

Analog or Digital?

Step 1. Pre-reading Activity

A. Fill in the blanks with suitable words chosen from the list below.

microprocessors both languages components interact bi-lingual

Working with electronics means dealing with [1] analog and digital signals, inputs and outputs. Our electronics projects have to [2] with the real, analog world in some way, but most of our [3], computers, and logic units are purely digital [4], These two types of signals are like different electronic [5]; some electronics components are [6], others can only understand and speak one of the two.

B. Name the components below and say if they are analog or digital.



1.



2.



3.



4.



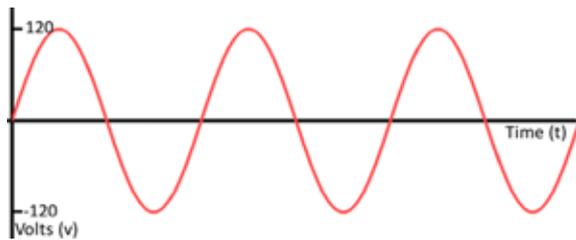
5.

Step 2. Reading Comprehension

Read the text about analog and digital signals and answer the questions that follow.

Analog Signals

Electronic signals are **time-varying** “quantities” which convey some sort of information. In electrical engineering the *quantity* that is time-varying is usually **voltage** or current. Signals are passed between devices in order to send and receive information, which might be video, audio, or some sort of encoded data. Usually the signals are transmitted through wires, but they could also pass through the air via radio frequency (RF) waves. Audio signals, for example, might be transferred between your computer’s audio card and speakers, while data signals might be passed through the air between a tablet and a WiFi router.



Because a signal varies over time, it is helpful to depict it on a graph where time is represented on the horizontal, *x*-axis, and voltage on the vertical, *y*-axis. Looking at a graph of a signal is usually the easiest way to identify if it’s analog or digital; a time-versus-voltage graph of an analog signal should be **smooth** and **continuous**.

While these signals may be limited to a **range** of maximum and minimum values, there are still an infinite number of possible values within that range. For example, the analog voltage coming out of your wall socket might be clamped between -120V and +120V, but, as you increase the resolution more and more, you discover an

infinite number of values that the signal can actually be.

Video and audio transmissions are often transferred or recorded using analog signals. The composite video coming out of an old RCA jack, for example, is a coded analog signal usually ranging between 0 and 1.073V. Tiny changes in the signal have a huge effect on the color or location of the video.

Digital Signals

Digital signals must have a finite set of possible values. The number of values in the set can be anywhere between two and a-very-large-number-that’s-not-infinity. Most commonly digital signals will be one of **two values** – like either 0V or 5V. Timing graphs of these signals look like **square waves**.



Analog and Digital Circuits

Most of the fundamental electronic components – resistors, capacitors, inductors, diodes, transistors, and operational amplifiers – are all inherently analog. Circuits built with a combination of solely these components are usually analog.

Analog circuits can be very elegant designs with many components, or they can be very simple, like two resistors combining to make a voltage divider. In general, though, analog circuits are

much **more difficult to design** than those which accomplish the same task digitally. Analog circuits are usually much more **susceptible to noise** (small, undesired variations in voltage). Small changes in the voltage level of an analog signal may produce significant errors when being processed.

Digital circuits operate using digital, discrete signals. These circuits are usually made of a combination of transistors and logic gates and, at higher levels, microcontrollers or other computing chips. Most processors operate digitally.

Now answer the Questions

1. What kind of information do electronic signals usually convey?

.....

2. How do signals travel?

.....

3. What example of audio signal transfer is given in the text?

.....

4. What example of wireless transfer is given in the text?

.....

5. What do the axes of a graph represent?

.....

6. What does an analogue signal look like?

.....

7. How many values can an analog signal have?

.....

8. What are analog signals usually used for?

.....

9. What do digital signals look like?

.....

10. How many values can digital signals have?

.....

11. Which circuits are more easily designed, analog or digital?

.....

12. What is another disadvantage of analog circuits?

.....

13. How is noise in the electronic signal produced?

.....

14. How are digital circuits constructed?

.....

Step 3. Technical Vocabulary Recycling

Exercise 1: Fill in the blanks by choosing the correct word or expression from a, b, c, d.

1. Using the right equipment, an experienced rock climber can climb up a rock face.
a. discrete b. smooth c. vertical d. wild
2. A balloon can rise high in the sky due to a large of hot air.
a. number b. level c. quantity d. range
3. There is a(n) number of stars and planets in the universe.
a. limited b. infinite c. digital d. finite
4. His father is French and his mother German, so he grew up in a(n) family.
a. elegant b. interactive c. communicative d. bilingual
5. If you are not courageous enough to take risks, you will nothing in life.
a. accomplish b. target c. complete d. identify
6. The organization's mission is to provide food to people who need it.
a. safely b. purely c. smoothly d. significantly
7. I won't be able to attend the meeting. Please my apologies to the others.
a. transmit b. convey c. interact d. transport
8. The on the computer was very weak which made me buy a new one.
a. frequency b. voltage c. depiction d. resolution
9. Because James smoked for twenty years, he is extremely to lung illnesses.
a. influenced b. accomplished c. valuable d. susceptible
10. Water and air are the elements of our planet's environment.
a. sole b. fundamental c. perfect d. outstanding
11. Just stand on the here for a second so I can check your weight.
a. output b. controller c. scale d. multimeter
12. There are over 200 satellites orbiting the earth for the purpose of private communications services, such as pagers, telephones, and computers.
a. simply b. digitally c. solely d. certainly
13. Language learning should be a(n) process in which the language is used for authentic communication.
a. interactive b. transferring c. continuous d. infinite
14. The installation process is broken down into a series of steps.
a. discrete b. fundamental c. significant d. square



