NUMBERS AND MEASUREMENTS

I. Discuss the questions below in your groups/pairs.

1. Do you have any lucky/unlucky number? Do you believe in numerology?
2. *"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?
3. What could you calculate or measure (express in numbers) in this room?
4. What are the things that these people need to calculate?
    a. biologist
    b. astronomer
    c. physicist
    d. geologist
    e. chemist

II. Read these numbers or fractions:

0.2	3000 000 000
0.05	7000 000 000 000
26	1st
138	2nd
2479 (ordinal number/hotel room)	43rd
503349777 (telephone number)	2000 000
2,053	67th
2.053 (g/kg)	1/3
	3/5

III. 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-fine *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

IV. Work in pairs. Solve these maths problems.

a) 12 − 6 = …
b) 9 × 5 = …
c) 30 ÷ 6 = …
d) $\sqrt{16}$= …
e) $4 + 7\frac{1}{5} =$…
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?

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

Work in pairs. Write down graphical image of the problems below, then take turns in saying them aloud and finding the answer (one of you should say the equation and 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?

V. Units of measuremet.

1. Give the names of measurement units missing in the table below:

	QUANTITY	UNIT	ABBR.	NOTES
SI BASE UNITS	length mass time temperature electric current luminous intensity		 K 	 =39.36 inches/in =2.2 pounds/lb
SI DERIVED UNITS	area volume velocity density frequency accelaration force work/energy/heat amount of substance pressure electric power electric resistance electric potential difference electric charge plane angle solid angle			
SOME OTHER MEASUREMENTS	surface tension heat capacity/ entropy radiance			

2.Work with a neighbour. Complete the table and then describe these numbers:

Example:

a) One kilometer equals a thousand meters or ten to the power of three

a) kilo-	*one thousand: 1 km = 1000 m*	*10^3*
b) deci-	one tenth: 1 dm = $\frac{1}{10}$m	10
c) centi-	one hundredth: 1 cm = $\frac{1}{100}$ m	10
d) milli-	one thousandth: 1 mm = $\frac{1}{1000}$ m	10
e) micro-	one millionth: 1 μm = $\frac{1}{1000000}$ m	10
f) nano-	one thousand millionth: 1 nm = $\frac{1}{1000000000}$ m	10
g) pico-	one picometer: 1pm	10
h)	one_____ : 1fm	10^{-15}
i)atto-	one _____ : 1__m	10^{-18}

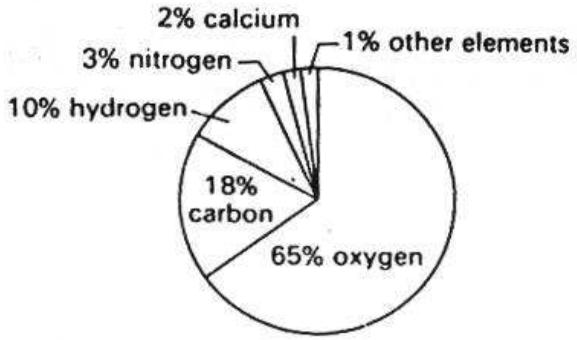
VI. Percentages

65% (per cent) of our body weight is oxygen.

Our body contains 65% of oxygen.

Oxygen represents 65% of our body weight.

Describe the rest of the diagram below using the structures given



VII. Using letters as symbols, write a formula for each relationship. The first one is done for you;

1. Work is the product of force times the distance through which the force acts.
w=f x d
2. Velocity is calculated by dividing distance by time.
3. The volume of a cube is calculated by multiplying the length times the width times the height.

4. Power is the rate at which work is done; it is computed by dividing work by time.
5. Kinetic energy is calculated as one half the product of the mass times the velocity squared.

