

Problem solving guidance

Word problems

EYFS KSI

Lower KS2

Upper KS2

Spring 2



Mathematics Intent

At Teagues Bridge, our intention is **ambitious**. We aim to create strong mathematicians who have the necessary skills and understanding to tackle mathematical challenges in varying contexts, including the ability to reason and apply their knowledge to solving problems. This should mean that children are able to apply their knowledge to everyday life and can **aspire** to achieve anything that they want. We want our pupils to have strong mental manipulation and to use written strategies when appropriate.

Our philosophy for mathematics is replacing an idea that maths is lots of rules and numbers with a study of patterns and connected ideas. In early years they will build a foundation of number understanding and representation through mainly concrete and pictorial representations. The approach will be supported by in depth questioning, throughout the school to develop mastery.

Use of CPA is encouraged to ensure the curriculum is accessible for all children and that they all have the **opportunity** and are able to demonstrate their understanding in a variety of ways. This will enable them to have a good understanding of maths and not just the ability to follow a procedure. We want to **empower** them to want to ask questions and want to find the answers.

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

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

Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The programmes of study are, by necessity, organised into apparently distinct domains, but pupils should make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge to science and other subjects.

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

Our lessons are structured to enable all children to achieve and have an **opportunity** to make progress with their learning. Each lesson begins with a **CLIC maths** activity, where they have chance to develop their mental strategies, secure number facts and number manipulation. They then **develop** their mathematical fluency with the teacher modelling and explaining before they have a go themselves. Children then have a **reasoning/ problem solving** activity which is a variation of the previous work to demonstrate they have mastered the objective. Children who are ready can then **challenge** themselves with a task that requires applying the learning to a greater depth. We have our own programme of study which is supported with schemes like White Rose to support.

EYFS and Key Stage One - Word Problems

Word Problems	EYFS(conditional)	KSI(conditional)
Read and analyse the problem. Identify the steps. Calculate efficiently. Check the solution.	I know how to listen to the word problem story. I know what the story is about. I know how to find the answer.	I know what the narrative is about and what words tell me about the maths. I know what arithmetic I need to answer a one-step problem. I know how to answer a two-step problem. I know what arithmetic methods best and what resources I might choose. I know when I have answered the question correctly.

Key Skills and Strategy Development EYFS	Question stems
Listen to and understand the problem.	What is the question about?
Identify the numbers/shapes.	What do you need to do?
Calculate or sort efficiently.	What methods would be best? What resources
	might you choose?
Check the solution.	Have you answered the question correctly?

One Step Word Problems	Model answers
How much? How many? material improve kittens improve children improve time improve paper improve sand	Declarative: Early years: numbers and number bonds to 10; concepts and vocabulary for talking about maths and mathematical patterns (size, weight, capacity, quantity, position, distance, time) Procedural: Early years: accurate counting, single digit addition and subtraction, halving doubling and sharing
Using stories, songs and rhymes to create word problem narratives.	Conditional: Early years Use combinations of number facts, shape facts, pattern facts, methods of counting, addition, and subtraction to \Rightarrow play games \Rightarrow sing songs \Rightarrow answer questions \Rightarrow talk about everyday objects \Rightarrow solve problems using objects within continuous provision.

Keystage One ~ Word Problems

Key Skills and Strategy Development KSI	Question stems
Read and analyse the problem.	What is the question about?
ldentify the steps.	What do you need to do?
Calculate efficiently.	What methods would be best? What resources
	might you choose?
Check the solution.	Have you answered the question correctly?

Declarative knowledge	Procedural knowledge
Maths facts: all number bonds within and between 20: key	Reading writing of the digits/sumbols
number bonds within and between 100 all multiplication fa	cts vocabulary and phrases required for
for the 2.5 and 10 multiplication tables, key 'fraction fac	its' working with simple Fractions, arithmetic
such as 'half of 6 is 3', key 'time facts' such as the numb	e^{r} expressions and equations \rightarrow measuring
of minutes in an hour	length capacity time and monetary value
5	The presentation and layout of
	= preservation and tayout of
One Step Ward Drahlense	calculations \rightarrow using a ruler
There are lly girls and 15 hours in Katia's class	Model altswers
How many children are there in the class altogether?	14 + 14 = 28
	28 + 1 = 29
	YI- solve one-step problems that involve
	addition and subtraction, using concrete
	objects and pictorial representations,
	and missing number problems such as 7 = - 9
	YI- solve one-step problems that involve
At the farm, there are 14 white rabbits and 11 grey	addition and subtraction, using concrete
ones. How many rabbits are there altogether?	objects and pictorial representations,
14 11	and missing number problems such as / = - 9
10 + 10 = 20	
4 + 1 = 5	$Y \ge -$ recognise and use the inverse
25 rabbits.	relationship between addition and
	subtractions and solve missing number
	problems
	problems.





