# 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. |

## Key/New Words:

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

Resources:
Lesson Pack
Place value counters
Place value grids
Interlocking cubes or base ten blocks

## 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 |
| They two 4-digit numbers. |
| Tnterlocking 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 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.

## Exploreit

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.


## Maths

## Addition and Subtraction

## Add LaoDigit Numbers with Multiple Regroupings



## 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.


## Remember It

Use the representations to help you solve the calculation.


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## Regrouping Multiple Times

The model and calculation show how multiple regroupings are made when adding four-digit numbers.



## Regrouping Multiple Times

Add the numbers shown in the model. Check your answer using column addition.



## Regrouping Multiple Times

Use the representations to help you solve these calculations.



## 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



## Challenge:

The smallest possible sum of 3 numbers is 3395 .

The largest possible sum of 3 numbers is 29615 .

## 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 9 m -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?


1 metre of cable: £428

## Materials

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


## Flying Machines



## Diving into Mastery

Dive in by completing your own activity!


## 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?

$$
\square+2848=4 \square 79
$$

Yes, there is more than one possible combination.

$$
\begin{array}{ll}
1231+2848=4079 & 1731+2848=4579 \\
1331+2848=4179 & 1831+2848=4679 \\
1431+2848=4279 & 1931+2848=4779 \\
1531+2848=4379 & 2031+2848=4879 \\
1631+2848=4479 & 2131+2848=4979
\end{array}
$$

## Aim

- To add 4-digit numbers with multiple regroupings.


## Success Criteria

- I can add whole numbers with up to 4 digits.
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| Aim: To add 4-digit numbers with multiple regroupings. |  |  |  | Date: |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | Delivered By: |  |  | Support: |  |  |
| Success Criteria | Me | Friend | Teacher | T | 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

| T | Teacher | I | Independent |
| :--- | :--- | :--- | :--- |
| PPA | Planning, Preparation and Assessment | AL | Adult Led |
| S | Supply | GP | Guided Practice |


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1) a) 5214
b) $\mathbf{4 3 1 8}$
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)

|  | 5 | 6 | 6 | 9 |
| :---: | :---: | :---: | :---: | :---: |
| + | 2 | 3 | 8 | 1 |
|  | $\mathbf{8}$ | $\mathbf{0}$ | 5 | $\mathbf{0}$ |
|  |  |  |  |  |

3) $\mathbf{1 4 3 5}+2186=\mathbf{3 6 2 1}$ $\square$ $2012+2699=4711$
$4385+3842=8227 \quad<\quad 9969+1069=11038$
$6127+2945=9072 \quad>\quad 6967+1978=8945$
$3574+1596=5170$
$2298+2389=4687$
4) 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.
3) There are $\mathbf{1 0}$ possible ways to complete the calculation:

| No Regrouping | Regrouping Once | Regrouping Multiple <br> Times |
| :--- | :--- | :--- |
| There are no calculations <br> involving no regrouping <br> as the hundreds column <br> will always require some <br> regrouping. | $5833+2310=8143$ | $5833+2317=8140$ |
|  | $5833+2312=8145$ | $583+2313=8146$ |
|  | $5833+2314=8147$ |  |
|  | $5833+2315=8148$ |  |
|  | $5833+2316=8149$ |  |

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.
a)

|  | 4 | 2 | 5 | 8 |
| :---: | :---: | :---: | :---: | :---: |
| + | 1 | 2 | 9 | 4 |
|  |  |  |  |  |
|  |  |  |  |  |

b)

c)

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

|  | 1 | 4 | 3 | 5 |
| :--- | :--- | :--- | :--- | :--- |
| + | 2 | 1 | 8 | 6 |
|  |  |  |  |  |
|  |  |  |  |  | $\quad$| $2012+2699$ |
| :--- |



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.

| + | 5 | 5 | 7 | 2 |
| :---: | :---: | :---: | :---: | :---: |
| 3 | 8 | 0 | 9 |  |
| $\mathbf{4}$ | $\mathbf{3}$ | $\mathbf{6}$ | $\mathbf{6}$ | $\mathbf{2}$ |
| $\mathbf{1}$ |  | $\mathbf{1}$ |  |  |



| Th | H | T | 0 |
| :---: | :---: | :---: | :---: |
|  |  |  | $\begin{aligned} & \square \\ & \square \end{aligned}$ |
|  |  |  |  |
| 8 | 13 | 7 | 11 |


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.
$\qquad$
$\qquad$
$\qquad$
$\qquad$

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.

