Year 6

Mastery Overview
Spring

MathsHUBS
White Rose

Year 6

SOL Overview

As well as providing term by term overviews for the new National Curriculum as a Maths Hub we are aiming to support primary schools by providing more detailed Schemes of Learning, which help teachers plan lessons on a day to day basis.

The following schemes provide exemplification for each of the objectives in our new term by term overviews, which are linked to the new National Curriculum. The schemes are broken down into fluency, reasoning and problem solving, which are the key aims of the curriculum. Each objective has with it examples of key questions, activities and resources that you can use in your classroom. These can be used in tandem with the mastery assessment materials that the NCETM have recently produced.

We hope you find them useful. If you have any comments about this document or have any ideas please do get in touch.

The White Rose Maths Hub Team

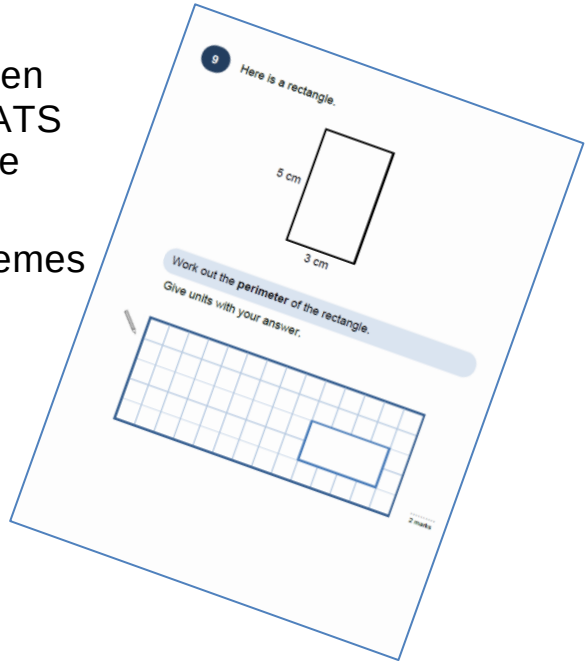
Assessment

Alongside these curriculum overviews, we also provide a free assessment for each term's plan. Each assessment will be made up of two parts:

Part 1: Fluency based arithmetic practice
Part 2: Reasoning based questions

You can use these assessments to determine gaps in your students' knowledge and use them to plan support and intervention strategies.

The assessments have been designed with new KS2 SATS in mind. The questions use strategies and methods promoted through the schemes of learning.



© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Year 6

Teaching for Mastery

These overviews are designed to support a mastery approach to teaching and learning and have been designed to support the aims and objectives of the new National Curriculum.

The overviews:

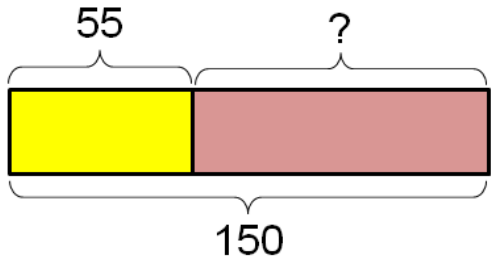
- have number at their heart. A large proportion of time is spent reinforcing number to build competency
- ensure teachers stay in the required key stage and support the ideal of depth before breadth.
- ensure students have the opportunity to stay together as they work through the schemes as a whole group
- provide plenty of time to build reasoning and problem solving elements into the curriculum.

Concrete – Pictorial – Abstract

As a hub we believe that all students, when introduced to a key new concept, should have the opportunity to build competency in this topic by taking this approach.

Concrete – students should have the opportunity to use concrete objects and manipulatives to help them understand what they are doing.

Pictorial – students should then build on this concrete approach by using pictorial representations. These representations can then be used to reason and solve problems.



An example of a bar modelling diagram used to solve problems.

Abstract – with the foundations firmly laid, students should be able to move to an abstract approach using numbers and key concepts with confidence.

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Frequently Asked Questions

We have bought one of the new Singapore textbooks. Can we use these curriculum plans?

Many schools are starting to make use of a mastery textbook used in Singapore and China, the schemes have been designed to work alongside these textbooks. There are some variations in sequencing, but this should not cause a large number of issues.

If we spend so much time on number work, how can we cover the rest of the curriculum?

