Title

Contents

1 – Safety Rules and Regulations

Safety Signs

Explain what the following signs mean.
What should you do (or not do)? What precautions should you take?

Warning Signs	Mandatory Signs	Prohibition Signs	Hazardous Substance Labels	Emergency Information
				

In Case of Fire-Alarm

Complete the Fire-Alarm Safety Rules by choosing the best answer. More than one answer may be correct.

1. The complete building will be __.
   a) elevated b) elongated c) emptied d) escaped e) evacuated
2. Close windows and doors – but do not __ them.
   a) break b) leave c) lock d) shut e) tighten
3. Guide helpless / disabled people to the __ point.
   a) assembly b) collection c) gathering d) holding e) meeting
4. Follow the signed __ routes.
   a) absence b) break out c) escape d) evacuation e) get-away
5. Do not __ elevators.
   a) consume b) contain c) employ d) use e) utilize
6. Follow the instructions of the evacuation __ (red safety vests) until the fire service arrives.
   a) chiefs b) controllers c) coordinators d) directors e) managers
7. Go directly to the assembly point – wait for further instructions given by authorized personnel.
   a) people b) personal c) personnel d) prospects e) public
8. Do not leave the grounds of Hochschule Darmstadt with your car. You may __ the access roads for the fire service.
   a) block b) check c) deter d) impede e) obstruct

General Safety Rules

9. You may only use safety-__ electrical devices

a) checked b) controlled c) proved d) proven e) tested

10. No serial connection of multiple __!

a) connectors b) outlets c) plugs d) power points e) sockets

11. No tripping __due to electrical installations! (Watch where you place your electrical cords!)

a) deathtraps b) exposures c) hazards d) risks e) threats

Tool Safety

12. Do not use the power tool if the __ does not turn it on and off.

a) button b) key c) lever d) shelter e) switch

13. Disconnect the plug from the power source before making any __.

a) adjustments b) arrangements c) formations d) shapes e) variations

14. Perform regular __ on your power tools.

a) care b) maintenance c) safety d) upholding e) upkeep

15. __ only with the charger specified by the manufacturer.

a) boost b) increase c) recharge d) restore e) upload

16. Do not __ power tools or battery packs in household waste. 

a) discard b) dispose of c) eliminate d) remove e) throw away

2 – Introduction to Engineering

WRITE DOWN THREE REASONS WHY YOU HAVE CHOSEN TO STUDY ELECTRICAL ENGINEERING

1.

2.

3.

DISCUSS WITH YOUR NEIGHBOUR THE ABOVE REASONS, ADD HIS or HERS AND WRITE THEM DOWN

4.

5.

6.

WHAT SKILLS OR ABILITIES DO ELECTRICAL ENGINEERS NEED?

_____

_____

_____

_____

_____

_____

WHERE DO YOU SEE YOURSELF WORKING AFTER GRADUATION AND WHAT DO YOU SEE YOURSELF DOING?

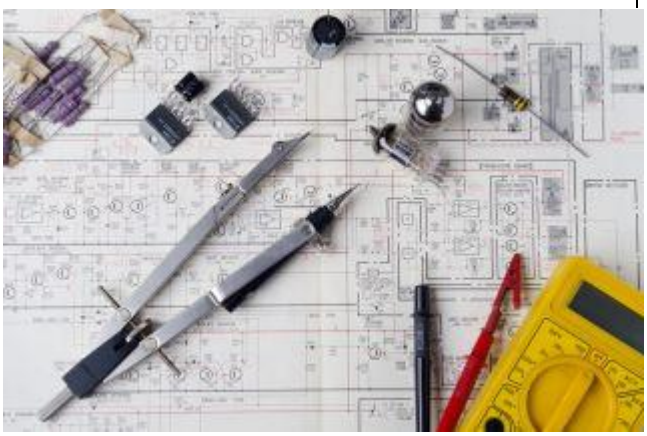
_____

_____

_____

_____

What do electrical engineers do?



Electrical engineers design, develop, test and supervise the manufacturing of electrical equipment, such as electric motors, radar and navigation systems, communications systems and power generation equipment. They design and develop electronic equipment, such as broadcast and communications systems — from portable music players to global positioning systems (GPS). They study and apply the physics and mathematics of electricity, electromagnetism and electronics to both large and small scale systems to process information and transmit energy. They work with all kinds of electronic devices, from the smallest pocket devices to large supercomputers.

Which industries can electrical engineers work in?

Electrical engineers are usually concerned with large-scale electrical systems such as motor control and power transmission, as well as utilizing electricity to transmit energy. Electrical engineers may work on a diverse range of technologies, from the design of household appliances, lighting and wiring of buildings, telecommunication systems, electrical power stations and satellite communications. Another emerging field for electrical engineers is microelectronics - the design and development of electrical systems and circuits in computers and mobile devices.

What are some real-life electrical engineering designs?

A few examples of the applications and reach of electrical engineering include:

The computer, tablet or smartphone you purchased recently is a masterpiece of electrical engineering design.

Robots are comprised of sensors, actuators, microprocessors and sophisticated feedback control systems, designed by electrical engineers!

Space projects - deep space communications, robust control systems, extra-terrestrial GPS for navigation and positioning, power generation and storage networks, imaging systems - made possible by electrical engineers.

Sophisticated medical technology that you come across in a modern hospital including CT, MRI and PET imaging machines, ECG and blood pressure monitors, all based off electrical engineering principles.

If it's a practical, real-world device that produces, conducts or uses electricity, in all likelihood, it was designed by an electrical engineer. Additionally, engineers may conduct or write the specifications for destructive or nondestructive testing of the performance, reliability and long-term durability of devices and components.

Exercise 1
What do the following words mean in English? Find equivalent words in the previous text.

1. entwerfen _____
2. entwickeln _____
3. prüfen _____
4. kontrollieren _____
5. Herstellung _____
6. Stromerzeugung _____
7. untersuchen _____
8. anwenden _____
9. Rundfunksendung _____
10. verarbeiten _____
11. übertragen _____
12. Gerät _____

Exercise 2
What is the difference between the following words? Give some examples of each.

1. Device
2. Appliance
3. Equipment
4. System
5. Station

Exercise 3 – Devices and their Functions:
Find words in the text (*lines 21 – 36*) that have the same meaning:

1. _____ uses
2. _____ bought
3. _____ consist of
4. _____ response
5. _____ tough/sturdy
6. _____ encounter
7. _____ requirements
8. _____ functionality
9. _____ dependability
10. _____ toughness/sturdiness

Exercise 3 – Discussion
1. Can you think of any other skills you might need when you start your engineering career?
2. Which subject / lessons do you think will benefit you the most during your career as an engineer? Why?
3. What courses / subjects do you think are missing from your studies? Which topics should be given more emphasis and which should be given less?

Fields of Engineering

How many different Engineering Fields can you name? Can you name at least 10 (including your own field of study)?

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Engineers Tasks

Complete the text below. The first letter has been given.

