# Mathematics Mastery

**At home materials**

**Year 2 Weeks 3-5**
**Addition and subtraction**

**Ark**

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Focus 3: Understanding the relationship between comparative addition and subtraction

**Printable resources can be found at the back of the pack.**

# Guidance

## Using the at home materials

This pack contains a series of tasks for you to experience with your child. Each session has been carefully designed to develop number sense and support understanding. Provide lots of opportunities to get children to use mathematical vocabulary and explain their reasoning and reveal their thinking.

We have purposefully selected these short tasks, which should last around 15 minutes, so that you can fit them around your daily lives.
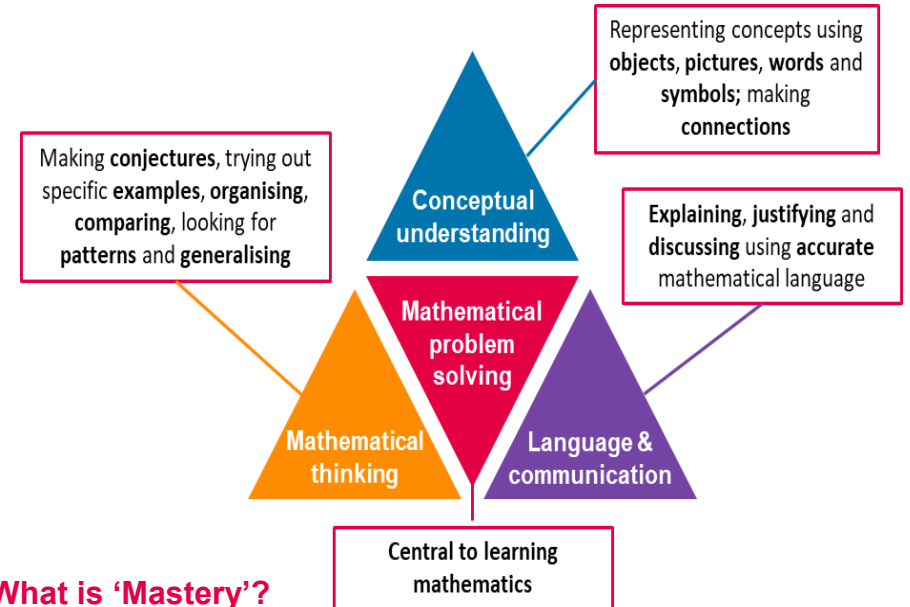
Each session begins with a short adult guided input, followed by a suggested task to complete and a suggested task to explore, which will take their learning deeper.

## Success for all

At school we believe <u>all</u> pupils can achieve success in maths. We encourage pupils to have a belief that effort leads to success and that challenges are opportunities to learn.

Here are a few tips to encourage your children at home with maths:

✓Talk to your children about everyday maths
✓Play games with them
✓Value mistakes as learning opportunities
✓Recognise that there is more than one way to work things out
✓Praise children for effort over outcome
✓Avoid saying things like "I'm useless at maths"

Representing concepts using **objects**, **pictures**, **words** and **symbols**; making **connections**

Making **conjectures**, trying out specific **examples**, **organising**, **comparing**, looking for **patterns** and **generalising**

Conceptual understanding

Explaining, **justifying** and **discussing** using **accurate** mathematical language

Mathematical problem solving

Mathematical thinking

Language & communication

Central to learning mathematics

## What is 'Mastery'?

The 'mastery approach' to teaching mathematics is the underlying principle of Mathematics Mastery. Instead of learning mathematical procedures by rote, we want your child to build a deep understanding of concepts which will enable them to apply their learning in different situations. To achieve this we aim to develop pupils' **Conceptual Understanding, Mathematical Thinking** and **Language and Communication** (see diagram).

## Addition and Subtraction Concepts: Combining and partitioning

Combining and partitioning are the inverse of each other and there fore these concepts for addition and subtraction should be taught alongside each other. Combining is where two or more sets are combined to form a group. Partitioning involves placing a group or quantity into two or more sub-sets or sub-quantities.

Teachers are expected to change the example according to the numbers that the pupils are familiar with.  For example, Year 1 teachers will provide examples that involve numbers within 20 after Unit 5 (Addition and subtraction within 20).

