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DIGITAL TECHNOLOGIES



WORKBOOK

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DIGITAL TECHNOLOGIES

Workbook for students aged 14-18.

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— PAVEL ROUBAL —
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D I G I T A L T E C H N O L O G I E S

NAME	
SCHOOL	
CLASS	SCHOOL YEAR

W O R K B O O K

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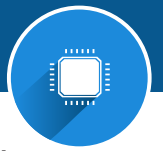
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1.1 BASIC COMPUTER COMPONENTS



1 a The principles of operation of current computers are based on their ___ basic parts.

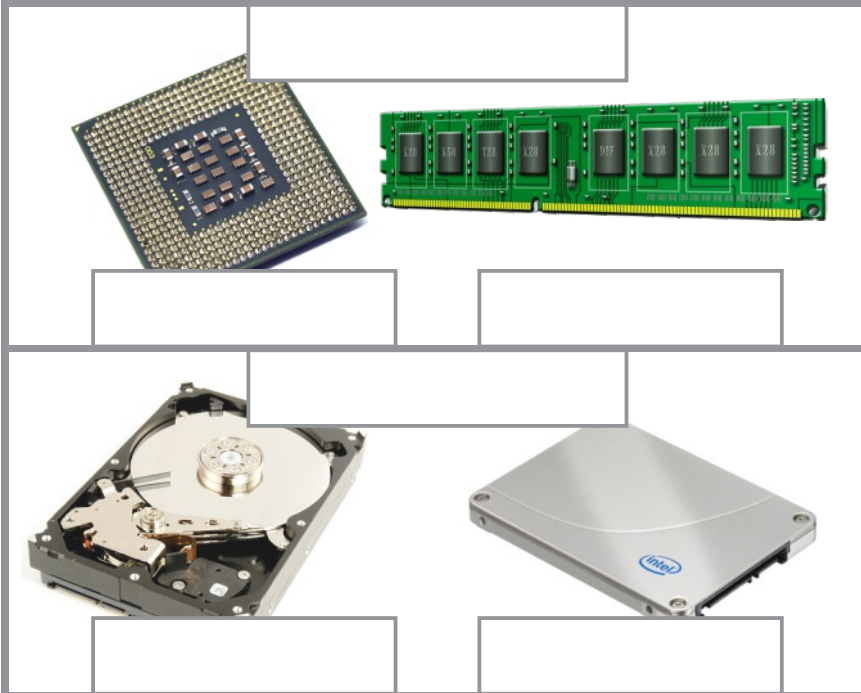
2 a All operations on the computer are performed by _____ in the _____

b After shutting the computer down these parts contain _____

3 a The _____ is for permanent data storage.

b When the power is turned off, contents of these 2 parts are **saved** **lost**

4 Fill in the types and names of these components:



9 Write the appropriate English abbreviation for each part:

processor:

random-access memory:

disk (mag. record):

disk (flash chips):

music disk:

video disk:

Computer components

5 a We can think of a processor as the _____ of a computer.

b Approx. how many operations does a processor perform in one second? _____

c Why is computer (quite correctly) called a computer? _____

6 a The operating memory is _____ for _____

b Why was the term random-access memory chosen unwell? _____

7 a We can think of a disk as a large _____ for our _____

b How does HDD differ from other types of drives (SSD, SD)?
HDD uses _____ recording, SSD (SD) drives use _____

8 a CDs were used to distribute _____. DVDs and Blu-ray disks for _____

b In order to use Cds and DVDs, the computer must have and appropriate optical _____