1. All engineers share certain t_____ and r_____. This often includes d_____ new devices. They a_____ a problem to see how a device might help s_____ the problem. Often they design or redesign a device to conform to the r_____ at hand. Then they create/draw up the s_____ so the device can be built. Next, they have to develop a p_____ of the device. They then test this device to v_____ performance and functionality.
2. Electrical Engineers specialize in power s_____ and g_____. They also design, develop, t_____ and s_____ systems, circuits, and devices used in communication, computer and entertainment s_____, health care i_____, and automated control systems

Word Formation

Add the appropriate form of the words below

Verb	Noun
1. analyze	_____
2. assign	_____
3. correct	_____
4. develop	_____
5. inspect	_____
6. perform	_____
7. prevent	_____
8. repair	_____
9. respond	_____
10. support	_____

Verb	Noun
11. _____	requirement
12. _____	test
13. _____	maintenance
14. _____	malfunction
15. _____	design

3 – Meeting and Greeting

During your career as an engineer, you will be required to **introduce** yourself and others when meeting other people. This can take place during **trade fairs**, **meetings**, **conferences**, **sales visits** or during many other occasions. During these times, you will want to make the best impression possible. Therefore, it is very important to note a few simple rules.

Saying hello

When you meet someone in a FORMAL situation – FOR THE FIRST TIME – you say "**how do you do?**". If you have already met this person, you can say "**how are you doing?**". In INFORMAL situations, you can say "**how are you?**" whether you already know the person or not. Remember: the answer to these questions is "fine". "How are you", "**how are you doing**", "**how do you do**" are not real questions about your health. Rather, these are just polite ways of introducing yourself or saying hello.

Asking about someone's job

If you want to know about someone's **profession** or **position**, you can ask them "**what do you do?**". You can also ask "**what do you do for a living?**" If you want to know where someone has a job, you can ask "**where do you work?**" or "**who do you work for?**". There are many ways you can answer this question. If you want to say the name of your company, you can say "**I work for [your company]**" or "**I am employed at [your company]**". If you want to say your location, you can say "**I work in [your city]**" or "**I work at [location]**".

Don't ask someone "**what are you doing?**" unless you are curious about the activity they are currently doing. "**What do you do?**" refers to asking about someone's job.

Talking about yourself

Often, you will be required to talk about current projects you are working on or about your past experiences. Perhaps you **did an internship** that is relevant to the situation. Possibly you **did an apprenticeship** which gives you specific specialized knowledge of the topic being discussed. It is also possible that you **had training** in a specialized area or **did/took a course** giving you certain background information relevant to the situation. In addition, you can refer to any subjects you are **certified in** / **have certification in**. You need to know how to express this in a professional manner.

When talking about your current **position** / **duties** (i.e. **tasks**), you can explain what you are **responsible for** or what you are **in charge of**. You can indicate any projects, activities or departments that you **run** or are the **head of**. You can also mention what you position **involves** (*involve + VERB + "ing"* e.g. "my job **involves** writing many status reports and **calculating** future costs.)

You may need to explain to someone what you **majored** (main courses of study) and **minored** (secondary courses of study) in during your university studies. It is also sometimes important to say where you **studied** / **did your studies**.

Exercises

Exercise 1

You are attending a conference with your boss. You are in a small group having a conversation during one of the breaks. Answer the following questions according to the situation given:

1. Your boss introduces you to another guest, Mr. Marshal. You have never personally met Mr. Marshal, but you know who he is. You shake hands with Mr. Marshal and say …
   a) How are you doing? b) How do you do? c) What are you doing? d) What do you do?
2. A second guest, Mrs. Johnson, joins your boss and Mr. Marshal. You have met Mrs. Johnson several times in the past. You shake hands with Mrs. Johnson and say …
   a) How are you doing? b) How do you do? c) What are you doing? d) What do you do?
3. You would like a little more information about Mr. Marshal's position in his company. You ask him …
   a) How are you doing? b) How do you do? c) What are you doing? d) What do you do?
4. Mr. Marshal says that he is an engineer. You tell Mr. Marshal …
   a) I am also an engineer. b) I am also engineer. c) I am an engineer, too. d) I am engineer, too.
5. Mr. Marshal mentioned the name of his company, but you didn't understand. You say …
   a) For what company do you work? b) For which company do you work? c) What company do you work for? d) Which company do you work for?
6. Mrs. Johnson did an internship at Mr. Marshal's company. She tells him …
   a) I jobbed at your company. b) I worked at your company. c) I made an internship at your company. d) I did a training at your company.
7. Mr. Marshal wants to know the name of Mrs. Johnson's supervisor when she was at his company. He asks her …
   a) Who did you work at? b) Who did you work for? c) Who did you work over? d) Who did you work with?
8. You notice that Mr. Marshal has a little accent. You want to know his nationality. You ask him …
   a) What is your accent? b) Where are you from? c) Where do you come from? d) Where were you from?

Exercise 2

Add the correct preposition, if needed, to complete these sentences. Sometimes more than one answer is possible.

1. I want to work _____ Siemens after I graduate.
2. He works _____ the Chemnitz factory.
3. She works _____ the marketing department.
4. He's responsible _____ the Chinese project.
5. My job involves _____ documenting the progress of the engineers.
6. She often works _____ foreign engineers.

Exercise 3 – Discussion

1. Is being “trained” and “certified” the same thing?

2. What is the difference between a trade fair, a conference, a meeting, and a social mixer?

3. How many ways can you say *verantwortlich für* in English?

4. What is the difference between an internship and an apprenticeship?

Exercise 4

Find words in the text that have the following definitions:

1. ..... an exhibition at which businesses in a particular industry promote their products and services
2. ..... a gathering of two or more people to discuss ideas, goals and objectives that concern the workplace, often to make important decisions regarding the organization
3. ..... an event, sometimes lasting a few days, at which there is a group of talks on a particular subject
4. ..... a meeting in which especially business matters are discussed formally
5. ..... face-to-face meeting between a salesperson and a customer or prospect for the purpose of generating a sale, usually prearranged

Exercise 5

Prepare a short presentation. Give information about yourself in regards to the following topics. Respond using the 6Ws (who, what, when, where, why & how):

1. an apprenticeship
2. an internship
3. special or interesting course
4. special or interesting hobby
5. special certification

4 – Numbers

Numbers are an essential part of an engineer's job. You will need them when **measuring** (i.e. how long, how far, how much), counting (i.e. how many) or **labeling** (i.e. equipment number, ISBN). It is important that you know how to use them in English.

Mathematics

Elementary arithmetic is expressed with addition, subtraction, multiplication and division:

• addition	3 + 2	3 plus 2	• multiplication	3 x 2	3 multiplied by 2 3 times 2
• subtraction	3 - 2	3 minus 2 3 subtracted from 2	• division	3 ÷ 2	3 divided by 2

NOTE: In some countries, division is expressed with another symbol (i.e. 3:2).
However, in English this represents a ratio (i.e. 3:2 – a ratio of 3 to 2)

Equality (or inequality) can be expressed in different ways in English. Here are some of the most common examples:

x = y	x equals y x is equal to y	x < y	x is less than y
		x ≤ y	x is less than or equal to y
x ≠ y	x does not equal y x is not equal to y	x > y	x is greater than y
		x ≥ y	x is greater than or equal to y
x ≈ y	x is approximately equal to y		

Scientific notation

Some numbers are so large or small that we use a special method of expressing these. Numbers such as 3 x 10^8 are known as scientific notation. The 8 in 10^8 is known as the exponent. The 10 is the base.

- The speed of light is 3 x 10^8 m/s. (three times ten to the power of eight)
- 12 grams of carbon contains approximately 6.023×10^{23} carbon atoms (six point zero two three times ten to the power of twenty-three)

Mathematical Symbols

Some common mathematical symbols and how to say them:

x^2	x –squared	$\sqrt{y}$	the square root of y	%	Percentage
x^3	x –cubed x to the 3rd power x to the power of 3	$\sqrt[3]{y}$	cubed root of y	π	pi (pronounced [pai])
		$\sqrt[4]{y}$	4th root of y	∞	infinity / infinite
x^4	x to the 4th power x to the power of 4			$\sum$	summation / the sum of …
x^{-4}	x to the negative 4th power x to the power of negative 4				

Written numbers

When writing, we spell out the numbers below 10. Larger numbers are denoted with their digits.

