

Mathematics and Associated Teaching Methods II

MAGNITUDE BASIC CONCEPTS

Degree in Primary Education Teaching

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MAGNITUDE IN PRIMARY SCHOOLS

- **Magnitude** is a **property of objects**, which is considered individually with respect to the other properties it may have.

IMPORTANT:

That property is required to be **measurable**, in the sense that it is possible to represent it by numbers. And we can **order** objects with respect to that property.

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Which one are magnitudes?

area

love

speed

weight

length

time

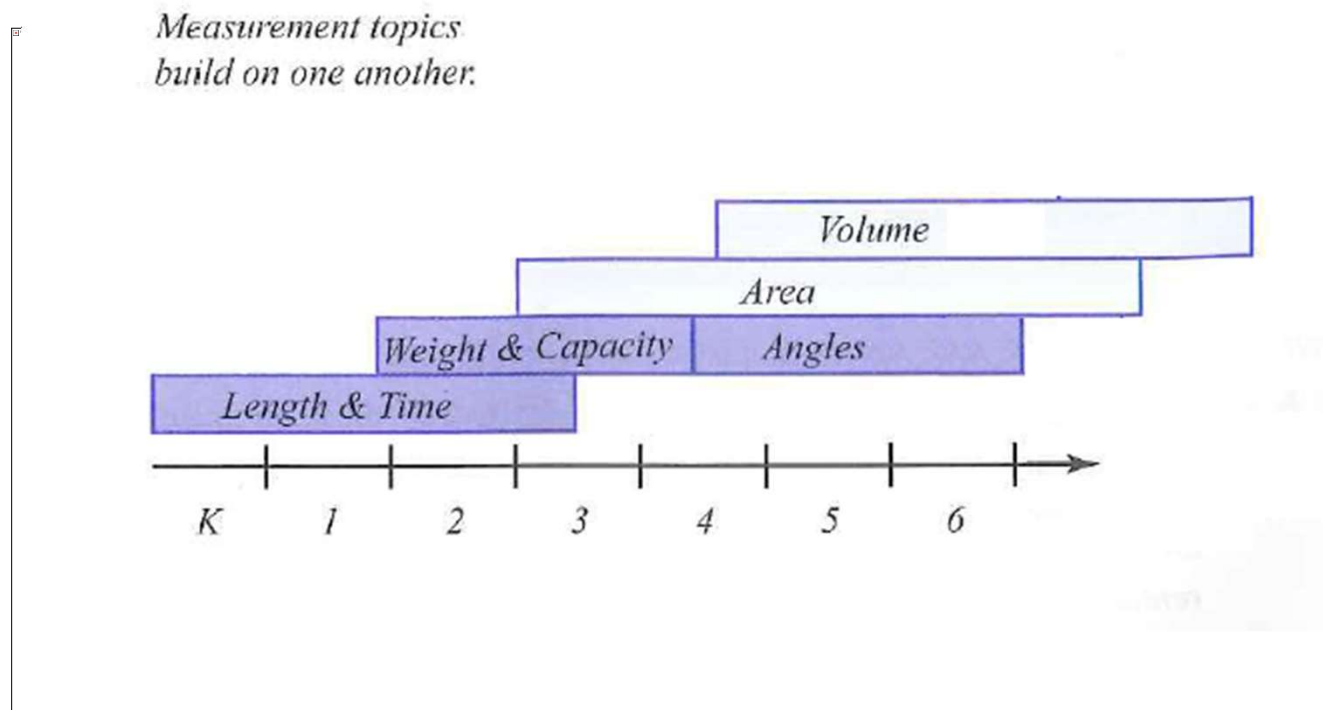
volume

capacity

beauty

density

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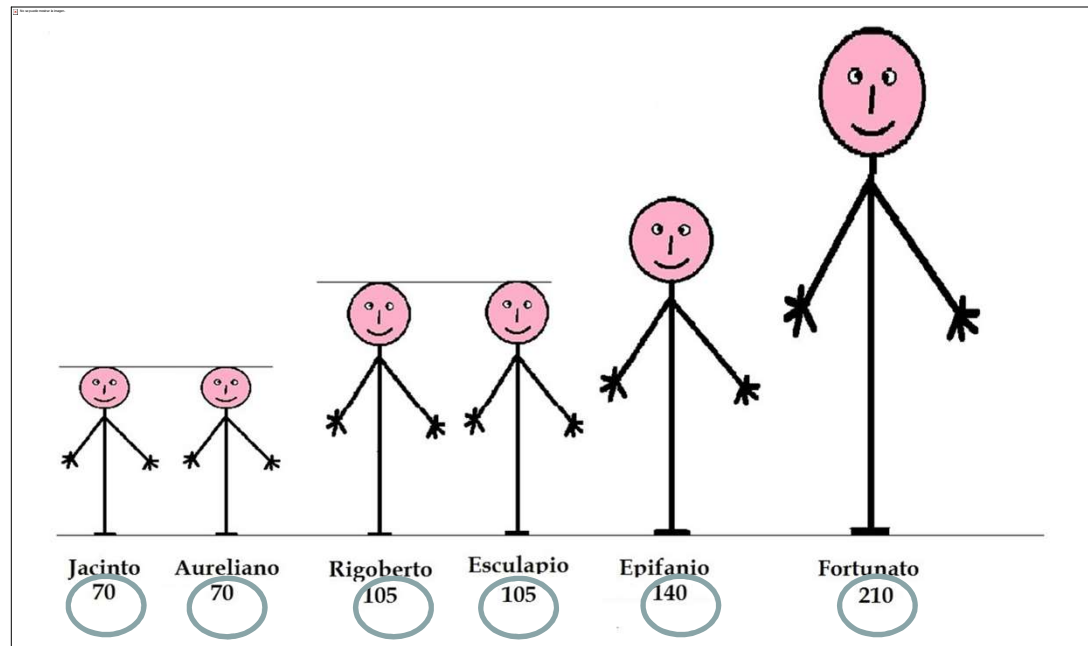
From: Parker T., Baldrige H. (2006) Elementary Geometry for Teachers, Sefton-Ash Publishing, USA.

Types of manitude