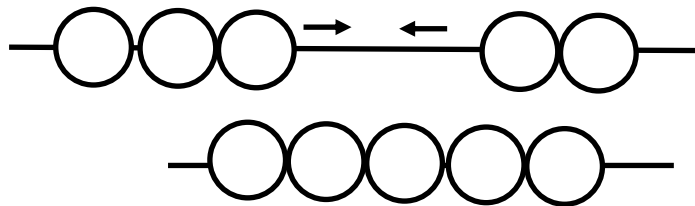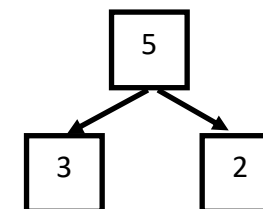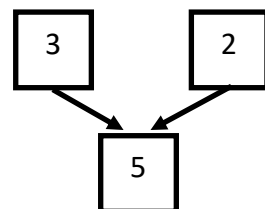|  | Combining | Partitioning |
|---|---|---|
| Word problem | Jess has three books about animals and two books about plants. How many books does Jess have alto- | Jess has five books. All of the books are about plants or about animals. Two of Jess' books are about animals. |
| Using cubes | | |
| Using a bead string | | |
| Making links to the part-part whole model | | |
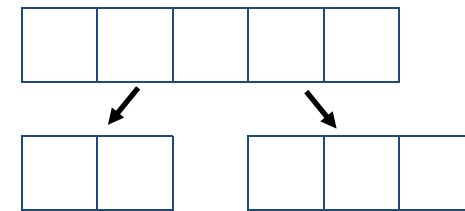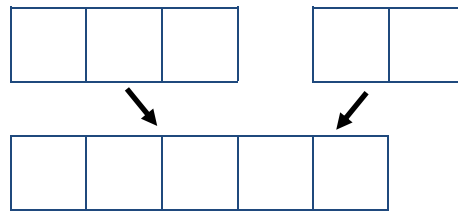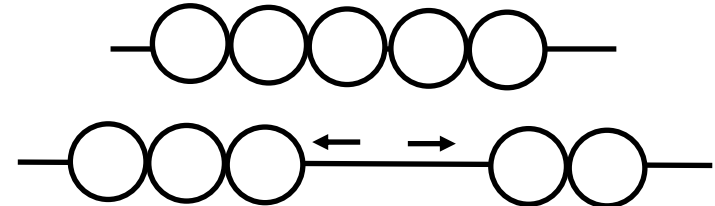
# Addition and Subtraction Concepts: Combining and partitioning

To understand the concept of addition as combining sets

## About the maths

This concept focuses on combining two or more quantities to form a larger quantity.

## Vocabulary

Part, whole, group, set, combine

How many in each

How many altogether

## Resources

Counters in two different colours

Pictorial representations for exploring combining groups

## Getting started

Place some counters on a piece of A4 paper (three red and two yellow).

Ask pupils to talk about what is on the paper and discuss how they are the same and how they are different.

*Through this discussion pupils should recognise that they are different colours and that they are all counters.*

Ask pupils to sort the counters into two groups.

Ask pupils to put the counters together and draw around all the counters on the paper.

Highlight that they had two sets of counters and they **combined** the sets of counters to create one group of counters, showing how many there were **altogether**.
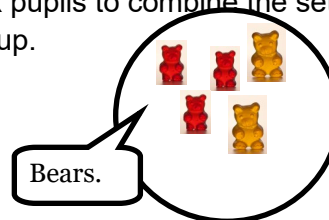
## Task for pupils

Provide images of two groups of related objects sorted into two sets.

E.g



Red bears          Yellow bears
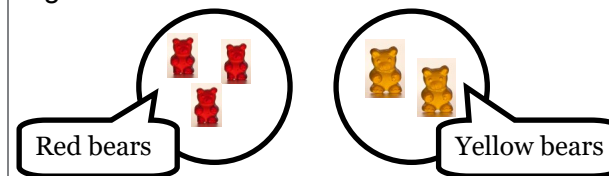
Ask pupils to label each set (this can be done orally) and use counters to represent the sets of bears.

Ask pupils to combine the sets to create one group.



Bears.

Ask pupils label each set (this can be done orally).

## Deepening understanding

Provide images of the two groups of related objects sorted into two sets.

Ask pupils to say how many there are in each group. Ask: How many are there in each part?

E.g. "There are three red bears. There are two yellow bears."

Ask pupils to combine the sets to create one group and say how many there are altogether.

Ask: What is the whole?

E.g. "There are five bears altogether.

Ask pupils to explore combining the groups in a different order.

E.g. "There are two red bears. There are three yellow bears. There are five bears altogether.

*Pupils should explore this concept using manipulatives such as counters.*

**Addition and Subtraction Concepts: Combining and partitioning**

To understand the concept of subtraction as partitioning into subsets

| **About the maths** | **Vocabulary** | **Resources** |
|---|---|---|
| This concept focuses on partitioning a group of related objects into subsets in order to find out how many there are in one of the subsets. | Part, whole, group, set, partition<br><br>How many altogether<br><br>How many in each | Counters in two different colours<br><br>Pictorial representations for exploring combining groups |

**Getting started**

Place some counters (three red and two yellow) on a piece of A4 paper in no particular arrangement. Highlight that they are all counters and label the page with 'counters' and that you want to **partition** the counters to show which counters are yellow.