- Please send us four samples.
- The delay is due to two machines malfunctioning simultaneously.
- We had 21 applicants for the internship position.

However, always use the number for dates, ages, monetary amounts, percentages, and ratios.

- 8 June
- 21 years old
- $129.99
- 14%
- 3:2

The use of commas and decimals are the opposite as in some countries (i.e. Germany)

- 1,400 one thousand four hundred
- 1.400 one point four zero zero

Spoken numbers

When speaking, you can say 'one' or 'a' when using large numbers.

- 100 one hundred / a hundred
- 1000 one thousand / a thousand

The use of 'and' is also optional.

- 123 one hundred twenty-three (AmEng)
- 123 one hundred AND twenty-three (BrEng)

When using decimals, read each number AFTER the decimal individually.

- π = 3.14195 (three POINT one four one nine 5)

Ordinal numbers

When referring to an ordered arrangement or a position in a list, we use ordinal numbers. Most ordinal numbers end with "th" – but not all.

- first 1st
- second 2nd
- third 3rd
- fourth 4th
- fifth 5th
- twenty-first 21st
- twenty-second 22nd
- twenty-fifth 25th
- ninety-ninth 99th
- hundredth 100th

Currency

Currency symbols come BEFORE the number in English

- $ 12.00
- ¥ 8000
- € 24.95
- £ 19.99

Percentages / Fractions

There are many ways we can refer to parts or partial section of an amount. We commonly use either percentage or fractions, although other ways are possible, too.

- One out of 10 products off the assembly line was defective.
- 12% of the inventory was returned.
- We were able to repair ¾ (three-fourths, three quarters) of the machines.
- We had to throw out ¼ (a fourth, a quarter) of merchandise.

Common abbreviations

We often use abbreviations for common expressions

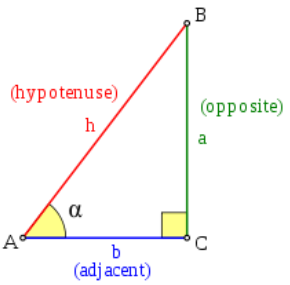
- Contamination levels have risen to 1000 ppm (parts per million)
- The speed limit on most sections of the Autobahn is 120 km/h (kilometers per hour).
- The official highest recorded temperature is 56.7°C (degrees Celsius). It was measured on 10 July 1913 at Greenland Ranch, Death Valley, California, USA.
- The device takes 12.5 V (volts).

Miscellaneous mathematical expressions

Here are some miscellaneous mathematical expressions which might be useful to you as an engineer:

$$\sin\theta = \frac{opposite}{hypotenuse} \qquad \cos\theta = \frac{adjacent}{hypotenuse} \qquad \tan\theta = \frac{opposite}{adjacent}$$

The sine of angle ϑ is equal to the opposite divided by the hypotenuse



$\int_a^b f(x)\,dx$ *the integral of a to b of f of x dx*

even numbers *2, 4, 6, 8, …*

odd numbers 1, 3, 5, 7, …

prime numbers 2, 3, 5, 7, 11, …

Exercises

Exercise 1

How do you say the following numbers?

1. 10,234 _____
2. 10.234 _____
3. 1000 _____
4. 1,000 _____
5. 1.000 _____
6. 10,000 _____
7. 100,000 _____
8. 1,000,000_____
9. 1,000,000,000_____
10. 1,000,000,000,000_____

Exercise 2

How do you say the following?

1. 1 + 1 _____
2. 2 – 1 _____
3. 3 × 1 _____
4. 5 ÷ 2 _____
5. 5 : 2 _____
6. x = y _____
7. AB ≠ CD _____
8. A ≈ B _____
9. A < B _____
10. A ≤ B _____
11. B > A _____
12. B ≥ A _____

Exercise 3

What are the English expressions for the following?

1. *Zahl* _____
2. *Ziffer* _____
3. *gerade* _____
4. *ungerade*_____
5. *Sinus* _____
6. *Cosinus* _____

Exercise 4

What are the following symbols?

1) x^2 _____
2) x^3 _____
3) x^4 _____
4) √ _____
5) % _____
6) π _____
7) ∞ _____
8) $\sum$ _____

Exercise 5

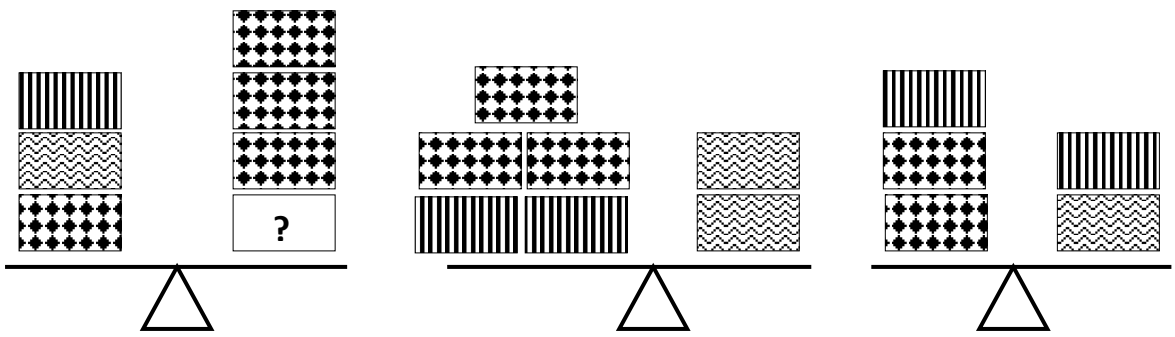
Circle the correct answer.

1. a^3
   a) a-3rd-power b) a-cube c) a-cubed d) a-high-3 e) a-power-3
2. AB ≠ CD
   a) AB does not equal CD b) AB equals not CD c) AB is not equal CD d) AB is unequal CD e) AB not the same as CD
3. 24 × 6
   a) twenty-four multiplicated by six
   b) twenty-four multiplicated with six
   c) twenty-four multiplied by six
   d) twenty-four multiplied with six
   e) twenty-four time six
   f) twenty-four times by six
4. A ≥ B
   a) A is greater than and equal B
   b) A is greater than and equal to B
   c) A is greater than or equal B
   d) A is greater than or equal to B
   e) A is greater then and equal B
   f) A is greater then and equal to B
   g) A is greater then or equal B
   h) A is greater then or equal to B
5. $^1/_3 + {}^2/_3 = 1$
   a) one-third plus two-third equal one
   b) one-third plus two-third equals one
   c) one-third plus two-thirds equal one
   d) one-third plus two-thirds equals one
   e) one-thirds plus two-thirds equal one
   f) one-thirds plus two-thirds equals one
6. eight billion dollars
   a) 8.000.000 $
   b) 8,000,000 $
   c) $ 8.000.000
   d) $ 8,000,000
   e) 8.000.000.000 $
   f) 8,000,000,000 $
   g) $ 8.000.000.000
   h) $ 8,000,000,000
   i) 8.000.000.000.000 $
   j) 8,000,000,000,000, $
   k) $ 8.000.000.000.000
   l) $ 8,000,000,000,000
   m) 8.000.000.000.000.000 $
   n) 8,000,000,000,000,000 $
   o) $ 8.000.000.000.000.000
   p) $ 8,000,000,000,000,000

Exercise 6

Which box is needed to balance the scale? You may only add one box.

