# **Addition and Subtraction:** Add 4-Digit Numbers with Multiple Regroupings

#### Aim:

Add and subtract whole numbers with more than 4 digits, including using formal written methods.

To add 4-digit numbers with multiple regroupings.

#### **Success Criteria:**

I can add whole numbers with up to 4 digits.

I can use formal written methods to calculate.

I can explain why regrouping is necessary in written calculations.

I can regroup more than once when using formal written methods of addition.

#### **Resources:**

**Lesson Pack** 

Place value counters

Place value grids

Interlocking cubes or base ten blocks

#### Key/New Words:

Add, addition, sum of, more, plus, increase, sum, total, altogether, regroup.

#### Preparation:

Flying Machines Materials Sheets - one per child

Differentiated Flying Machines Order Sheet - one per child

**Diving into Mastery Sheets** - as required

Prior Learning: Children will have previously added numbers using formal written methods where one regrouping is required.

#### **Learning Sequence**



**Remember It:** Children revisit adding four-digit numbers, regrouping up to once, using the representations on the **Lesson Presentation** as clues – solving the mathematical calculation.





**Regrouping Multiple Times:** Children compare the visual models shown on the **Lesson Presentation** with the corresponding calculations to the right-hand side. They explore what happens when regrouping is required multiple times within a calculation. Can children explain why regrouping is necessary in addition calculations?





**Time to Regroup:** Children choose a section and answer the addition questions using column addition, remembering to regroup where necessary. Once completed, the children can mark their calculations using the answers provided on the **Lesson Presentation**. Can children regroup more than once when using formal written methods of addition?





**Flugtag:** Introduce children to the event 'Flugtag' where teams build human-powered flying machines and compete to see who can travel the furthest. Explain that their task is to use column addition to find the total price for materials needed to make flying machines.





**Materials:** Show children the combinations of materials on the **Lesson Presentation**. Using whiteboards, children discuss in pairs how to calculate the answer using column addition. Model repeating the number in the calculation when adding multiple quantities of materials.





**Flying Machines:** Children work individually, using the **Flying Machines Cost Sheet** to help calculate the total price of the orders shown on the differentiated **Flying Machines Order Sheet**. Children use column addition to add together the prices of different materials.





Children use column addition to add together combinations of two 4-digit numbers. They may use interlocking cubes, base ten materials or place value grids to aid understanding of column addition if required.



Children use column addition to add together combinations of two or three 4-digit numbers.



Children use column addition to add together combinations of up to six 4-digit numbers. They work out combinations to fit within given budget totals.



**Diving into Mastery:** Schools using a mastery approach may prefer to use the following as an alternative activity. These sheets might not necessarily be used in a linear way. Some children might begin at the 'Deeper' section and in fact, others may 'dive straight in' to the 'Deepest' section if they have already mastered the skill and are applying this to show their depth of understanding.





Children answer addition questions using written methods where multiple regroupings are required. Models are provided to support the layout of calculations.



Children answer reasoning questions in the context of addition. They recognise mistakes made within calculations and offer solutions where mathematical misconceptions have been demonstrated within workings out.



Children answer open-ended problem-solving questions. They find multiple solutions to particular problems, supporting their ideas with clear reasoning where appropriate.





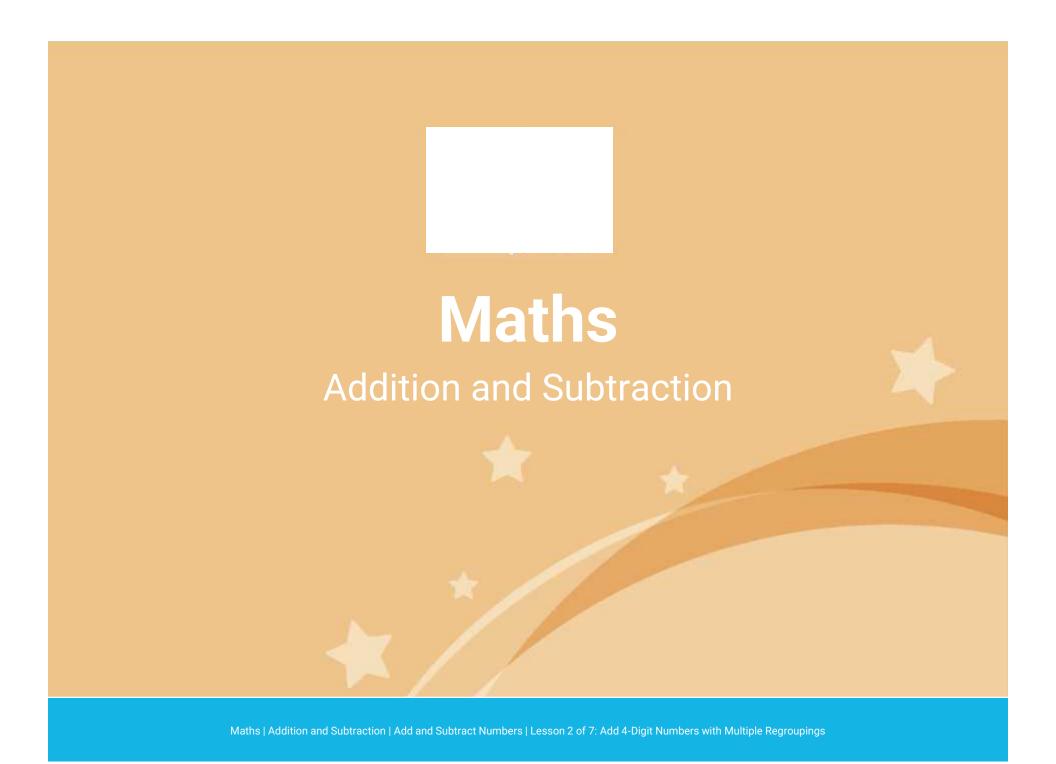
**Question Time:** Children discuss how they could use the skill learnt today in other areas of the curriculum, before completing the hidden number questions on the **Lesson Presentation**. What strategies did children use to find the answers?