Students who have an excellent grasp of number make better mathematicians. Spending longer on mastering key topics will build a student's confidence and help secure understanding. This should mean that less time will need to be spent on other topics.

In addition schools that have been using these schemes already have used other subjects and topic time to teach and consolidate other areas of the mathematics curriculum.

My students have completed the assessment but they have not done well.

This is your call as a school, however our recommendation is that you would spend some time with the whole group focussing on the areas of the curriculum that they don't appear to have grasped. If a couple of students have done well then these could be given rich tasks and deeper problems to build an even deeper understanding.

Can we really move straight to this curriculum plan if our students already have so many gaps in knowledge?

The simple answer is yes. You might have to pick the correct starting point for your groups. This might not be in the relevant year group and you may have to do some consolidation work before.

These schemes work incredibly well if they are introduced from Year 1 and continued into Year 2, then into Year 3 and so on.

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

Year 6

NCETM Mastery Booklets

In addition to the schemes attached the NCETM have developed a fantastic series of problems, tasks and activities that can be used to support 'Teaching for Mastery'. They have been written by experts in mathematics.

It will also give you a detailed idea of what it means to take a mastery approach across your school.

Information can be found on the link below.

https://www.ncetm.org.uk/resources/46689

Everyone Can Succeed

As a Maths Hub we believe that all students can succeed in mathematics. We don't believe that there are individuals who can do maths and those that can't. A positive teacher mindset and strong subject knowledge are key to student success in mathematics.

More Information

If you would like more information on 'Teaching for Mastery' you can contact the White Rose Maths Hub at mathshub@trinitytsa.co.uk

We are offering courses on:

- Bar modelling
- Teaching for Mastery
- Subject specialism intensive courses – become a maths expert.

Our monthly newsletter also contains the latest initiatives we are involved with. We are looking to improve maths across our area and on a wider scale by working with the other Maths Hubs across the country.

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

Year 6 Overview

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number: Place Value		Number: Addition, Subtraction, Multiplication and Division				Fractions					
Spring	Number: Decimals		Number: Percentages	Measurement			Number: Algebra		Number: Ratio		Geometry and Statistics	
Summer	Geometry: Properties of Shapes		Geometry: Position and Direction	Post SATs Project Work								

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

Year Group	Y6	Term	Spring

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Number: Decimals Identify the value of each digit in numbers given to three decimal places and multiply numbers by 10, 100 and 1000 giving answers up to 3 decimal places (dp). 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. Recall and use equivalences between simple FDP including in different contexts.	Measurement Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate. Use, read, write and convert between standard units, converting measurements of length, mass, volume and time 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. 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 parallelograms and triangles. 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. 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 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.		Geometry and Statistics Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius. Interpret and construct pie charts and line graphs and use these to solve problems. Calculate the mean as an average.	Time at the beginning or end of the term for consolidation gap filling, seasonal activities, assessments

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

Decimals

National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**
Identify the value of each digit in numbers given to three decimal places and multiply numbers by 10, 100 and 1000 giving answers up to 3dp.	• What is the value of the underlined digit in the following numbers? 3.4<u>2</u> 4.56<u>2</u> 34.6<u>2</u>1 54.3<u>6</u> • How many gallons of petrol have been bought?  • 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, "To multiply by 100, you should add two zeros." 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. 3.454 4.445 4.345 3.54 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.*" **Match each number to the correct child.** • Tina says that 3.24 can be wrote as 2 wholes, 13 tenths and 4 hundredths. How else can it be written? • Using the digit cards, how many numbers can you make that are more than one and less than 1.4? 1 2 3 4

	X10	X100	X1000
0.1			
3.42			
5.36			
1.872			

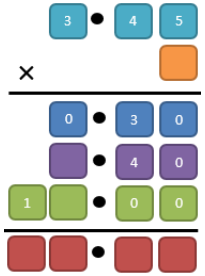
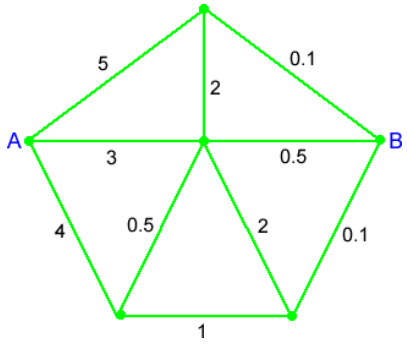
© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

Decimals

National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**
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 | | 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? Prove it.** When you multiply a number with 2 decimal places by a whole number, the answer always has more than 2 decimal places. • Fill in the empty boxes 	• 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?

