm to 1km to make a scale drawing. How far is it from Darnford to Tingley?

Geometry: Properties of shapes

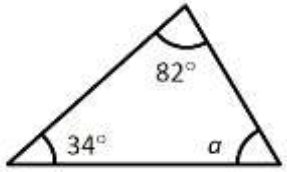
Compare and classify geometric shapes based on their properties and sizes.

Find unknown angles in any triangles, quadrilaterals and regular polygons.

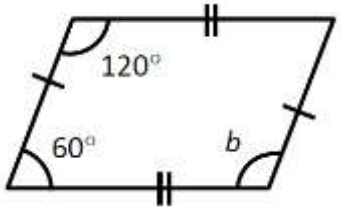
- Find the missing angles in the isosceles triangles.



- Find the missing angle.



- What is angle b?



- If one angle in an isosceles triangle is 42°, what might the triangle look like?

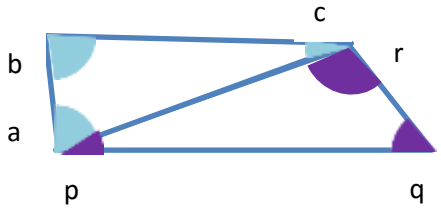
  Draw it.
  Are there any other possibilities?

- Tom says:

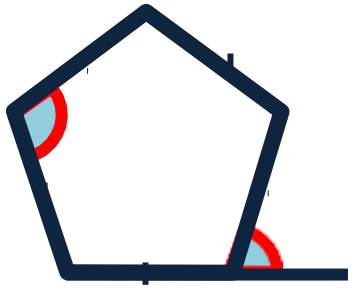
  All quadrilaterals have at least one right angle.

  Draw two different shapes to prove Tom wrong.
  Measure and mark on the angles.

- This quadrilateral is split into two triangles.
  What is a + b + c?
  What is p + q + r?
  Use this to explain why the sum of the interior angles of the quadrilateral is 360°



- The interior angles of a pentagon add up to 540°.
  Use this fact to find the missing angles in the diagram below.



- Use your knowledge of properties of shapes to say whether the following statements are true or false.

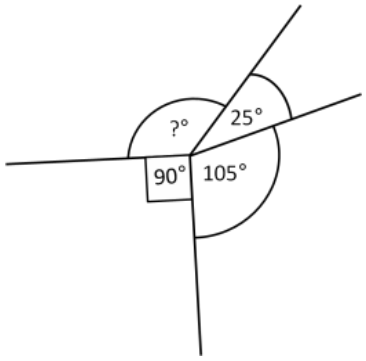
  a) A parallelogram with a right angle is a rectangle.
  b) A trapezium with a right angle is a rectangle.
  c) A rectangle with equal sides is a square.
  d) Every kite is also a rhombus.

- Sara is thinking of a quadrilateral. Think of three questions that you could ask Sara to work out what kind of quadrilateral she is thinking of.
  She can only answer yes or no.

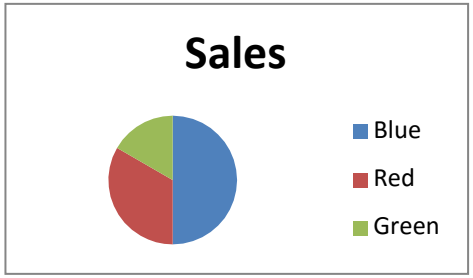
Geometry: Properties of shapes

Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.

- Find the missing angles in the diagrams below.



- Here is a pie chart showing the colour of cars sold by a car dealer.



The number of red cars is twice the number of green cars.
The number of blue cars is three times the number of green cars.

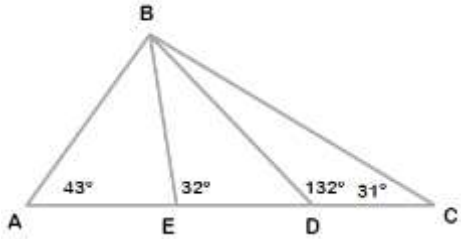
Work out the inside of angle of each section of the pie chart.

- Five equal angles all meet around a point.

What is the size of each angle?
Explain how you know.