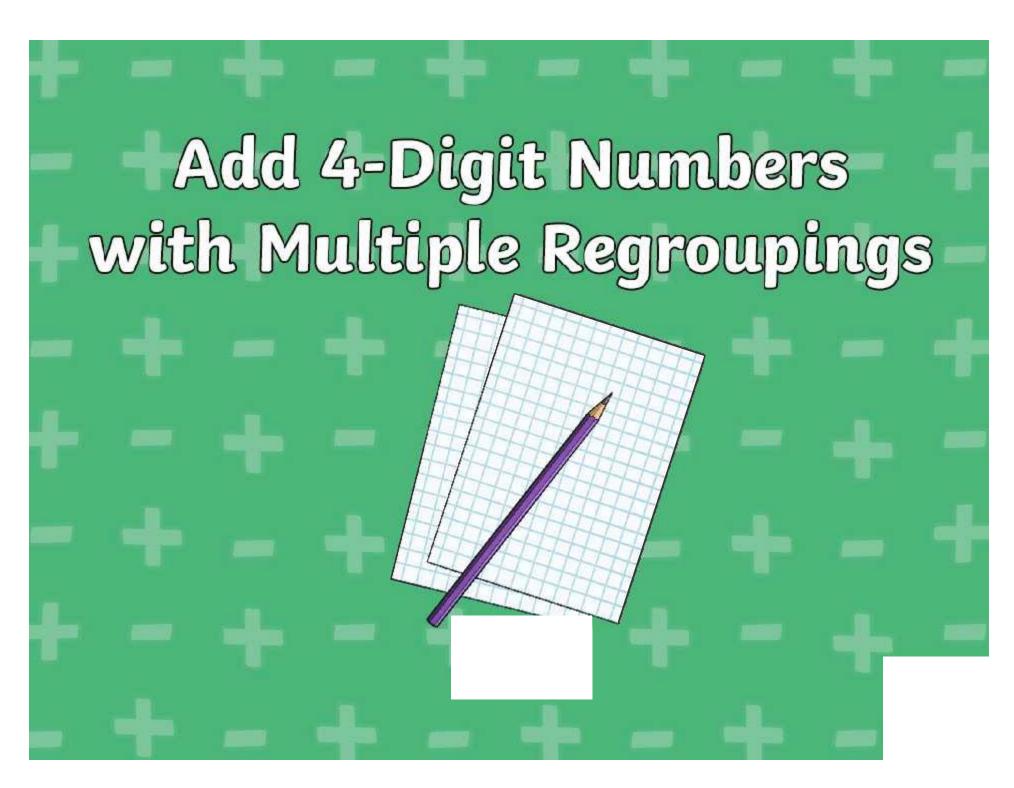
#### **Explore**it

Filmit: Children create their own video clip explaining how to use column addition to a different year group.

Challengeit: Children complete the questions on the Large Numbers Addition Maths Challenge Cards.

Learnit: Children will find this visually exciting Knowledge Organiser a useful tool for visualising addition and subtraction.