Draw a ring on the A4 page and label it 'yellow counters' and select a pupil to create a subset of yellow counters.
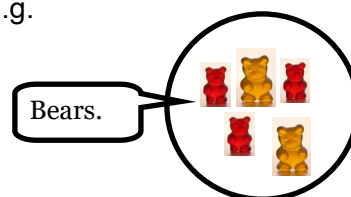
Repeat, but this time, label the ring with 'red counters' and select a pupil to create a subset of red counters.

Highlight that they had one group of counters and they **partitioned** the group of counters into subsets to show how many there were in each **subset**.
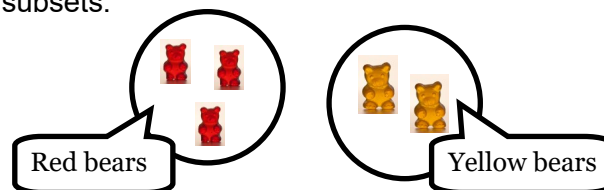
**Task for pupils**

Provide images of a group of related objects.
E.g.


Bears.

Ask pupils label the group (this can be done orally) and use counters to represent the group of bears.

Ask pupils to partition the group to create two subsets.


Red bears          Yellow bears

Ask pupils label each set (this can be done orally).

**Deepening understanding**

Provide images of the group of related objects sorted into two sets.

Ask pupils to say how many there are altogether, how many there are in one of the subsets and how many there are in the other subset.

E.g. "There are five bears altogether. Three of the bears are red. Two of the bears are yellow."

"Five is the whole. Three and two are the parts."

Ask pupils to talk about the sets in a different order.

E.g. "There are five bears altogether. Two of the bears are yellow. Three of the bears are red."

"Five is the whole. Two and three are the parts."

*Pupils should explore this concept using manipulatives such as counters.*

# Addition and Subtraction Concepts: Combining and partitioning

To explore the inverse relationship between combining and partitioning

## About the maths

The concept of combining and partitioning are inverse operations and therefore it is important that children have the opportunity to compare and explore these concepts together.

## Vocabulary

Part, whole, group, set, partition

How many altogether

How many in each

## Resources

Counters in two different colours

## Getting started

Place some counters on a piece of A4 paper (three red and two yellow) sorted into two sets.

Explore combining sets and partitioning a group to illustrate the inverse relationship.

Discussion points:

When the sets are combined, it becomes one group of red and yellow bears.

When the yellow bears are partitioned into a sub set, there is a set of red bears left.

When the yellow bears are combined with the red bears. There is a group of red and yellow bears.

When the red bears are partitioned into a sub set, there is a set of yellow bears.

When the red bears are combined with the yellow bears. There is a group of yellow and red bears.
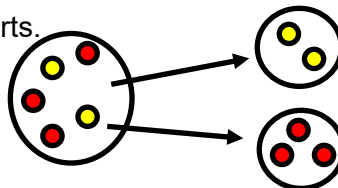
## Task for pupils

Provide pupils with three red counters and two yellow counters.

Ask pupils to explore combining sets and partitioning the group of counters and talk about the sets, without talking about the number in each set.

E.g.

There are some red counters and some yellow counters. When combined there is one group of red and yellow counters. This is the whole.

There is a group of red and yellow counters. When I partition the yellow counters into a set, I also have a set of red counters. These are the parts.

## Deepening understanding

Provide pupils with three red counters and two yellow counters.

Ask pupils to explore combining sets and partitioning the group of counters and talk through how many there are altogether, how many there are in one subset, and how many there are in the other subset.

E.g. Two and three are the parts. Five is the whole.

There are three red counters and two yellow counters. When combined there are five counters altogether.

There is a group of five counters. When I partition the two yellow counters, I also have a set of three red counters.
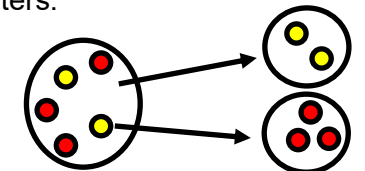
# Addition and Subtraction Concepts: Augmenting and reducing

Augmentation and reduction are the inverse of each other and therefore these concepts for addition and subtraction should be taught alongside each other. Augmentation of one quantity involves adding to a quantity. Reduction involves reducing the value of a quantity and is often referred to as 'take away'. It is important that the language of 'take away' is only used with this concept for subtraction and not for other concepts for subtraction.

