

The Box Game

Adding and subtracting
Solving problems



Children often enjoy visualising how many toys are hidden in a box.

Adults could start by using three large toys and a giant box with a group of young children. Then use bigger numbers or miniature toys with smaller groups or individuals.

The Activity

Put toys one at a time into the box, so children cannot see them inside, counting altogether. Ask: 'Can you show on your fingers how many are hidden?'. Display a large numeral.

Add one to the box, without showing the objects inside and ask children to show on their fingers, 'How many are there now?'. Then show how many are inside the box and count to check.

Encouraging mathematical thinking and reasoning:

Describing

How many are there to start?

How many now?

Reasoning

How do you know?

How did you work it out?

Opening Out

What if we add two more?

What if we take one out? Two out?

Imagine there are 10 in there and I take out 6 - how would you know how many were left?

Recording

Can you show how many there were?

Can you show how many there are now?

Can you show how many there were and what happened?

The Mathematical Journey

Counting and cardinality

- saying numbers in the right order
- saying one number for each object
- saying how many there are by showing 'finger numbers'
- by counting fingers
- instantly, without counting

Matching numerals and amounts

- selecting numerals to match the starting and finishing numbers

Adding

- predicting adding one to a number (or two)
- modelling on fingers
- counting all e.g. putting up 4, then 2 more, then counting from one through to 6.
- counting on, starting from the first number: '4, 5, 6'
- visualising or counting mentally, e.g. nodding at hidden objects; saying, 'I went 4, 5, 6'
- using number facts: 'Because there were 3 and you put one more', 'I know 2 and 2 is 4'.

Subtracting

- predicting taking one from a number (or two)
- modelling on fingers
- counting all, then how many left: putting up 6, putting down 2, counting the 4 still up.
- visualising or counting backwards mentally: 'I went 6, 5, 4, so there's 4'.

Development and Variation

Increase numbers to start, to add and take away:

- repeatedly add one to the previous number.
- repeatedly subtract one from the previous number.
- vary the starting number, but just add one each time (or two):
- keep one starting number and subtract varying amounts to build number fact knowledge.
- repeatedly add 2, or subtract 2 from a starting number.

Children can choose how many to add or take away.

Vary the context: use pennies in a pot, children behind a screen, dinosaurs in a cave. Model with fingers, Numicon, large number line, 'staircase' of cubes or other resources.

Resources

- Box or tin with lid, a pot to upturn or a screen, cloth, cave ...
- Toys, pennies, children, dinosaurs ...
- Large numerals to display

Acknowledgement:

Martin Hughes (1986) Children and number: Oxford, Blackwell



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Teachers: Early Years

Number Book

Counting reliably with numbers from 1 to 20
Sorting and describing



Children often enjoy collecting objects and counting them, and many love having a sticker book.

Adults could suggest creating a 'number book' when they see a child picking up one or two related objects.

The Activity

Children are asked to collect four (or whatever number is appropriate) of a range of objects both indoors and outdoors, for example, they may choose four leaves, four stones, four play figures ... They are invited to create their own book, 'My Book of 4', by sticking the objects into a plain-paged book, where appropriate, or by sticking in photos of the objects.

Encouraging mathematical thinking and reasoning:

Describing

Tell me what you are looking for.

Tell me about these things you've collected. Tell me about your book.

Reasoning

Do you need any more? How do you know?

Have you got enough? How do you know?

Have you got too many? How do you know?

The Mathematical Journey

Opening Out Counting skills:

Provide further opportunities for children to do similar activities in different environments, on forest visits, in the playground, in the school garden, in the PE store

- understanding cardinality i.e. that the last number gives the total

Recording

Same and different:

Will you keep that/them for your book?

How shall we put them in your book?

Could we draw/take a picture of these things for your book?

