### Mass 2

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| A student: | | Background information | • mass,  
• heavier,  
• lighter,  
• about the same as,  
• pan balance,  
• (level) balance,  
• measure,  
• estimate. |
| › describes mathematical situations and methods using everyday and some mathematical language, actions, materials, diagrams and symbols **MA1-1WM** | In Stage 1, measuring mass using informal units enables students to develop some key understandings of measurement. These include:  
› repeatedly using a unit as a measuring device  
› selecting an appropriate unit for a specific task  
› appreciating that a common informal unit is necessary for comparing the masses of objects  
› understanding that some units are unsatisfactory because they are not uniform, eg pebbles. Students should appreciate that the pan balance has two functions: comparing the masses of two objects and measuring the mass of an object by using a unit repeatedly as a measuring device. When students realise that changing the shape of an object does not alter its mass, they are said to conserve the property of mass. | |
| › uses objects, diagrams and technology to explore mathematical problems **MA1-2WM** | | |
| › supports conclusions by explaining or demonstrating how answers were obtained **MA1-3WM** | | |
| › measures, records, compares and estimates the masses of objects using uniform informal units **MA1-12MG** | | |

**Syllabus reference:**
Hardcopy page: 101  
Digital: 105
### Activities

#### Explicit Mathematical Teaching

Compare the masses of objects using balance scales (ACMMG038)
- compare and order the masses of two or more objects by hefting and check using a pan balance
- recognise that mass is conserved, eg the mass of a lump of plasticine remains constant regardless of the shape it is moulded into or whether it is divided up into smaller pieces
- use uniform informal units to measure the mass of an object by counting the number of units needed to obtain a level balance on a pan balance
  - select an appropriate uniform informal unit to measure the mass of an object and justify the choice (Problem Solving)
  - explain the relationship between the mass of a unit and the number of units needed, eg more toothpicks than pop sticks will be needed to balance the object (Communicating, Reasoning)
- record masses by referring to the number and type of uniform informal unit used
- compare two or more objects according to their masses using appropriate uniform informal units
- record comparisons of mass informally using drawings, numerals and words, and by referring to the uniform informal units used
- find differences in mass by measuring and comparing, eg 'The pencil has a mass equal to three blocks and a pair of plastic scissors has a mass of six blocks, so the scissors are three blocks heavier than the pencil'
  - predict whether the number of units will be more or less when a different unit is used, eg 'I will need more pop sticks than blocks as the pop sticks are lighter than the blocks' (Reasoning)
- solve problems involving mass (Problem Solving)
- estimate mass by referring to the number and type of uniform informal unit used and check by measuring

#### Ignition Activity

"Bigger is Heavier" (controversial statement).
Students discuss statement. Show a golf ball and a tennis ball - which is heavier?
Show a container filled with cotton balls and similar container filled with rice: which would be heavier?

**Make another bag**
The teacher displays a bag with some blocks in it. Students make a bag that has the
same mass by filling with blocks and then hefting the two bags. Students find the mass of their bag by choosing appropriate units and measuring on an equal-arm balance. The measuring process and results are recorded, including a comment on the choice of units.

**What do you think?**
Students predict how many of a given unit it will take to balance an object and then check by measuring. Students record their estimate and measure using their own words and format.

**Does it balance?**
Students are given a choice of objects they might use to find the mass of different objects using an equal-arm balance. It is important that students are given tasks that emphasise different volumes can have the same mass and vice versa to differentiate these two concepts.

**Which is heavier?**
Estimate then find which of two objects is heavier (but the students are not allowed to heft them or to put them on the balance together).

**Has to be the same mass**
My mystery object can be balanced by five blocks. Find or make three objects that would have the same mass. How can you prove you are correct? Students record their trials and answers.

### Guided Group/Independent Activities

#### Make a balance
In pairs, students make a balance using a coathanger, stockings or socks and pegs. Students choose appropriate units to balance an object which is suspended in the sock. The mass of the object should be estimated and recorded, before the item is measured. Students count and record their measure.

#### A cup of rice
Pairs of students choose suitable measuring units to find the mass of a cup of rice. Students record the mass and state why they chose the units. Class discusses the results and compares the units which were chosen. Some units may have a greater or smaller volume than other units.
### Heaviest pencil case
Work in groups of three or four to estimate, then measure whose pencil case is heaviest by measuring the mass of each pencil case with blocks (teddies, marbles etc.).
Ensure that the same units are selected for measuring. Record in order of mass.

### Mystery boxes
Students are given three or four identical opaque boxes, such as margarine containers, which each hold one item. Students place the containers in order by mass and record their prediction of what the contents might be.

### No more gaps
Discuss and predict the mass of the same quantity of a specific object in two different structures. For example:
Does a flat have the same mass as 100 shorts?
Do ten loose popsticks have the same mass as a bundle of ten sticks? (ten loose interlocking blocks and a rectangular prism of ten blocks.)
Measure each quantity to find the mass.

### Reflection
- What is mass? (how heavy things are)
- Place two objects of different masses on either side of equal arm balance. Discuss what happens to 'equal arms' - not equal! Which is heavier? How many more marbles are needed to balance each item (informal units)? Which item is heavier?
- Year 2 to record the number of marbles needed for each item and place items in order of mass. Continue with more items.
- Compare and order the items measured by comparing the informal units.
- Use an equal arm balance to find two collections of objects that have the same mass e.g. a collection of blocks and a collection of counters

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