Bonus: can you give a weight to each box? (Hint: one of the boxes weighs 3 kilograms)



5 – Programming

Computers do what they are told, and their instructions come in the form of **programs** written by humans. This is known as **programming** or **coding** and this is done using a programming **language**. Often, the **source code** to these programs can be read by humans but not by computers. In these cases, it is said that source code is **compiled**. This means it is "translated" into **machine code** which the computer can understand. Some programs are not compiled, but rather **interpreted**. This means that it is composed on the computer while it is **running**. Such programs are often known as **scripts**.

Functions

A computer program **implements** the steps to carrying out its task. These steps are called **algorithms**. An algorithm is a step by step method of solving a problem. It is commonly used for **data processing**, calculation and other related computer and mathematical operations. An algorithm is also used to manipulate data in various ways, such as **inserting** a new **data item**, **searching** for a particular item or **sorting** an item.

If certain algorithms are used repeatedly or in different tasks, they can be implemented in a function or method. Functions are a way of grouping algorithms so that you can readily call them to compute a result. A function has three parts: a **name**, **parameters**, and a **body**. The body is the block code which performs the calculations (i.e. the algorithm). Parameters are variables that exists only in the **scope** of the function (while the function is being used). Functions or methods generally need parameters in order complete their task correctly. The name of a function is used to **call** that function (i.e. the code within the function). Functions are often used to **return a value**, using a **return statement**. Functions that do not return a value are referred to as **void**.

Data Types

Fundamentally, computers manipulate numbers, or more precisely 0s and 1s. These binary numbers are then "translated" into the decimal numbers, which we use and understand. However, not all numbers are created equally. To be useful, these numbers need to be of special data types.

Boolean these are **binary** numbers. They can only be 0 or 1. This often corresponds to "true"/"false", "on"/"off", or "active"/"inactive".

Integers these are commonly referred to as "counting numbers". They are **whole numbers** (not a **fractional** number). Integers can be **signed** (**positive**, **negative** or zero) or **unsigned** (only positive or zero). Unsigned integers can reach a higher value (dependent on **memory space** reserved for such numbers).Examples of **integers** are: -5, 1, 5, 8, 97, and 3,043

Float/double these are numbers with **decimal parts.** Whether they are referred to as double or float depends on how precise the decimal must be and on the programming language. Generally, double is more **precise**, thus needs more memory, than float.

Char or **character** – these are letters represented by certain numerical values. They are used to make the computing experience easier. One of the most famous **encoding systems** is **ASCII** (American Standard Code for Information Interchange). ASCII codes represent text in computers, telecommunications equipment, and other devices. Most modern character-encoding schemes are based on ASCII, although they support many additional characters.

The data types explained above are known as the **elementary**, **primary** or **basic data types**. We can build more complex data types from these basic data types. A **list** is a number of items in an **ordered** or **unordered** structure. Items in a list can be **stored**, **added/inserted** or **deleted**. An **array** is similar to a list, but has some **advantages**. Arrays allow both **direct** and **sequential access**; lists only allow sequential access. Arrays can also be **multi-dimensional** (i.e. an array within an array). A

string is a simple array of characters. This allows the computer to deal with complete words, sentences or even complete texts.

Variables

Programming languages use numbers (and text) and allow you to **add**, **delete**, **edit** and **manipulate** this data as well as **storing** the data for later **retrieval**. These numbers and text are called **variables**. Variables are **allocated** specific memory locations for easy retrieval. Variables, and **constants**, can be given a name chosen by the programmer to make it easier to remember the purpose of the variable (i.e. "High Score"). The value of a variable can be altered. The value of a constant cannot.

Operators

Variables are useless unless you can do something with them, such as **adding** or **multiplying** their values. Processing variables is known as an **operation**.

We use **parenthesis** in programming languages to control the **order of operation**. Parenthesis can also be **nested** (i.e. one set of parenthesis (within another set of parenthesis)). Which type of parenthesis you require depends on the syntax of the programming language. You may need basic **parenthesis ( )**, **square brackets [ ],** or **braces { }**. The first parenthesis or bracket in a set is referred to as the **opening parenthesis**; the end parenthesis is referred to as **closing parenthesis**.

Basic **Operators**:

+	addition
-	subtraction
*	multiplication
/	division

Conditions:

Conditional statements are commonly called **if-statements**. A condition is specified by a set of **boolean expressions** which are **evaluated** to a value of **true** or **false**. An **if statement** executes a block of code if the condition is true. An **if else** statement runs different block of code depending on whether the condition is met or not. If execution of a block of code depends on a series of conditions, then multiple if-statements are used. This can be an **if-else-if ladder** or a **nested if-else statement**. However, it is often recommended to use a **switch statement** rather than multiple nested if-else statements. **Multiple conditions** are often stated using **Boolean algebra** (**&&** (**AND**), **||** (**OR**), **!** (**NOT**)).

Relational Operators
In conditional statements

==	**equal to**
!=	**not equal to**
>	**greater than**
<	**less than**
>=	**greater than or equal to**
<=	**less than or equal to**

Loops

Loops are a fundamental construct for many programs. The purpose of loops is to **repeat** the same, or similar, code a number of times. All loops allow you to **initiate** a **counter** (or **index**) variable, a **check** condition, and a way to **increment** your **counter**.

Most programming languages have versions of the following loops:

- **For-loops**
- **While-loops**
- **Do…while-loops**

For-loops are used when we know how many times the **block of code** should be **executed**. **While-loops** are used in situations where we do not know how many times (or **iterations**) the loop needs to be **executed** beforehand. **Do…while-loops** are used when we do not know how many iterations are necessary, but the block of code should be executed at least once.

Functions

A computer program **implements** the steps to carrying out its task. These steps are called **algorithms**. An algorithm is a step by step method of solving a problem. It is commonly used for **data processing**, calculation and other related computer and mathematical operations. An algorithm is also used to manipulate data in various ways, such as **inserting** a new **data item**, **searching** for a particular item or **sorting** an item.

If certain algorithms are used repeatedly or in different tasks, they can be implemented in a function or method. Functions are a way of grouping algorithms so that you can readily call them to compute a result. A function has three parts: a **name**, **parameters**, and a **body**. The body is the block code which performs the calculations (i.e. the algorithm). Parameters are variables that exists only in the **scope** of the function (while the function is being used). Functions or methods generally need parameters in order complete their task correctly. The name of a function is used to **call** that function (i.e. the code within the function). Functions are often used to **return a value**, using a **return statement**. Functions that do not return a value are referred to as **void**.

Examples of loops:

for loop

```
for (int i=0; i<100; i++)
{  //executed until i >= 100  }
```

while loop

```
while (condition)
{  //executed after condition checked  }
```

do…while loop

```
do
{  // executed at least once }
   while (condition);
```

Punctuations/Symbols

In most source code, you will generally find different punctuation marks depending on the programming language. Common punctuation marks include **comma** (,), **semi-colon**(;), **colon**(:), **braces** ({}), **brackets** (B.Eng) **/ parenthesis** (AmEng) (()), **square brackets** ([]), **quotation marks** (“ ”), **pipe** (|), **slash** (/), **back slash** (\) **period** (.), **question mark** (?), **caret**(^) and **percentage** (%).