- **Extensive:** it is possible to define the sum between different quantities of that magnitude, and that operation verifies certain properties (opposite element, associative, commutative, neutral element). For example: length, weight, capacity,...
- **Intensive:** the sum operation does not make sense. For example: color, intensity of an earthquake,...

Quantity of Magnitude

Magnitude $\longrightarrow$ Length



Quantities of magnitude

Quantity of Magnitude

The resulting length measurement is then a quantity: a number times a unit.

164 cm

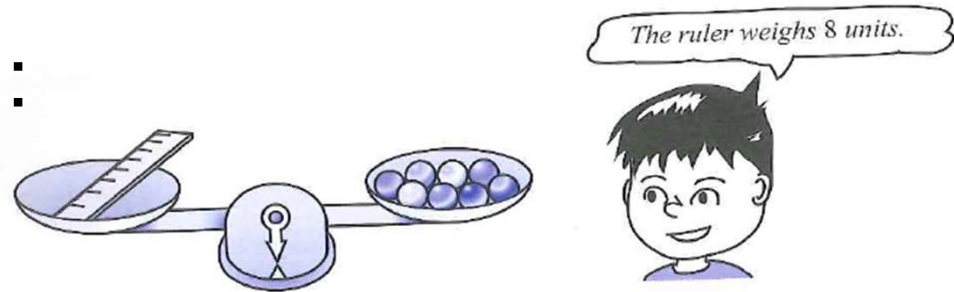
NUMBER

UNIT

How to choose the unit

Compare weighs with:

- One object (u)



- Different objects:

Iron die (u1)

Nuts (u2)

Grains of rice(u3)



How to choose the unit

A package of detergent weighs 1 iron die, 4 nuts and 5 grains of rice.

Different units → It is a complex expression.

It is not regular, since:

$$1u_1 = 12u_2$$

$$1u_2 = 1237u_3$$

Do you Know another not regular sistem?