The Mathematical Journey

Counting skills:

- saying one number for each object
- remembering the pattern of the number sequence
- understanding cardinality i.e. that the last number gives the total

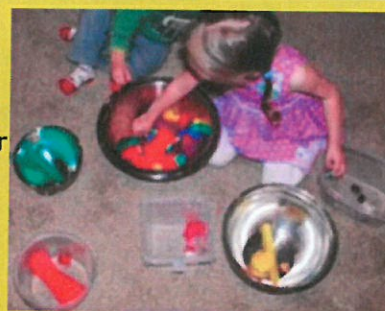
Same and different:

- grouping e.g. these are all leaves, these are all square-shaped buttons

Development and Variation

You could encourage children to group together to count their objects in total and perhaps to create a new book as a result.

You could suggest that the whole group/class creates a counting book of numbers in order from 1. Pairs of children could be given a particular number and asked to find that number of objects of their choice. You could then assemble the book as a whole group/class. It would be lovely for the book to follow the group up the school, where possible. The following NRIC Early Years activities might offer similar mathematics: [Tidying](#), [Incey Wincey Spider](#), [Dice](#) and [Washing Line](#).



Resources

Simple plain-paged scrap books

Glue/paste

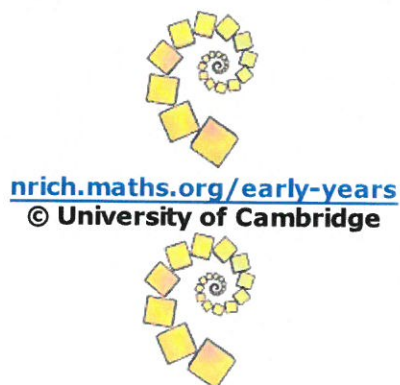
A variety of collections of objects in your setting, some of which may be present all the time, some of which may be introduced for shorter periods

An outdoor space

A camera will be useful to take photographs of the items that can't be stuck into the books

Photo acknowledgement:

<http://www.mommywithselectivememory.com/p/all-activities-for-kids.html>



Maths Story Time

Solving problems



Children often enjoy the challenge of being asked to help solve a problem, especially if it has big numbers and involves injustice.

Adults could introduce story problems with a large group of three and four-year-olds. The story can involve sharing with toy characters and a familiar context which will provoke mathematical discussion, language and reasoning. Having another character come along creates a new problem and remainders present options involving fractions, addition or subtraction.

The Activity

Pirate Panda has taken all the treasure, 20 golden coins. Cat, Dog and Rabbit jump about excitedly, "Can we have some too?"

"No! No! No!" says Pirate Panda.

Can the children suggest what Panda ought to do?

Encouraging mathematical thinking and reasoning:

Describing

Is it fair?

Have they all got the same amount?

Is it fair now?

Reasoning

Why is this fair/not fair? How do you know?

Opening Out

What if we give them another one each?

Sheep comes along - what should we do now?

Bear comes too, so what could we do about the remainder?

What else could we do?

Recording

Could you draw a picture to show Panda what to do in order to be fair?

The Mathematical Journey

Counting

- cardinality - the last number gives how many there are
- counting for a purpose - to see if everyone has the same number

Number symbols

- matching numerals to amounts, or recording amounts informally

Comparing

- saying who has more or not as many
- saying which numbers are more or less than others

Adding and subtracting

- saying how many there will be if we give them one more each
- saying how many there will be if we take one away

Dividing

- sharing practically, using one-to-one and many-to-one
- understanding how 'dealing' results in equal shares and the same number each

Problem-solving

- starting again and redistributing
- using adding and subtracting to make it fair
- creating fractions to solve a remainder problem
- finding alternative solutions
- checking to make sure they all have the same

Development and Variation

You could start the story with Panda sharing unfairly, provoking the children to comment. The numbers chosen determine the level of challenge: 20 shared between four toys encourages counting up to 5 for younger children. You might simplify the problem by having two then three characters, but use larger numbers for expert counters.

Deliberately choosing numbers which create remainders, like 4 or 5 shared between three, offers opportunities for alternative solutions such as fractions, subtracting some or adding some more. Problems such as 7 shared between four offer more challenging multistep solutions.

Toys and objects could fit with a current interest, such as a teddy bear party.

Use a real context such as sharing fruit. This would encourage discussion of fractions, especially if there was a 'bigger half'!

Other contexts include sharing bulbs between containers or sharing resources for artwork. You could use Numicon or ten frames to check that everyone has the same amount, or arrange coins on trays or plates.