Exercise 1
Find a word that has the same meaning as the definitions below:

1. ..... a text listing of commands to be compiled or assembled into an executable computer program
2. ..... carrying out of operations on data, especially by a computer, to retrieve, transform, or classify information
3. ..... collection of instructions that performs a specific task when executed
4. ..... computer programming language consisting of binary or hexadecimal instructions which a computer can respond to directly
5. ..... direct execution of source code without compiling it beforehand
6. ..... implementation
7. ..... process of converting source code into a form in which the program can be executed
8. ..... well-defined procedure that allows a computer to solve a problem

Exercise 2
Use the words below to complete the text. Sometimes more than one word can go in the blank. All the words should be used.

• call	• edit	• insert	• script	• sort
• delete	• execute	• remove	• search	• store

Databases are a user-friendly form of data processing. For example, it is easy to keep up to date and _____ (change or make corrections) a mailing list. If you have a new customer, it is a simple process to ADD a new contact. You would go to the correct field and _____ the new information. If some of the contacts are no longer up-to-date, it is a simple matter to _____ the outdated elements. However, don't forget to save the changes or you won't _____ the new version of the list. When you need to find information about a particular client, you can use the _____ function to find this. Oftentimes, the data should be presented in a particular way, such as alphabetical order. The _____ function is the command you need for this. Sometimes tasks that are often performed are automated. The commands would be saved into a _____ which you then _____ as needed.

Exercise 3

Examples of different types of data are given below. Explain what each example represents:

1. ..... true/false
2. ..... 1, 2, 3, 4, 126
3. ..... 3.14159
4. ..... ‘a’, ‘b’, ‘c’, ‘1’, ‘2’
5. ..... 1.0, 3.5, -1.0, -3.5, 0
6. ..... 1.0, 2.0, 3.5, 0

Exercise 4

Write down the following punctuation / programming symbols:

1. _____ back slash
2. _____ braces
3. _____ brackets
4. _____ caret
5. _____ colon
6. _____ comma
7. _____ parenthesis
8. _____ percentage
9. _____ period
10. _____ pipe
11. _____ question mark
12. _____ quotation marks
13. _____ semi-colon
14. _____ slash
15. _____ square brackets

Exercise 5

Explain the different parts of each of the following code segments:

1.
```
for (int i=0; i<100; i++)
   {    //executed until i >= 100    }
```

2.
```
int addition (int a, int b)
{      int r;
       r=a+b;
       return r;       }
```

3.
```
if (n1 >= n2)
   {    if (n1 >= n3)
        {    largestNumber = n1;     }
        else
        {    largestNumber = n3;     }
   }
else
   {    if (n2 >= n3)
        {    largestNumber = n2;    }
        else
        {    largestNumber = n3;    }
    }
System.out.println("Largest number is " + largestNumber);
```

6 – Tools

Common tools when dealing with electronics

You are likely to find a variety of **tools** and other **equipment** in your shop or at home. Many of these tools will have specific functions for dealing with electricity. You need to know how to utilize such tools and equipment properly.

Soldering

Soldering is one of the most fundamental skills needed to dabble in the world of electronics. **Soldering** (pronounced "soddering") involves a material called **solder** that **melts** when heated. The heat comes from a **soldering iron**. The melted solder cools and **forms a bond** between two items. A **soldering station** is often useful because it holds your hot soldering iron and keeps your solder and cleaner for the soldering iron **tip** organized. Most soldering stations also include a set of **helping hands** / **third hand**. A third hand has at least one **clamp** on it that can hold a component while soldering it. It allows you to you both of your other hands. Many of these third hand **accessories** also come with a **magnifying glass**. This is very useful for viewing part numbers on small components. Other equipment you might need in a soldering station include **solder flux**, a **solder smoke extractor** (**filter** to keep you from breathing soldering **fumes**), and a **solder vacuum** / **solder sucker**. This is very useful for when you **make a mistake** while soldering. Solder wick is another tool for correcting soldering mistakes. It is sometimes called **solder braid** or **copper braid** and is used to **desolder** (**mop up solder**)

Pliers

Pliers are another tool which is necessary for electrical engineers. Pliers are very useful for **gripping** an object **firmly**. These objects can then be **turned**, **bent**, **twisted**, or otherwise manipulated.

All pliers have **handles**, **pivot points** and **jaws**. The jaw is where you can grip an object. Special pliers may have other components (e.g. **blades** for cutting, **springs** for self-opening pliers, etc.).

Needle-nose pliers (**long-nose pliers**) are often used when dealing with a component's pins. Because of the long shape of the jaws, they can be used for reaching into small areas. Needle-nose pliers often have a **cutting edge** at the base of the jaws.

Note:
Grammatically, *pliers* and *tweezers* are plural nouns. This means you must use the plural form when referring to pliers.

- If you want to refer to a single tool, you can say "a pair of pliers".
- When referring to multiple tools, you can say "two pairs of pliers".

Wire strippers are used for **stripping** (cutting and removing) off the electrical **insulation** from wires. They leave the **conductive** wire unharmed.

Crimping pliers are used to attach a **connector** to a **wire**. The connector may be used to connect two lengths of wire together or to connect a wire to an **electrical terminal**. The connection can be **temporary** or can remain as a **permanent** electrical **joint**.

Locking pliers (**vise grips**) are pliers that can be locked into position when **gripping** an object. Because they lock into place, you can apply more **force** (or **torque**).

Diagonal pliers are special pliers because they are not used to **grab** anything. Their purpose is to **cut wire**. This is why they are also called **cutting pliers** or **wire cutters**. Electricians often refer to them as **dikes**.

Tweezers

Tweezers are similar to pliers. These are small tools used for picking up objects too small to be easily **handled** with the human fingers. They are usually **lightweight** and are especially useful for working with **components** under a **magnifying glass**.

Scopes and Meters

A **multimeter** is has three main parts: a **display**, **selection knob** and **ports**. The selection knob allows the technician to **set** the multimeter to read different things such as **current** (mA), **voltage** (V) and **resistance** (Ω). Some **meters** are capable of measuing other units, such as **capacitance** (F) and **frequency** (Hz). Measurements are made using **probes**, which are plugged into the **ports** on the front of the **device**.

Oscilloscopes are used for **displaying** and **analyzing** the **waveform** of **electronic signals.** It is useful for uncovering information like **frequency**, **noise**, **amplitude**, or any other characteristic that might **vary**, **fluctuate** or otherwise change over time.

Screwdrivers

One of the most commonly seen and used tools is the **screwdriver**. Screwdrivers consist of three parts: the **tip**, the **handle**, and the **shank**.

A screwdriver is used by inserting its tip into the **head** of the **screw** and **rotating** it. The three most common types of screwdrivers are **Philips** (**plus**), **flat head** (**minus**), and **Torx**. (Flat head screwdrivers are also sometimes called **slot head** or **standard screwdrivers**.) The tip is vital for the proper implementation of this tool. It must fit **snuggly** (i.e. **tightly**). If it is too large, it will not **grip** the screw properly. If it is too small, it can **strip** the head. To **screw something in** (or on) or to **tighten** a screw, rotate the screwdriver **clockwise**. To **unscrew** something or **loosen** a screw, rotate it **counterclockwise** (BrE **anti-clockwise**).

Wrenches / Spanners

Wrenches (spanners) differ from screwdrivers in that they fit around the fastener whereas screwdrivers fit inside the fastener. Wrenches also use **leverage** to increase the **torque** applied to the nut or bolt. Wrenches should also fit snuggly around the nut or bolt. If there is any **play**, then the fastener can be **stripped**.