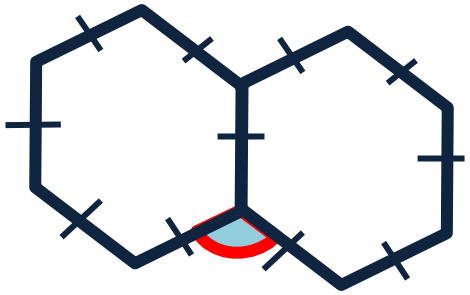
- Four angles add up to 180° on a straight line. One angle is 81°. The other three angles are equal. What size are the other three angles?
  Draw a diagram to prove your answer.

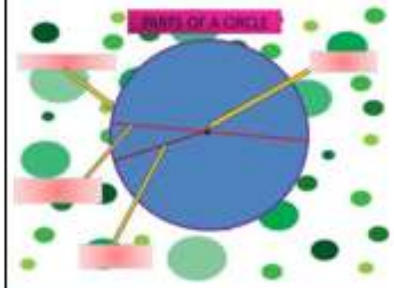
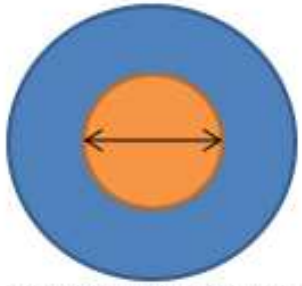
- Calculate angle B in the triangle below.



- Here are two regular hexagons.

  The interior angles of a hexagon add up to 720°.
  Use this fact to find the missing angles in the diagram below.

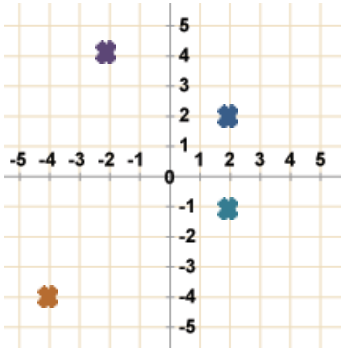


	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Geometry: Circles	Illustrate and name parts of circles, including radius, diameter and circumference; know that the diameter is twice the radius.	• Label the diagram below using the labels provided.  centre diameter radius circumference • Use the radius of the circles to find the diameter: a) 5cm b) 3cm c) 9cm • Use the diameter of the circles to find the radius: a) 10cm b) 12cm c) 20cm	• Complete the statement: The …… of a circle = 2 × the …… of a circle. Draw a circle to prove the statement you have written. • Kainat says, "The bigger the radius of a circle, the bigger the diameter." Do you agree? Explain your reasoning.	• Here are 2 circles. Circle A is orange, Circle B is blue. The diameter of Circle A is $\frac{3}{4}$ the diameter of Circle B.  1) If the diameter of Circle A is 6cm, what is the diameter of Circle B? 2) If the diameter of Circle A is 6cm, what is the radius of Circle B? 3) If the diameter of Circle B is 16cm, what is the diameter of Circle A? 4) If the diameter of Circle B is 16cm, what is the radius of Circle A?

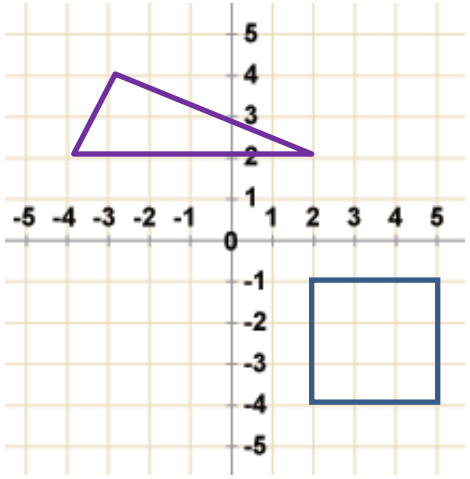
Geometry: Position & Direction

Describe positions on the full coordinate grid (all four quadrants).

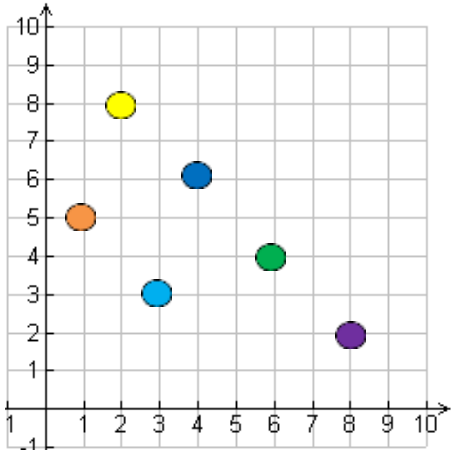
- Describe the position of the crosses marked on the grid.