Large numeral cards will emphasise whether everyone has the same number and encourage discussion about comparing numbers if the sharing is unfair. These could be supported by dot patterns on card, Numicon or other representations of amounts.

Resources

Puppets or toy animals
Things to share e.g. gold coins, treasure
Large numerals and dot cards
Trays, plate



With thanks to Kim McDonagh and Janine Davenall,
from a North London school, who inspired this activity.



Teachers: Early Years

Number Rhymes

Counting down from, and up to, 10
Saying how many there are altogether



Children often enjoy singing and saying rhymes and telling familiar stories.

Adults could share the song 'Ten Green Bottles' in order to involve the children in singing and counting.

The Activity

Provide a collection of ten green bottles, partly filled with sand. Stand them in a row for all the children to see. Sing the song and act it out.

Encouraging mathematical thinking and reasoning:

Describing

What is happening to the number of bottles each time one falls?

Reasoning

Two bottles have fallen off the wall. How many are there left? How do you know that? What if you count the bottles on the wall and those that have fallen off? Can you see a pattern?

Opening Out

What if two fell off at once?

Imagine how many bottles there will be on the wall if three have fallen off.

What if we add five more bottles, how many would there be then?

Recording

Can you show on your fingers how many there are/how many will be left?

Can you find the numeral, dotty card or Numicon to match the number left?

Can you draw a picture/make a mark, to show me how many bottles there are on the wall now?

The Mathematical Journey

Counting and cardinality

- using number words and language about counting e.g. none, zero, next door number/number neighbour
- cardinality: saying how many there are altogether
- showing on fingers how many there are

Linking symbols and amounts:

- finding numerals to match the number left

Subtracting

- counting them all to find out how many are left
- using the language of subtraction: saying how many are left
- knowing that one less is the next number counting backwards e.g. predicting the next number before the next bottle falls

Describing position

- using positional language e.g. on, off, next to, before, after, left, right

Development and Variation

If two fall off at once, children may realise they can count back to subtract: you could support this with a number line.

Children could show with fingers how many there will be.

Counting up and down from a given number in the context of the number of children in the group e.g. ten children and two are away today so there are eight here.

Counting sets and collections of objects and adding or removing some by hiding objects under a cloth or in a bag.

Story, rhyme and song links

Five Little Ducks Went Swimming One Day, Ten Fat Sausages

Resources

Green plastic bottles partly filled with sand or water to weigh them down

Numerals, dotted cards, Numicon

Whiteboards and pens

Camera or video camera for recording



Shopping - Pirate Poundland

Counting



Children often enjoy shopping role play and exchanging coins for selected purchases.

Adults could structure the prices and money allocated to shoppers and model ground rules.

The Activity

Set up the pirate shop where pirates are only allowed ten pounds each and all pieces of treasure cost one pound. Encourage children who are acting as cashiers to check that shoppers buy no more than ten items. You may suggest that customers go back for more items to make up the ten if they don't have 'enough'!

Encouraging mathematical thinking and reasoning:**Describing**

How much have you spent so far? How much have you got left?

Reasoning

How many more do you need to buy to have ten?

If you buy those two jewels, how much will you have spent? How much will you have left? How do you know?

Opening Out

If jewels are on offer, 'buy one get one free', how many will you get for five pounds?

Recording

Can you make a shopping list, so you know how many things to get?

How do you know what you have bought from your list?

The Mathematical Journey

Counting

- cardinality - the last number gives how many there are altogether
- counting for a purpose - to check the right amount of treasure

Number symbols

- linking numerals to amounts

Adding and subtracting

- saying how many you will have if you buy one more thing
- saying how many pounds you will have left if you buy one more thing
- saying how many more you need to have ten things altogether

Dividing and multiplying

- counting in twos for the two-for-one offer

Development and Variation

Shops can obviously take a variety of forms, such as a building supplier, garden centre or fast food outlet.

Changing prices, so everything costs £2, 10p or 5p, increases the level of challenge.

Games, where the supply of money is controlled by throwing the dice, can also help to structure the activity and focus children on the numbers involved.

