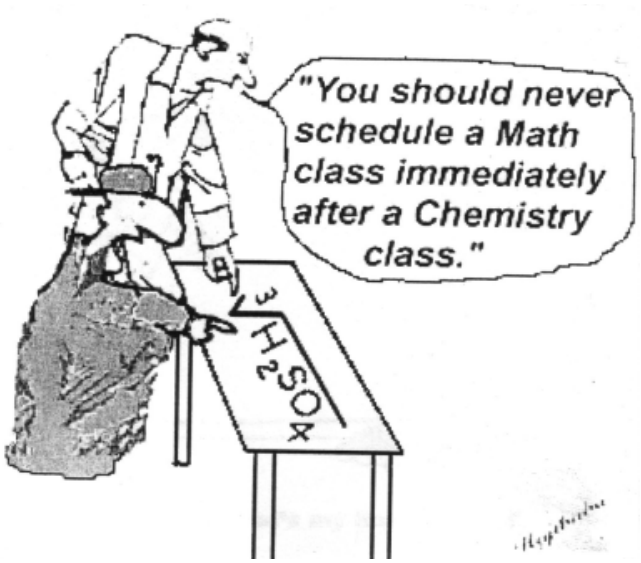
8. NUMBERS AND MEASUREMENTS



1. Introduction. Discuss these questions in small groups.

a) Do you like learning English? What other languages can you speak? At what level?
b) Describe some interesting teacher you had at secondary school.
c) Do you like mathematics and physics? Are you good at it? What is difficult about it?
d) What are some things that a biologist needs to calculate? An astronomer? A physicist? A geologist? What about a chemist?
e) *"Mathematics is the father of all sciences.", "Everything in science has its origin in mathematics.", Mathematics is the most primary science."*
Do you agree with these statements? Why? Why not?
f) What could you calculate or measure in this classroom? Think of weight, volume, temperature, size…
g) Do you know any magical/lucky/unlucky numbers? Have you heard of numerology? Do you trust it?

READING NUMBERS:

0 zero / nought (in mathematics) / „o" (in telephone numbers)
25 twenty-five
135 one hundred and thirty-five
1258 one thousand two hundred and fifty-eight
2 000 000 two million

1. the first
2. the second
5. the fifth
26. the twenty-sixth
26 / 11 the twenty-sixth of October
October the twenty-sixth

2. Work in pairs. Find out this information:

a) What´s your name and surname? Can you spell it?
b) How old are you? When were you born?
c) In which year of your study are you?
d) What´s your phone number?
e) What´s your address? Include the postal code.
f) How many brothers and sisters do you have? Can you spell their names?
g) How many students are there in this class?
h) Can you read these numbers? : 2654 4000 25 158 264 3 000 000 25. 78.

SIMPLE ARITHMETICS

Look at the way we say these examples:

4 + 4 = 8	four and (plus) four is / equals eight
9 − 2 = 7	nine minus two is seven
5 × 5 = 25	five times five is twenty-five *or* five multiplied by five is twenty-five
8 ÷ 4 = 2	eight divided by four is two

Here are some more arithmetical symbols. Notice how to say them.

2^2	two squared	$\sqrt{\ }$	square root of …
-2^3	minus (negative) two cubed	$\sqrt[3]{\ }$	cube root of …
2^4	two to the power of four	π	pi
$\log_{10}7$	log of seven to the base ten	x=3(a+b)	x equals three, bracket a plus b, bracket

This is how we say fractions

$\frac{1}{2}$	a half	$\frac{1}{3}$	a third	$\frac{1}{1000}$	one thousandth/one over a thousand
$\frac{1}{4}$	a quarter	$\frac{3}{5}$	three fifths	$\frac{1}{100}$	one hundredth/ one over a hundred
$\frac{3}{4}$	three quarters	$2\frac{1}{2}$	two and a half	$\frac{35}{10}$	thirty-five over ten

Look at this example

5 + 4 = … How much is five and four?

Five and four is nine.

3. Work in pairs. Ask and answer questions about these in the same way.

a) 12 − 6 = …
b) 9 × 5 = …
c) 30 ÷ 6 = …
d) $\sqrt{16}$= …
e) $4 + 7\frac{1}{5} = \ldots$
f) 9^2 = …
g) $\sqrt[3]{27}$= …
h) 2^4 = …
i) π = …

Look at this example:

Add six to seven. Now multiply by four. Subtract four. Divide by twelve. What is the answer? *Four.*

6 + 7 = 13, 13 × 4 = 52 52 − 4 = 48 48 ÷ 12 = 4.

4. Work in pairs to do these exercises. One of you should ask the questions. The other should give the answers without looking at the paper. See how quickly you can do it.

a) Multiply 7 by 9. Add 9. Divide by 6. Subtract 3. What is the answer?

b) Subtract 8 from 24. Divide by 2. Add two. Multiply by 10. What is the answer?

c) Add six to eight. Multiply by 10. What is the answer?

d) Take 50% of the students in your class. Multiply by 2. Divide by 4. What is the answer?

FRACTIONS AND DECIMALS

Notice how we say the decimals. Read these examples.

$\frac{1}{2}$ = 0.5 (nought point five / zero point five)

$1\frac{3}{4}$ = 1.75 (one point seventy five)

$3\frac{8}{10}$ = 3.8 (three point eight)

$\frac{874}{1000}$ = 0.874 (nought point eight seven four)

and the measurements:

0.643 g = (nought) point six four three of a gramme

1.385 cm = one point three eight five centimetres

1 km = 0.621 miles : one kilometre equals nought point six two one miles

5. Change these fractions into decimals. Read it aloud with a neighbour.

a) $\frac{5}{8}$ = c) $6\frac{1}{3}$ =

b) $4\frac{3}{5}$ = d) $7\frac{1}{4}$ =

6. Work with a neighbour. Describe these numbers:

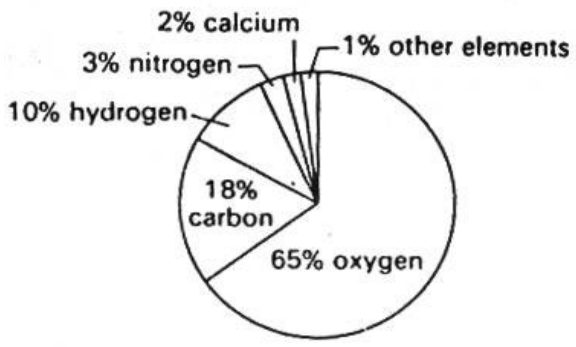
Example:

a) *One kilometre equals one thousand meters* *or ten to the power of three.*
One decimetre equals one tenth of a meter *or ten to the power of minus one.*

a) kilo-	*one thousand:*	*1 km = 1000 m*	10^3
b) deci-	*one tenth:*	*1 dm =* $\frac{1}{10}$ *m*	10^{-1}
c) centi-	one hundredth:	1 cm = $\frac{1}{100}$ m	10^{-2}
d) milli-	one thousandth:	1 mm = $\frac{1}{1000}$ m	10^{-3}
e) micro-	one millionth:	1 µm = $\frac{1}{1000000}$ m	10^{-6}
f) nano-	one thousand millionth:	1 nm = $\frac{1}{1000000000}$ m	10^{-9}

PERCENTAGES

7. 65% (per cent) of our body weight is oxygen. Use the diagram to make more sentences.



READING SIMPLE EQUATIONS[1]:

Here are some common compounds, their names and FORMULAS:

NaCl – sodium chlor**ide**	H_2SO_4 – sulphur**ic** acid	$ZnSO_4$ – zinc sulph**ate**	C_6H_6 - benzene
ZnO – zinc ox**ide**	HCl – hydrochlor**ic** acid	Na_2CO_3 – sodium carbon**ate**	NH_3 - ammonia
CO_2 - carbon **di**ox**ide**	NaOH – sodium hydrox**ide**		

These formulas are useful for writing EQUATIONS.

Example: **HCl** + **NaOH** → **NaCl** + **H_2O**

We spell as: H Cl **plus** Na OH **gives** Na Cl **plus** H_2O
We read as: hydrochloric acid **reacts with** sodium hydroxide **to form** sodium chloride **and** water.
combines with

8. Complete these equations:
a) $CuO + H_2 \rightarrow$ ……
(copper oxide reacts with hydrogen to form copper and water)

b) $Na_2CO_3 + 2\ HCl \rightarrow$ ……..
(sodium carbonate reacts with 2 molecules of hydrochloric acid to form sodium chloride, carbon dioxide and water)

c) $Zn + 2HCl \rightarrow$ ……
(zinc reacts with 2 molecules of hydrochloric acid to form zinc chloride and hydrogen)

9. Express these equations in words:
1. $2\ Na + Cl_2 \rightarrow 2\ NaCl$ .....

2. $ZnO + H_2SO_4 \rightarrow 2\ ZnSO_4 + H_2O$ .....

3. $2\ Na + 2\ H_2O \rightarrow 2\ NaOH + H_2$ .....

10. Watch the video lecture about pH calculation given by Dr.Goldwhite.[2]
Listen and write down the calculation. Then watch it for the second time and note down the important words and phrases. Finally, try to describe the calculation in pairs.
Useful vocabulary:

acid (n) - kyselina	base (n) – zásada	obtain (v) – získat
strongly acidic (adv+adj) – silně kyselé	basic (adj) - zásadité	species (n) - vzorek
concentration of a solution (n) – koncentrace roztoku	ion (n) - iont	relate to (v) – vztahovat se k …
		relationship (n) - vztah

11. HOMEWORK – UNITS OF MEASUREMENT

a) Make 10 sentences from the table below. a) *Example*: The height of large objects is measured in metres.

The	height volume area width surface area length radius cross-sectional area diameter circumference	of	large small very small minute cylindrical	objects	is measured in	m cm mm μm m^3 cm^3 mm^3 m^2 cm^2 mm^2
	distance	between		places		km

Help: Units of measurements and their abbreviations

kilometre	km
metre	m
decimetre	dm
centimetre	cm
millimetre	mm
square metre	m^2
cubic metre (metre cubed)	m^3
micrometre	μm = („micron“)

b) Say whether the following statements are true or false. Correct the false statements.

a) Duration is measured in degrees Centigrade T/F

b) The second is a unit of time T/F

c) Speed is measured in kilograms per hour. T/F

d) The watt is a unit of electrical charge. T/F

e) Density is measured in grams per metre cubed. T/F

f) The gram is a unit of mass. T/F

g) Liquid measurements are made in litres, or cubic decimetres. T/F

Help: Other measurements and their units:

electric current	ampere (amp)
electric power	watt (W)
electric resistance	ohm (Ω)
electric potential difference	volt (V)
temperature	degrees Centigrade (°C)
mass	gram (g), kilogram (kg)
weight (the force of gravity on mass)	newton (N). kilonewton (kN)
speed	kilometres per hour (km/h) ($km.h^{-1}$)
density	kilograms per cubic metre (kg/m^3) ($kg.m^{-3}$)
time (duration)	second (s), minute (min), hour (h)
fluid capacity	litre (l) = cubic decimetre (dm^3)
concentration	molar (mole/liter)

For more units and their abbreviations visit http://www.jbc.org/site/misc/itoa.TI.xhtml

Sources: Lesson based on Bates, Martin and Dudley-Evans, Tony: *Nucleus of General Science.* Longman 1990.

[1] **Adapted from** Cihová, Jarmila et al. *Angličtina pre študentov chémie***.** Bratislava: Univerzita Komenského, 2003.

[2] **Available at** http://www.youtube.com/watch?v=LZk1_yzF9js. Accessed 29th October 2010

Week 8 – Numbers and Measurements - Vocabulary	
four and (plus) four is / equals eight	čtyři plus čtyři se rovná osm
nine minus two is seven	devět mínus dva je sedm
five times five is twenty-fine / five multiplied by five is twenty-five	pět krát pět je dvacet pět
eight divided by four is two	osm děleno čtyřmi je dva
two squared	dva na druhou
minus (negative) two cubed	mínus dva na třetí
two to the power of four	dva na čtvrtou
square root of …	druhá odmocnina
cube root of …	třetí odmocnina
three quarters	tři čtvrtiny
a third	třetina
one thousandth/one over a thousand	jedna tisícina / jedna lomeno tisíc
How much is five and four?	Kolik je pět plus čtyři?
one thousand two hundred and fifty-eight	tisíc dvěsta padesát osm
add (v)	přičíst
subtract (v)	odečíst
One kilometre equals nought point six two one miles.	Jeden kilometr se rovná nula celá šedesát dva mil.
7. 65 per cent of our body weight is oxygen.	7,65 procent těledné váhy je kyslík.
Hydrochloric acid reacts with sodium hydroxide to form sodium chloride and water.	Kyselina chlorovodíková reaguje s hydroxidem sodným a vytvoří chlorid sodný a vodu.
sodium chloride	chlorid sodný
carbon dioxide	oxid uhličitý
sulphuric acid	kyselina sírová
sodium hydroxide	hydroxid sodný
sodium carbonate	uhličitan sodný
acid (n) / acidic (adj)	kyselina / kyselý
base (n) / basic (adj)	zásada / zásaditý
obtain a species (v)	získat vzorek
formula (n)	vzorec
equation (n)	rovnice
ion (n)	iont
relate to (v) / relationship (n)	vztahovat se k / vztah
concentration of a solution (n+prep+n)	koncentrace roztoku
The height of large objects is measured in metres.	Výška velkých předmětů se měří v metrech.
surface area (n+n)	povrch
width (n)	šířka
length (n)	délka
square metre (adj+n)	metr čtvereční
cubic metre (metre cubed) (adj+n)	metr krychlový
electric current (adj+n)	elektrický proud
electric power(adj+n)	elektrický výkon
electric resistance (adj+n)	elektrický odpor
kilometres per hour	kilometry za hodinu
Temperature is measured in degrees Centigrade (n+n)	Teplota se měří ve stupních Celsia.