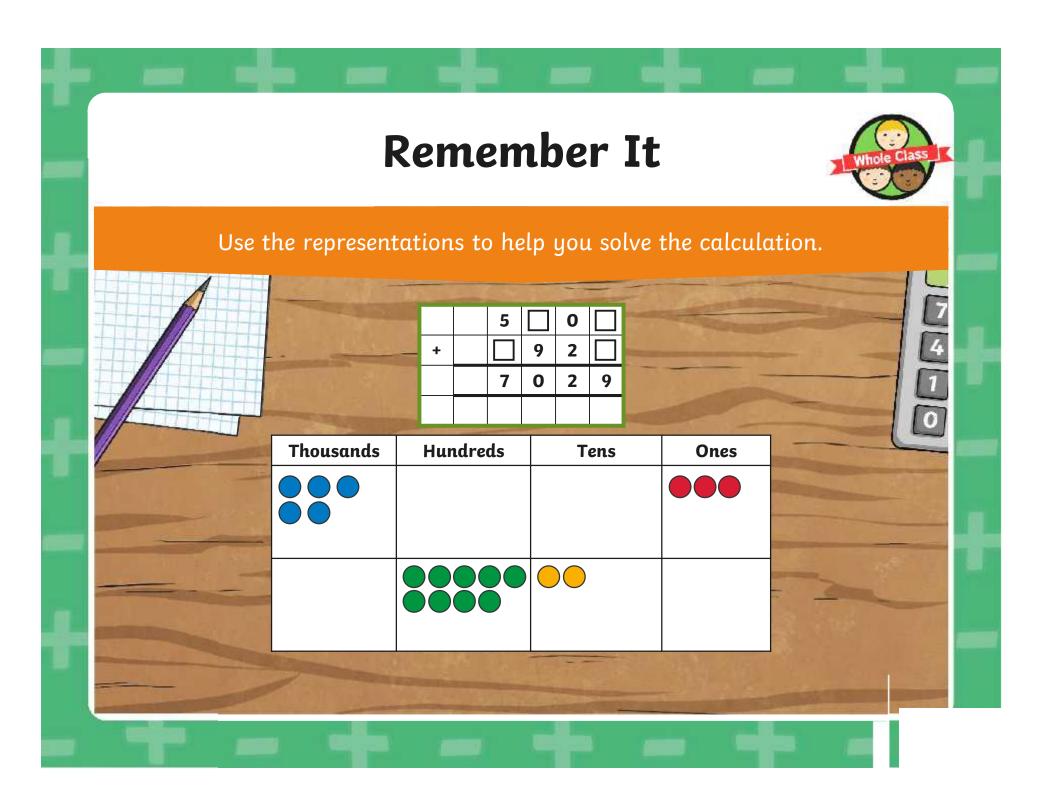


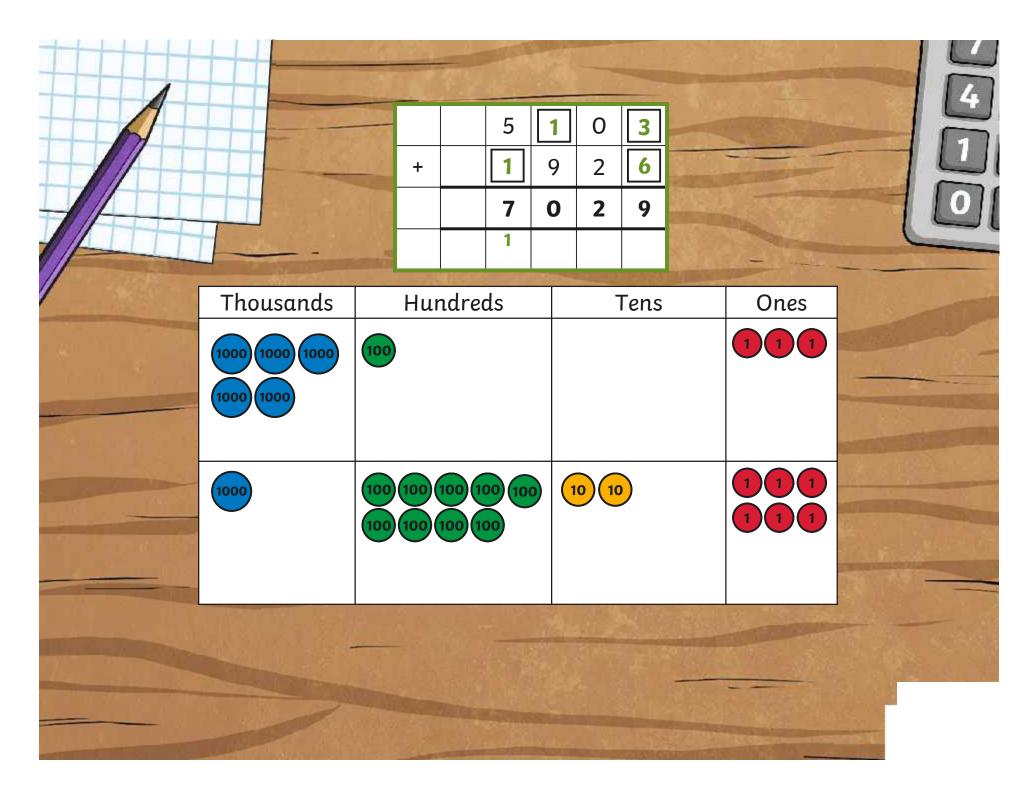
### Aim

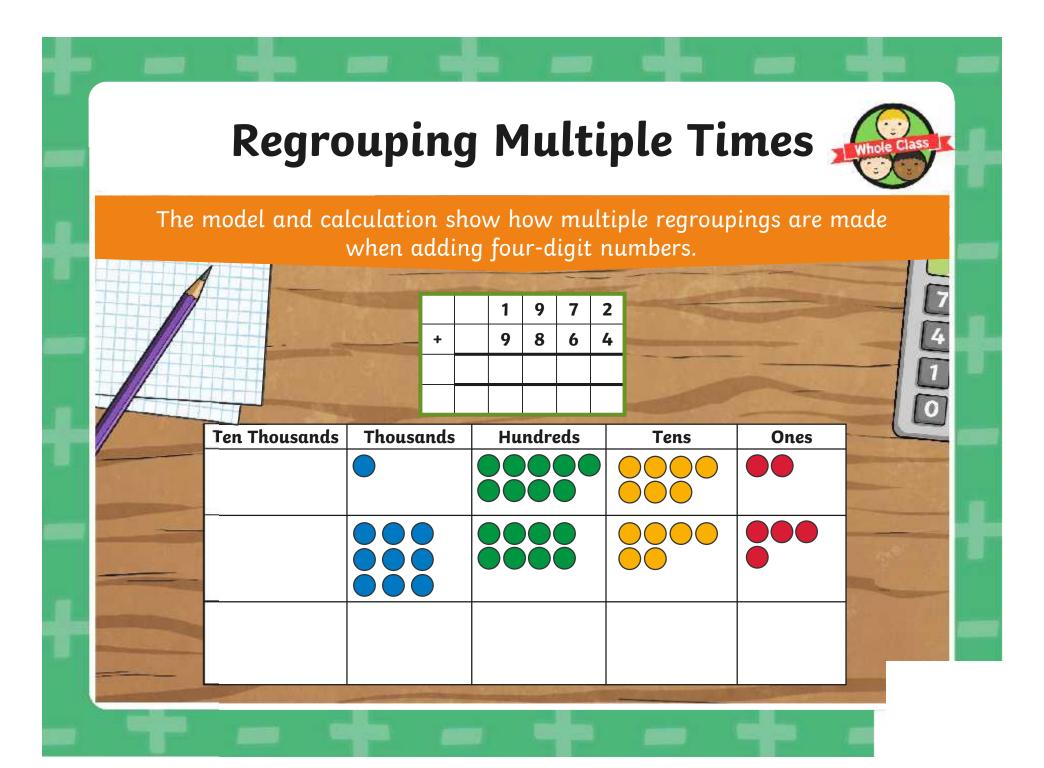
• To add 4-digit numbers with multiple regroupings.

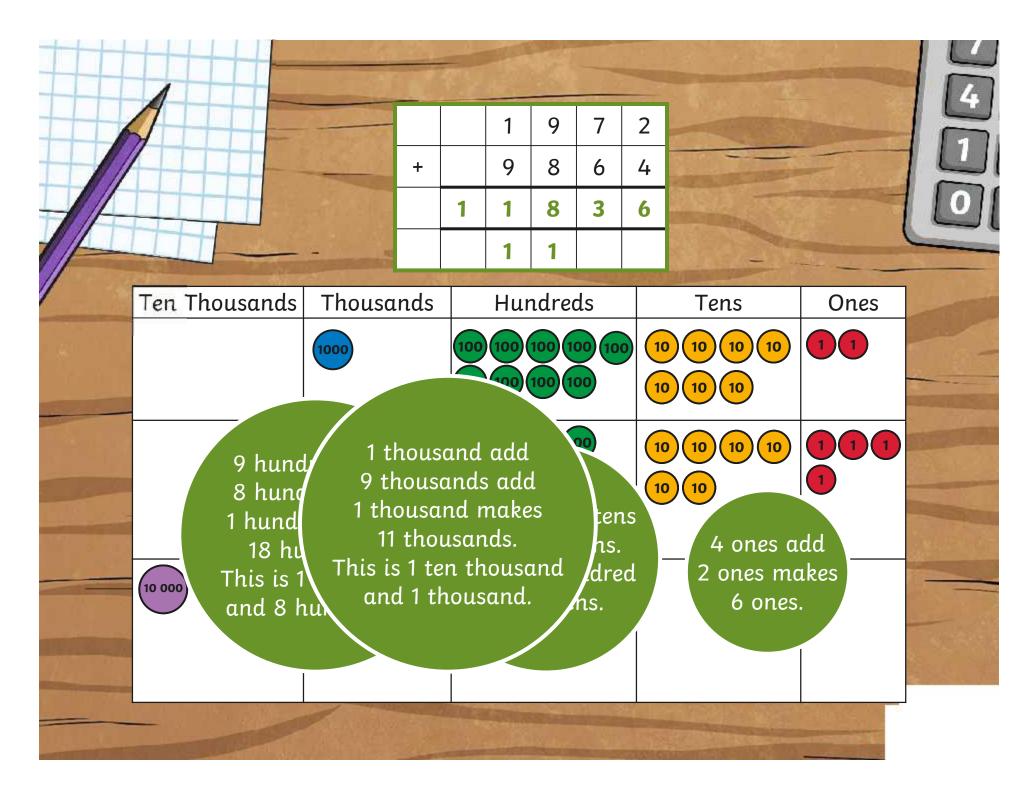
### Success Criteria

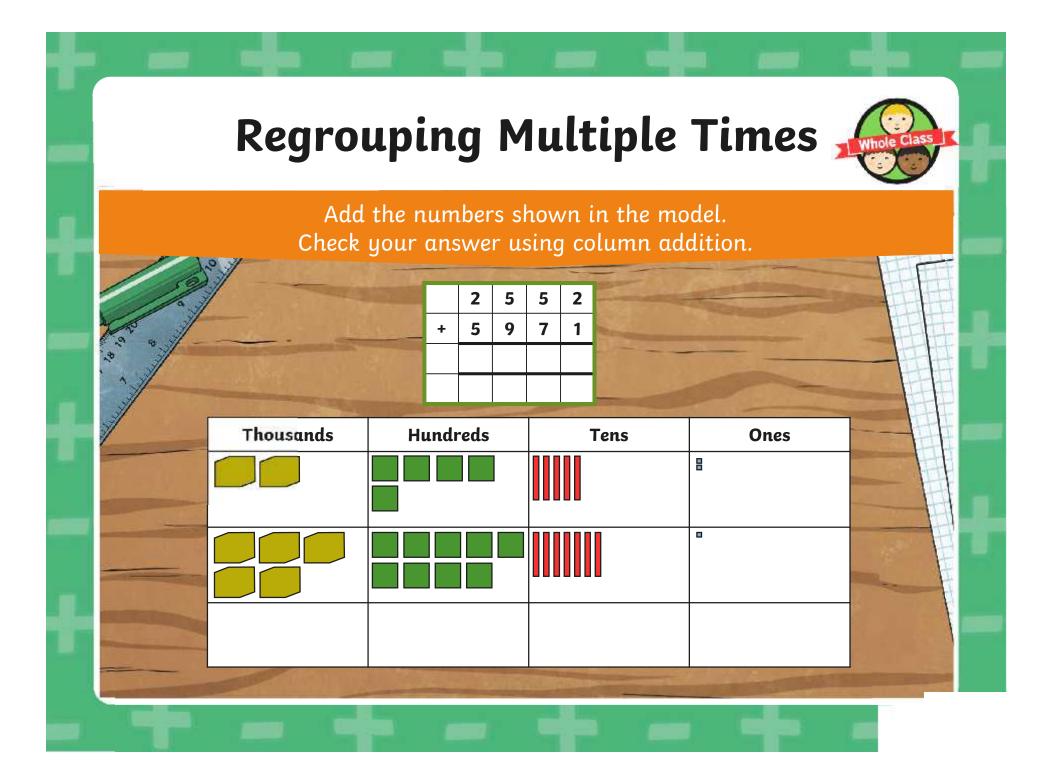
- I can add whole numbers with up to 4 digits.
- I can use formal written methods to calculate.
- I can explain why regrouping is necessary in written calculations.
- I can regroup more than once when using formal written methods of addition.