Examples

$\left\{ \begin{array}{l} 1 \text{ inch} \\ 1 \text{ foot} = 12 \text{ inches} \\ 1 \text{ mile} = 5280 \text{ feet.} \end{array} \right.$

1 cup (*cup*)
 1 pint (*pt*)
 1 quart (*qt*)
 $\frac{1}{2}$ gallon
 1 gallon (*gal*)

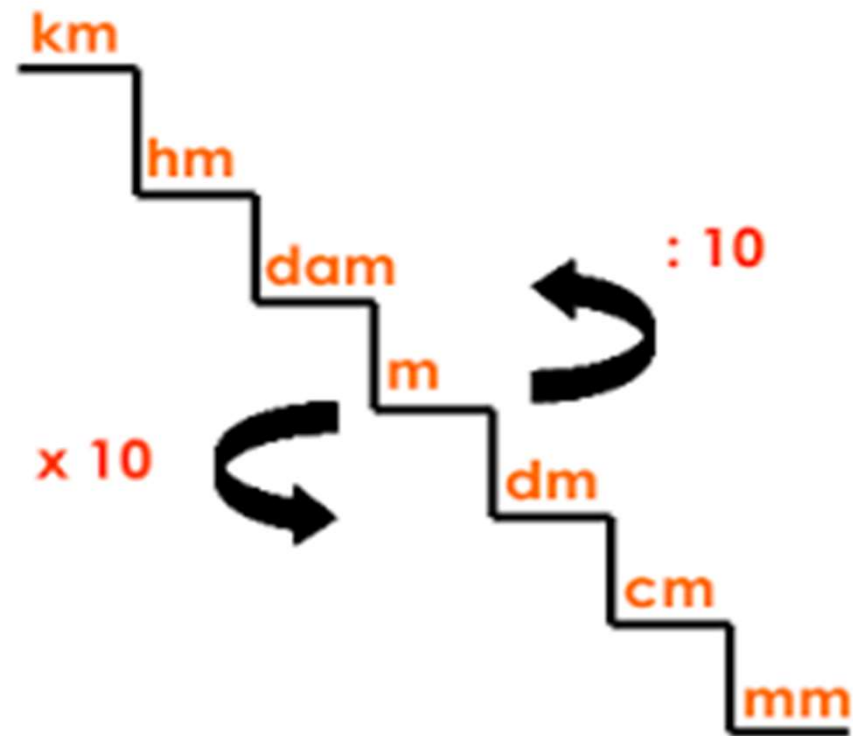
<i>milli-</i>	<i>centi-</i>	<i>deci-</i>	METER	<i>deca-</i>	<i>hecto-</i>	<i>kilo-</i>
$\frac{1}{1000}$	$\frac{1}{100}$	$\frac{1}{10}$	1	10	100	1000

Regular Measurements systems. Legal Systems.

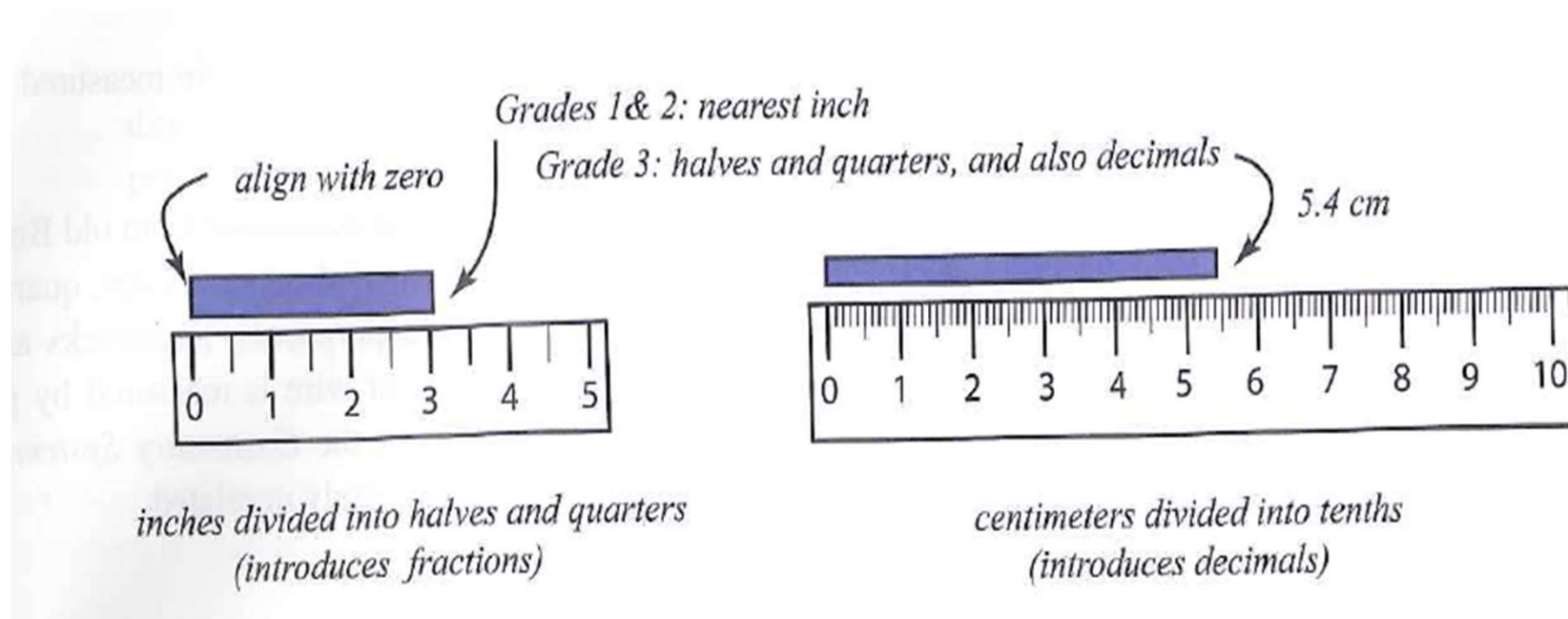
Systems of measurement are called **LEGAL**, because their use has been proclaimed by laws.

- **Decimal Metric System (1889)**. It is a system in which changes of units are made 10 by 10 in linear quantities, and they are made by powers of 10 in multidimensional quantities. (Relationated to our numbering system on base 10). Its units are the meter, Kg, liter, ...
- **International System of Units (1960)**. It's the name you have now.

Measuring Length

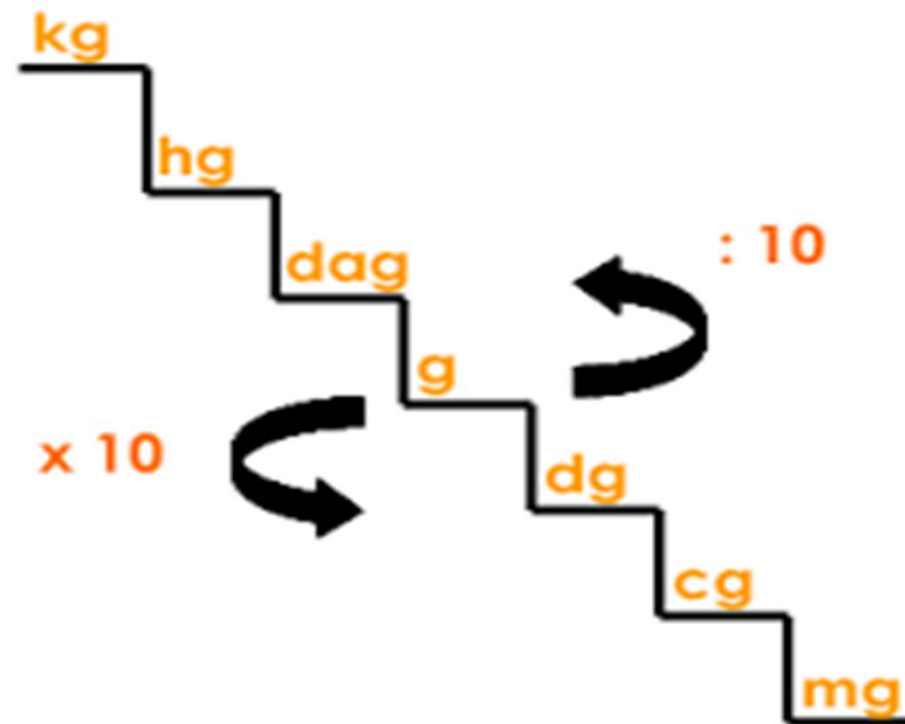


Measuring Length

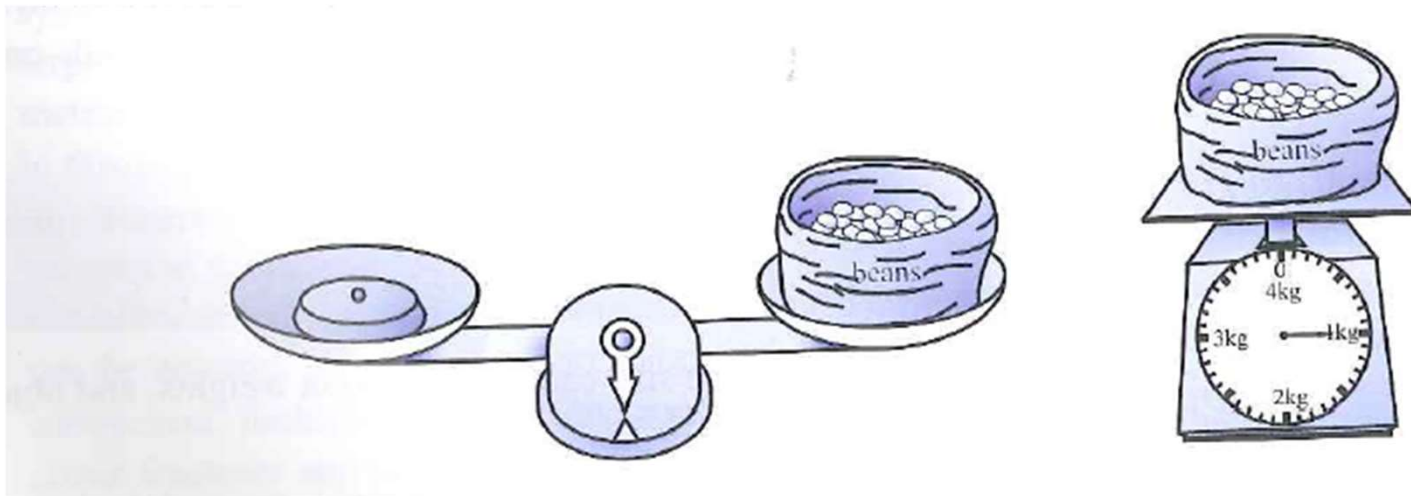


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Measuring weight

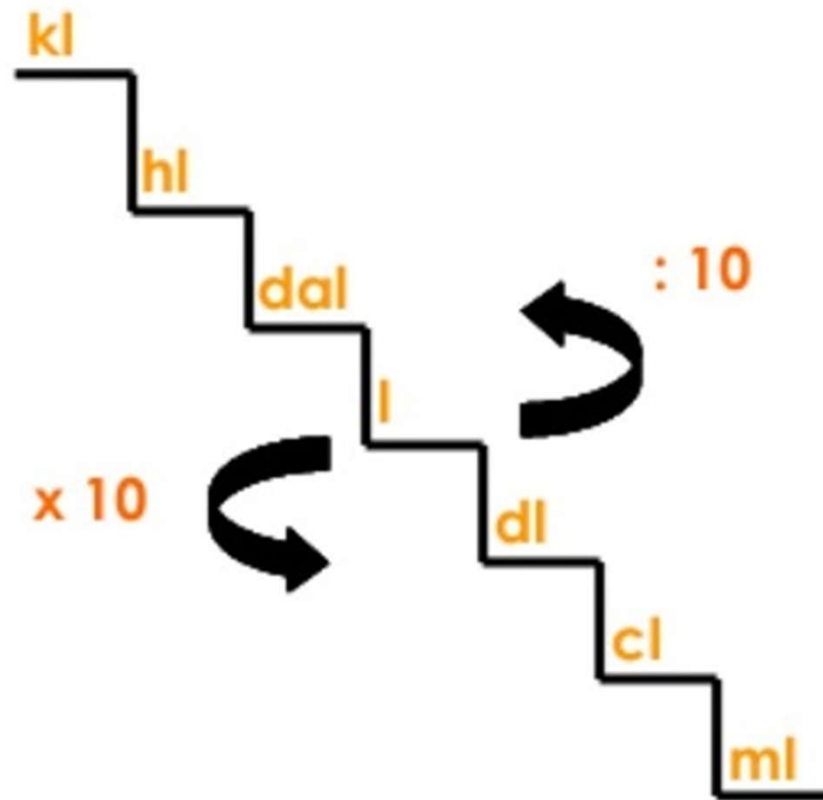


Measuring weight

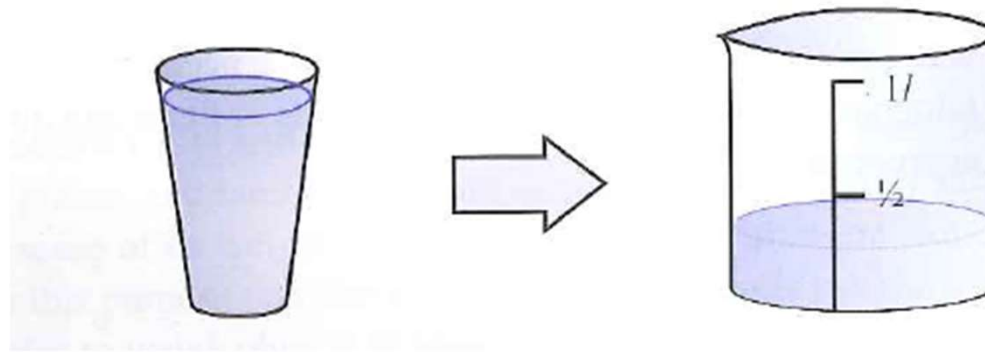


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Measuring capacity



Measuring capacity



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To explain...

km	hm	dam	m	dm	cm	mm

25 hm 36 m = _____ m

km	hm	dam	m	dm	cm	mm
2	5	3	6			

25 hm 36 m = 2 536 m

Useful for quadratic units

km ²		hm ²		dam ²		m ²		dm ²		cm ²		mm ²	

32 km² 345 m² 421 cm² = _____ m² _____ cm²

km ²		hm ²		dam ²		m ²		dm ²		cm ²		mm ²	
3	2	0	0	0	3	4	5	0	4	2	1		

Respuesta = 32'000.345 m² 421 cm²

Problem of measurement

