

Number

This document is part of a set that forms the subject knowledge content audit for Key Stage 1 and Key Stage 2 maths. Each document contains: audit questions with tick boxes that you can select to show how confident you are (1 = not at all confident, 2 = not very confident, 3 = fairly confident, 4 = very confident), exemplifications; explanations; and further support links. At the end of each document, there is space to type notes to capture your learning and implications for practice. The document can then be saved for your records.

Question 2

How confident are you that you understand and can support children to use mathematical symbols to show relationships and compare quantities?

1

2

3

4

How would you respond ...?

a. These questions focus on the relationship between the numbers. How would you support a child struggling to understand them?

Insert <, > or = to make these number sentences correct.

$$7 + 8 \bigcirc 8 + 7$$

$$3 + 6 \bigcirc 2 + 7$$

$$3 + 6 \bigcirc 4 + 7$$

$$4 + 7 \bigcirc 2 + 6$$

b. How could you use manipulatives to explore these questions?

Use <, > or = signs to make these number sentences correct.

$$3 \text{ tens and } 2 \text{ ones} \square 2 \text{ tens } 12 \text{ ones}$$

$$4 \text{ tens and } 3 \text{ ones} \square 3 \text{ tens } 14 \text{ ones}$$

$$5 \text{ tens and } 4 \text{ ones} \square 4 \text{ tens } 11 \text{ ones}$$

c. A child has completed the following piece of work. What misconceptions have arisen and how could you address these?

Fill in the missing symbols: <, > or =

$$1 \bigcirc 2$$

$$-1 \bigcirc -2$$

$$2 \bigcirc 3$$

$$-2 \bigcirc -3$$

$$3 \bigcirc 4$$

$$-3 \bigcirc -4$$

$$31 \bigcirc 29$$

$$-31 \bigcirc -29$$

$$31 \bigcirc 30$$

$$-31 \bigcirc -30$$

$$31 \bigcirc 31$$

$$-31 \bigcirc -31$$

$$31 \bigcirc 32$$

$$-31 \bigcirc -32$$

$$-1 \bigcirc 1$$

$$1 \bigcirc -1$$

$$-2 \bigcirc 1$$

$$2 \bigcirc -1$$

$$-3 \bigcirc 1$$

$$3 \bigcirc -1$$

$$-4 \bigcirc 1$$

$$4 \bigcirc -1$$

Responses

Note your responses to the questions here before you engage with the rest of this section:

Did you notice that...?

- a.** In these examples, it is important for the child to look at the expressions on either side. They should consider what they know about each expression, rather than just calculating, then record and compare the answers. The focus should be on the children reasoning about how the numbers used are connected. In part a, children should recognise that:
- The calculation $7 + 8$ has been reordered to $8 + 7$ so the equals sign is required
 - $3 + 6$ is equal to $2 + 7$ as the calculation is equivalent (2 is one less than 3 but 7 is one more than 6 so the expression is balanced)
 - $3 + 6 < 4 + 7$ because the amounts on the right have both increased so the right-hand side must equal more than the left
 - $4 + 7 > 2 + 6$ because the amounts on the right have both decreased so the right-hand side must equal less than the left
- Encourage children to explain, using full sentences, why they have chosen to insert each symbol.
- b.** In this example, children are required to apply their understanding of unitising language to compare. For example, three tens and two ones are equivalent to 32. In some instances, regrouping is also required. Dienes apparatus can be used to make each of the numbers to support children with regrouping. This manipulative is particularly useful for this concept as the cardinal value is visible.
- Three tens and 14 ones is equivalent to four tens and four ones
 - Three tens and two ones = two tens and 12 ones
 - Four tens and three ones < three tens and 14 ones
 - Five tens and four ones > four tens and 11 ones
- c.** This child has shown a misconception around the value and position of negative numbers. They have used their number knowledge and looked at which amount is larger, but they have not taken into consideration its relative position or what the negative symbol indicates. A number line could be used here to support children's understanding, so they are able to identify the position of the numbers.

Comparing and expressing relationships with symbols

This section focuses on the typical progression in **comparison** during the Early Years.