2.3 ORIGIN AND PRINCIPLES OF INTERNET

1 Where did the Internet originate from and what are its properties?

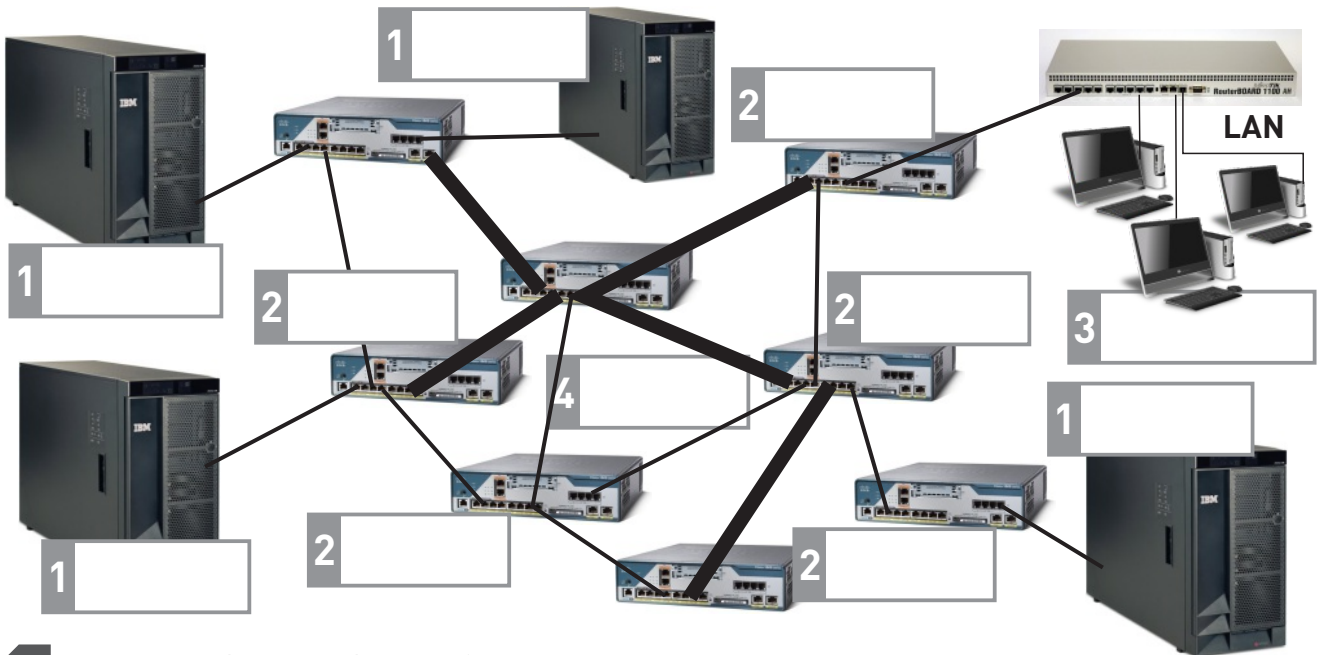
a What was the proposed network made by the US engineers supposed to be? _____

b What technical features of the network did the engineers use to accomplish this task?

1 2 3

c Internet = _____

2 Internet – structure and elements. Fill in the names of the elements that make the Internet:



a What is the function of routers? _____

3 Data transfer over the Internet

a Describe the data transfer. Your (client) computer requests data (for example a picture) from a server (for example Instagram.com):

recipient IP	source IP
192.168.0.67	192.168.0.55
Data	

1 _____

2 _____

3 _____

4 Ways to connect to the Internet

a What types of data connection does the Internet use? _____

b What (type and speed of connection) does your school use? _____

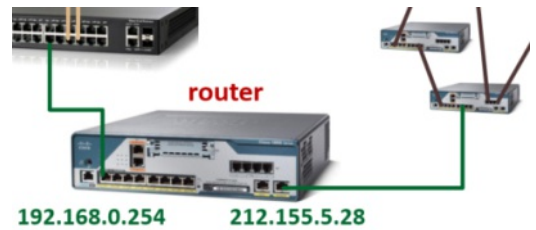
c What connection do you have at home? _____

2.4 LAN TO INTERNET ROUTING

FOR THOSE INTERESTED IN IT

1 Router and its addresses

- a The router has _____ IP addresses:
- b 1) IP _____, is seen from _____
- c 2) IP _____, is seen by _____



