

Mass 1			
Outcome	Teaching and Learning Activities	Notes/ Future Directions/Evaluation	Language / Date
<p>A student:</p> <ul style="list-style-type: none"> › describes mathematical situations and methods using everyday and some mathematical language, actions, materials, diagrams and symbols MA1-1WM › measures, records, compares and estimates the masses of objects using uniform informal units MA1-12MG <p>Syllabus Content Note: Students investigate mass using a pan balance Note: only informal units of measurement used</p> <p>Syllabus reference: Hardcopy page: 101 Digital: 105</p>		<p>Background information</p> <p>Mass is an intrinsic property of an object, but its most common measure is in terms of weight. Weight is a force that changes with gravity, while mass remains constant.</p>	<ul style="list-style-type: none"> • mass, • heavy, • heavier, • light, • lighter, • about the same as, • pan balance, • (level) balance.

Activities		
<p>Explicit Mathematical Teaching</p> <p>Mass is defined as the amount of matter in an object but, like time and temperature, it cannot be seen. Students may confuse mass and volume because objects with a larger volume will often have more mass than those with a smaller volume. However, if two contrasting materials are compared, for example, foam packaging and iron, students will quickly realise that the larger volume does not necessarily have the larger mass. Mass may also be confused with weight. Students may have some awareness of the difference between these two concepts now that space travel has been widely reported and astronauts have been shown to weigh less on the moon because the moon's gravitational field is not as strong as that of earth. Weight is a force that is affected by gravity and so as gravity changes, the weight of an object will change. So scientifically, it is incorrect to say an object weighs one kilogram because weight is measured in units of force (Newtons, named after Sir Isaac Newton who formulated the law of gravity). The correct expression is that an object has a mass of one kilogram. Use of precise language by teachers will assist students to distinguish between these two concepts when they encounter them in secondary school. Young students begin to directly compare masses by hefting them. Once they have had experience comparing two masses by hefting, students will have a sense of what balance means, especially if they try to heft one mass that is much heavier than the other so that their arms feel "pushed down" on one side. At this stage, measuring mass using informal units enables students to develop some key understandings of measurement. These include:</p> <ul style="list-style-type: none"> 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 mass of objects and <p>-understanding that some units are unsatisfactory because that they are not uniform eg pebbles</p>		
<p>Ignition Activity</p> <p>"Bigger is Heavier" (controversial statement).</p>		

<p>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?</p>		
<p>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.</p>		
<p>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.</p>		
<p>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.</p>		
<p>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).</p>		
<p>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</p>		
<p><u>Guided Group/Independent Activities</u> 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.</p>		

<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>		
<p><u>Reflection</u></p> <ul style="list-style-type: none"> - 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. 		