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

	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. Answers with 1dp | Answers with 2dp 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. Justify your answer. • Which answer is correct for 156 ÷ 5? A) 31 B) 31.2 C) 21.2 Can you work out the mistakes that were made in the two incorrect answers?	• 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 7 7 8 8 9 9 □ 3 ÷ □ = 10.33 12 □ ÷ □ = 18.14 □ 34 ÷ □ = 104.25

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

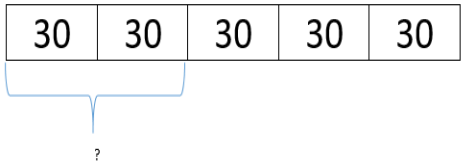
	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Decimals	Solve problems which require answers to be rounded to specified degrees of accuracy.	• 437 children are going on a school trip. a) 1 adult is needed for every 12 children. How many adults must go on the 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 • Mrs Jones gives each child a number card. 15.41 163.46 1, 364, 596 Tim: *My number to the nearest whole is 15.* Sally: *My number to the nearest tenth is 163.4* Owen: *My number to the nearest ten thousand is 1, 360, 000* Can you work out which card each pupil had?	• 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) Explain your answer. Is this always the case? • Which answer is correct? Round 6096.5 to the nearest 10. A) 6100 B) 6090 C) 6000 Explain which mistakes were made for the incorrect answers.	• 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? • The population of New York is 11.2 million to the nearest hundred thousand. Think of at least 5 populations it could have been before rounding. Explain each answer.

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

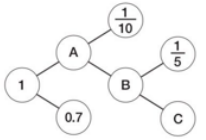
	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Percentages	Solve problems involving the calculation of percentages [for example, of measures and such as 15% of 360] and the use of percentages for comparison.	• Calculate: 10% x 60 25% of 300 45% of 460 • Find: 20% of £340 35% X 6m 75% x £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? • What question can you write for this bar model 	• Isla says, "To find 10% you divide by 10, to find 20% you divide by 20" Do you agree? Explain your reasoning. • Daniel is saving money. His dad offers him two lots of money. 60% of £35 45% of £48 Which should he take? Explain your reasoning. • 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? **Prove your answer**	• Jack and Tara both have a string of beads. They have red beads, blue beads, white beads and purple beads. 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. *How many beads did Jack have?* *How many beads did Tara have?* *What if we know they have 10 purple beads between them?* • How many towers can you create which show: a) 15% are blue and 75% yellow b) 20% of each colour c) There are 10% more red than green.  • A laptop, in the sales has a new price of £180. What could its original price have been?

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

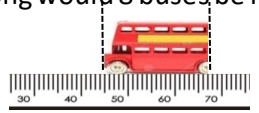
	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Percentages	Recall and use equivalences between simple FDP including in different contexts.	• Fill in the table. **Fraction** | **Decimal** | **Percentage** | 0.375 | $\frac{2}{5}$ | | 75% • Order from smallest to largest: 40% , $\frac{3}{5}$, 0.45, 54%, $\frac{5}{10}$, 0.05 Can you place them on a number line? • 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? • Use the place value counter to show that $\frac{2}{10}$ is also 2 ÷ 2	• 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. • What is the next value in the sequence? ¼ , 30%, 0.35…. A) $\frac{2}{5}$ B) 0.45 C) $\frac{3}{4}$ Can you explain the mistakes for the two incorrect answers?	• 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% • 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? What fraction/percentage/decimal of £100 does she have? • Complete the part whole model 

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Measurement	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 How much further does he have to run? • Miss Brown is making a packed lunch for each child in her class. They each receive: *A 200g sandwich* *A 35g packet of crisps* She has 32 children in her class. What is the total weight of the packed lunches? • 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? 	• **True or false?** If you convert any amount of grams into kilograms then it will never have an amount in the ones column 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? • How else can you write: 2568 metres + 2 miles + 1.8 kilometres. Explain your answer.	• 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? • Tami is 0.2 metres taller than Sam. Dimo is 15cm taller than Tami. Who is tallest? What could their heights be? • Mummy bear is three quarters the size of daddy bear. Baby bear is half the size of daddy bear. If daddy bear is 2.2m tall how tall, in cm, is mummy bear and baby bear?