2 1

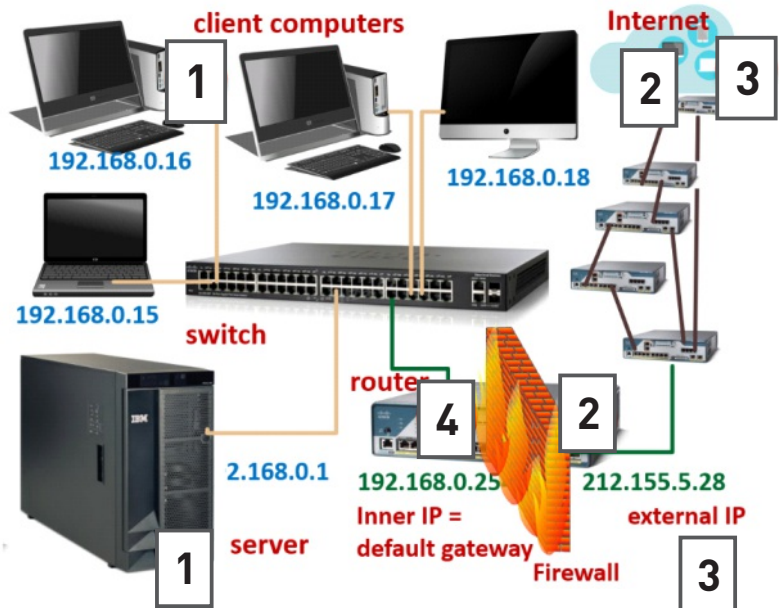
2 Describe in points how NAT (Network Address Translation) works:

1 _____

2 _____

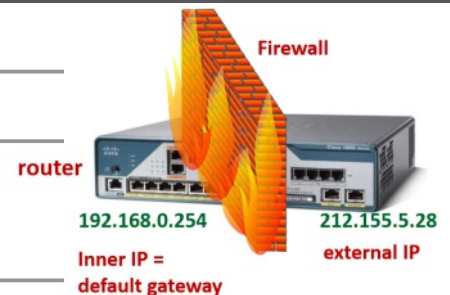
3 _____

4 _____



3 Firewall

- a The firewall blocks _____
- b The firewall can also _____
- c What makes it possible to detect all access on the router from LAN to the Internet? _____
- d What does the router administrator know about? _____
- e Why is the IP address personal information? _____

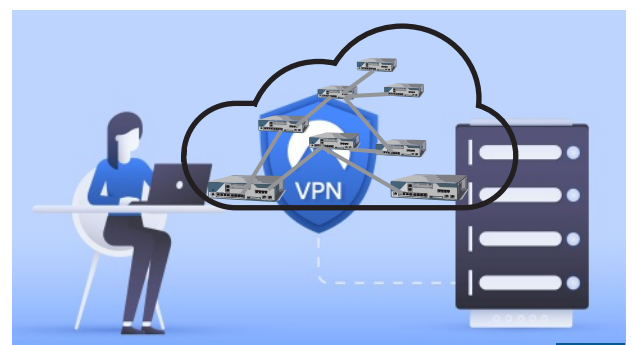


4 VPN = Virtual Private Network

- a Why are VPNs used? _____
- b What is the principle of a VPN? _____

1 _____

2 _____



2.6 GSM AND GPS

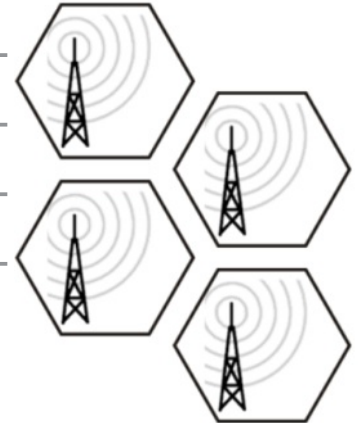
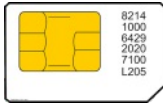