Teachers are expected to change the example according to the numbers that the pupils are familiar with. For example, Year 1 teachers will provide examples that involve numbers within 20 after Unit 5 (Addition and subtraction within 20).
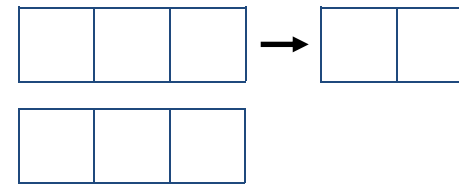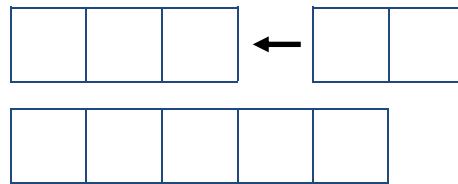
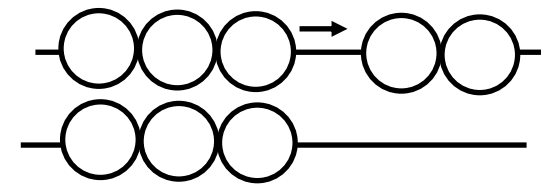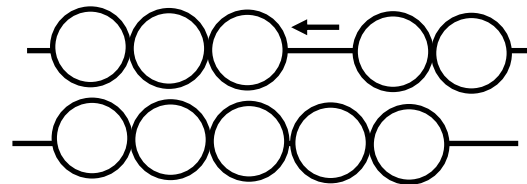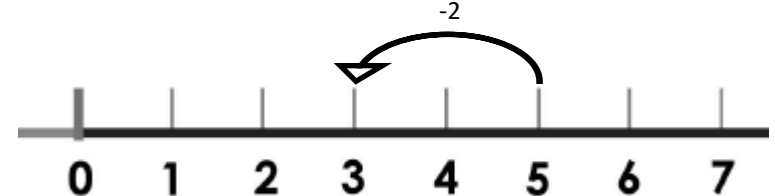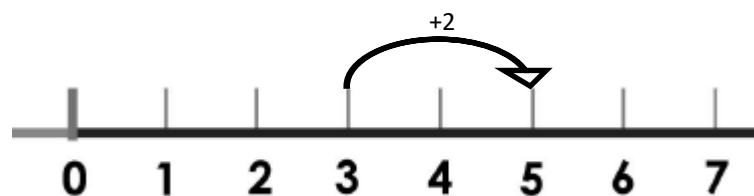| | Augmentation | Reduction |
|---|---|---|
| Word problem | Jess had three books. She bought two more books. How many books does Jess have now? | Jess had five books. She gave two books to her friend Tom. How many books did Jess have left? |
| Using cubes | | |
| Using a bead string | | |
| Using a number line | +2 | -2 |

# Mathematics Mastery

## Addition and Subtraction Concepts: Augmenting and reducing

To understand the concept of addition as augmenting

### About the maths

This concept focuses on adding on to a quantity.

### Vocabulary

Add on

How many altogether

### Resources

Cubes or use other countable coloured objects.

### Getting started

Place three red cubes on a piece of A4 paper.

Ask pupils to say how many cubes there are on the paper.

Tell pupils that you are going to place more cubes on the paper and add two yellow cubes.

Ask pupils to say how many cubes were added and how many there are altogether.

Reflect and discuss.

*Through this discussion pupils should recognise that there were three cubes, that two cubes were added and that there were five cubes in the end.*

Highlight that you **added** to a set of cubes and then found out how many there were altogether.

### Task for pupils

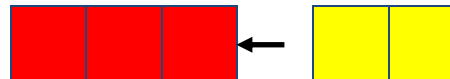Provide pupils with five red cubes and five yellow cubes.

Ask pupils to select three cubes and use them to create a tower. Ask pupils to explore adding two yellow cubes and finding out how many there are altogether.

E.g.

"There are three red cubes."

"I have added two yellow cubes to the three red cubes."

"There are five cubes altogether."

### Deepening understanding

Provide pupils with five red cubes and five yellow cubes.

Ask pupils to explore adding to a set in different ways.

I.e..

- Add two yellow cubes to three red cubes.
- Add three red cubes to two yellow cubes.
- Add two red cubes to three yellow cubes.
- Add three yellow cubes to two red cubes.

**With each example, ensure pupils are focusing on the concept of adding on to a set.**

Discuss what was the same and what was different.

# Addition and Subtraction Concepts: Augmenting and reducing

To understand the concept of subtraction as reducing

| **About the maths** | **Vocabulary** | **Resources** |
|---|---|---|
| This concept focuses on taking away from a quantity. | Take away<br><br>How many left | Interlocking cubes or other countable objects |

**Getting started**

Place five cubes on a piece of A4 paper.

Ask pupils to say how many cubes there are on the paper.

Tell pupils that you are going to take away two cubes from the paper.

Ask pupils to say how many cubes there were at the start, how many cubes were taken away and how many cubes there were left.

Reflect and discuss.

*Through this discussion pupils should recognise that there were five cubes, that two cubes were taken away and that there were three cubes left.*

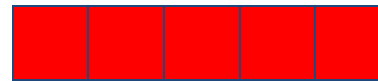Highlight that you **took away** from the set of cubes and then found out how many there were left.

**Task for pupils**

Provide pupils with five red cubes.

Ask pupils to explore taking away two from the set of five cubes and finding out how many there are left.

E.g.

