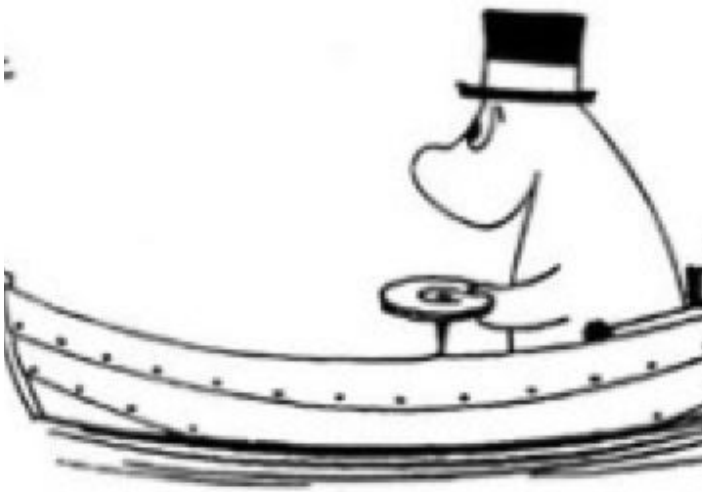
PART V: Literature & Mathematics

AGE RANGE: 16-18



TOOL 51: MOOMINPAPPA AT SEA AND SCALING

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TheArtOf Maths

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Educator's Guide

Title: Moominpappa at sea and scaling

Age Range: 16-18 years old

Duration: 2 hours

Mathematical Concepts: Scaling

Artistic Concepts: Literature analysis, allegory

General Objectives: This task will make you learn more about scaling. You will learn how to use scaling in order to measure heights

Instructions and methodology: Read the excerpts and then you measure heights and scale objects in the same way as Moominpappa did when he built his lighthouse model

Resources: This tool provides pictures and excerpts for you. To solve the tasks in the end of the tool you will also need cardboard, a pair of scissors, adhesive tape, string and a weight (eg a nut). You may also need a calculator

Tips for the educator: Try to separate the mathematics from the storytelling

Desirable Outcomes and Competences: At the end of this tool, the student will be able to: Understand scaling in an improved way.

Explore Nordic literature and lighthouses.

Debriefing and Evaluation:

Write 3 aspects you liked about this activity:	1. 2. 3.
Write 2 aspects that you have learned	1. 2.
Write 1 aspect for improvement	1.

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Introduction

The books about the Moomin family are classics in Scandinavian literature. They are sometimes today regarded as childrens' literature, but they were not at all written for that purpose. They are allegories on grand themes such as life, death, environmental issues and longing. A central character in the first chapter of "Moominpappa at sea" is Moominpappa and his lighthouse model that he has built. It describes how he struggles with ordinary life and longs for adventure, just like he experienced them when he was young and travelled at sea. He gets an idea that the family should leave Moomin valley and travel to the real lighthouse far out in the archipelago.

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Moominpappa at sea

Excerpts

"One afternoon at the end of August, Moominpappa was walking about in his garden feeling at a loss. He had no idea what to do with himself, because it seemed everything there was to be done had already been done or was being done by somebody else." (p.1)

He walks on and contemplates his place in life, and also the fact that life is dangerous in August. You have to be careful with fire. It is very warm and hot. He arrives at the patio on the Moominhouse and sees that the floor ought to be varnished. But it is too hot. Moominmamma seems to think that autumn is coming and lights a lamp on the patio.

"The lamp sizzled as it burned. It made everything seem close and safe, a little family circle they all knew and trusted. Outside this circle lay everything that was strange and frightening". (p.9)

Everyone goes inside to have supper. The mood is heavy. The Groke (who everybody is afraid of) sees the oil lamp and comes closer to the house. The grass crackles and snaps under her feet when she looks through the window. The family sees her and screams. They barricade themselves in the house and put out the oil lamp. The Groke leaves the house and the family is able to, with a bit of melancholy, settle down for the night.

Moominpappa goes outside to keep track of the surroundings. Actually it is true as Little My says; that he´s blowing up steam because no one listens to him.