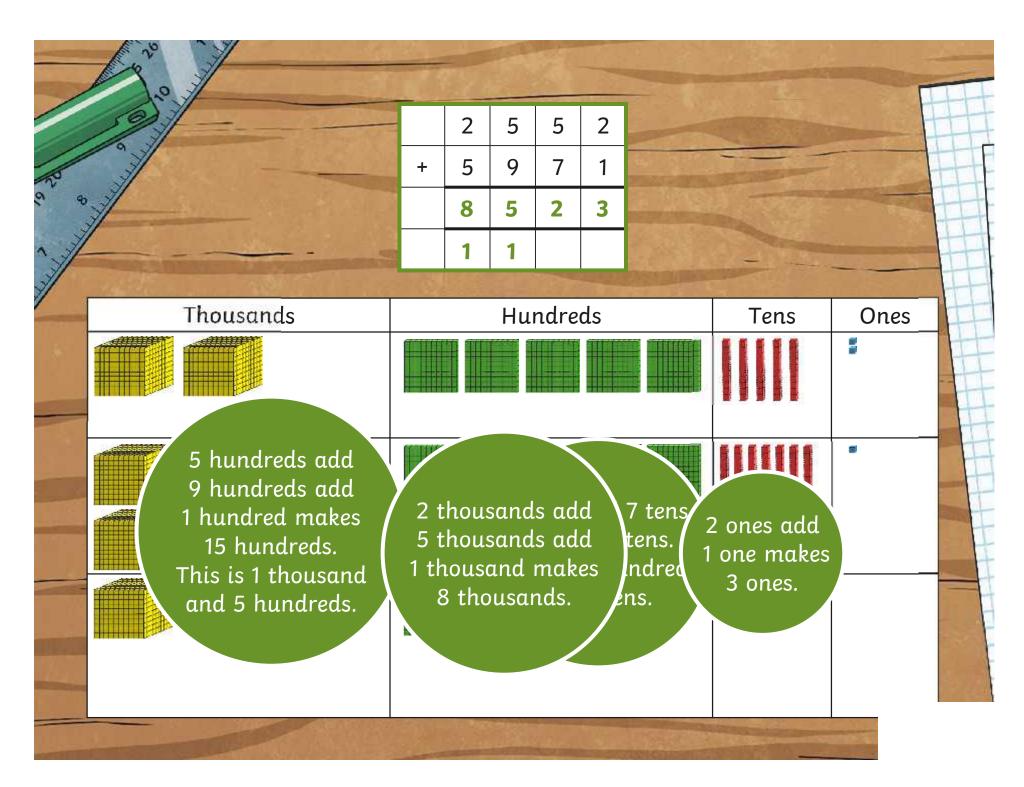


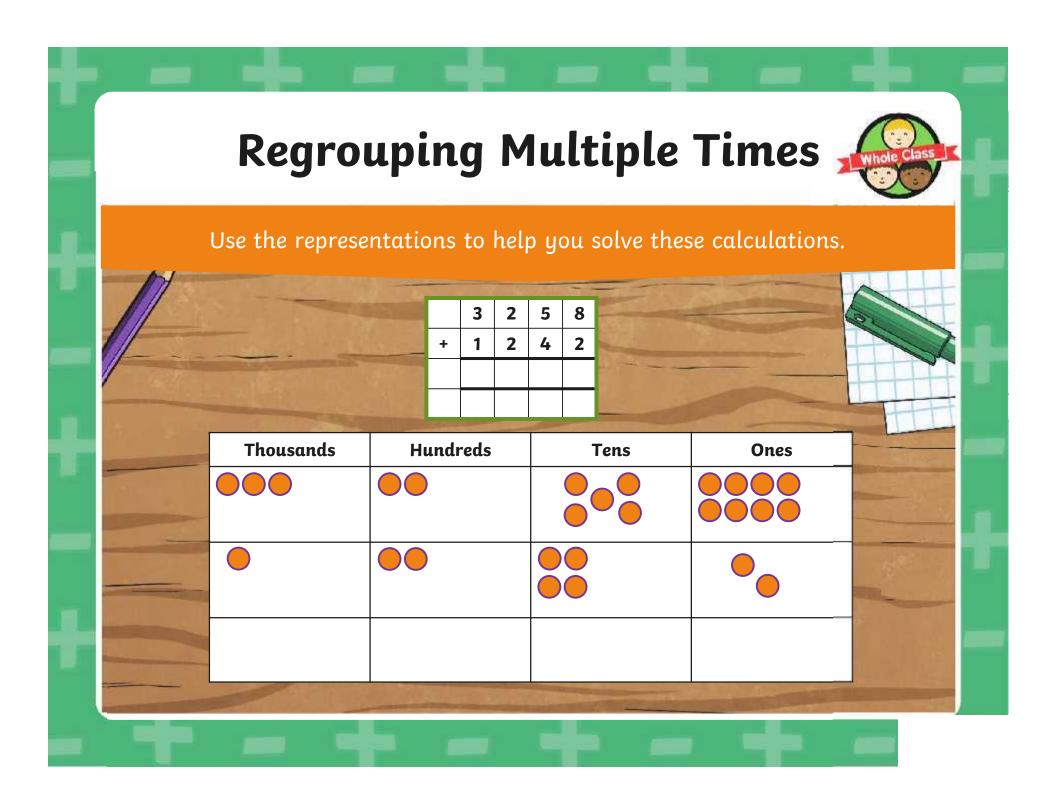


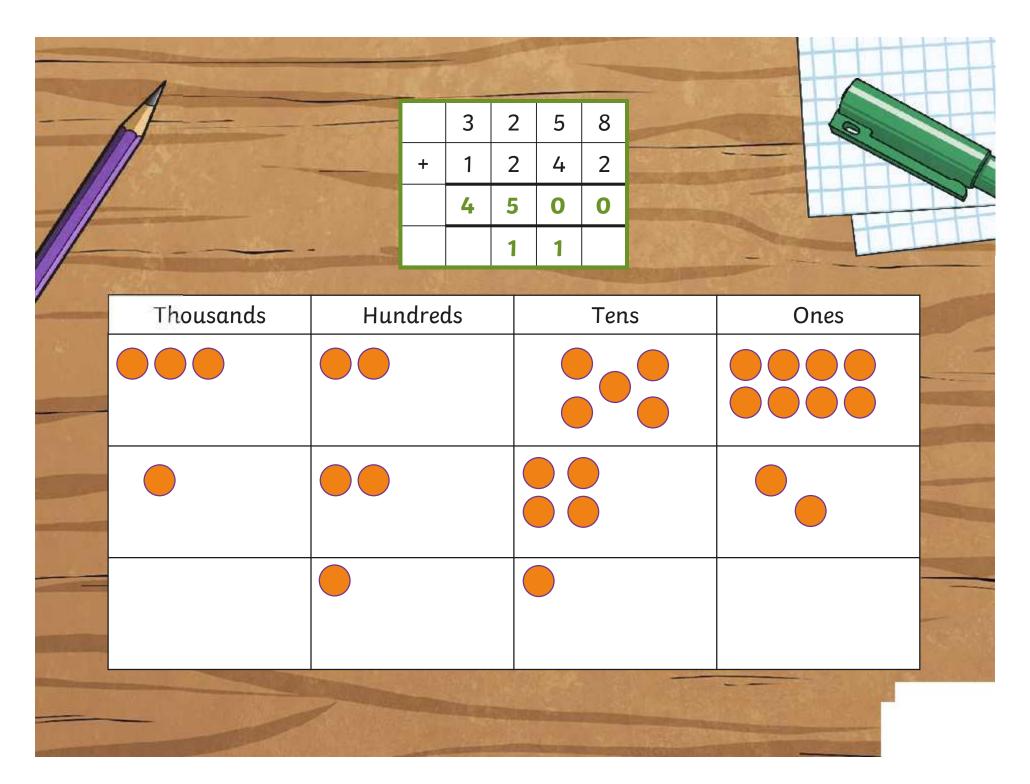












## Time to Regroup



Choose a section and answer the questions.