- Write down the co-ordinates of the vertices of the shapes below.



- Beth draws a map of her town.



Key: My house, Shop, Park, School, Cinema, Ice rink

What is at these co-ordinates?

a) (3,3) b) (6,4)

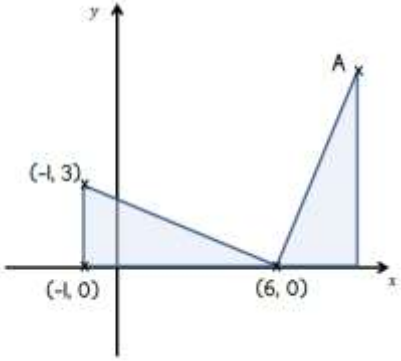
Write down the co-ordinates of these places.

a) School b) My house

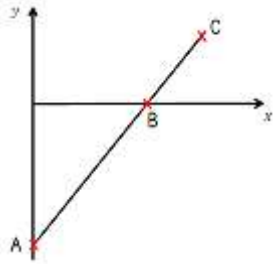
Tom and Keira look at Beth's map.
Tom says ' The cinema is at (8,2)
Keira says 'No, the park is at (8,2)

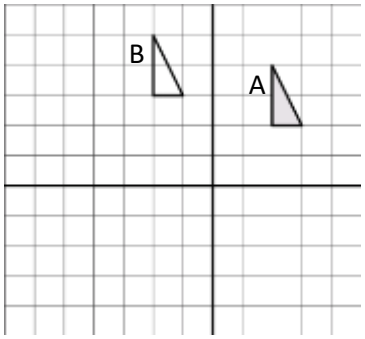
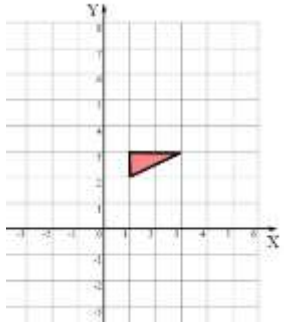
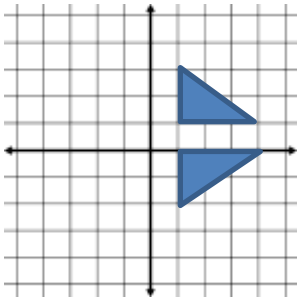
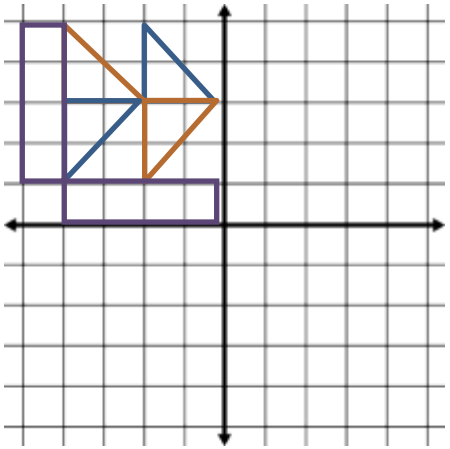
Who is wrong? Why does their mistake matter?

- The diagram shows two identical triangles. The co-ordinates of three points are shown.
  Find the co-ordinates of point A.



- A is the point (0, -10)
  B is the point (8, 0)
  The distance from A to B is two thirds of the distance from A to C.
  Find the coordinates of C.



Geometry: Position & Direction	Draw and translate simple shapes on the coordinate plane. Reflect shapes in axes on full coordinates grid.	• Describe the single translation that takes A to B.  • Reflect the triangle in the y axis.  Hannah translates the triangle 2 squares to the right and 5 squares down. Find the new coordinates of the triangle.	• Two squares have the following co-ordinates: Square A:(3, 5) (7, 5) (3, 9) (7,9) Square B: (1, 1) (5, 1)(1, 5) (5,5) Describe the translation of square A to B and then from B to A. **Always, sometimes, never.** When a shape is reflected in the y axis, the y co-ordinates never change. When a shape is reflected in the x axis, the x co-ordinates never change. Phil has completed the reflection in the x axis  Is Phil correct? Convince me.	• Max is designing a pattern. Copy the diagram and reflect the pattern in the y axis. Now reflect the whole pattern in the x axis.  • Describe two transformations that map rectangle A onto rectangle B.