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

<table>
<tr><th></th><th>National Curriculum Statement</th><th colspan="3">All students</th></tr>
<tr><th></th><th></th><th>Fluency</th><th>Reasoning</th><th>Problem Solving</th></tr>
<tr>
<td>Measurement</td>
<td>Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to 3dp.</td>
<td>
• 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
</td>
<td>
• 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.
</td>
<td>
• Here is a train time table showing the arrival times of the same trains to Halifax and Leeds

<table>
<tr><th>Halifax</th><th>Leeds</th></tr>
<tr><td>07:33</td><td>08:09</td></tr>
<tr><td>07:49</td><td>08:37</td></tr>
<tr><td>07:52</td><td>08:51</td></tr>
</table>

An announcement states all trains will arrive $\frac{3}{4}$ 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
$\frac{3}{4}$kg self-raising flour
10g baking powder

What weight, in kilograms, did the unbaked products come to?
</td>
</tr>
</table>

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

<table>
<tr><th></th><th>National Curriculum Statement</th><th colspan="3">All students</th></tr>
<tr><th></th><th></th><th>Fluency</th><th>Reasoning</th><th>Problem Solving</th></tr>
<tr>
<td>Measurement</td>
<td>Convert between miles and kilometres.</td>
<td>

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:

<table>
<tr><th>Miles</th><th>Kilometres</th></tr>
<tr><td></td><td>1.6km</td></tr>
<tr><td>2 miles</td><td></td></tr>
<tr><td></td><td>4.8km</td></tr>
<tr><td>5 miles</td><td></td></tr>
<tr><td></td><td>16km</td></tr>
<tr><td>20 miles</td><td></td></tr>
</table>

The distance from Edinburgh to Glasgow is approximately 80km. What is this in miles to the nearest whole number?

</td>
<td>

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?
Explain your answer.
Miles and his 6 friends take part in a 5km charity race. Between them, how many miles do they run altogether?
Write a calculation to show your working out.

</td>
<td>

The tally chart below shows the number of miles different drivers did in a day.

<table>
<tr><td>Mihal</td><td>𝍸 |||</td></tr>
<tr><td>David</td><td>|||</td></tr>
<tr><td>Abdul</td><td>𝍸 𝍸 ||</td></tr>
<tr><td>Claire</td><td>𝍸</td></tr>
</table>

When Stefan's and Tina's miles are added to it the whole amount of kilometres driven can be rounded to 60 when rounded to the nearest 10.
How many miles did could Stefan and Tina have driven?
Raj runs 30 miles over the course of 3 days. How many miles/kilometres could he have ran each day?
e.g. day 1- 8km, day 2- 10 miles, day 3- 9 miles and 9.6km

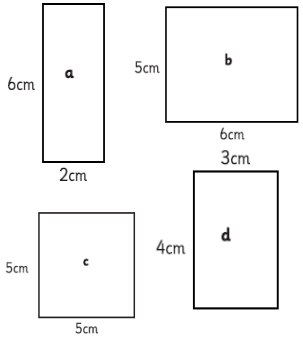
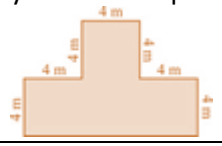
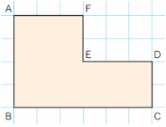
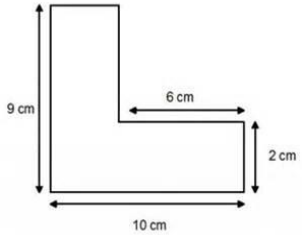
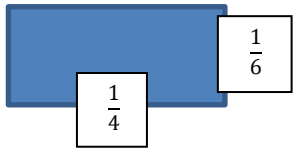
</td>
</tr>
</table>