Remember to regroup where necessary.

	*	**	***
1	1119 + 1231	1779 + 1231	1202 + 9808
2	2748 + 1161	2748 + 2979	7898 + 9909
3	1805 + 2229	1115 + 2999	7999 + 9898

#### Challenge

Pick 3 of the 4-digit numbers and add them.
What are the smallest and greatest possible sums of 3 numbers?

## Time to Regroup - Answers

	_				-				-								
1.		1	1	1	9	1.		1	7	7	9	1.		1	2	0	2
	+	1	2	3	1		+	1	2	3	1		+	9	8	0	8
		2	3	5	0			3	0	1	0		1	1	0	1	0
				1				1	1	1				1		1	
2.		2	7	4	8	2.		2	7	4	8	2.		7	8	9	8
	+	1	1	6	1		+	2	9	7	9		+	9	9	0	9
		3	9	0	9			5	7	2	7		1	7	8	0	7
			1					1	1	1				1	1	1	
3.		1	8	0	5	3.		1	1	1	5	3.		7	9	9	9
	+	2	2	2	9		+	2	9	9	9		+	9	8	9	8
		4	0	3	4			4	1	1	4		1	7	8	9	7
		1		1				1	1	1				1	1	1	

### Challenge:

The smallest possible sum of 3 numbers is 3395.

The largest possible sum of 3 numbers is 29 615.

## Flugtag



Flugtag is an event in which competitors attempt to fly their homemade human-powered flying machines. It began in Vienna in 1992 but now happens in 35 countries around the world. The machines, with their pilots, are launched from a 9m-high pier into the water.



## Flugtag



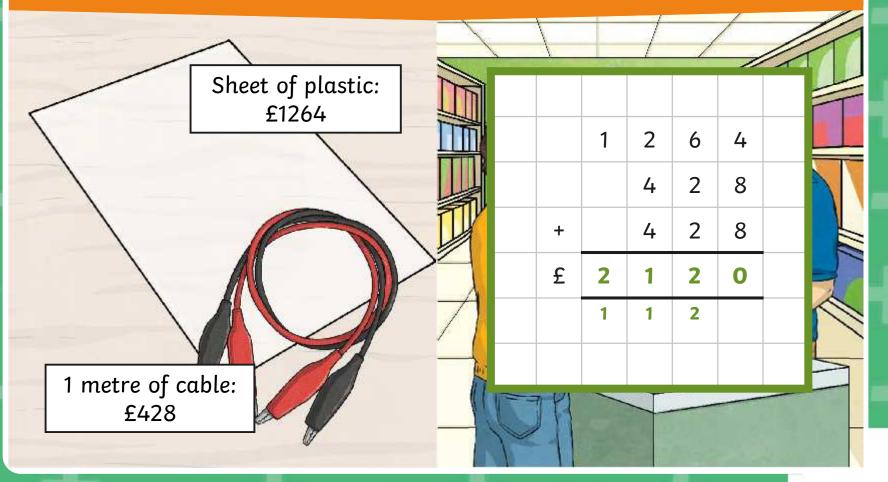
Each competitor has to purchase materials to build their flying machine. Can you work out the cost for each flying machine to be created?



### Materials



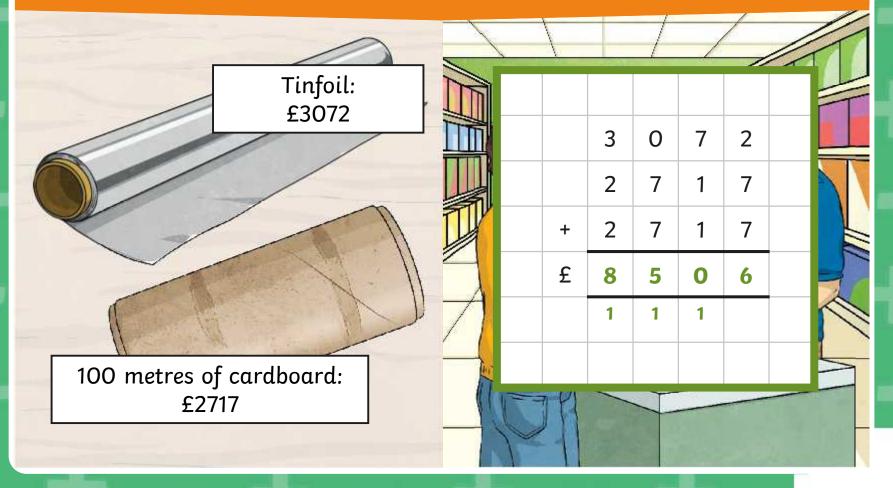
What is the total cost for a sheet of plastic and 2 metres of cable?



### Materials

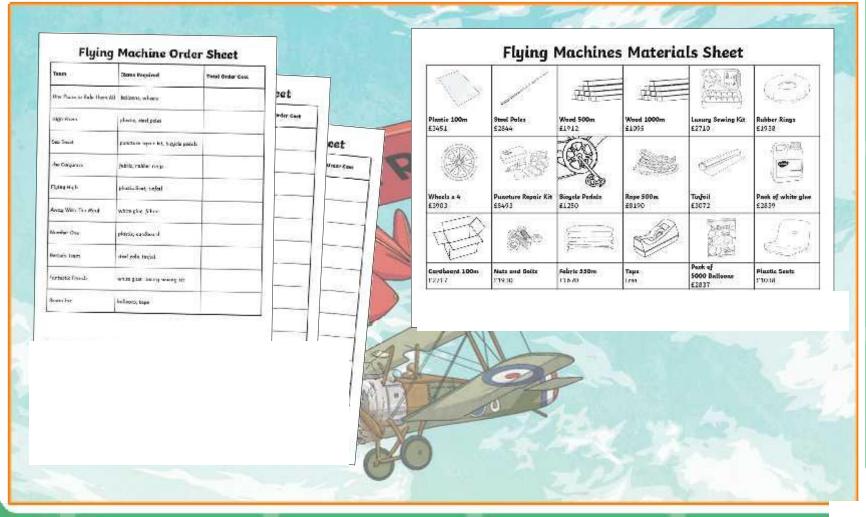


What is the total cost for tinfoil and 200 metres of cardboard?