1 GSM

a The mobile network consists of _____ which form _____

b After turning it on your phone _____

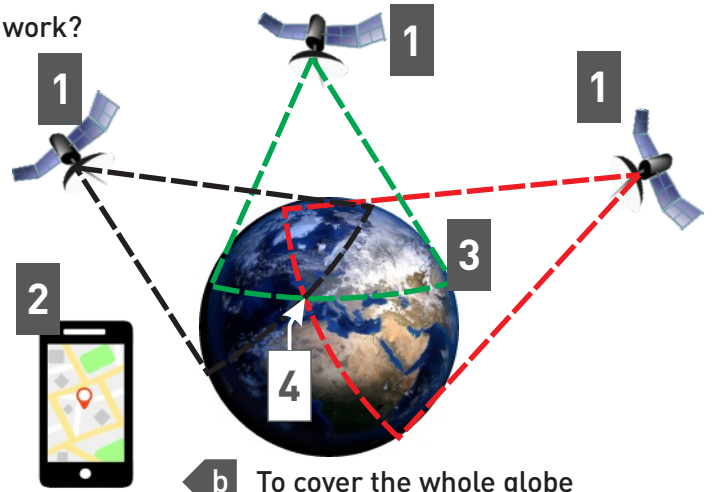
c A SIM card contains: _____



2 Global positioning satellite systems - principle of operation

a How does the satellite positioning system work?

- 1 _____
- 2 _____
- 3 _____
- 4 _____



b To cover the whole globe you need min. _____ satellites.

3 Global positioning satellite systems

a The american navigation system: _____

b The Russian navigation system: _____

c The European navigation system: _____

d Find out: Where the headquarters of the European satellite system Galileo are located? _____



4 GPS - to think about

a Is it possible to get your location if you are just using a hiking GPS, that has no connection to any (mobilní, wi-fi) network? **YES** **NO** Why?



3.1 ORIGIN AND PRINCIPLES OF THE WEB

1 Internet and web

a Internet is a „cloud“ of _____

b Web is a _____ which uses the _____ for transferin data.

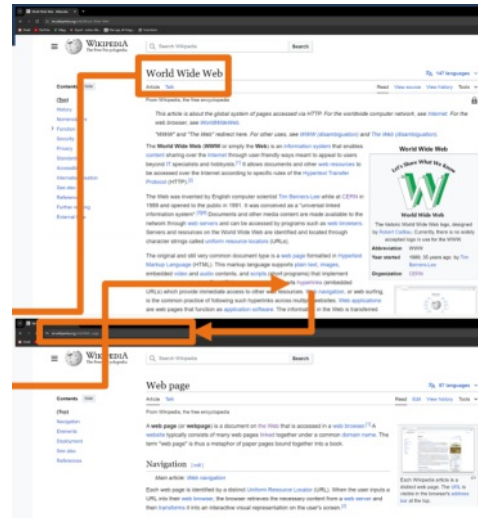
c In _____ while working at CERN _____ developed _____

d The web is based on two simple principles:

1 _____

2 _____

e The principle of the web is (in short):



2 Website

a Websites are sotered as _____ on _____

b The web browser can _____

c The Internet (network of computers) behaves like a _____

3 Web addresses (URL)

a URL = _____

b A web page is a document in the _____ format.

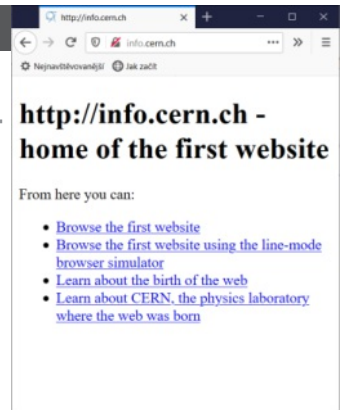
c The transfer of web pages provides the _____ protocol.

d The URL consists of _____

e The full address of a page (object on web) consists of:



https://en.wikipedia.org/wiki/World_Wide_Web



4 DNS – Domain Name System

a The web uses text addresses (URL), e.g. _____, Internet IP addresses, e.g.:

b Translation of correct (valid) URLs to IP addresses is provided by _____

4.1 SEARCH ENGINE - PRINCIPLES

1 The first search engines

- a Around the year 1996 students at Stanford university in USA _____
- b they created a complicated _____, which they called _____
- c _____ was set up on a few computers in their garage. And...
- d a new (at the time) small company called _____ was formed.

2 How do search engines work?

a Does a search engine goes through bilions of web pages in 0,5 s ? **YES** **NO**

b The three parts of the **search engine**:

1 _____ constantly scans the World Wide Web and goes through sites

2 _____ according to many criteria.