Games can also involve real money which has to be checked at the end (e.g. by matching on silhouettes on box lids).

Resources

Plastic pounds (these are more realistic than other plastic coins).

Treasure: anything gold, silver or sparkly - necklaces, gold chains, buttons etc. You can buy brightly coloured 'jewels' from educational suppliers.

Pirate supplies could include food, drink, nautical equipment, perhaps weapons

Treasure chests, purses, bags for treasure purchases

Pirate hats



Acknowledgements: Georgina Harry and her Reception class,
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Teachers: Early Years

Exploring 2D Shapes

Describing and comparing 2D shapes.
Understanding the characteristics of 2D shapes



Children often enjoy playing with long strings and ribbons and making and describing shapes.

Adults could build on this by providing long loops of string or elastic to stimulate conversations about 2D shapes.

The Activity

Provide loops made from string or elastic at least 3m long. For the task, these can be put on the ground or held in the air by children working in groups of three or four. Ask the children to make shapes with their loops and talk about what they see.

Encouraging mathematical thinking and reasoning:

Describing

Have you seen a shape like this before? Where?
Can you see another shape like yours that someone else has made?
Put your shape near/inside/outside/under another one. What do you notice? See what you can make.
Tell me about what you have made.

Reasoning

What if something was different?
What if you had another one the same?

Opening Out

I like your shape. I wonder how you could change it? What would you like to do next?
How about working with some more string?
Can you fit inside the shape?
Can you fit more/fewer children in the shape when you change it?

Recording

Trace your shape with chalk on the playground or with felt tip pens on a big sheet of paper.
Make a small drawing of your shape on paper.

The Mathematical Journey

Same and different:

- developing the use of language to compare, contrast and describe. Examples: straight, wiggly, curved, rounded, pointy, bigger, smaller, longer, shorter, corner, like, different, side, curve

Recognising & labelling common shapes:

- making connections with shapes in their own environment and beginning to use names such as triangle, rectangle, square, corner, side . . .
- counting the sides and corners of the shapes they make

Describing position:

- using words such as on, inside, outside, under, left, right, above, below to describe the position

Comparing sizes:

- beginning to use language such as bigger, smaller, longer, shorter, to introduce ideas about measuring

Development and Variation

This is presented here as a teacher-led activity. It might also be possible to model the activity and then let children play freely with the string or elastic but they would need careful supervision to avoid the health and safety issues associated with the resources.

Other activities that complement this:

- Drawing.
- Shape searches in a series of photos or in books and drawings.
- I-spy shapes games.
- Using educational games that involve shape sorting or matching.
- Building pictures from precut shapes or cutting shapes from coloured paper or magazines.
- Painting on the ground or wall with big wallpaper brushes and water.
- Using natural materials to make shapes: leaves, twigs, daisy chains. Printing with potato or sponge shapes.
- Drawing shapes in the sand tray, with paints, through cornflour gloop, with a finger.
- Riding wheeled toys through puddles and looking at the tracks.



Story, rhyme and song links

My Mum and Dad Make Me Laugh by Nick Sherratt
Washing line by Jez Alborough
Aliens Love Underpants by Claire Freedman,
Kipper's Book of Opposites by Nick Butterworth
Opposites by Eric Carle.
Opposites pop up book Robert Crowther

Resources

String or elastic at least 3m long



Teachers: Early Years

Building Towers

Exploring 3D shapes



Children often enjoy playing with blocks.

Adults could encourage children who show an interest in building towers to explore further in order to develop an awareness of the properties of 3D shapes.

The Activity

Provide children with a selection of wooden blocks of various shapes. Talk about experiences of building and stacking. (Children may do all sorts of things with blocks, building towers is just one example you might choose to develop mathematically.)

Encouraging mathematical thinking and reasoning:

Describing

Which block are you going to put on top of your tower?
Which is the tallest block in your tower?

Reasoning

How could you make your tower taller?
I wonder if we could stack two shapes like this on top of each other?
Which blocks would you use to make a very big castle?
What would happen if we turned that block the other way up, would it make the tower any different?
If you do that, will it fall down? Can you do that without it falling down?