"There are five cubes."



"I have taken away two cubes from the set of five cubes"



"There are three cubes left."



**Deepening understanding**

Provide pupils with five red cubes.

Ask pupils to explore taking away from the set of five in different ways.

I.e.

- Take away two cubes from the five cubes. Find out how many are left.

- Take away three cubes from the five cubes. Find out how many are left.

***With each example, ensure pupils are focusing on the concept of taking away from a set.***

Discuss what was the same and what was different.

![Mathematics Mastery logo]

# Addition and Subtraction Concepts: Augmenting and reducing

To explore the inverse relationship between augmenting and reducing

## About the maths

The concept of augmenting and reducing are inverse operations and therefore it is important that children have the opportunity to compare and explore these concepts together.

## Vocabulary

Add on, take away

How many altogether

How many left

## Resources

Cuisenaire

Interlocking cubes

## Getting started

Place five red cubes and five yellow cubes on the table

Select three red cubes and create a tower, ensure pupils recognise that there are three red cubes.

Add two yellow cubes to the tower and ensure pupils recognise that you added two yellow cubes and that there are five cubes altogether.

Highlight that there are five cubes altogether.

Take away the two yellow cubes and discuss how many are left.

Discuss the relationship between adding on to and taking away from a set of objects.

## Task for pupils

Provide pupils with three red cubes and two yellow cubes.

Ask pupils to explore the relationship between adding on and taking away from a set of objects.

E.g.



"There were three cubes. I added two cubes. There are now five cubes altogether."



"There were five cubes. I took away two cubes. There are now three cubes left."



## Deepening understanding

Provide pupils with five red cubes and five yellow cubes.

Ask pupils to explore the relationship between adding on and taking away from a set of objects using three and two.

I.e.

- Add two yellow cubes to three red cubes and find out how many there are altogether. Take away two yellow cubes from five cubes and find out how many there are left.

- Add three red cubes to two yellow cubes and find out how many there are altogether. Take away three red cubes from five cubes and find out how many there are left.

## Addition and Subtraction Concepts: Comparative addition and difference

Comparative addition and difference are the inverse of each other and therefore, these concepts for addition and subtraction should be taught alongside each other. Comparative addition involves making a comparison between situations where at least one of them involves an addition. For example, 3+2 = 5 and 3+2 = 4+1 both involve the concept of comparative addition. Comparative difference involves making a comparison between two quantities and finding the value of the difference between them. It is important to understand that, when finding the difference between two numbers, the answer is the same regardless of the order of the numbers in the problem. This is not the same for the subtraction concepts of partitioning or reduction i.e. the difference between 2 and 5 is the same as the difference between 5 and 2 but 5 take away 2 is not the same as 2 take away 5.
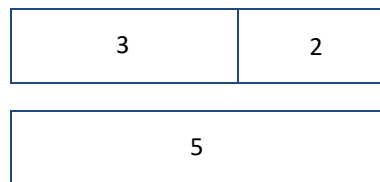
Teachers are expected to change the example according to the numbers that the pupils are familiar with. For example, Year 1 teachers will provide examples that involve numbers within 20 after Unit 5 (Addition and subtraction within 20).

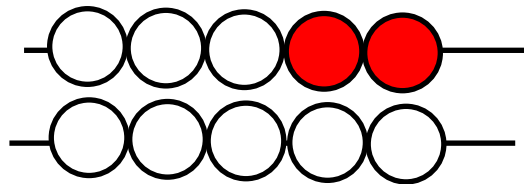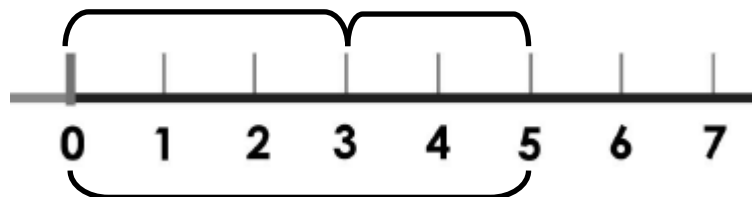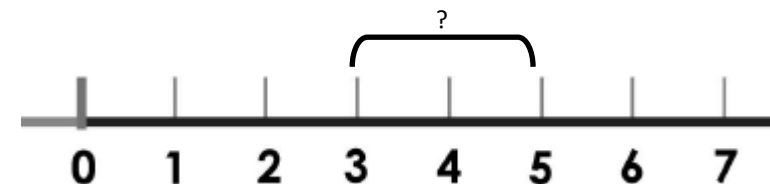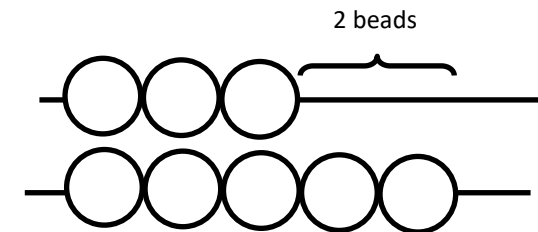| | Comparative addition | Comparative difference |
|---|---|---|
| Word problem | Jess has three books about animals and two books about plants. Tom has five books. Ali has six books. Who has the same number of books as Jess? | Jess has three books. Tom has five books. How many more books does Tom have than Jess? |
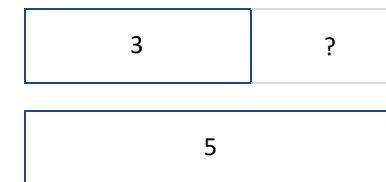
Using Cuisenaire ®