3 _____ finds in its index _____

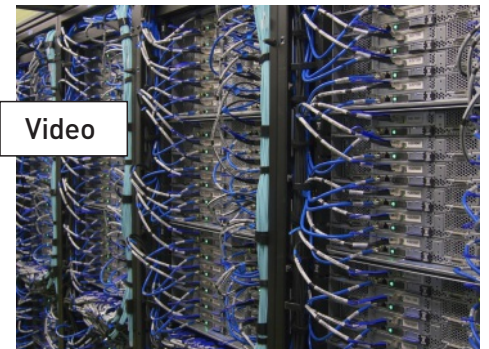
c Behind every search engine are _____

d What parts (floors) does the datacenter consist of?

1 _____

2 _____

3 _____



3 Google Ecosystem (collaborative services) of Google

- a The dominant (larges) revenue for search engines comes from _____
- b Advertising should be always clearly _____ and _____ from other information.
- c All Google services are owned by an American multinational company _____
- d Google's operating system for mobile phones is called _____
- e The web browser is called Google _____, cloud services _____
- f E-learning system is called _____ and the advertising _____
- g Next I know (use): _____

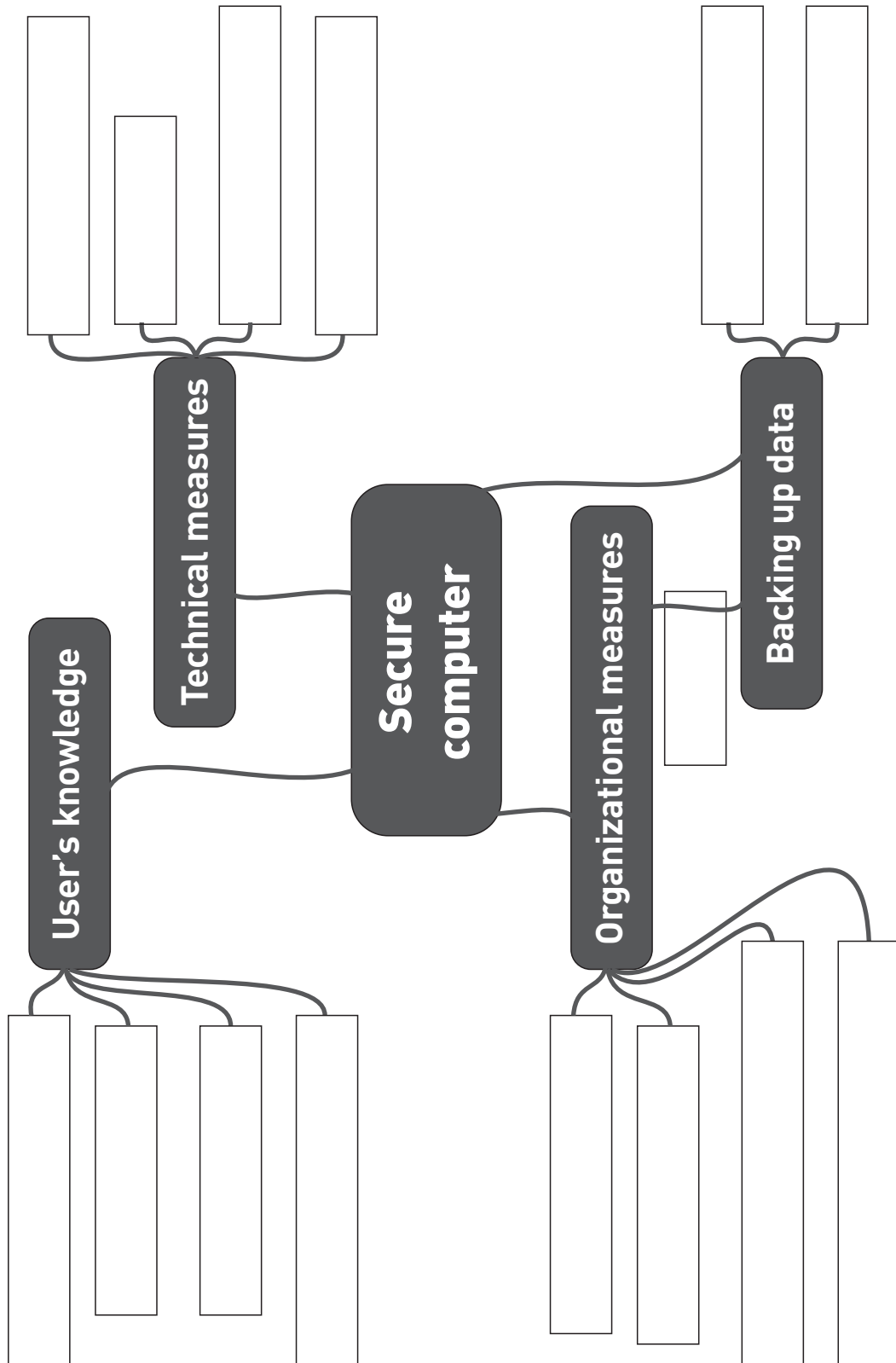
4 Other search engines

a Most commonly used in the USA is _____, in China the most popular is _____

5.6 SYSTEMATIC APPROACH TO SECURITY

1 What is the basis of a systematic approach to IT security?

2 Complete the computer security mind map:



6.3 TEXT ENCODING



1 ASCII table

- a Computers use _____ for recording data stored in _____
- b How does text encoding work?
 - 1 _____
 - 2 _____
 - 3 _____
 - 4 _____
- c Which characters has the 107 ASCII code? _____
- d What is the ASCII code for the letter G? _____

Dec	Hex	Znak	Dec	Hex	Znak	Dec	Hex	Znak
32	20	SP (mezera)	64	40	@	96	60	`
33	21	!	65	41	A	97	61	a
34	22	"	66	42	B	98	62	b
35	23	#	67	43	C	99	63	c
36	24	\$	68	44	D	100	64	d
37	25	%	69	45	E	101	65	e
38	26	&	70	46	F	102	66	f
39	27	'	71	47	G	103	67	g
40	28	(72	48	H	104	68	h
41	29)	73	49	I	105	69	i