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

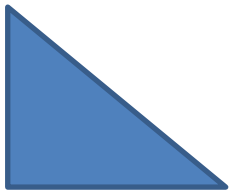
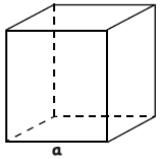
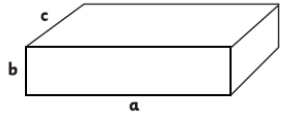
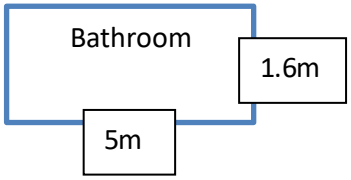
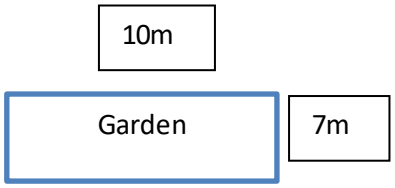
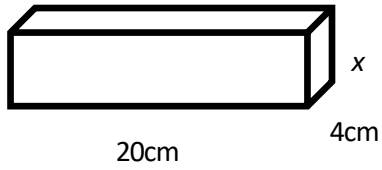
	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Measurement	Recognise that shapes with the same areas can have different perimeters and vice versa.	• Look at the shapes below.  Do two shapes have the same area? Do two shapes have the same perimeter? Draw two different rectangles that have an area of 12cm² and a perimeter of 12cm • Investigate which shapes have the same area and perimeter. • Find the perimeter of the compound shape. Where might you see a shape like this? 	• **True or false?** Two rectangles with the same area can have different perimeters. Explain your answer. • Look at the compound shape below. Each square measures 1cm. To find the area, Tami calculated: 2 x 3 + 6 x 2 and Leah calculated: 4 x 6 – 2 x 3. They both get the correct answer of 18cm² Explain how they both thought about the problem.  • Look at the shape below:  Which is the correct perimeter? A) 27cm B) 38cm C)31cm With the other 2 answers, can you work out the mistake that has been made?	• 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? Do you notice a pattern? • Three children are given the same shape to draw. Kate says, "The smallest length is 4cm." Lucy says, "The area is less than 30cm²." Ash says, "The perimeter is 22cm." What could the shape be? Is there more than one option? • My back garden has an area of 130cm² and a perimeter of 46cm. What could my garden look like? If I want to buy fence panels which are 1m wide and cost £4.20 each, how much will this cost be?

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

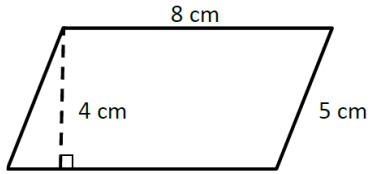
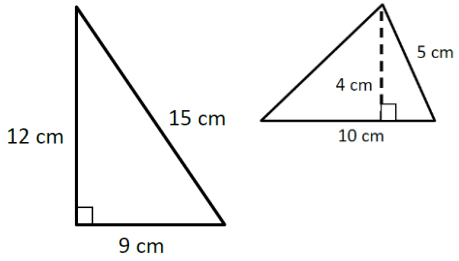
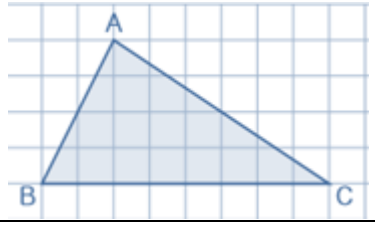
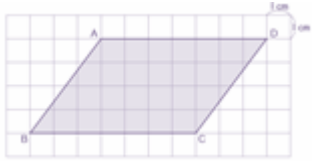
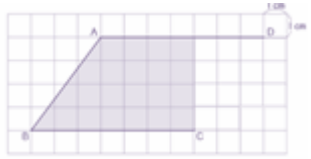
	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Measurement	Recognise when it is possible to use formulae for area and volume of shapes.	• Which formula below would calculate the area of the right angled triangle?  a) a + b x 2 b) ab × 0.5 c) a + b + c • Look 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. ab + ac +bc  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. • Bob is tiling his bathroom wall. It costs £1.50 per 4cm^2. Does the image below give you the correct information to work out the cost to tile a wall? 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. He has a budget of £10. Where could he plant the seeds? • The volume is between 160 and 250, calculate the possibilities for the missing length:  • The volume of a cuboid container is 50cm^3. What could the dimensions of the container be?