Using a bead string



Using a number line

# Addition and Subtraction Concepts: Comparative addition and difference

To understand the concept of addition and finding equivalence

| About the maths | Vocabulary | Resources |
|---|---|---|
| This concept focuses on comparing two situations where at least one involves addition. | Add, plus <br><br> equal | Number rods such as Cuisenaire ® <br><br> Interlocking cubes or other countable objects |

## Getting started

Place Cuisenaire ® rods on the table.

Ask pupils to select the yellow rod .

Ask pupils to find two rods that are equal to the rod they selected.

Ask pupils to talk about the rods they selected.

*Through this discussion pupils should recognise that the two rods they selected are equal to the yellow rod.*

E.g.

"The red rod and the light green rod are equal to the yellow rod."

Highlight that they are **comparing** the rods to find two that are **equal to** the yellow rods.

Ask pupils to explore different possibilities.

## Task for pupils

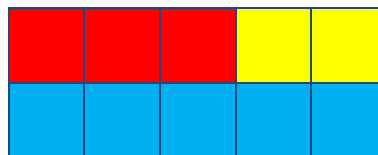Provide pupils with three red cubes and two yellow cubes.

Ask pupils to place the three red cubes and two yellow cubes together to create a tower. Ask pupils to create a blue tower that is equal to the red cubes **plus** the yellow cubes.

E.g.

"There are three red cubes and two yellow cubes. there are five cubes altogether."



"I have created a tower of five blue cubes. three plus two is equal to five."



## Deepening understanding

Provide pupils with five blue cubes, four white cubes, three red cubes, two yellow cubes and one black cube.

Ask pupils to explore comparative addition in different ways.

Through this task pupils should explore the following:

- Three plus two is equal to five.
- Two plus three is equal to five.
- Five is equal to two plus three.
- Five is equal to three plus two.
- Three plus two is equal to four plus one. etc.

***With each example, ensure pupils are focusing on the concept of comparative addition.***

![Mathematics Mastery logo]

# Addition and Subtraction Concepts: Comparative addition and difference

To understand the concept of subtraction as finding the difference

| **About the maths** | **Vocabulary** | **Resources** |
|---|---|---|
| This concept focuses on comparing two quantities and finding the difference between them. | Difference, minus<br><br>More, fewer | Cuisenaire<br><br>Interlocking cubes or other countable objects. |

**Getting started**

Place Cuisenaire ® rods on the table.

Ask pupils to select the yellow rod and the light green rod.

Ask pupils to find the rod that is equal to the difference between the two rods.

Ask pupils to talk about the rods they selected.

E.g.

"The red rod is equal to the difference between the light green rod and the yellow rod."

Highlight that they are **comparing** the rods to find the **difference**. Pupils are expected to find the two rods that are **equal to** the yellow rod when one of the parts is light green.
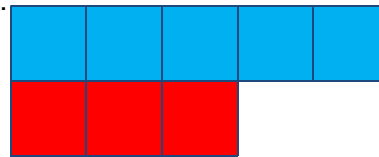
**Task for pupils**

Provide pupils with five blue cubes and three red cubes and five yellow cubes.

Ask pupils to explore finding the difference between the three red cubes and the five blue cubes by creating a tower of yellow cubes, making the red plus the yellow equal to the blue.

E.g.

"There are five blue cubes. There are three red cubes."

"The difference between five and three is two.

**Deepening understanding**

Provide pupils with five blue cubes, four white cubes, three red cubes, two yellow cubes and one black cube.

Ask pupils to explore comparative difference in different ways.

Through this task pupils should explore the following:

- The difference between five and two.
- The difference between two and five.
- The difference between five and three.
- The difference between three and five.
- The difference between five and one.
- The difference between five and four. etc.

*With each example, ensure pupils are focusing on the concept of comparative difference.*

# Mathematics Mastery

## Addition and Subtraction Concepts: Comparative addition and difference

To explore the inverse relationship between comparative addition and difference

### About the maths

The concept of comparative addition and difference are inverse operations and therefore it is important that children have the opportunity to compare and explore these concepts together.

### Vocabulary

Add, plus

Difference, minus

More, fewer, equal

### Resources

Cuisenaire

Interlocking cubes

### Getting started

Place Cuisenaire ® rods on the table.