In the Early Years, comparing numbers involves knowing which numbers are worth more or less than each other. This depends both on understanding the cardinal values of numbers and also knowing that the later counting numbers are worth more (because the next number is always one more). This understanding underpins the mental number line children will develop later, representing the relative value of numbers, that is, how much bigger or smaller they are than each other.

Progression through the curriculum

More than/less than

Children need progressive experiences where they can compare collections and begin to talk about which group has more things. Initially, the groups need to be very obviously different, with one group having a widely different number of things. These collections should also offer challenges, such as including more small things and fewer large things, to draw attention to the **numerosity** of the comparison, i.e. the *number* of things not the *size* of them.

Activities and opportunities:

- Provide collections for children to sort and compare, which include objects that are identical, as well as different kinds of objects that are also different sizes.
- Provide collections with a large number of things and collections with a small number of things.

Identifying groups with the same number of things

Children need the opportunity to see that groups could consist of equal numbers of things. Children can check that groups are equal by matching objects on a one-to-one basis.

Activities and opportunities:

- Ensure that when providing groups to compare, some groups have an equal amount.
- Ask the children to convert two unequal groups into two groups that have the same number. For example, *'There are 6 apples in one bag and 2 apples in another bag. Can we make the bags equal for the two hungry horses?'*

Comparing numbers and reasoning

Children need opportunities to apply their understanding by comparing actual numbers and explaining which is more. For example, show a child two boxes and tell them one of the boxes contain five sweets and the other contains three sweets. Which box would they choose to keep and why? Look for the reasoning in their response, such as, *'I would pick the 5 box because 5 is more than 3 and I want more.'* If shown two numerals, children can say which is larger by counting or matching one-to-one.

Children can compare numbers that are far apart, near to and next to each other. For example, *'8 is a lot bigger than 2 but 3 is only a little bit bigger than 2.'*

Activities and opportunities:

- Explain unfair sharing: 'This one has more because it has 5 and that one only has 3.'
- Compare numbers that are far apart, near to, and next to each other.

Knowing the 'one more than/one less than' relationship between counting numbers

Children need opportunities to see and begin to generalise the 'one more than/one less than' relationship between sequential numbers. They can apply this understanding by recognising when the quantity does not match the number. For example, if a pack is labelled as 5 but contains only 4, the children can identify that this is not right. Support them to recognise that if they add one, they will get the next number, or if one is taken away, they will have the previous number. For example, *'There are 4 frogs on the log, 1 frog jumps off. How many will be left? How do you know?'*

Activities and opportunities:

- Label groups with the correct numeral. Do children spot the error if a group is mislabelled? For example, *'The label on the pot says 4 and we have 5 – what do we need to do?'* A child may say, *'We need to take one out because we have one too many.'*
- Ensure that children focus on the numerosity of the group by having items in the collection of different kinds and sizes.
- Make predictions about what the outcome will be in stories, rhymes and songs if one is added to, or if one is taken away.

By developing children's understanding of comparison through practical activities, abstract symbols can be introduced to explain the relationship between the numbers, through the inequality and equality signs.

Common errors in this area may include:

- children not comparing the numerosity of the group and considering more in terms of size
- giving a response that does not match the context when estimating a number; for example, when adding, giving an answer that is smaller than the numbers given (*'There are 7 cars in a garage and then 2 more go in'* and the child guesses there are 4 cars in total)
- reading the sentence the wrong way round so putting the incorrect symbol in.

What to look for

Can a child:

- state which group of objects has more?
- do this with a large or small visual difference?
- compare two numbers and say which is the larger?
- predict how many there will be if you add or take away one item?
- use a full sentence to describe the images?
- describe the relationship between the numbers using the appropriate language?

Links to supporting materials:

NCETM Primary Professional Development materials, Spine 1: Number, Addition and Subtraction:

- Topic 1.1: Comparison of quantities and measure
- Topic 1.27: Negative numbers: counting, comparing and calculating

Notes:

Key learning from support material and self-study:

What I will focus on developing in my classroom practice: