 **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?
	1. biologist
	2. astronomer
	3. physicist
	4. geologist
	5. 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.**

|  |  |  |  |
| --- | --- | --- | --- |
| 22 | two squared | $$\sqrt{}$$ | square root of …  |
| - 23 | minus (negative) two cubed | $$\sqrt[3]{}$$ | cube root of … |
| 24 | two to the power of four | π | pi |
| log107 | 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 = … | d) $\sqrt{16}$= … | g) $\sqrt[3]{27}$= … |
| b) 9 × 5 = … | e) $4+7\frac{1}{5}=...$ | h) 24 = … |
| c) 30 ÷ 6 = … | f) 92 = … | 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.

1. Multiply 7 by 9. Add 9. Divide by 6. Subtract 3. What is the answer?
2. Subtract 8 from 24. Divide by 2. Add two. Multiply by 10. What is the answer?
3. Add six to eight. Multiply by 10. What is the answer?
4. 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 | lengthmasstimetemperatureelectric currentluminous intensity |  | K | =39.36 inches/in=2.2 pounds/lb |
| SI DERIVED UNITS | areavolumevelocitydensityfrequencyaccelarationforcework/energy/heatamount of substancepressureelectric powerelectric resistanceelectric potential differenceelectric chargeplane anglesolid angle |  |  |  |
| SOME OTHER MEASUREMENTS AND THEIR UNITAStheir units | surface tensionheat capacity/ entropyradiance |  |  |  |

**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* | *103* |
| 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

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**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.m.s-2
		2. v = u + at
		3. s = ut + $\frac{1}{2}$at2
		4. p = $\frac{Δm}{Δv}$
		5. K = mc2 ( $\frac{1}{\sqrt{1-(\frac{v}{c})^{2}}}$ - 1)

**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 107 m. The Sun’s diameter is of the order of magnitude of 109 m. The radius of the Erth’s orbitabout the Sun is of the order of 1011 m. Calculate:
1. the approximate number of the Earth diameters in the diameter of the Sun
2. the approximate number of the Earth diameters in the average radius of the Earth’s orbit
	* + - 1. 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 3x 108 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;**

It takes thousands of seconds for the light to travel from the Sun to the Earth.

Distance of the Earth from the Sun is of the order of magnitude of 1011 km.

One day is millions of seconds.

The size of a virus is of the order of magnitude 10-4.

It takes fewer than 102 terrestrial days for Mars to orbit the Sun

**XII. Say whether the following statements are true or false. Correct the false statements.**

1. Duration is measured in degrees Centigrade T/F
2. The second is a unit of time T/F
3. Speed is measured in kilograms per hour. T/F
4. The watt is a unit of electrical charge. T/F
5. Density is measured in grams per metre cubed. T/F
6. The gram is a unit of mass. T/F
7. 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**

1. **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

1. **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.**

1. **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. |