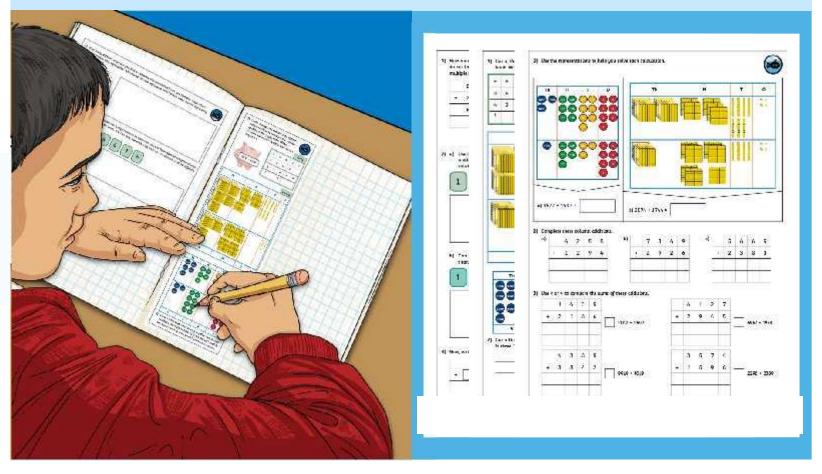
# Flying Machines





#### Diving into Mastery

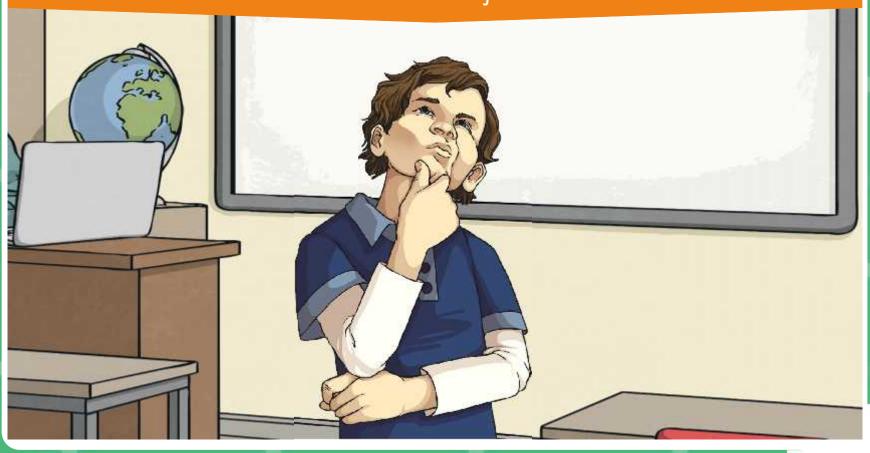




## **Question Time**



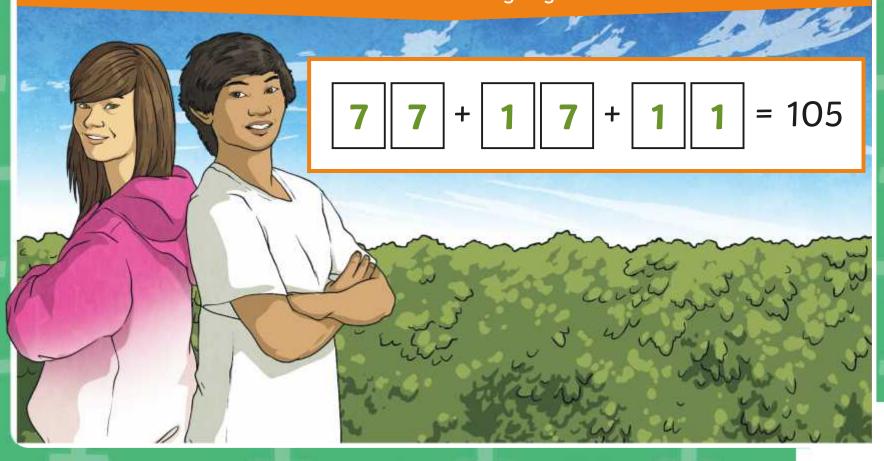
Where can you use this skill in other areas of mathematics or in other subjects?



## **Question Time**



The total is 105. Each missing digit is either a 1 or a 7. Write in the missing digits.



## **Question Time**



What numbers could go in the blank spaces? Is there more than one possible combination?

Yes, there is more than one possible combination.

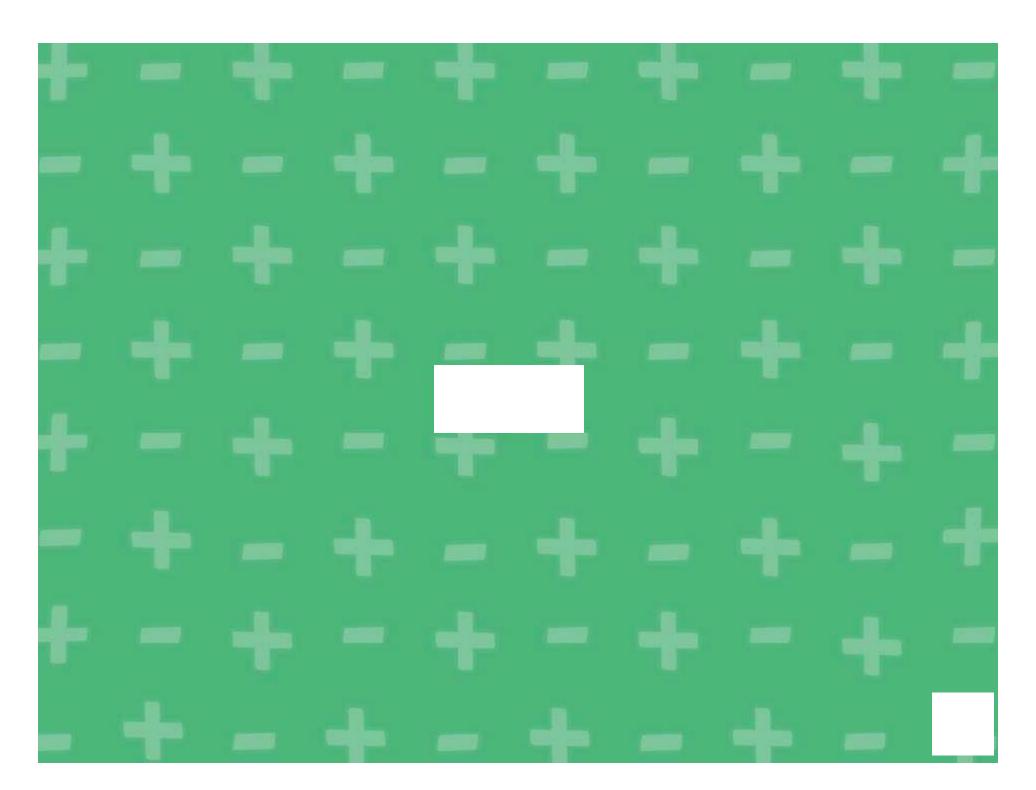
### Aim



• To add 4-digit numbers with multiple regroupings.

### Success Criteria

- I can add whole numbers with up to 4 digits.
- I can use formal written methods to calculate.
- I can explain why regrouping is necessary in written calculations.
- I can regroup more than once when using formal written methods of addition.



