AIMSSEC

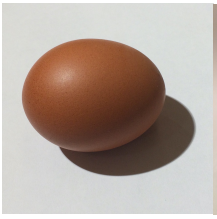
AFRICAN INSTITUTE FOR MATHEMATICAL SCIENCES
SCHOOLS ENRICHMENT CENTRE (AIMSSEC)
AIMING HIGH

MASS AND WEIGHT is the theme for this INCLUSION AND HOME LEARNING GUIDE

This Guide suggests related learning activities for all ages from 5 to 17+

The HOW HEAVY activity was designed for Primary and Lower Secondary

There is enough work for several days here so
just choose whatever seems suitable for your group of learners.



HOW HEAVY?

In your kitchen or in a supermarket, look at the information on labels on unopened packages and discover how heavy the items are.

Some small items may be labelled in grams and other items will be labelled in kilograms.

The picture shows a hen's egg, a pen, a new-born baby and a glass of water.

How heavy do you think these things are?

Arrange these things in order from the lightest to the heaviest?

Here are their masses in grams:

440 grams; 6 grams; 60 grams; 4000 grams (or 4 kilograms).

Can you match the correct mass to each one?

Now find some other objects, weigh them if you have scales and compare their masses with these four things.

How heavy are you? How much has your mass increased since you were a small baby?

HELP

Work with a partner. Find 3 objects that can be weighed such as a stone, a pencil, a brick, a book or anything else you have around. Try to find a light object, a heavy one and one that is in-between.

Any sort of scales can be used.

You can make your own scales with a coat-hanger and 2 bags to put the objects in. To weigh an object you need to balance it against a known mass.




Handle the objects and try to estimate the weights. Then actually weigh them. Check your estimates. Ask for help in reading the scales if you need it. How close were your estimates?

NEXT

What is the approximate weight of an average man, a small family car, a cow, a South African minibus taxi and a double decker bus?

Not to scale

1000 milligrams = 1 gram
1000 grams = 1 kilogram
1000 kilograms = 1 metric tonne

1 litre of water weighs 1 kilogram
A medicine spoon holds 5 millilitres or 5 milligram

RECIPE FOR SOUP FOR 8 PEOPLE

1 tablespoon olive oil
1 large onion, finely diced
4 celery stick, finely diced
3 carrots, peeled and cubed
1 large potato, peeled and cubed
150 g or 1 cup cubed butternut squash
1 teaspoon salt
1 teaspoon dried thyme or other seasoning
1.4 litres or 6 cups hot chicken stock (broth)
900 g chicken meat
3-4 tablespoon tomato paste
1 zucchini (courgette), cubed
150 g or 1 cup sweet corn
150 g or 1/2 cup pasta
1 tablespoon lemon juice
2 tablespoon parsley, chopped, plus extra to serve
Salt and pepper to season
A little graded cheese to serve (optional)

Suppose you have to make enough soup to feed 120 people and you can get most of these ingredients but perhaps not all of them.

What would you put in your soup? Make a list of the ingredients you would use and the quantities of each one.

INCLUSION AND HOME LEARNING GUIDE

THEME: Discussing, estimating, measuring mass and weight

Suggestions for Home Learning

Young children and Lower Primary

This is the time to handle some common objects, to talk about how heavy they are, to make comparisons, to arrange a few objects in order from lightest to heaviest and to develop the language to discuss all this.

Upper Primary

Learners can do the **How Heavy?** learning activity. They should learn about milligrams, grams, kilograms and metric tonnes and also that one litre of water weighs 1 kilogram.

This is a good topic for a mixed-age group and for everyone, adults and children, learning together. Many adults are no more confident than children about estimating mass and doing so within reasonable margins of error. Young people need to be prepared for a future job market where existing knowledge and skills have limited value unless they can be applied in new ways to solve complex problems and to improve the quality of life for all.

In everyday language we talk about weights and masses interchangeably but in mathematics and science we must use the words correctly.

Mass is a property of objects that is the same wherever they are whereas

weight is the force of attraction that pulls an object towards another object.

It follows that our weight will be different in space, or on the moon, but our mass will remain the same.

If possible, use scales so that the learners can weigh some common objects. Any sort of scales will do but it would be an advantage to have bathroom scales so that they can weigh themselves.

Before weighing the objects you can discuss with the learners which one is the lightest and which the heaviest, arrange them in order and try to estimate their masses.

You might like to discuss the masses of some objects, for example objects in the photos on page 2. But it would be better to discuss objects that people are familiar with in your home area. The suggested ‘solutions’ are only average values. You can also discuss the typical range of masses of each object.

Perhaps discuss health issues related to obesity or social issues related to being underweight and to poverty and malnutrition.

Key questions

Which of those objects do you think is the lightest?

Which of those objects do you think is the heaviest?

Do you think that it is best to give that mass in grams or in kilograms? Why?

Lower Secondary - Years 7 to 10

All the learners might weigh themselves then there can be discussion about reading the scales to the nearest 100 grams or 0.1 kilograms.