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

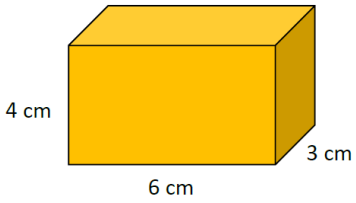
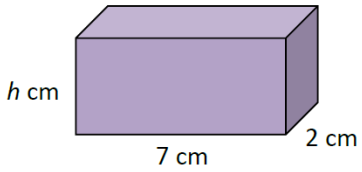
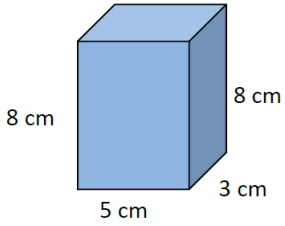
	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Measurement	Calculate the area of parallelograms and triangles.	• Calculate the area of the parallelogram:  • Calculate the area of the triangles:  • Is there a way to make a 4 sided shape to help you calculate the area of the triangle below?  	• 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. • Tami is calculating the area of parallelogram below.  She uses the triangle that has been removed below. Where can she put it and how does this give her the area?  Is there any other way to calculate the area of the parallelogram? • Prove that Area of triangle= base X height ÷ 2	• 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? • The area of a triangle is 54m^2. What could the dimensions be? Think of at least 3 ways. • The base of my flower planter is a parallelogram. The area must be 42m^2<?<54m^2. What could the dimensions be?

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Measurement	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.  • A cube has a volume of $125cm^3$. Calculate the length, height and width of the cube.  • A box of matches measures 1cm by 4cm by 5cm. The matches are placed in a cardboard box measuring 15cm by 32cm by 40cm. How many boxes of matches fit into cardboard box?	• 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.	• 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? • A cuboid has a volume of $70cm^3$. What could the dimensions be? Can you build it with cubes?

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

Algebra

National Curriculum Statement

Use simple formulae.

All students

Fluency

- Calculate the value of the letter in each equation.

3a = 15	a =
5b = 10	b =
63 = 9c	c =
12d = 48	d =

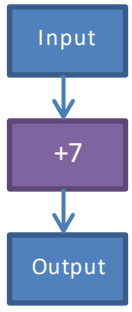
- Calculate the value of the letter in each equation.

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



Reasoning

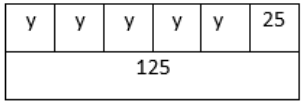
- If **a** stands for a number, complete the table below:

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?

- Kat substitutes b = 3 into the formula 4b + 5. She gets the answer 17.
Is she correct?
Explain your answer.

- Tom says that the bar model below shows that 5y+25=125.

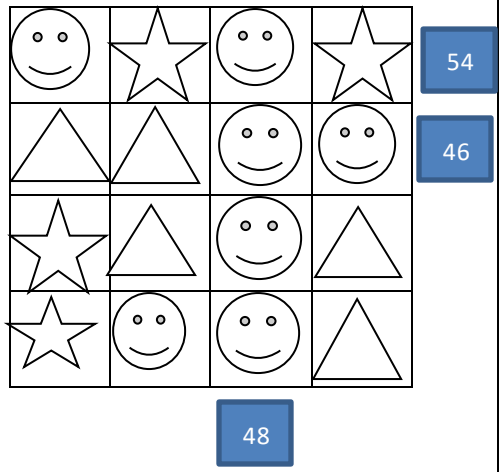


Is he correct? Explain why.

How can he use the bar model to find out the value of y?

Problem Solving

- 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?

- Green is worth 3, blue is worth 6 and yellow is worth 10. How many formulas can you create to reach a total of 22?

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

<table>
<tr><th></th><th>National Curriculum Statement</th><th colspan="3">All students</th></tr>
<tr><th></th><th></th><th>Fluency</th><th>Reasoning</th><th>Problem Solving</th></tr>
<tr><td>Algebra</td><td>Generate and describe linear number sequences.</td><td>

Fill in the first two terms in this sequence.

___, ____, 55, 63, 71

Can you write a formula to describe the sequence?
0.7 is the first term in this sequence. What is the 7th term?