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

a) $3677+1537=$

| Th | H | T | 0 |
| :---: | :---: | :---: | :---: |
|  |  |  | $\begin{aligned} & \square \square \\ & \square \square \end{aligned}$ |
|  |  |  | $\begin{aligned} & \square \square \\ & \square \square \end{aligned}$ |

b) $2574+1744=$
2) Complete these column additions.
a) $\qquad$ b)
$\left.\begin{array}{|l|l|l|l|}\hline 7 & 3 & 4 & 9 \\ \hline+ & 2 & 9 & 2\end{array}\right) 6$.

|  | 5 | 6 | 6 | 9 |
| ---: | :--- | :--- | :--- | :--- |
| + | 2 | 3 | 8 | 1 |
|  |  |  |  |  |
|  |  |  |  |  |

3) Use < or > to compare the sums of these additions.
$1435+2186 \quad 2012+2699$
$4385+3842 \square 9969+1069$
$6127+2945 \square 2967+1978$
$3574+1596 \square \square$
4) Use the representations to help you solve each calculation.

a) $3677+1537=$

| Th | H | T | 0 |
| :---: | :---: | :---: | :---: |
|  |  |  | $\begin{aligned} & \square \\ & \square \end{aligned}$ |
|  |  |  | $\begin{aligned} & \square \square \\ & \square \square \end{aligned}$ |

b) $2574+1744=$
2) Complete these column additions.
a) $\qquad$ b) $\qquad$ c)

| 5 | 6 | 6 | 9 |
| ---: | :--- | :--- | :--- |
| + | 2 | 3 | 8 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

3) Use < or > to compare the sums of these additions.
$1435+2186 \square 2012+2699$
$4385+3842 \square 9969+1069$
$6127+2945 \square 6967+1978$
$3574+1596 \square 2298+2389$
4) 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.


Ramon

| Th | H | T | 0 |
| :---: | :---: | :---: | :---: |
|  |  |  | $\pm$ |
|  |  |  |  |
| 8 | 13 | 7 | 11 |


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) 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.



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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4) 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?

5) Now, write a missing number addition for a friend to solve that involves regrouping multiple times.
6) 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?

| + | 5 | 8 |  | 3 |
| :---: | :---: | :---: | :---: | :---: |
|  | 2 | 3 | 1 | $\square$ |
|  | $\mathbf{8}$ | $\mathbf{1}$ | 4 | $\square$ |
|  |  |  |  |  |

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 £3451 | Steel Poles £2844 | Wood 500m £1912 | Wood 1000m £1095 | Luxury Sewing Kit $£ 2710$ | Rubber Rings £1938 |
|  |  |  |  |  |  |
| $\begin{aligned} & \text { Wheels x } 4 \\ & £ 3903 \end{aligned}$ | Puncture Repair Kit £8493 | Bicycle Pedals $£ 1250$ | Rope 500m £8190 | Tinfoil <br> £3072 | Pack of white glue $£ 2839$ |
|  |  |  |  |  |  |
| Cardboard 100m \|£2717 | Nuts and Bolts £1930 | $\begin{aligned} & \text { Fabric 550m } \\ & \text { £1670 } \end{aligned}$ | Tape <br> 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, 1000 m 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, 1000 m 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, 1000 m 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 | 1000 m rope, 1000 m 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 | 1000 m rope, 1000 m wood | £17475 |
| Number One | 300 m 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, 1000 m of wood and tape would produce a bill under $£ 4000$. |

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