42	2a	*	74	4a	J	106	6a	j
43	2b	+	75	4b	K	107	6b	k
44	2c	,	76	4c	L	108	6c	l
45	2d	-	77	4d	M	109	6d	m
46	2e	.	78	4e	N	110	6e	n
47	2f	/	79	4f	O	111	6f	o
48	30	0	80	50	P	112	70	p
49	31	1	81	51	Q	113	71	q
50	32	2	82	52	R	114	72	r

2 ASCII table extension

- a The original ASCII table encoded at most _____ characters.
- b MS Windows operating systems use its extension for _____ characters named _____
- c ASCII table extension which is often used for 65 535 possible characters: _____
- d Try out: Which character has the code 169? _____ Which 132? _____ Which 147? _____

3 Character encoding. What letters (what characters) are encoded here?

a

b

4 Character encoding

- a Try encoding your name (part of your name, max. 6 characters) using signal levels:

8.2 OPERATING PRINCIPLES OF AI



1 Machine learning

a Artificial intelligence needs to be _____

b If we want AI to recognize something:

- 1 _____
- 2 _____
- 3 _____



2 Training data

a Machine learning requires a huge amount of _____

b The AI creates the necessary training data itself by _____



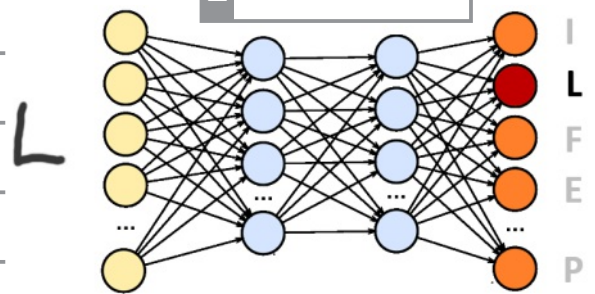
3 Neural networks

a The human brain consists of _____ and their interconnections - _____

b What layers does an artificial neural network consist of? 3

c What do these layers do? 1 2

- 1 _____
- 2 _____
- 3 _____



d To create an application using AI, we need hardware - _____

e Creating your own AI app is SIMPLE DIFFICULT because the software is _____

4 AI surprises us

a _____ the structure of the paths that the AI will create in advance.