0.7, 1.2, 1.7,
The formula 4n+1 can be used to generate the numbers in this sequence. Fill in the table below:

<table>
<tr><th>erm</th><th>Calculation</th><th>Value</th></tr>
<tr><td>1st</td><td>4 × 1 + 1</td><td>5</td></tr>
<tr><td>2nd</td><td></td><td>9</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 .....
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)
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.’

What’s the same and what’s different about the rules?
For the sequence below, write your own 2 rules.
31, 36, 41, 46, 51

</td></tr>
</table>

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

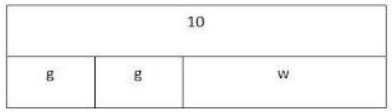
	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Algebra	Find pairs of numbers that satisfy an equation with two unknowns.	• X and Y are whole numbers. X is a one digit number. Y is a two digit number. X + Y = 25. Find all the possible pairs of numbers that satisfy the equation. • a and b are variables: a + b = 6 Find 5 different possibilities for a and b. a | b | | | | | | | | | | • What could the value a and b be? 290 a | b	• Rhian is solving the equation a + b = 18 a and b are both positive whole numbers. Rhian says, "a and b must 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 possible 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? • Find 3 different possible pairs of values for a and b: ab= 18

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

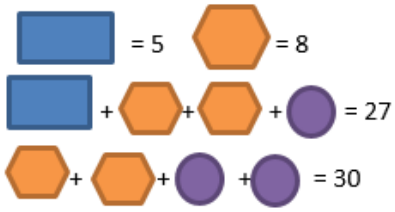
	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Algebra	Enumerate possibilities of combinations of two variables.	• In this equation, a and b are both whole numbers which are less than 12. 2a=b Write the calculations that would show all the possible values for 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

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Algebra	Express missing number problems algebraically.	• 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. • Find the value of the circle in each of the following problems. It is worth a different value in each question. 	• 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 a 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? • Which of the following algebraic statements correctly describes the following problem? *"Four times a number and add 5 to get the answer 17"* $4n + 5 = 17$ $4(n + 5) = 17$ $n^4 + 5 = 17$ Explain the mistakes made in the incorrect answers.	• Using the values of the shape below, how many ways can you combine them to make different totals?  Can you write each of your number sentences 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?

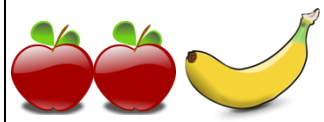
© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

Ratio and 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. If she eats 4 apples, Sally eats ___ bananas. If Sally eats 8 bananas, she eats ___ apples. • Create a story, linked to ratio, for the bar model below: 	• 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. • Orange paint is made from red and yellow paint in the ratio of 3:5 Tim says to make 40 litres of orange paint, he would need 15 litres red and 25 litres yellow. Draw a bar model to prove that his answer is correct. • Raj is solving a ratio problem. Two children share a box of chocolates in the ratio 2:3. There are 35 chocolates. Raj divides 35 by 5. Explain why he does this.	• 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				

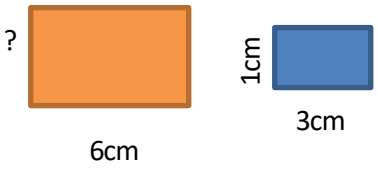
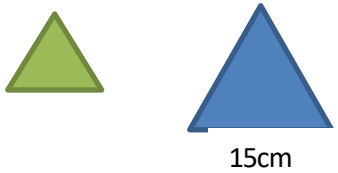
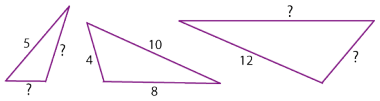
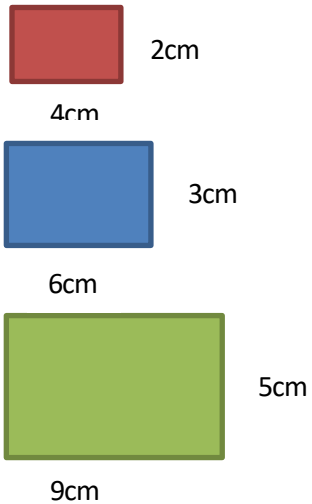
© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

Ratio and Proportion

National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**
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. • 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?

