



Converting length units

SEQUENCE 1

Age group	6-9 y.o.
Prior knowledge	None
Material needed	Thick paper, templates for cutting out units of measurement, one unit of measurement 1 cm and, 1 unit of measurement 1 dm and 1 unit of measurement 1 m. 1 sheet of paper for writing down the results, 3 pens, scissors, glue.
Subjects	Measurement, correlations between units of length, conversion.
Skills involved	Measurement, converting of units of length.
Time to carry out the sequence	60 min

Step 1: Listen to the story

The teacher reads the story “The Measure of Happiness” to the children, it will be the way you can introduce the topic covered by the box.

After reading the story, ask pupils about the story some questions:

- Which was disputed by the Tiny Decimeters and the Giant Meter?
- Why they got different results in measurement: How far is that border?
- What conclusions can you draw from the story?

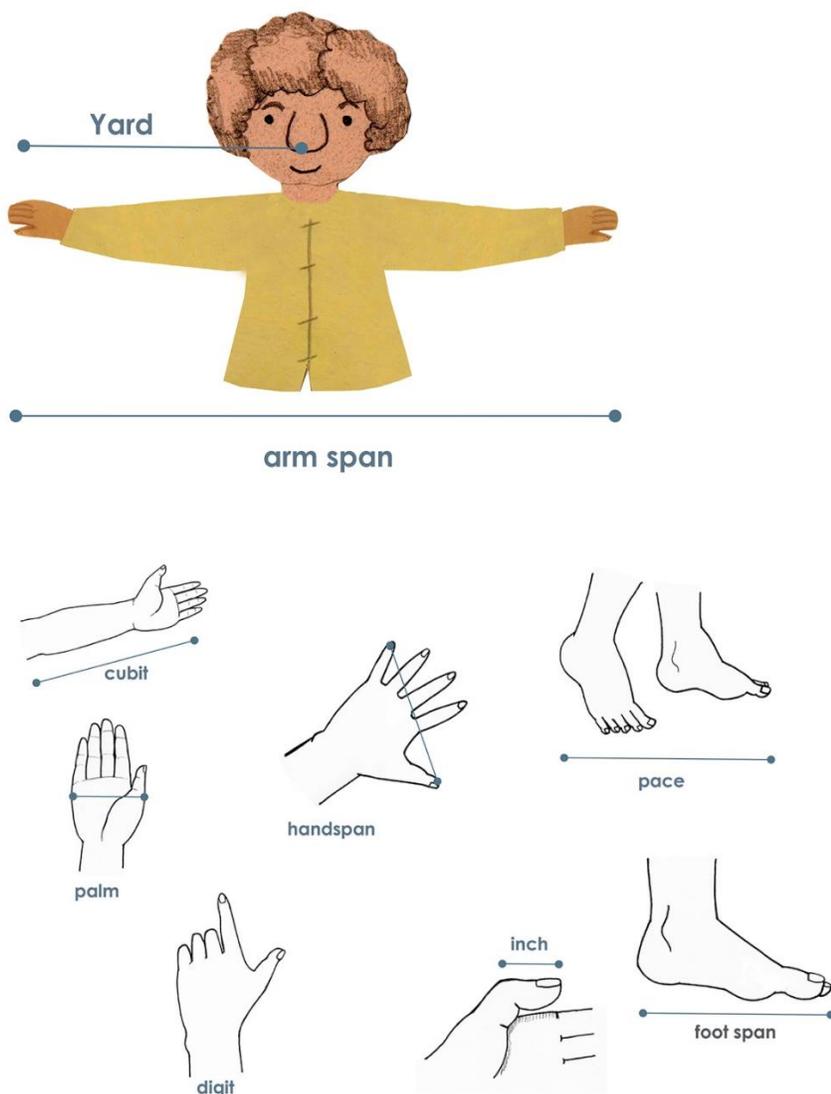


Co-funded by
the European Union

MATHEMATICS

Step 2: Introduction

The teacher shows pictures of length units related to different parts of the body to the children. Instead of pictures, the teacher can also demonstrate length units using their own body parts. Then the teacher can ask the children if they know the demonstrated length units.



Co-funded by
the European Union

MY BOX OF STEAM (project nr. 2022-2-EE01-KA220-SCH-000099273) is funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

MATHEMATICS

Give pupils some tasks. Let pupils to:

- measure the width of the classroom in foot span;
- measure the length of the book (workbook, etc) in digits;
- measure the height of the blackboards in cubits;

Let them compare their results.

Lead a discussion of why they didn't get equal results.

After that is good to take a small historical introduction about using the body for measuring.