VIII. Read the following formulas:

1. $N = kg \cdot m \cdot s^{-2}$
2. $v = u + at$
3. $s = ut + \frac{1}{2}at^2$
4. $p = \frac{\Delta m}{\Delta v}$
5. $K = mc^2 \left(\frac{1}{\sqrt{1-(\frac{v}{c})^2}} - 1 \right)$

IX. Put the following statements into mathematical notation:

1. x has been defined as the ratio of the cube root of the quotient 10 divided by z, to the product of 12 to the power of minus 4 and y squared;
2. half x increased by the product of 25 and y;
3. the squared sum of x and y is equal to the sum of x squared, the product of two x and y, and y squared;
4. twice the sum of p and 5, diminished by 30;
5. x to the power of minus 10 is less than cube root of y;

X. Solve the problems:

1. The Erth's diameter is of the order of magnitude of 10^7 m. The Sun's diameter is of the order of magnitude of 10^9 m. The radius of the Erth's orbitabout the Sun is of the order of 10^{11} m. Calculate:
   a) the approximate number of the Earth diameters in the diameter of the Sun
   b) the approximate number of the Earth diameters in the average radius of the Earth's orbit
2. Find the approximate number of kilometres in the distance light can travel in one year. Do it by rounding off the numbers involved to one digit and the power of ten. That is, take 3×10^8 m/s for the speed of light, 4,000 s in an hour, 20h in a day and 400 days in a year. Round off your answer to one digit times the power of 10.

XI. Say whether the following statements are true or false;

1. It takes thousands of seconds for the light to travel from the Sun to the Earth.
2. Distance of the Earth from the Sun is of the order of magnitude of 10^{11} km.
3. One day is millions of seconds.
4. The size of a virus is of the order of magnitude 10^{-4}.
5. It takes fewer than 10^2 terrestrial days for Mars to orbit the Sun

XII. 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

Ex. I-VI and XII adapted from A. Rozkošná (*Sources: Lesson based on* Bates, Martin and Dudley-Evans, Tony: *Nucleus of General Science.* Longman 1990. *Adapted from* Cihová, Jarmila et al. *Angličtina pre študentov chémie***.** Bratislava: Univerzita Komenského, 2003.)
Ex. VII-XI: *Angličtina pre fyzikov,* Alena Zemanová

GRAMMAR REVISION: COUNTABLE/ UNCOUNTABLE NOUNS

I. Divide the words below into two categories: countable and uncountable nouns

percentage, metre, science, molecule, nitrogen, information, radius, second, temperature, heat, fraction, time, quark, petroleum, research, change, watt, object, ion, water, light, substance, matter, energy, electron, equilibrium, neutron

II. Complete the sentences below with "many"or "much"

1. How _____years ago were the Universe and space-time created?
2. How _____time does it take the Earth to go around the Sun?
3. How_____ seconds are there in one day?
4. How _____ of the Universe do we know today?
5. How _____ planets are there in the solar system?
6. How _____ liquid does a beaker contain?
7. How _____energy would you need to boil 10 litres of water?
8. How _____ nitrogen does the atmosphere contain?
9. Do you find _____ useful information about quantum physics on the Internet?
10. Will we exploit _____ more nuclear energy in the future than we do today? What do you think?

Now answer these questions.

III. Complete the sentences with "little", "a little", "few", "a few"

1. As very _____ research has been done in the field, we still have no antidote to the disease.
2. Doing just _____ research threw up some very useful information.
3. Only _____ scientists were invited to take part in the project. That is probably why it was not successful.
4. The project team consists of _____ well-known chemists.

Week 6 – 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
acceleration	zrychlení, akcelerace
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.
approximate	přibližný
Round off	zaokrouhlit
diameter	průměr
velocity	rychlost
resistance	odpor
el.charge	elektrický náboj
angle	úhel
density	hustota; propustnost
obtain a species (v)	získat vzorek
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
temperature (n)	teplota
degree Centigrade (n+n)	stupeň Celsia
kilometres per hour	kilometry za hodinu
Second is a unit of time.	Sekunda je jednotka času.