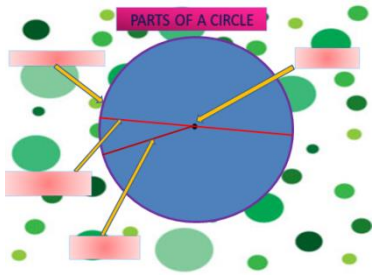
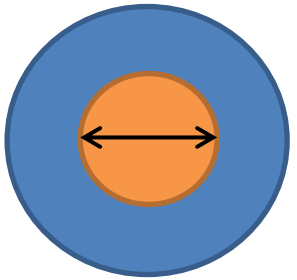
Rectangle	Length	Width
A	5cm	2cm
B		4cm
C	25cm	
D		18cm

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Circles	Illustrate and name parts of circles, including radius, diameter and circumference and 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. • True or false? Prove it! The diameter of a circle is twice the length of the radius. All circles with a radius of 6cm will also have the same circumference • How are circles and ovals similar and different?	• 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?

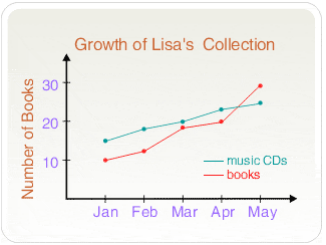
© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

Statistics

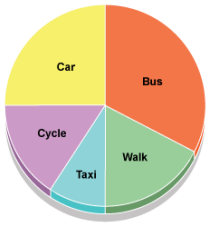
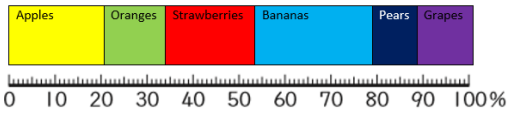
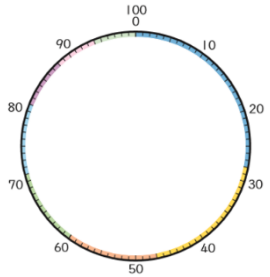
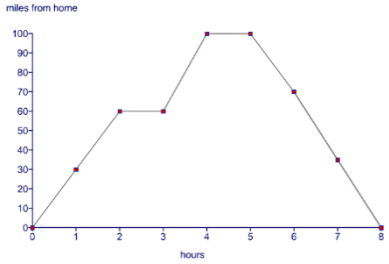
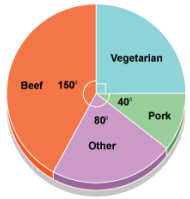
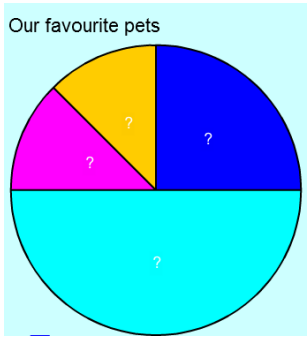
National Curriculum Statement	All students		
	Fluency	**Reasoning**	**Problem Solving**
Calculate the mean as an average.	• Calculate the mean of these sets of numbers: a) 3, 6, 8, 2, 4, 12 b) 7, 13, 16, 9, 8 • Hassan is his school's cricket team's top batsman. His scores over the year are: 134, 60, 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) What else can you calculate?	• 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 ?? • What is the mean of the numbers below? 9, 7, 5, 9 and 13 a) 43 b) 8.6 c) 8.3 Explain the mistakes made in the incorrect answers. • Jasmine says, "The mean average is always a whole number." Do you agree? Prove it.	• Here is a line graph. Can you write three different ways someone could find the mean from the graph?  • The mean of Tilly's maths test scores is 26. What could the 5 test scores have been if the score was out of 30? Did you use a method to help you find more than on solution?

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose

Term by Term Objectives

Year 6

	National Curriculum Statement	All students		
		Fluency	**Reasoning**	**Problem Solving**
Statistics	Interpret and construct pie charts and line graphs 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?  • Create a pie chart using the information from the percentage bar graph  	• 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? • If 23 people are vegetarian, how many people took part in the survey?  Explain your method.	• 96 people took part in this survey.  Dogs Horses Cats Hamsters How many people voted for cats? $\frac{3}{8}$ of the people who voted for dogs were male. How many females voted for dogs? What other information can you gather from the pie chart?

© Trinity Academy Halifax 2016
mathshub@trinitytsa.co.uk

MathsHUBS White Rose