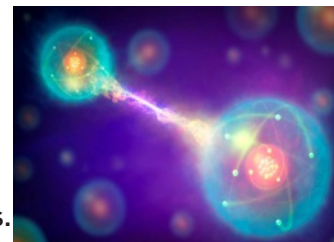
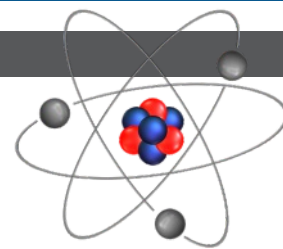
b So we don't even know _____ that AI will find, AI will _____

c This brings exciting new _____ but also relatively large _____

9.1 QUANTUM COMPUTERS

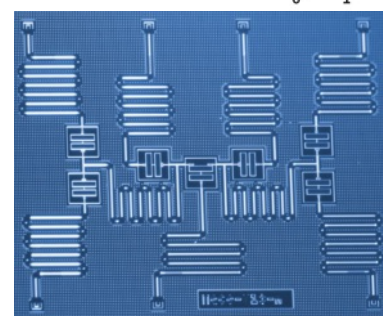
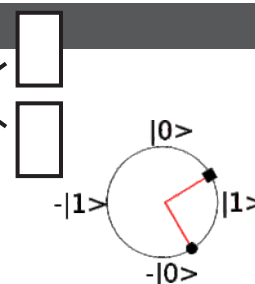
1 Quantum physics

- a This is _____ atom. This is a _____
- b The electron is in _____, it can be and in all physically possible states _____
- c Between the two elementary particles produced together, the so-called _____
- d Quantum computers _____, they are not "classical" computers.
- e They're more like _____ solving problems through the ability _____



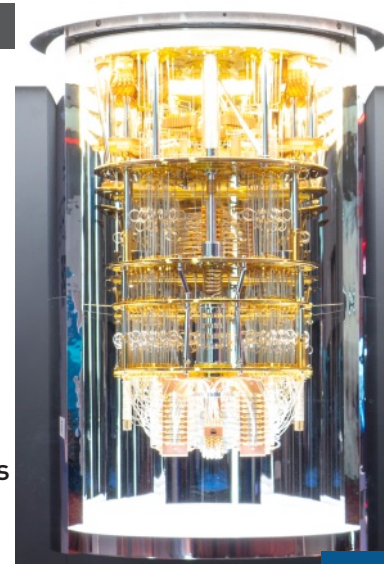
2 Principles of quantum computers

- a Classical computers use _____ system, which uses two digits
- b The smallest unit of information is called _____
- c Quantum computers use so-called _____
- d The quantum computer is set to _____ that the grid we've created _____
- e A special device reads _____
- f The number of possible calculations is determined by _____
- g How many simultaneous operations would a 40 qubit quantum computer theoretically compute? _____
- h However, this would have to be linked _____



3 Limitations and possibilities of quantum computers

- a Creating and maintaining coherent qubits is _____
- b A quantum computer can be used for tasks that include _____
- c Examples of possible applications of quantum computers: _____
- d Possible dangerous uses of quantum computers have been cited as _____



C O N T E N T S

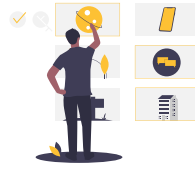
1

HOW THE COMPUTER WORKS,
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2

LOCAL NETWORK AND INTERNET



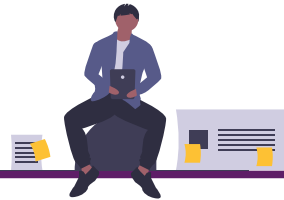
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WEB, BROWSERS,
SECURITY AND PRIVACY ON THE WEB



4

SEARCH ENGINES AND CLOUD SERVICES



5

SAFE COMPUTER



6

DATA ENCODING AND COMPRESSION, HARDWARE

7

TURNING POINTS OF DEVELOPMENT
HARDWARE AND SOFTWARE



8

ARTIFICIAL INTELLIGENCE



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THE PRESENT AND FUTURE OF IT