Lower Key Stage 2 – Word Problems

Word Problems	EYFS	KSI	LKS2
	(conditional)		
Read and analyse the	I know how to listen to	I know what the	I know what the
problem.	the word problem	narrative is about	narrative is about
ldentify the steps.	story.	and what words tell	and what words
Calculate efficiently.	I know what the story	me about the	identify the
Check the solution.	is about.	maths.	operations needed.
	I know how to find	l know what	l know what
	the answer.	arithmetic I need to	arithmetic I need to
		answer a one-step	answer a one-step
		problem.	problem, two-step or
		I know how to	multi step problem.
		answer a two-step	l know what
		problem.	arithmetic
		l know what	methods are
		arithmetic methods	efficient and what
		best and what	to record.
		resources might	know when have
		choose.	answered the
		know when have	question correctly
		answered the	and checked the
		question correctly.	context.

Key Skills and Strategy Development LKS2	Question stems
Read and analyse the problem.	What is the question asking you to do?
Identify the steps.	What arithmetic or calculations do you need?
Calculate efficiently.	What order do you need to proceed? What methods
	would be the most efficient?
Check the solution.	Have you answered the question correctly?

Declarative knowledge	Procedural knowledge
Lower Key Stage 2 Concepts, representations and associated	Lower Key Stage 2 Efficient and
vocabulary: \Rightarrow Arithmetic: enhanced knowledge of the code for	accurate methods: \Rightarrow counting up and
number (to 1000s) including patterns and associated rules for	down in multiples of 3, 4, 6, 7, 8, 9,
addition and subtraction of numbers, decimal numbers, place	11, 12, 25, 50, 100, 1000, in tenths, in
value, negative numbers, associative and distributive laws \Rightarrow	ones through to negative numbers \Rightarrow
Maths facts: all multiplication facts for the 3, 4, 6, 7, 8, 9,	Column addition and subtraction \Rightarrow
II, 12 multiplication tables, decimal equivalents of key fractions	Mental addition and subtraction using

⇒ equivalent fractions ⇒ Formulae: Units of measurement conversion rules, formulae for perimeter and area ⇒ Roman Numeral system and associated historical facts ⇒ Geometry facts: right angles, acute and obtuse angles, right angles in whole and half turns, symmetry, triangle and quadrilateral classifications; horizontal, perpendicular, parallel and perpendicular lines ⇒ Links between words/phrases in word problems and their corresponding operations in mathematics (e.g. `spending' is associated with `subtraction from an amount') ⇒ The rules for multiplying and dividing by 10, 100 and 1000 ⇒ First quadrant grid coordinate principles	patterns and rules of number \Rightarrow Short division and multiplication \Rightarrow Mental multiplication using derived facts \Rightarrow Fractions: finding unit and non-unit fractions of amounts, common equivalents, addition, subtraction and comparison of fractions with the same denominator \Rightarrow measure, compare, add, subtract: lengths, mass, capacity (all units of measurement) \Rightarrow read, write and compare roman numerals \Rightarrow Draw 2D and 3D shapes \Rightarrow Interpret and present data \Rightarrow Estimation and rounding \Rightarrow
One Step Word Problems	Model answers
Scott has 240 cakes to sell. He chooses one size of box and puts the same number of cakes in each box. He has no cakes left over. Which of these boxes could he use? 10 20 30 40 50 10 20 30 40 50 10 20 30 100	Y3 - solve problems, including missing number problems, involving multiplication and division.
Brett and lack are plauing a game.	Y3 - solve problems, including missing
Brott bas 212 points	number problems, using number facts,
Brett hus 215 points.	place value, and more complex addition
Jack has 102 more points than Brett.	and subtraction.
How many points do they have altogether?	
The original price of this car is £8,999 Sale £1,100 off What is the sale price of the car?	Y4- Jind 1000 more or less than a given number
14 A train has 8 carriages.	Y4 - multiply two-digit and three-digit
Each carriage has 56 seats.	numbers by a one-digit number using
How many seats are there on the train altogether? Show your method	formal written layout

Two Step Word Problems	Model answers
8 Ken buys 3 large boxes and 2 small boxes of chocolates. Each large box has 48 chocolates. Each small box has 24 chocolates.	Y4 - multiply two-digit and three-digit numbers by a one-digit number using formal written layout.
Large 48 chocolates How many chocolates did Ken buy altogether?	
Show your method	
9 Mr and Mrs Jones are saving for a holiday. Mr Jones has saved £742 Mrs Jones has saved £1359 The holiday costs £3415	Y4 - solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.
How much more do they need to save?	
 Fran, Simon and Abe count their football stickers. Fran has 107 stickers. Simon has 249 stickers. Altogether, the three friends have 500 stickers. How many stickers does Abe have? 	Y3 - solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.
Show your method	
	Y3 - solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.