Opening Out

Encourage children to feel the surfaces of the blocks, finding and selecting flat surfaces on which to stand the blocks.
Can you balance this flat block on these three cones? What if they're in a straight line? What if you squash them together?
Could you build with only cylinders?

Recording

Let's make a picture of your tower.
You could print a picture with blocks dipped in paint.

The Mathematical Journey

Properties of shapes:

- selecting appropriate blocks to represent something else or to fit into a structure, analysing properties such as flat, curved etc.
- using informal language - soft, smooth, sharp, slopey, pointy, like a brick, arch, box, roof etc.
- using mathematical language - corner, side, flat, curved, rectangular, cylinder etc.

Position and spatial properties:

- positional language - on top of, next to, underneath, in front of, behind, between, left, right etc.
- using symmetry for placing blocks, creating patterns and complex structures e.g. castles
- connecting ideas about balance to the choice of blocks

Development and Variation

Other activities that complement this:

- Stacking box-modelling materials and other containers
- Stacking shoe boxes in a role-play shoe shop
- Stacking cuboid boxes or cylinders as tins in a role play grocery shop
- Making large-scale constructions using crates, large boxes and cylinders
- Stacking stones or sticks in a forest school environment
- Making a pile of real bricks
- Tackling group challenges such as building a castle for a mouse, a house for a teddy or a giant's castle.



Story, rhyme and song links

London Bridge is Falling Down
Humpty Dumpty
Build a House with Five Bricks
Titch by Pat Hutchins
Rapunzel and Jack and the Beanstalk (traditional tales)
How Big is a Pig? by Clare Beaton
All Shapes and Sizes by Shirley Hughes

Resources

All the blocks, both hollow and solid, that you can find, including regular and irregular shapes



Shapes in the Bag

Sorting and describing, using mathematical properties such as size and shape
Understanding the characteristics of 2D and 3D shapes



Children often enjoy puzzling and guessing games.

Adults could provide a bag containing assorted shapes and, when a suitable opportunity arises, encourage the children to play a kind of game.

The Activity

Children put their hand(s) in a bag to choose one of the shapes inside. By exploring the shape with their hands while it is still in the bag, they try to reason what shape it is, then bring it out to see their choice.

Encouraging mathematical thinking and reasoning:

Describing

(While hands are still in the bag)

Tell me about the shape you have found.

Reasoning

Why do you think it could be a ...?

Is there another shape it could be?

Opening Out

Put many examples of shapes with the same name into the bag.

Can you find others in the bag that have the same name?

How many are there that have the same name?

Recording

How could you remember what you all found in the bag today?

Do you want to make a label for your collection and show how many there are?

The Mathematical Journey

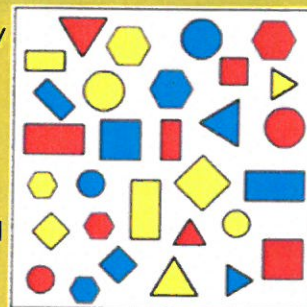
Properties of shapes:

- using everyday language such as curved, pointy, straight, wiggly to describe shapes
- progressing to using mathematical language such as corner, side, circle, square, rectangle, triangle, oblong, having analysed the properties of the shapes involved
- counting the sides and corners of the shapes they choose

Development and Variation

Encourage children to notice shapes around them - both in the setting and beyond. If they walk around with an example of a particular shape, they may find it easier to discover more of that shape in the environment. This offers opportunities for developing language associated with comparing and contrasting (i.e. 'what is the same and what is different?').

You may like to ask them to take photographs of the shapes they see. If printed, the photographs could become a sorting game back in your setting. You could adapt this game for all sorts of purposes. For example, why not fill a bag with numbers for the children to identify without looking?



Resources

A collection of shapes - try to include a range of different types and, if possible, a range of different materials from which they are made (ideally the shapes should contain examples that children might have already come across in the setting as well as those which are likely to be new to them)

An attractive bag that is deep enough to contain all the shapes without the children being able to take a peek

A camera might be useful for taking pictures.

With thanks to Kirsty Lombardi at Ludwick Nursery School who was the inspiration for this activity.



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