Introduction
Students will use balance scales to determine whether the mass of different objects is more, less or the same. Students will use informal uniform units to measure the mass of common objects.

Resources
• Equal arm balancing scales
• A collection of items, for example: a pencil, a stapler, a ruler, a shoe, a ball, an orange, bottle of water, bag of rice, tennis ball, cricket ball, a calculator, a book.
• Unifix cubes
• Marbles

Time / Classroom Organisation
The activity process may be introduced in a whole or small group format. Allow 20 to 30 minutes for each part of the activity. Come together for discussion and reflection at the end and review the findings about mass. Students’ understanding of uniform units of measurement (MAG 2.1.9 and 2.3.9) is pre-requisite to this activity.

Australian Curriculum Year Two
Compare masses of objects using balance scales (ACMMG038)
Proficiency Strand:
Fluency – using units iteratively (repeatedly) to compare measurements.

Activity Process---Balance scales
1. Have a collection of items, for example, a ruler, a glue stick, a shoe, a ball, an orange, bottle of water, bag of rice, tennis ball, cricket ball, a calculator, a book.
2. Pick up the ruler and the book. Which one do you think is heavier? How could we check to see which is heavier? Listen to suggestions.
3. If students suggest hefting, demonstrate how this is done. Ask a student to place one item in each hand and compare the two masses and predict which object is heavier and which is lighter.
4. Ask the students: How could we check to see if this guess is correct? Use the balancing scales to show how it can be used to find which item is heavier.
5. Pick up other items. Ask: Which is heavier/lighter? Choose a student to heft both items and another to use the balancing scales to check. Repeat several times.

Activity Process---Measuring mass
1. Use a balancing scale, a collection of cubes, and some everyday items such as a pencil and a stapler. Hold up the pencil and the stapler. Which item is heavier?
2. Demonstrate how items are weighed. Put the pencil in one side. How many cubes would we need to balance the pencil? Students estimate and write their estimation on their individual whiteboard.
3. Count together as a student puts the cubes in the other side of the balancing scale. When the pans balance say: The pencil has the same mass as 2 cubes.
4. Check the estimations and discuss who guessed a number closest to the actual number.

5. Repeat this process using the stapler. Say: The pencil has the same mass as 2 cubes and the stapler has the same mass as 24 cubes. Which is heavier? Which is lighter.
7. Repeat this process using household items such as a small box of cereal and a juice box, with marbles as a uniform unit of measure

Variations & Extensions

1. Balancing Act
   
   Resources: Balancing scales and everyday items in the classroom
   
   Each pair of students choose a fat heavy book for this investigation.
   
   Students find something in the classroom that is:
   - Heavier and larger than the book they chose;
   - Heavier and smaller than the book they chose;
   - Lighter and larger than the book they chose;
   - Lighter and smaller than the book they chose.
   
   The游戏 continues until one student has all the pieces.

2. Lighter than/heavier than
   
   Resources: Each pair requires a die with lighter than, heavier than, balancing scales, and twenty unifix cubes
   
   Each student chooses a number of blocks to place in the balancing scales. If the sides balance the game starts again. If they are different, one student throws the die. If the die shows lighter than, the student with the lighter side takes all the unifix cubes and vice versa. The game continues until one student has all the pieces.

Digital Resources

http://illuminations.nctm.org/Activity.aspx?id=3531

Each shape has a different weight. Find combinations of shapes that are equal in mass.

Contexts for Learning

Play:

Provide a set of pan balance scales, kitchen scales and bathroom scales in an area set aside for exploratory play. Provide materials such as pens, books, scissors, bag of rice, can of soup, glue stick, marbles. Allow students to explore the materials. Provide pens and paper for students to record their findings.

Investigation:

Fill a small jar with rice. Now find another container and fill it with water so it is the same mass as the jar with rice. Students should see that objects that have different size, shape and texture can have the same mass.


Real life experience:

Ask students to bring in their lunchboxes. Compare mass of lunchboxes. Make predictions, for example: Which lunchbox do you think has the greatest mass? Is the largest lunchbox the heaviest one? Is the smallest lunchbox the lightest one? Can you find someone whose lunchbox is about the same bass as yours?


Routines and Transitions:

Transition:

• Place 10 marbles in an equal arm balance. Students suggest items that would balance them.
• Students name items that are heavier than, lighter than, the same as a given item.


Assessment

Observe students as they participate in the variation and extension activities – Balancing Act. Ask students to journal their understandings about mass from this activity. Note students’ understanding of:

- Use of comparative language
- Ability to estimate visually and by hefting
- Using pan scales to determine which is heavier/lighter/same
- Understanding of difference between size and mass.

Achievement Standard: order shapes and objects using informal units

Background Reading

Students need to internalise the following ideas if they are to fully understand how ‘measuring’ works.

- We can use numbers to describe the size of a thing by selecting a unit and counting how many repeats of the unit it takes to match the thing as closely as possible
- A unit is itself a quantity; that is, it is the mass of the marble that is the unit, not the marble itself.
- The size of something doesn’t change when you use a different-sized unit to measure it, but the number of units taken to match it may change.
- We can say which of two things is bigger by comparing how many of the same unit match each. These ideas develop more slowly than is often recognised. Having developed these ideas, however, students can see why:
  - We should generally use the same unit repeatedly to measure an object
  - When comparing two things, the same unit should be chosen for each.


Links to Related MAGs

P.2.8 – Comparative Measurement
P.2.9 – Measurement – 2
2.3.9 – Measurement – 3
3.3.7 – Measurement using metric units