Aim: To add 4-digit numbers with multiple regroupings.				Date:					
				Delive	ered By:		Suppo	ort:	
Success Criteria	Me	Friend	Teacher	Т	PPA	s	I	AL	GP
I can add whole numbers with up to 4 digits.				Notes/Evidence					
I can use formal written methods to calculate.									
I can explain why regrouping is necessary in written calculations.									
I can regroup more than once when using formal written methods of addition.									
Next Steps									
J									
J									

Т	Teacher	I	Independent
PPA	Planning, Preparation and Assessment	AL	Adult Led
S	Supply	GP	Guided Practice

Aim: To add 4-digit numbers with multiple regroupings.	Aim: To add 4-digit numbers with multiple regroupings.						Date:				
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Next Steps											
J											
J											

Т	Teacher	I	Independent
PPA	Planning, Preparation and Assessment	AL	Adult Led
S	Supply	GP	Guided Practice

1) a) 5214

b) 4318



2) a)

	4	2	5	8
+	1	2	9	4
				_
	5	5	5	2

b)

	7	3	4	9
+	2	9	2	6
		_	_	_
1	0	2	7	5

c)

		8	0	5	0	
	+	2	3	8	1	
)		5	6	6	9	

3)

9969 + 1069 = **11 038** 

6127 + 2945 = **9072** 

1) Haaran's calculation is correct. Carla's column addition is incorrect: the digits have not been aligned in the correct columns. Ramon's base ten calculation is not correct: there has been no regrouping of the 13 hundreds into 3 hundreds and 1 thousand or of the 11 ones into 1 ten and 1 one. The answer to the calculation is 9381 and should be written as:



	5	5	7	2
+	3	8	0	9
	9	3	8	1
	1		1	

2) Carla is not correct: it is possible to need to regroup for each column of an addition calculation. For example, 3789 + 9542 would require regrouping in every column, including the thousands, to make a 5-digit answer.

1) There are 10 possible ways to complete the calculation:

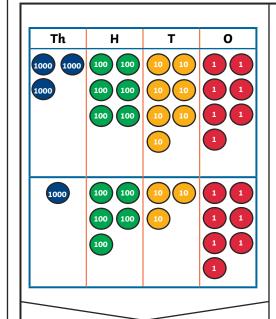


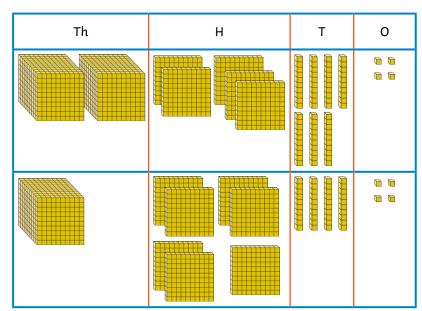
No Regrouping	Regrouping Once	Regrouping Multiple Times
There are no calculations involving no regrouping as the hundreds column will always require some regrouping.	5833 + 2310 = 8143 5833 + 2311 = 8144 5833 + 2312 = 8145 5833 + 2313 = 8146 5833 + 2314 = 8147 5833 + 2315 = 8148 5833 + 2316 = 8149	5823 + 2317 = 8140 5823 + 2318 = 8141 5823 + 2319 = 8142

- 2) a) There are many possibilities. Here are some examples: 5678 + 1432, 1678 + 5432, 5478 + 1632, 5638 + 1472, 5672 + 1438, 5438 + 1672, 5472 + 1638, 5768 + 1342, 5368 + 1742, 5748 + 1362, 5742 + 1368
  - b) It is possible. Here is one solution where only the ones digits would be regrouped into a ten: 4456 + 3316 + 1225

1) Use the representations to help you solve each calculation.

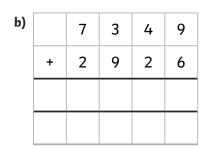






2) Complete these column additions.

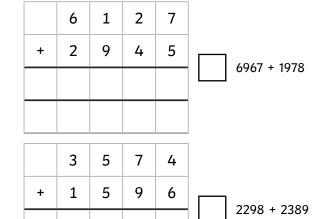
α)		4	2	5	8
	+	1	2	9	4



c)		5	6	6	9
	+	2	3	8	1

3) Use < or > to compare the sums of these additions.

	1	4	3	5	
+	2	1	8	6	2012 + 2400
					2012 + 2699



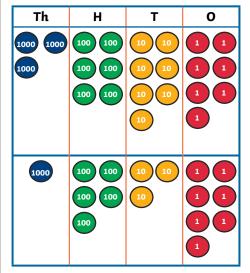


1) Carla, Ramon and Haaran used different representations to calculate the number of coins in this piggy bank. Whose answers are correct? Explain and correct any errors. Carla 5572 + 3809 Th Н Т Ramon Th Н Haaran 2) Carla thinks that when adding together two 4-digit numbers, the most number of times she will need to regroup is three. Is she correct? Prove your answer.

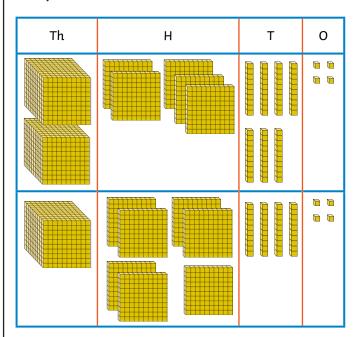
1)		incli	ude ar				find to co									
		5	8		3											
	+	2	3	1												
		8	1	4												
21	<b>~\</b> 11	- a + b -	امسيم	205.00	rda ba	ـــا	roato tu	o / digit		ora aa th	at whom		مرم ما دا	togoth	or using	the column
2)	m		l, regr													10 different
	SO	lutio	ns.									)				
	1	$\prod$	2		3	4	<b>J</b> 5		•	7	8					
		an yo an or		these	cards	to mal	e a calcu	ılation a	dding t	hree 4-	digit nu	mbers to	gethe	r witho	out regro	uping more
	LII	an or	ice:													
	1	$\int$	1		2	2	][3		3	4	4	5	儿	5	6	6
3)	Now,	write	a mis	sing ı	numb	er addi	tion for a	ı friend t	o solve	that i	าvolves r	egroupii	ıg mu	ltiple t	imes.	
	+															
						•										

1) Use the representations to help you solve each calculation.





**a)** 3677 + 1537 =



- **b)** 2574 + 1744 =
- 2) Complete these column additions.

a)		4	2	5	8
	+	1	2	9	4

)		7	3	4	9
	+	2	9	2	6

c)		5	6	6	9
	+	2	3	8	1

3) Use < or > to compare the sums of these additions.







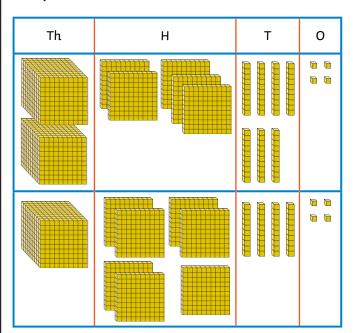
2298 + 2389

1) Use the representations to help you solve each calculation.



Th	Н	Т	0
1000	100 100	10 10 10 10 10 10	
1000	100 100	10 10	1 1 1 1 1 1

**a)** 3677 + 1537 =



- **b)** 2574 + 1744 =
- 2) Complete these column additions.

a)		4	2	5	8	b)		7	3	4	ç
	+	1	2	9	4		+	2	9	2	6

c)		5	6	6	9
	+	2	3	8	1

3) Use < or > to compare the sums of these additions.

1435 + 2186

2012 + 2699

4385 + 3842



9969 + 1069

6127 + 2945



6967 + 1978

_		_
		- 1

3574 + 1596 2298 + 2389

1) Carla, Ramon and Haaran used different representations to calculate the number of coins in this piggy bank. Whose answers are correct? Explain and correct Carla any errors. 5 5 7 2 3 9 8 0 2 4 3 6 6 5572 + 3809 Ramon Т Th Н 0 

			Haaran
Th	Н	Т	0
1000 1000	100 100	10 10	1 1
1000 1000	100 100	10 10	
1000	100	10 10	
		10	
1000 1000	100 100		1 1
1000	100 100		1 1
	100 100		1 1
	100 100		
			1
9	3	8	1

13

7

11

8

2) Carla thinks that when adding together two 4-digit numbers, the most number of times she will need to regroup is three. Is she correct? Prove your answer.  Carla, Ramon and Haaran used different representations to calculate the number of coins in this piggy bank. Whose answers are correct? Explain and correct any errors.