Wrenches often come in a set and each wrench has a **certain** size. If you want to use one wrench for various size **nuts**, you need an **adjustable wrench** (**crescent wrench**) or a **ratchet** (**socket wrench**). Adjustable wrenches have a screw which allows you to change the size of the head. Ratchets have special **bits** which **attach** directly over the head of the nut or bolt. These bits are called **sockets**

Allen wrenches (**hex keys**) are a hybrid between screw drivers and wrenches. They are inserted INSIDE the fastener (like screwdrivers) but use leverage to apply torque (like wrenches). And it is even possible to buy hex key screwdrivers. Nevertheless, **hex keys / Allen wrenches** are classified as wrenches.

Exercise 1

What are these tools called? Write the name next to the picture.

1 

2 

3 

4 

5 

6 

7 

Exercise 2

1. Pictures 1 - 3 are all different types of _____ .

2. You use them to _____(*lockern*) or

   _____(*festziehen*) a _____(*Bolzen*) or a

   _____(*Mutter*).

3. Generally, these tools are turned _____(*im Uhrzeigersinn*) to tighten a

   nut or bolt and _____(*gegen den Uhrzeigersinn*) to loosen it.

Exercise 3

Insert the appropriate words to complete the sentences.

1. In order to _____ (*"insert"*) the screw/bolt, turn the screwdriver clockwise.
2. To _____ ("*remove*") the screw/bolt, turn the screwdriver counterclockwise / anti-clockwise.
3. You may _____ ("*ruin*") the threads in the hole or on the screw / bolt if it does not remain at a 90° angle.

Exercise 4

What are these tools called? Write the name under the picture.

1 

2 

3 

4 

5 

Exercise 5

1. There are a total of 5 _____ (*Zangen*) on this worksheet.
2. The primary purpose these are to grip objects _____(fest).
3. The objects can then be _____(*verdreht*),

   _____(*verbogen*), or otherwise manipulated.
4. The tool in picture 4 (exercise 4) is used to remove the _____(*Isolierung*)

   from a wire. This process is known as _____ a wire.
5. The tool in picture 5 (exercise 4) is used to _____ connectors onto a wire.

   These connections can either be _____ (lasting only a short time) or

   _____ (lasting forever).

Exercise 6 – Discussion

State whether you agree or disagree with the following statements. Explain your answer.

1. If you are in a hurry, and you are careful, you can use the tip of a knife to loosen/tighten a screw.
2. Save your money when buying screwdrivers. The cheapest screwdrivers functions as well as the most expensive.
3. Safety goggles should be worn when using a screwdriver because the tip can be very sharp and can easily poke out someone's eye.
4. When tightening a screw, you should use all your strength while turning the screw to ensure that the screw is tight.
5. If you don't have a wrench readily available, it is OK to use a pair of pliers.

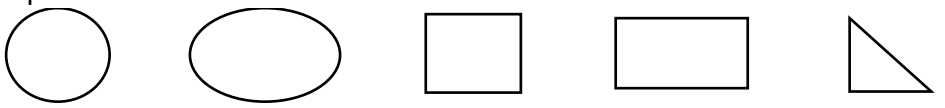
7 – Shapes and Dimensions

Shapes

When working on a project, it is often necessary to have **detailed** descriptions of the design. One of the most common ways of doing this is with **technical drawings** (**schematics** or **blue-prints**). Objects have **forms** or **shapes** referring to their **length**, **width**, and **height** (and sometimes **depth**). These can be presented in either two or three dimensions.

2D objects

Two-dimensional objects are represented as flat shapes. Here are some common shapes seen in 2D representations:



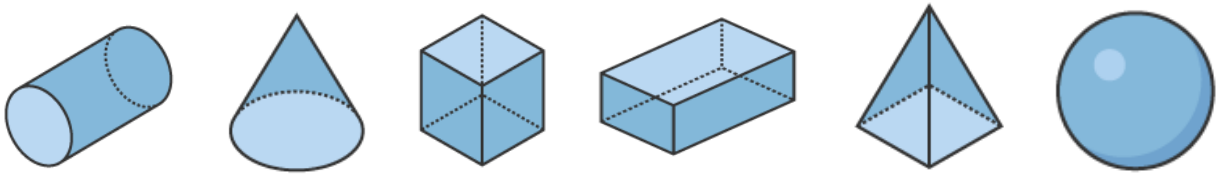
circle **ellipse, oval** **square** **rectangle** **triangle**

Examples:

Coins are **circular**; have a **circular** shape
Planetary orbits are **elliptical**
Origami paper is **square**; has a square shape
A4 paper is **rectangular**; has a rectangular shape
Nacho chips are **triangular**; have a triangular shape

3D objects

Three-dimensional objects are represented with **depth** or **thickness**, as they are seen in the real world. Here are some common shapes seen in 3D representations:



cylinder **cone** **cube** **cuboid (rectangular) block** **pyramid** **sphere**

Examples:

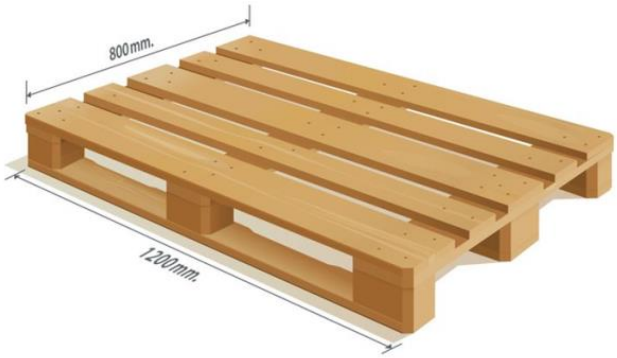
Pipes/**hoses** are **cylindrical**; have a cylinder shape
A **funnel** has a **cone** shape
Balls are **spheres**; have a sphere shape
A 6x4 Lego block is a **cuboid** (**rectangular block**); has a cuboid (rectangular block) shape
The Luxor Hotel in Las Vegas has a **pyramid** shape; is shaped like a pyramid.

Other common shapes

Some objects have irregular shapes, yet they are easy to describe.

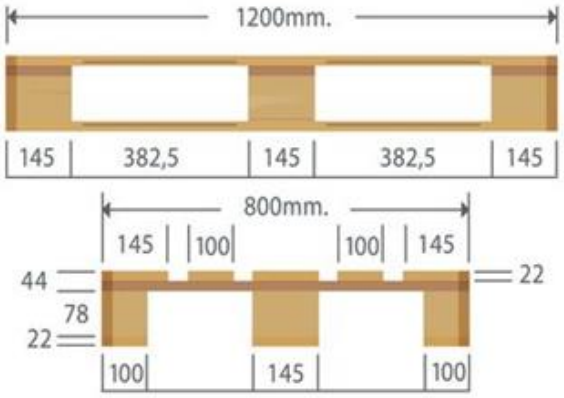
Hook (S-shape) **Bolt (U-shape)** **Pipe (Y-shape)** **Hex key (T-Shape)**

Dimensions



Most technical drawings **display** the projects' dimensions to help an engineer understand how to **construct** an object. This is especially true for **prototypes**.

When referring to 2-dimensional objects, the longest dimension is usually referred to as the **length**. The shorter dimension is referred to as the **width**. For example, euro pallets have a length of 1,200 mm / are 1,200 m long. They also have a width of 800 mm / are 800 mm wide. We can also say that euro pallets are 1.2 meters **by** 800 millimeters. Or that euro pallets have a loading **area** of 0.96m^2 (or almost one square meter).



Surface refers to the **exposed** side of an object. No **measurement** is used. **Area** refers to the exposed side of the object which is being **measured**. In our example, the **surface** of the euro pallet has an area of 0.96m^2.