Upper key stage 2 - Word problems

Key Skills and Strategy Development UKS2	Question stems
Read and analyse the problem.	What is the context of the question?
Identify the steps.	What arithmetic or calculations do you need?
Calculate efficiently.	What order do you need to proceed? What methods
	would be the most efficient?
Check the solution.	Have you answered the question correctly? Do you need
	to change the units of measurement in this answer?

Declarative knowledge	Procedural knowledge
Upper Key Stage 2 Concepts, representations and associated vocabulary: \Rightarrow	Upper Key Stage 2 Efficient and
Enhanced knowledge of the code for number: up to and within 1 000 000,	accurate methods \Rightarrow Scaling,
multiples, factors, decimals, prime number facts to 100, composite numbers,	coordinate geometry in all four
indexation for square and cubed numbers \Rightarrow Properties of linear sequences	quadrants \Rightarrow Division with
\Rightarrow Conversion facts metric to imperial measurements and vice versa \Rightarrow Key	remainders as fractions, decimals
circle, quadrilateral and triangle facts and formulae (e.g. angles on a	and where rounding is needed \Rightarrow
straight line sum to 180 degrees) Rules and principles governing order of	Fractions: conversion mixed to
operations.	improper and vice versa, add,
	subtract and multiply \Rightarrow Finding
	percentages of amounts \Rightarrow
	Converting units of measurement \Rightarrow
	Measurement of length, angles, area,

Single Step Problems In a theatre there are 45 rows of chairs. There are 36 chairs in each row How many chairs are there altogether ?	perimeter, volume ⇒ Use of order of operations ⇒ Convert between fractions, decimals and percentages Linear algebra, basic trigonometry Long multiplication and division Model answers Y5 – solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes
Dr Trent is celebrating his birthday. His age is a square number. Last year, his age was a multiple of 12 Next year, his age will be a multiple of 10 How old is Dr Trent?	Y5 – solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes
14 Amina planted some seeds. For every 3 seeds Amina planted, only 2 seeds grew. Altogether, 12 seeds grew. How many seeds did Amina plant?	Y6 - solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts.
3 Class 6 have some fruit. For every 2 apples, they have 3 bananas. Image: Class 6 have some fruit. Image: Class 6 h	Y6 - solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts.
Two Step Word Problems	Model answers
	Y5 - solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why
Image: the mass of a box containing 6 tins of beans is 7.5 kg. Image: the mass of a box containing 6 tins of beans is 7.5 kg. When 2 tins of beans are removed, the mass of the box is 5.1 kg. What is the mass of one tin of beans? Image: the mass of the box is 5.1 kg. Show your method	Y5 - use all four operations to solve problems involving measure.

11 At the start of April, a shop had 15,000 games. The shop sold: • • 7,918 games in April • 4,624 games in May. How many games did the shop have left at the end of May? Show your method games games 2 marks	
	25 - solve problems involving
15 Amina went to a concert one evening.	converting between units of time.
It took her an hour and twenty minutes to get there from home.	
She arrived at ten past seven.	
At what time did she leave home?	
1 mark	
The concert started at 7:20 pm.	
It finished at 9:05 pm.	
How long did the concert last?	
hours minutes	
Ms Fisher's age is double her sister's age.	Y6 - solve problems involving the
They are both older than 20 but younger than 50	relative sizes of two quantities
Their ages are both multiples of 7 What are their ages?	by using integer multiplication and division facts.
lulti-Step Problem	Model answers
	Y6- solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison

21 There are 25 classes in a school. Each class has 34 pupils. 62% of all the pupils play a sport after school.	
Show your method pupils do not play a sport?	
 Julia Sanchez is a basketball player. Here are some statistics about her performance last season: She played 16 matches. On average, she scored 12 baskets per match. Last season, for every 3 shots she scored she missed one shot. How many times did Julia Sanchez shoot last season? 	YG - solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts
I have read 40% of my book. I have 90 pages left to read. How many pages have I read so far?	require knowing percentages and decimal equivalents.
omplex	Model answers
There are 5 times as many pens in box A than box B. Jaz moves 76 pens from box A to box B. Both boxes now have the same amount of pens. How many pens are in box A now?	76 I a graph to be noted a A shad is grant as an only perm as & 1 parel. This is equal tools A word from A to B must represent 2 parts. So each pert is B.R. A out B B.R. A out B B.R. A out B B Areau I Japanese and A and B Areau I Japanese and B Areau I
	Y6 - solve problems involving the
	where missing values can be found by using integer multiplication and division facts