The way base units of length have been determined has changed greatly over time. Long ago, the base for reference was the human body. For example, the cubit was a unit that indicated the length from the elbow to the fingertips. This unit was used in ancient cultures in Mesopotamia, Egypt, and Rome. The length varied from region to region, ranging from 450 to 500 mm. Studies have proven that the pyramids of Egypt, known for their accurate construction, were built using two types of cubits: a long one and a short one. It is said that the standard measure of length in these eras was the body of the country's ruler or some other powerful individual. Even today, units of length based on the human body are used in countries such as the United States, such as the yard, foot, and inch. (<https://www.keyence.com/ss/products/measure-sys/measurement-selection/basic/unit.jsp>)

Step 3: Measurement testing using body parts

The teacher forms groups of 3. All the following activities take place in the groups formed.

The group will measure 3 items using a measurement tool of their choice (in inches, in digits or handspan). The pupils will compare the measurement results.

Are the results obtained with the measurement tools used understandable to all?



MATHEMATICS

For the measurement, they choose 3 objects of different sizes, such as a sheet of paper, a window sill and a footprint.

Sheet of paper - could be measured in handspans or inches.

Window sill - could be measured in cubits.

Footprint - could be measured in inches.

Students write down the results of the measurement on a sheet of paper.

Next, the groups present their measurements.

The results of the groups are compared, and the accuracy of the groups' measuring instruments is assessed.

Are the results of the measurement clear for everyone? Why do the measurement results differ between groups?

Step 4: Discover the content of the box

Students discover the contents of the box.

Students cut out and make a giant, a 1m tape measure and men representing decimetres according to the instructions.

Step 5: Solve tasks

The students place the smaller units (dm men) on top of the larger strip and write down the correlation between them.

Items are then measured.

The results are written next to the first measurement results.

When measuring, it could be discussed which units of measurement would be appropriate.

Here are several ways to convert units of measurement, how many cm, dm or m is the unit of measurement used in the creative measurement, etc.



Co-funded by
the European Union

MATHEMATICS

Step 6: The game: Compare results

1. The teacher gives each group a sheet of paper and a task to measure and write down the lengths of the children's feet. The length units made by the children are used.
2. The students have to line up in a group according to the measurement results, starting from the smallest.
3. The fastest lined-up team wins.

To make the competition fun, you could also measure, for example, children's ears, nose length, smile length, knee height, stride length, etc.



Co-funded by
the European Union

MATHEMATICS

SEQUENCE 2

Age group	9-12 y.o.
Prior knowledge	Units of measurement cm, dm and mm and their correlations.
Material needed	2 A4 sheets of thick paper or cardboard, 1 unit 1 cm and, 1 unit 1 dm and 1 unit 1 m; 1 A4 sheet of paper for writing out measurements, printed board game kit, coloured pencils, scissors, glue.
Subjects	Measurement, correlations between units of length and conversion.
Skills involved	Measurement, correlations between units of length and conversion.
Time to carry out the sequence	90 min

Step 1. Listen to the story

To introduce the topic, the teacher reads a story to the children.

After reading the story, ask pupils about story some questions:

- Which was disputed by the Tiny Decimeters and the Giant Meter?
- Why they got different results in measurement: How far is that border?
- What conclusions can you draw from the story?

Step 2. Introduction

The teacher starts the discussion on measurement and units of measurement. The teacher asks what can be measured.



Co-funded by
the European Union

MATHEMATICS

As a result of the discussion, draw up a concept map of measurable quantities.

- time
- length
- mass
- volume
- temperature
- speed
- amperage, etc.

The teacher will discuss with the children whether the measurement tools and units of measurement are the same everywhere in the world.

From now on, only length units are dealt with.

The teacher asks the children which units of length they know (millimetre, centimetre, etc.).

Do the pupils know how the units of measurement relate to each other?

Step 3. A conversation about measurement, measuring instruments and units of length

Give pupils a challenge: ask them to measure the length of a table, for example, but without using any measuring instruments or objects, so that they can suggest using their body parts on their own.

The teacher asks which units of measurement the pupils know.