When we add in a 3rd dimension, i.e. the distance measured from the bottom to the top of an object, we usually refer to this as the object's **height**. For example, the height of the euro pallet is 144 mm (it is 144 mm **tall**). The length and width of the euro pallet mentioned above remain the same. We can also say that the dimensions of euro pallets are 1,200 mm **by** 800 mm **by** 144 mm.

We refer to **depth** when talking about how far down something goes. For example, the gap between the deckboards (i.e. the top pieces of wood forming the "deck") of the euro pallet has a **depth** of 22 mm / is 22 mm **deep**.

Euro pallets also **weigh / has a weight** approximately 22 kg / euro pallets have a weight of approximately 22 kg. The pallets also have a **payload** of up to 1000 kg (i.e. they can **hold/bear a weight** of 1000kg).

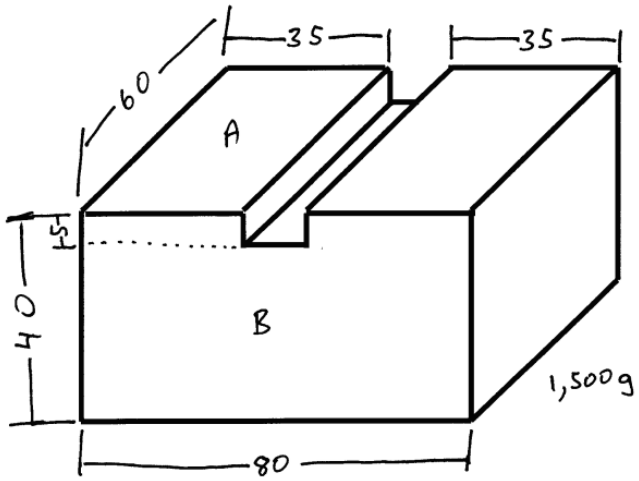
The **payload** of a euro pallet has enough **capacity** to hold six 45-gallon steel drums / barrels. Each barrel has a height of 89 cm and a **volume** / **capacity** of 45 gallons (205 liters). (This is **equivalent** to 205,000 cm^3). The barrel and lid have a **diameter** of 60 cm. If you remember your formulas from school, this means the **circumference** of the lid is **approximately** 188.5 cm and the **area** of the lid is **roughly** 2,825 cm^2. Of course, the **radius** is 30 cm. When empty, the drum **weighs** 10 kg.

The siphon drum pump in Figure 3 has a capacity of 8 strokes/liter. The **inlet** and **outlet hose** are **comprised of (made of/constructed of)** flexible PVC. The inlet hose has an **outer diameter** of 3.1 cm and a length of 180 cm. This can be increased by 120 cm for a total length of 3 m without affecting **performance**. The outlet hose has a length of 21 cm.

The inlet hose is set into the liquid. The pump should be **perpendicular** (i.e. **at a right angle**, **at 90°**) to the liquid. The outlet hose can be **horizontal (**i.e. **parallel** to the floor**)** or **vertical**.

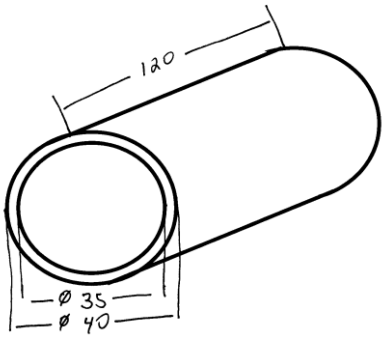
Exercise 1

Complete the following exercises. All measurements are in millimeters.

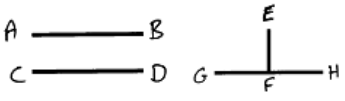


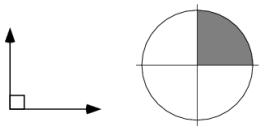
1. The dimensions of the block are 80 _____ 60 _____ 40.
2. a) Its _____ is 80.
   b) It has a(n) _____ of 80.
   c) It is 80 _____
3. a) Its _____ is 60.
   b) It has a(n) _____ of 60.
   c) It is 60 _____
4. a) Its _____ is 40.
   b) It has a(n) _____ of 40.
   c) It is 40 _____
5. The ridge at the top of figure 1 is 60 _____ 10 _____ 5.
6. The _____ of the ridge is 60. / The _____ of the ridge is 10.
7. a) Its _____ is 5.
   b) It has a(n) _____ of 5.
   c) It is 5 _____
8. The bottom of the ridge is 35 _____ (measured from the bottom of the block).
9. The top of the figure, section A, has a(n) _____ of 2100.
10. The entire _____ of the block covers an area of 10,950.
11. The figure _____ 1,500g. The figure has a(n) _____ of 1.5kg-

12. This figure has a(n) _____ shape.
13. It has a(n) _____ of 40.
14. It has a(n) _____ of 20.
15. Its _____ is 125.6 [c=πd].
16. Its _____ is 1256.6 [$A=\pi r^2$]



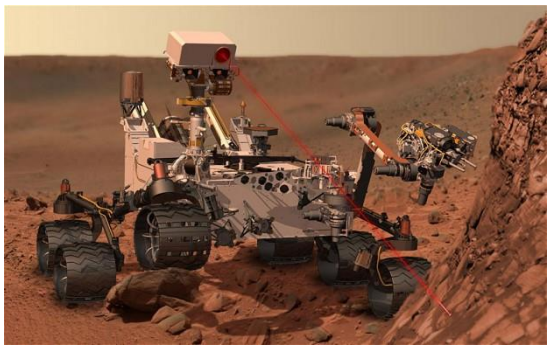
17. Lines AB and CD are _____ .
18. Lines EF and GH are _____ (*senkrecht*).
19. These are symbols for a _____ .
20. They are _____ a 90-degree angle.





Exercise 2

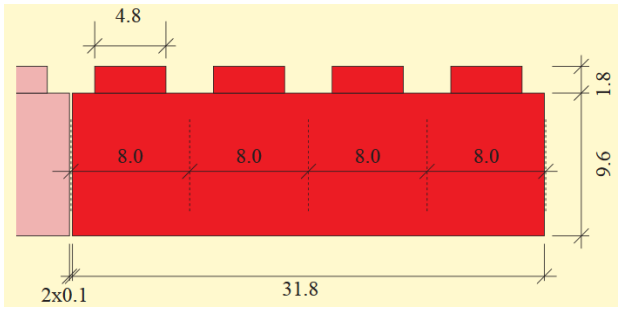
Fill in the blanks with the appropriate word



1. The Mars Rover Curiosity _____ 899 kg.
2. This includes scientific instruments with a _____ of 80 kg
3. The _____ of the rover is 2.9 m.
4. It is also 2.7 m _____.
5. It is 2.2 m in _____ (from the ground to the top).
6. Curiosity has six wheels. Each wheel has a _____ (*Durchmesser*) of 50 cm.
7. Curiosity is _____ (*ausgerüstet*) with several significant telecommunication modules.
8. The rover can _____ (another word meaning *function*) in temperatures varying between -127 to 40°C.
9. The rover has a 2.1 m _____ arm.
10. There is a cross-shaped turret with five devices _____ (*montiert*) on the end of the arm.
11. One of these devices is a drill. It can drill a hole up to 5 cm _____ (distance into the rock)
12. The turret can rotate 350 _____

Exercise 3

Fill in the blanks with the appropriate word. Use the diagram to the right if you need help.