"Moominmamma said nothing. She padded up and down, getting ready for the night. As usual, she looked in her handbag, she turned the lamp down; and all the time there was a silence in the room that didn´t seem natural. She came to

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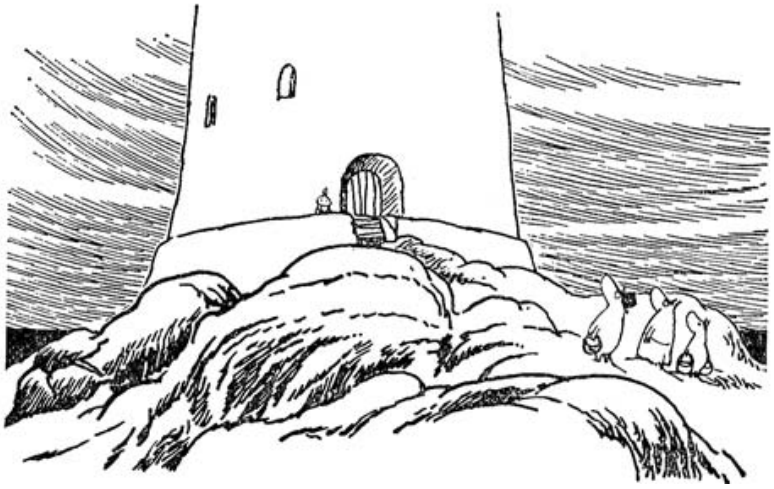
Moomimpappa`s model lighthouse, standing on the shelf by the washstand in the corner.

She went up to the big map hanging on the wall, the one showing Moomin valley with the coast and its islands. She puts her nose right on a spot .

There it is, she murmured. That's where we´re going to live and lead a wonderful life, full of troubles..." (p.12).



Picture 1. The lighthouse https://www.pinterest.co.uk/pin/184788390930044662/

They decide to travel to the real lighthouse. They arrive safely after a long but calm ride to the island. The real lighthouse is a tall building and the island is desolated. Moominmamma starts looking for soil in which she can plant her vegetables. There is none.

In the morning they walk up to the lighthouse and it is enormous. But the door is locked. The key ought to hang on a nail beside the door. This is a big disappointment and Moominpappa decides to sleep before he decides what to do.

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The Math behind Moominpappa at sea

Scale

With the word scale you usually mean length scale. Watch the figures below and try to see how length scale, area scale and cubic capacity scale interrelates.

length scale and area scale

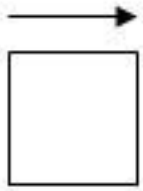	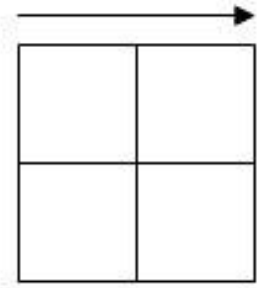	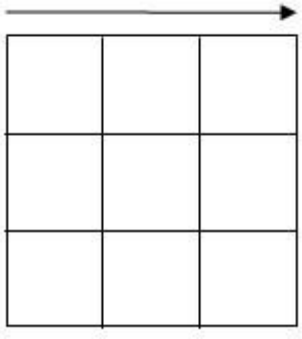
Length scale: 1:1	Length scale: 2:1	Length scale: 3:1
Areascale: 1^2:1= 1:1	Areascale: 2^2:1= 4:1	Areascale: 3^2:1 = 9:1

Table 1: Length scales

You say: Area scale is equal to length scale squared.

You write: Area scale = Length scale ·Length scale = (Length scale)^2

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Cubic capacity scale

In the same way that we have an area scale we also have a cubic capacity scale.

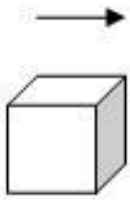	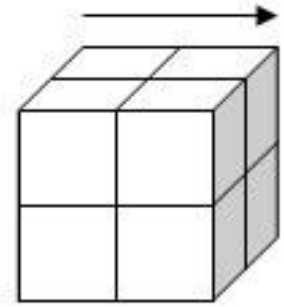	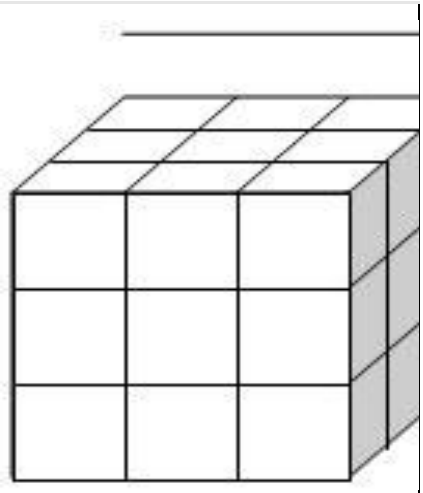
Length scale: 1:1	Length scale: 2:1	Length scale: 3:1
Cubic capacity scale: 1^3:1= 1:1	Cubic capacity scale: 2^3:1= 8:1	Cubic capacity scale: 3^3:1= 27:1