- A bookcase contains two rows of identical textbooks. One row is 18 inches long, the other is 24 inches long. The longer row contains 4 more textbooks than the shorter row. How thick is each textbook?

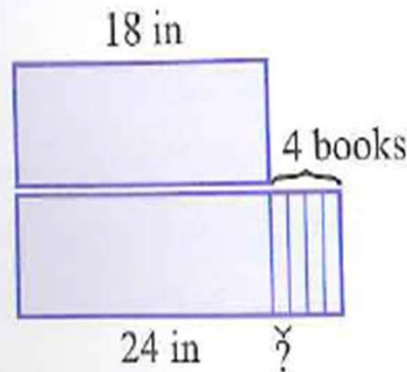
Problem of measurement

EXAMPLE 1.1. A bookcase contains two rows of identical textbooks. One row is 18 inches long, the other is 24 inches long. The longer row contains 4 more textbooks than the shorter row. How thick is each textbook?

Teacher's Solution with bar diagram and units.

Labeled picture describes the entire problem.

Unknown clearly labeled with a question mark.



Width of 4 books: $24 \text{ in} - 18 \text{ in} = 6 \text{ in}.$

Width of 1 book: $6 \text{ in} \div 4 = 1\frac{1}{2} \text{ in}.$

Each textbook is $1\frac{1}{2}$ inches wide.

Computations explained using simple language.

Each step on its own line.

Answer is clearly stated.