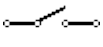
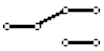
1. Each brick has a _____ (Spielraum) of 0.1 mm (the amount a particular dimension is allowed to vary) according to manufacturing guidelines.
2. The classic 2 _____ 4. (2 mal 4) brick is the most famous Lego brick.
3. It _____ 2.5 g. and
4. has a _____ of 31.8 mm.
5. It is also 16 mm _____.
6. The bricks are also 9.6 mm _____ – excluding the knobs at the top.
7. These last two dimensions have a _____ of 10:6 (the relationship between the sizes when you compare them).
8. This aspect (from #7) is essential if you want to build a _____ (box with equal height/length/width)
9. The _____ of the knobs is 1.8mm (from top to bottom).
10. Its _____ is 4.8mm (*Durchmesser*).
11. This means that is has a _____ (*Umfang*) of 15.08 mm.

8 – Schematic Symbols

Group 1: _____

1)  2) 

Group 2: _____


1)

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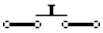
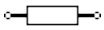
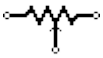
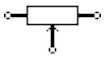
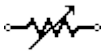
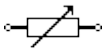

3)

Group 3: _____


1)

2)

3)

4)

5)

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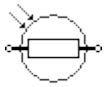
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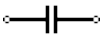
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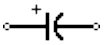
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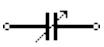
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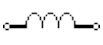
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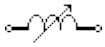
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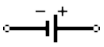
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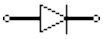
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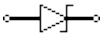
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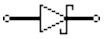
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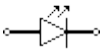
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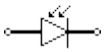
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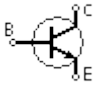

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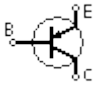

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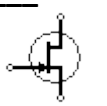
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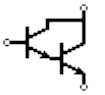
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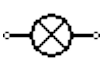
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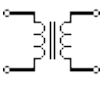
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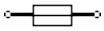
5)

6)

7)

8)

9 – Components

Wire

You may be wondering what there is to say about wire? Well - a lot!
Choose the best answer provided to complete the texts below.

Exercise 1:

- close
- insulated
- jacket
- sheath
- core
- isolated
- kern
- short

In electronics, the wire we deal with is _____. This means that there is a metal _____inside of a rubber or plastic _____. This allows electricity to flow, but prevents a _____in the wires if they were to touch.

Exercise 2:

- breadboard
- figure
- prone
- shape
- solid
- circuit board
- plugs
- pure
- socket
- tendency

There are basically two types of metal cores. _____ core wire has a single piece of metal inside the insulation. This type of wire is good for electronic circuit boards or connecting components together on a _____ because it can easily plug into the board's _____. Solid wire keeps its _____ when bent, but it's also more _____ to break if flexed too often.

Exercise 3:

- elastic
- fray
- prototyping
- snap
- troubleshooting
- flexible
- jump
- sliced
- stranded
- wiggle

_____ core wire consists of thin metal strands bunched together. This wire is better for connecting to components which are handled a lot or move around (such as connecting to motors on a robot arm). This type of wire does not easily plug into a microcontroller's sockets, as the strands spread apart and _____. This makes it annoying for _____. However, it is very _____ and it won't _____ if it is bent a lot.

Exercise 4:

- common
- contrasting
- reliable
- stable
- conductor
- electrode
- resistant
- standard

The most _____ material used in home wiring is copper. This metal is usually chosen because it is not only great as a/an _____, but is also easy to shape. Copper is also _____ to corrosion, heat, and other extreme elements, which makes it a/an _____ choice when used in everything from cellphones to telecommunication wiring.

Switches

So many switches, so little time.
Match the names of the switches with their picture. Then draw a line between the switch and its description.

- Pushbutton Switch
- Rocker Switch
- Tactile Switch
- Toggle Switch
- Read Switch
- Rotary Switch
- Tilt Switch

Name	Appearance	Description
1. _____		a) activated when you push down on it
2. _____		b) toggles between different configurations of multiple inputs and outputs
3. _____		c) connection is made depending on angle of the switch
4. _____		d) just a small pushbutton switch that gets soldered directly to a circuit board
5. _____		e) lever moved back and forth to activate the switch
6. _____		f) lever pivots to activate the switch
7. _____		g) switch that is activated by a magnet

Resistors

Resistors come in many different shapes and sizes. Vive la résistance!

1. One purpose of a resistor is to resist the __ of current.
   a) fleece b) flow c) movement d) run e) stream
2. Another __ is to regulate the voltage in a circuit.
   a) function b) job c) mission d) operation e) task
3. You measure the __ of resistance that a resistor offers is in Ohms.
   a) amount b) parts c) sum d) total e) volume
4. Most resistors have colored __ on the outside.
   a) bands b) bars c) hoops d) lines e) stripes
5. This code will tell you the __ of its resistance.
   a) measure b) rate c) significance d) value e) worth
6. You can use the resistor color codes or a multi-meter to __ its resistance.
   a) analyze b) calculate c) control d) decide e) determine
7. The last color refers to the __ of the resistor.
   a) accuracy b) error margin c) exactness d) precision e) tolerance

Capacitors

Remember, capacitors and condensators are NOT the same thing!

1. A capacitor is like a __.
   a) accumulator b) battery c) charge loader d) current saver e) rechargeable battery
2. A capacitors __ electricity.
   a) collects b) loads c) provides d) saves e) stores
3. It then __ this electricity back into the circuit …
   a) decharges b) discharges c) excharges d) subcharges e) uncharges
4. … when there is a __ in voltage.
   a) drop b) lower c) reduction d) shrinkage e) small
5. The value is measured in the F (Farad), nano Farad (nF) or pico Farad (pF) __.
   a) range b) scale c) scope d) value e) width
6. Electrolytic capacitors are __.
   a) dielectric b) insulated c) polarized d) reverse biased e) static

Resistance is not futile

$\Omega = V / I$

It's voltage divided by current

More Switches

A switch is probably the most commonly used component in everyday life. You use a switch from the moment you turn on the light to brush your teeth in the morning and until you turn off the lights to go to bed at night.

1. A switch consists of two (or more) __ terminals.
   a) carrying b) conductive c) insolated d) isolated e) passing
2. These terminals can be connected or __ with a mechanism (such as a lever or button).
   a) disconnected b) inconnected c) plugged out d) unconnected e) unplugged
3. When a switch is in an open position, there is a __ in the circuit.
   a) brake b) break c) gap d) halt e) pause
4. A __ switch, on the other hand, allows current to flow through the circuit.
   a) closed b) completed c) passable d) shut e) sufficient
5. So, the basic function of a switch is to __ electric current by turning a circuit on or off.
   a) break b) disrupt c) disturb d) interfere e) interrupt
6. Switches can come in many __ such as pushbutton, rocker, momentary and others.
   a) forms c) places e) styles
   b) methods d) shapes f) systems
7. A toggle switch has a little __ that is toggled back and forth to activate the switch.
   a) hebel c) lever e) point
   b) knob d) pin f) stick
8. By flicking the lever back and forth, you can __ or break one or more connections.
   a) create c) make e) produce
   b) do d) manufacture f) realize
9. The standard light switch is just a specialized toggle switch meant to handle __ current and voltage.
   a) amplified c) higher e) more
   b) greater d) increased f) super
10. A rocker switch is very __ to a toggle switch.
    a) like b) likely c) same d) similar e) similarly
11. They are commonly used as power switches and are sometimes __.
    a) electric b) illuminated c) lighted up d) lit up e) powered

Toggle Switch

Rocker Switch

10 – Reading Data Sheets (LM555 timer)

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