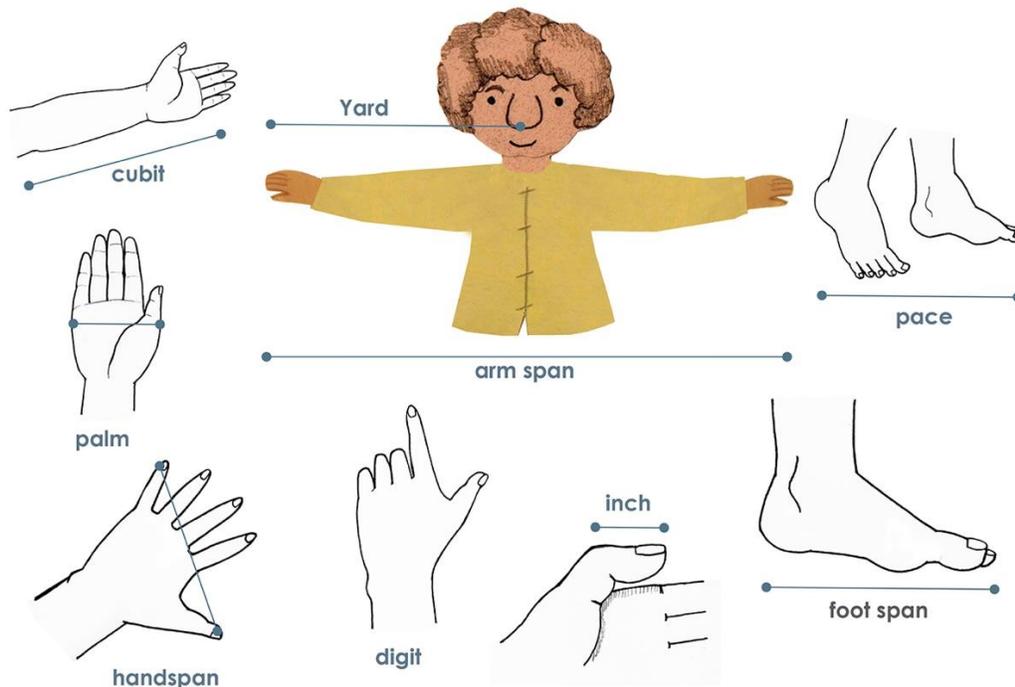
List of units of measurement:

https://en.wikipedia.org/wiki/List_of_unusual_units_of_measurement



MATHEMATICS

In the old times, informal measurement systems used body parts such as foot length, cubit, arm span, etc., which were less accurate and varied from person to person. Even then, attempts were made to find correlations between units. The best-known units derived from the dimensions of body parts are the following:



1 inch - length of thumb;

1 handspan – the distance between the extended thumb and the little finger;

1 foot span – foot length;

1 cubit – the length of the arm from the extended fingertips to the elbow;

1 arm span – the difference between the fingertips of the outstretched hands.

In the past, it was customary to think that one arm span was equal to three cubits or six feet span. The length varied from region to region, ranging from 450 to 500 mm. The cubit was a special unit and for some even sacred. The Egyptians were likely the



MATHEMATICS

first to use it, using it to measure the Nile River, an essential element for the life and economy of the populations living along its banks. Therefore, there was also a royal cubit like those preserved in the Egyptian Museum of Turin, decorated and even covered in gold, which we can say had the function of our "meter".

The English unit of length, the yard, which comes from the Old English word "gyrd" meaning a stick or rod, is a typical measurement system of the Anglo-Saxon world.

Legend has it that King Henry I of England established the measurement of the yard, using the distance from his nose to the fingertips of his outstretched hand.

For others, it could simply be twice a cubit or perhaps the circumference of a person's chest.

Yard: 91cm 4mm

A cubit: it was different for different cultures (from the elbow to the fingertips).

Ancient Romans: 44cm 4mm

Ancient Greeks: 46cm 3mm

Ancient Egyptians: 45-54cm

Old Estonians: 53cm 8mm

Units of length:

1 foot span: 30cm 48mm (30.48 cm)

1 inch: 2cm 54mm (2.54 cm)

1 mile: 1km 609m

1 sea mile: 1km 852m

Units of volume:

1 barrel: varies between 100 and 200l (depends what you measure)

1 bucket: 18l

1 quart: varies between 0,95l and 1,13l



Co-funded by
the European Union

MATHEMATICS

Step 4. Experimenting with measurement using a creatively chosen measuring instrument

The teacher asks the students to think of a way to measure their own body using their body parts (handspan, foot span, cubit, etc.).

To measure, choose three different-sized objects, such as a sheet of paper, a window sill, and a footprint. Record the measurement results on a piece of paper. Next, the groups recite their measurements. The groups' results are compared, and the accuracy of the groups' measuring instruments is assessed.

Are the measurement results unambiguous for everyone? Why do the measurement results differ between groups?

Step 5. Discover the content of the box

The pupils discover the contents of the box. They take out the "Instruction for making a board game."

Step 6. Creating a board game

Students make dice according to the instructions, cut out the answer cards and decorate the background of the game board. You can then start playing.

How to play

1. To move on the game board, you need dice, game pieces, and cards with answers. Small, handy items can be used as game pieces. The shortest player rolls the dice first.



Co-funded by
the European Union

MATHEMATICS

2. Roll the dice and move your game piece to the corresponding number of steps.
3. Convert the square measure of the board you are landing on to metres or centimetres. Find the answer on the cut-out card. For example, if you land on a square of 1.2m, you must find its length in centimetres from one of the answers on the card.
4. Place the answer card on the game board.
5. Each correct answer is worth one point. If the board is already covered with an answer, the player does not get a point.
6. The player who covers the most answers wins.

Step 7. Additional task

Students can build and design their own board games using the same instructions, coming up with new sizes and modified answers. New games are exchanged between groups, and the play continues.