Table 2: Cubic capacity scales

You say: Cubic capacity scale: is equal length scale in cubic.

You write: Cubic capacity scale:= length scale ·length scale ·length scale = (length scale)^3.

Note!

Please note that Cubic capacity scale:= (length scale)^3 only can be used when all the sides are enlarged or reduced equally.

Equable shape

This is when two objects in geometry have the same shape, but not necessarily same size, it can be moved and twisted in relation to each other.

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TASK

Equable shape

1 Go outside and choose some different buildings or other tall objects in your surroundings.

2 Try to estimate how high they are by looking at them.

3 Fill in you estimates in the table below.

4 Follow the instructions below and build an altimeter and find out how high your buildings are in real life,

5 Try to explain how the altimeter works

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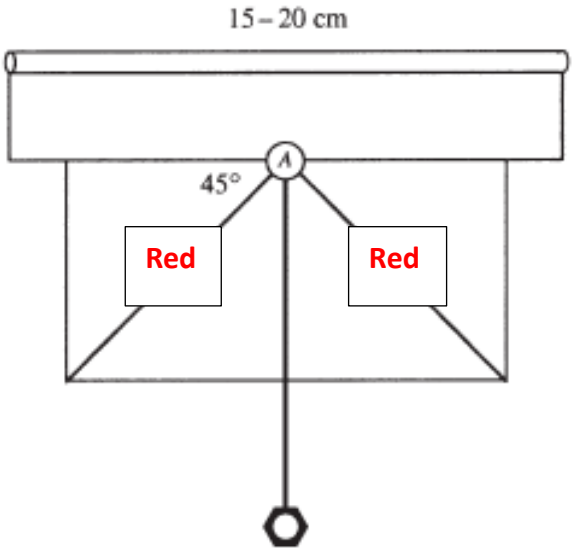


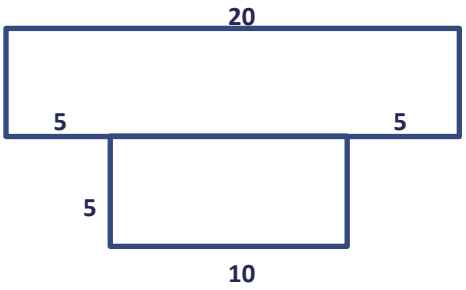
Picture 2. Finished altimeter

Altimeter

1 Cut out a piece of cardboard, shaped like a T.

See picture 3.

All lengths are in centimeters.



Picture 3 Cardboard model

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2 Draw lines like picture 2 shows. Paint the 45° lines red.

3 Fasten a straw along the upper edge with adhesive tape.

4 Make a hole at A on Picture 2.

5 Lace a string with a needle through the hole A and make a strong knot on the backside.

6 Put a small weight, for example a nut, in the end of the string.

To make a correct measurement you have to work in pairs. Do it like this:

- One of you watches the top of your building through the straw.
- The other person watches the red lines on the altimeter and tells his friend to go forward or backwards until the perpendicular coincides exactly with one of the red lines.
- When you find the right spot, use a long measuring tape or string and measure the length from the spot you stand to your building.
- You have to add the height from the ground to the eyes of the person who holds the altimeter when you measure the distance from where you are standing to your building.

Building	Estimate	Estimate with reference dimensions	Measured length with the altimeter

Table 3: Answers

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LEARN MORE…

Famous Lighthouses

You can learn more about the Tower of Hercules through this link.

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

Another famous lighthouse is the lighthouse of Genoa.

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

The lamp in the lighthouses was revolutionized in the early 1900's. This was a Swedish invention that you can read about here.

https://en.wikipedia.org/wiki/Dal%C3%A9n_light

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