Carla



5	5	7	2
8	0	9	
3	6	6	2
	1		
	8	8 0	8 0 9

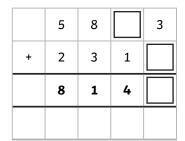
			Ro	amon
Th	Н	Т		О
8	13	7		11

			Haaran
Th	Н	Т	0
1000 1000	100 100	10 10	1 1
1000 1000	100	10 10	
1000 1000	100 100	10	1 1
1000	100 100		1 1
	100 100		
9	3	8	1
7	3	8	1

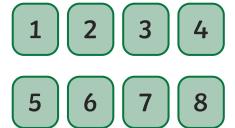
2) Carla thinks that when adding together two 4-digit numbers, the most number of times she will need to regroup is three. Is she correct? Prove your answer.

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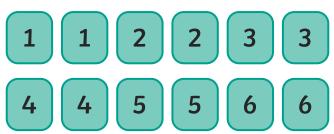
1) How many different ways can you find to complete this calculation? Can you find any ways which do not include any regrouping? Which ways involve regrouping once? Which ways involve regrouping multiple times?



2) a) Use the number cards below to create two 4-digit numbers so that when you add them together using the column method, regrouping happens three times. You can only use each card once per calculation. Find 10 different solutions.



**b)** Can you use these cards to make a calculation adding three 4-digit numbers together without regrouping more than once?

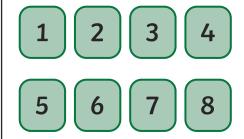


3) Now, write a missing number addition for a friend to solve that involves regrouping multiple times.

1) How many different ways can you find to complete this calculation? Can you find any ways which do not include any regrouping? Which ways involve regrouping multiple times?

+	5	8		3
	2	3	1	
	8	1	4	
			_	

2) a) Use the number cards below to create two 4-digit numbers so that when you add them together using the column method, regrouping happens three times. You can only use each card once per calculation. Find 10 different solutions.



**b)** Can you use these cards to make a calculation adding three 4-digit numbers together without regrouping more than once?



3) Now, write a missing number addition for a friend to solve that involves regrouping multiple times.

## Flying Machines Materials Sheet

Plastic 100m	Steel Poles	Wood 500m	Wood 1000m	Luxury Sewing Kit	Rubber Rings
£3451	£2844	£1912	£1095	£2710	£1938
	Constitution and Constitution of Constitution				Washable PVA
Wheels x 4	Puncture Repair Kit	Bicycle Pedals	Rope 500m	Tinfoil	Pack of white glue
£3903	£8493	£1250	£8190	£3072	£2839
				Bolloons	
Cardboard 100m £2717	Nuts and Bolts £1930	<b>Fabric 550m</b> £1670	<b>Tape</b> Free	Pack of 5000 Balloons £2837	Plastic Seats £1038

# Flying Machine Order Sheet

Team	Items Required	Total Order Cost
One Plane to Rule Them All	balloons, wheels	
High Fliers	plastic, steel poles	
Sea Beast	puncture repair kit, bicycle pedals	
The Conjurers	fabric, rubber rings	
Flying High	plastic seat, tinfoil	
Away With The Wind	white glue, fabric	
Number One	plastic, cardboard	
Bertie's Team	steel pole, tinfoil	
Fantastic French	white glue, luxury sewing kit	
Bruno Inc	balloons, tape	

# Flying Machine Order Sheet **Answers**

Team	Items Required	Total Order Cost
One Plane to Rule Them All	balloons, wheels	£6740
High Fliers	plastic, steel poles	£6295
Sea Beast	puncture repair kit, bicycle pedals	£9743
The Conjurers	fabric, rubber rings	£3608
Flying High	plastic seat, tinfoil	£4110
Away With The Wind	white glue, fabric	£4509
Number One	plastic, cardboard	£6168
Bertie's Team	steel pole, tinfoil	£5916
Fantastic French	white glue, luxury sewing kit	£5549
Bruno Inc	balloons, tape	£2837

# Flying Machine Order Sheet

Team	Items Required	Total Order Cost
One Plane to Rule Them All	balloons, wheels	
High Fliers	plastic, steel poles	
Sea Beast	puncture repair kit, bicycle pedals	
The Conjurers	fabric, luxury sewing kit	
Flying High	plastic seat, tinfoil	
Away With The Wind	white glue, fabric, nuts and bolts	
Number One	plastic, cardboard, 1000m wood	
Bertie's Team	steel pole, tinfoil, bicycle pedals	
Fantastic French	white glue, luxury sewing kit, plastic seats	
Bruno Inc	balloons, fabric, nuts and bolts, wheels	

# Flying Machine Order Sheet **Answers**

Team	Items Required	Total Order Cost
One Plane to Rule Them All	balloons, wheels	£6740
High Fliers	plastic, steel poles	£6295
Sea Beast	puncture repair kit, bicycle pedals	£9743
The Conjurers	fabric, luxury sewing kit	£4380
Flying High	plastic seat, tinfoil	£4110
Away With The Wind	white glue, fabric, nuts and bolts	£6439
Number One	plastic, cardboard, 1000m wood	£7263
Bertie's Team	steel pole, tinfoil, bicycle pedals	£7166
Fantastic French	white glue, luxury sewing kit, plastic seats	£6587
Bruno Inc	balloons, fabric, nuts and bolts, wheels	£10 340

# Flying Machine Order Sheet

Team	Items Required	Total Order Cost
One Plane to Rule Them All	plastic, cardboard, 1000m wood	
High Fliers	steel pole, tinfoil, bicycle pedals	
Sea Beast	white glue, luxury sewing kit, plastic seats	
The Conjurers	balloons, fabric, nuts and bolts, wheels	
Flying High	wheels, rubber rings, white glue	
Away With The Wind	1000m rope, 1000m wood	
Number One	300m plastic, 5000 balloons, 1000m rope	
Bertie's Team	Ordered 2 items with a total cost under £2000. What might they have ordered?	
Fantastic French	Ordered 3 items with a total cost under £3000. What might they have ordered?	
Bruno Inc	Ordered 4 items with a total cost under £4000. What might they have ordered?	

# Flying Machine Order Sheet **Answers**

Team	Items Required	Total Order Cost
One Plane to Rule Them All	plastic, cardboard, 1000m wood	£7263
High Fliers	steel pole, tinfoil, bicycle pedals	£7166
Sea Beast	white glue, luxury sewing kit, plastic seats	£6587
The Conjurers	balloons, fabric, nuts and bolts, wheels	£10 340
Flying High	wheels, rubber rings, white glue	£8680
Away With The Wind	1000m rope, 1000m wood	£17 475
Number One	300m plastic, 5000 balloons, 1000m rope	£29 570
Bertie's Team	Ordered 2 items with a total cost under £2000. What might they have ordered?	Any item costing less than £2000 plus tape will produce a bill under £2000.
Fantastic French	Ordered 3 items with a total cost under £3000. What might they have ordered?	Fabric, bicycle pedals and tape would produce a bill under £3000.
Bruno Inc	Ordered 4 items with a total cost under £4000. What might they have ordered?	Plastic seats, bicycle pedals, 1000m of wood and tape would produce a bill under £4000.

Addition and Subtraction | Add 4-Digit Numbers with Multiple Regroupings

. 3	 1 3
To add 4-digit numbers with multiple regroupings.	
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