They can then collect data from their classmates on social media, make a table of results and draw a bar chart or pie chart. The masses should be allocated to groups. Make the boundaries between the groups clear. We might use the groups:

≤ 20 kg;

$20 \text{ kg} < \text{mass} \leq 25$ kg;

$25 \text{ kg} < \text{mass} \leq 30$ kg;

$30 \text{ kg} < \text{mass} \leq 35$ kg.

For example: $20 \text{ kg} < \text{mass} \leq 25$ kg
includes 25 kg and all masses between 20 and 25 kg
but does not include 20 kg.

Learners could also work out the mean mass and draw a stem and leaf diagram.

Years 11, 12 and 13

Learners could choose their own projects, anything that interests them relating to weight and mass.

Examples might include:

Gravity and Space Travel.

Health Issues.

What is Atomic Mass and why is it important?

Mass and the law of conservation of energy.

SOLUTION

Pen 6 grams,

Egg 60 grams,

Glass of water 440 grams,

New born baby 4000 grams or 4 kilograms.

Approximate weights:

An average man 85 kilograms;

A cow 300 –1100 kilograms (depending on the breed);

A small family car 1800 kilograms;

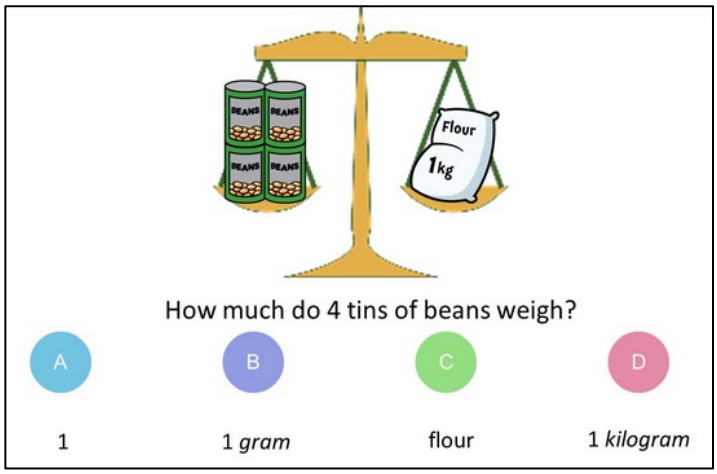
A South African Minibus Taxi 3500 kilograms;

Double decker bus 16.6 tonnes = 16600 kilograms.

DIAGNOSTIC ASSESSMENT This should take about 5–10 minutes.

Ask the question say to the group:

"Put up 1 finger if you think the answer is A, 2 fingers for B, 3 fingers for C, 4 fingers for D".



2.Notice how the learners respond. Ask learners to explain why they gave their answer and DO NOT say whether it is right or wrong but simply thank the learner for giving the answer.

3.It is important for learners to explain the reason for their answer. Putting their thoughts into words may help them to clarify their thinking and develop communication skills.

4.Then do the same for answers B, C and D. Try to make sure that learners listen to these reasons and try to decide if their own answer was right or wrong.

5. Ask the learners again to vote for the right answer by putting up 1, 2, 3 or 4 fingers. Notice if there is a change and who gave right and wrong answers.

This is a good question to check prior understanding of the concept of balancing to show two masses (or weights) are the same.

D. is the correct answer.

Common Misconceptions

A. Learners may not understand the importance of units.

B. Can these learners read 1 kg on the bag of flour. Do they know the word kilogram?
Do they know that 1 kilogram = 1000 grams?

C. The question asks for a unit of mass not just that the 4 cans weigh the same as a bag of flour.

https://diagnosticquestions.com

Why do this activity?

This activity gives an opportunity for learners to talk about the masses of some familiar objects and to get some feeling for their comparative sizes. Each one of these examples is only a representative of like objects with a range of masses so averages can be discussed in this context.

The activity could be accompanied by work on data collection. A group could all weigh themselves and draw a graph of their weights. Another possibility might be to weigh some common objects.

Learning objectives

In doing this activity students will have an opportunity to:

- use measuring instruments such as bathroom scales and kitchen scales (analogue and digital) and balances to find the masses of common objects.
- to estimate, measure, record, compare and order the masses in grams (g) and kilograms (kg).

Generic competences

In doing this activity students will have an opportunity to develop life skills and confidence about using and applying in everyday life what they learn in school.

Follow-up ideas

Primary

Comparing Mass https://aiminghigh.aimssec.ac.za/years-6-to-8-comparing-mass/
Metric Measures https://aiminghigh.aimssec.ac.za/years-3-7-metre-measures/
Estimate my Girth https://aiminghigh.aimssec.ac.za/years-5-7-estimate-my-girth/
How Hot https://aiminghigh.aimssec.ac.za/years-5-to-8-how-hot/

Lower Secondary

Comparing Mass https://aiminghigh.aimssec.ac.za/years-6-to-8-comparing-mass/
Thousands and Millions
https://aiminghigh.aimssec.ac.za/years-6-9-thousands-and-millions/

Upper Secondary

Belt around the Earth
https://aiminghigh.aimssec.ac.za/years-8-to-12-belt-around-the-earth/
Extremes https://aiminghigh.aimssec.ac.za/years-6-10-extremes/