Ask pupils to select the red and the light green rod .

Ask pupils to find one rod that is equal to the red and light green rod.

Ask pupils to place the yellow rod above the light green rod.

Ask pupils to find the rod that represents the difference between the yellow and the light green rod.

Ask pupils to find the rod that represents the difference between the yellow and the red rod.
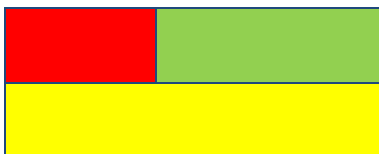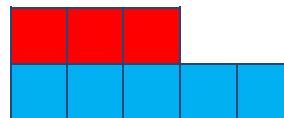
### Task for pupils

Provide pupils with three red cubes, two yellow cubes and five blue cubes.

Ask pupils to explore the relationship between comparative addition and difference.

E.g.

"Three plus two is equal to five."

The difference between three and five is two."

The difference between five and three is two."

### Deepening understanding

Provide pupils with three red cubes, two yellow cubes and five blue cubes.

Ask pupils to explore the relationship between adding on and taking away from a set of objects using three and two.
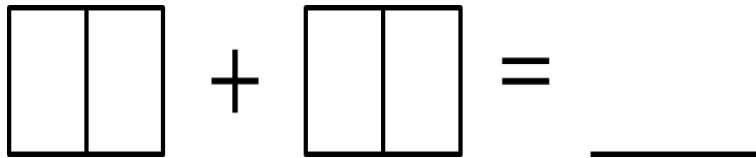
Questions to explore and discuss:

- Five is equal to three plus what?
- Three plus two is equal to what?
- Five is equal to two plus what?
- Two plus three is equal to what?
- What is the difference between five and two?
- What is the difference between two and five?

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## Make 100

For this game, you need dice, a pencil and paper.
Each player draws an addition grid like this:

|  |  |  |  |  |
|--|--|--|--|--|

□ + □ = ____

Take it in turns to roll the dice. After you have rolled the dice, you decide which box to place that number in. Once all four numbers have been placed, add your two 2-digit numbers to get your total. Closest to 100 wins.

Adapting: You can change the target total, or try using subtraction
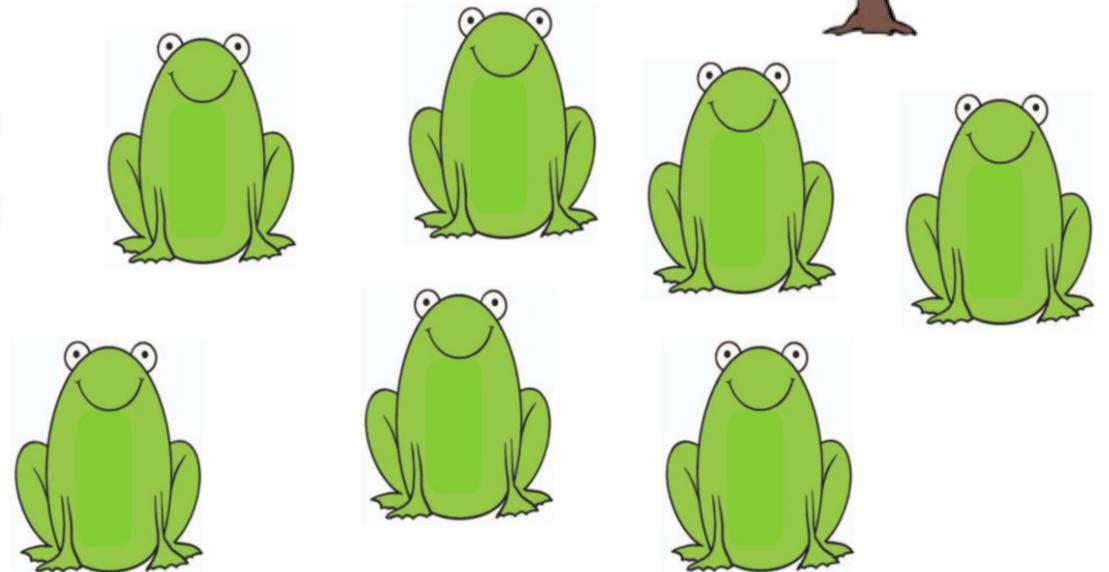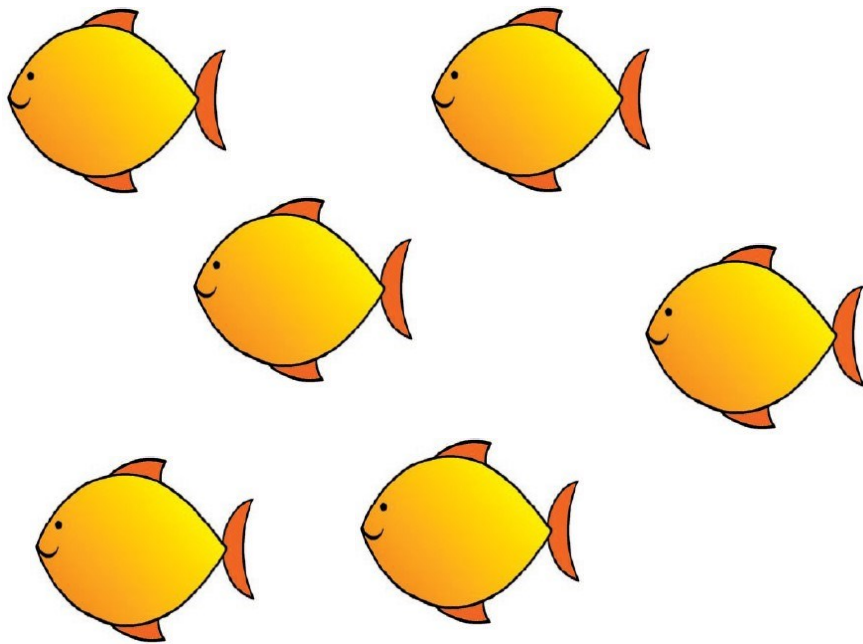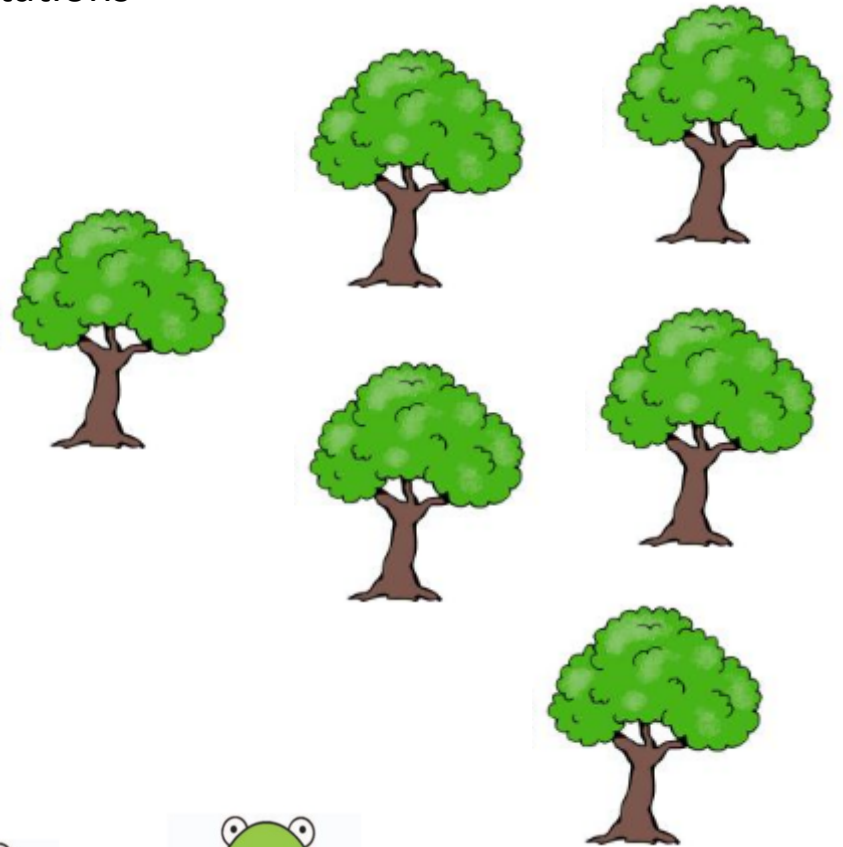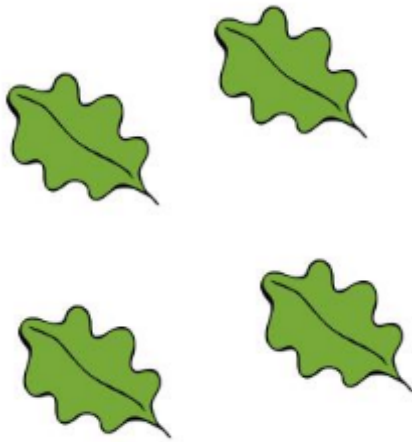
## Zero the Hero

| 4 | 0 | 3 | 1 |
|---|---|---|---|
| 6 | 3 | 2 | 2 |
| 7 | 1 | 7 | 5 |
| 6 | 4 | 5 | 8 |

For this game you need the number grid, (or make your own filled with numbers under 10) two cubes/counters, a plastic cup and pencil and paper.

Write 50 down as your starting score. Put two cubes into the plastic cup and roll them onto the grid. Add the two numbers together then subtract from 50.

Take it in turns to do this. The first to reach zero is the winner

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