Exercise 2: Match the terms to their definitions.

voltage divider noise inductor router tablet logic gate
multimeter analog digital scale

1. Unwanted electrical or electromagnetic energy that degrades the quality of signals and data:
2. An instrument that combines an ammeter, ohmmeter, voltmeter into one unit:
3. A device in a network that handles message transfers between computers:
4. A passive electronic component that stores energy in the form of a magnetic field:
5. A signal that has a theoretically infinite resolution:
6. A wireless, portable personal computer with a touch screen interface:
7. A signal transmitted as binary code, either in the presence or absence of current:
8. An electronic device that makes logical decisions based on the different combinations of digital signals present on its inputs:
9. A resistor or series of resistors connected to a voltage source and used to provide voltages that are fractions of that of the source:
10. A device that measures weight or calculates mass:

Exercise 3: Fill in the blanks choosing the right word from the three choices given.

It is now common to convert analog signals to a digital [1], which can be stored in computer memory, on magnetic or optical [2]....., or on magnetic tape. Digital storage has [3]..... Everyone who has heard music played from a digital disk [4]..... that it is usually noise free. Digital recordings do not deteriorate with use as [5]..... recordings do.

Another advantage of [6]..... analog signals to digital is that computers can then be used to [7]..... the signals. Computers are digital machines. A computer can do various things to signals such as [8]..... noise and distortion, correct for frequency errors, and [9]..... signal patterns. This area of electronics is known as digital signal [10]..... (DSP).

1. a. circuit b. format c. device
2. a. disks b. nerves c. images
3. a. diodes b. limits c. advantages
4. a. hears b. sees c. knows
5. a. analog b. integrated c. clear
6. a. processing b. converting c. sending
7. a. enhance b. transmit c. receive
8. a. destroy b. eliminate c. disappear
9. a. design b. display d. identify
10. a. processing b. player c. procedure

Exercise 4: Fill in the blanks with the correct derivative.**value – valuable(s) – invaluable – evaluate – evaluation – evaluative**

1. Students who use the Internet should always the Web pages they use for authenticity.
2. The university has done years of research on this subject.
3. According to a recent safety procedures at U.S. airports are better after the attacks of 2000.
4. You should maintain your property in good condition because every year its varies.
5. We really your contribution to the project.
6. He is a member of the team; without him, we probably would have lost the game.
7. Don't leave your in the car when you go shopping or someone will break into.
8. They put his work on video and stored it as an source of reference.

code – encode – decode – encoder – decoder

9. Julius Caesar was the first to communications in order to keep his messages secret.
10. I can't understand the computer, so I can't fix the program I'm having trouble with.
11. The information on DNA must be preserved for the survival of an organism.
12. Archeologists try to encrypted data in order to identify historical periods.
13. I have just bought a telephone with an integrated digital TV
14. An is a device, circuit, transducer, software program, algorithm or person that converts information from one format or code to another.

finish – finite – infinite – infinity – infinitely

15. We have only a amount of time to work on this, so we'd better get started.
16. I had to leave my previous job for a(n) numbers of reasons.
17. As they were their conversation, a loud sound came from the garage.
18. Computers today are faster and more complex than those of five years ago.
19. The stars and planets have provided an endless need for man to explore

compose – decompose – composer – composition – composite – component

20. Scientists analyze the of certain elements to identify their origin.
21. Dead plant matter can be completely by micro-organisms.
22. Many people consider Mozart to be the greatest who ever lived.
23. The interview panel will be of the head of personnel, the office manager and one other employee.
24. Instead of aluminum, we will use a high-tech blend of lightweight composite material.
25. The various are manufactured by different suppliers around the world.

Step 4. Listening Activity

Listen to a sound engineer explaining how a loudspeaker works and answer the questions. The figure on the left will help you.

1. What is a loudspeaker?

- The recorded music heard from a radio.
- A microphone.
- An electric apparatus that produces sound.

2. Where is the outer part of the metal cone attached ?

- To the outer part of the loudspeaker's metal rim.
- To the inner part of the loudspeaker.
- To an iron coil.

3. Where is the inner part of the metal cone attached?

- To the voice coil.
- To a magnet.
- To the outer part of the loudspeaker's metal rim.

4. What is true?

- The iron coil is placed in front of a permanent magnet.
- The field magnet is always yellow.
- The cone is attached to the magnet.

5. What makes the coil move back and forward?

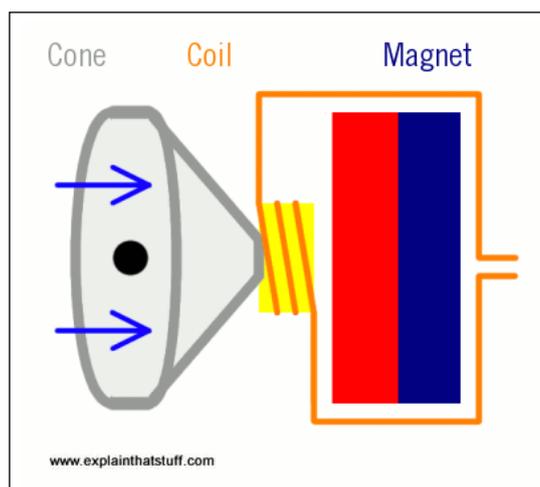
- The vibrations of the cone.
- The motion of the cone.
- The attraction or repulsion between the permanent magnet and the electromagnet.

6. What determines the loudness of the sound?

- The vibrations of the drum skin.
- The quantity of electricity.
- The generation of pulses.

7. What is true?

- Big loudspeakers with large cones produce high frequencies.
- Small loudspeakers with small cones produce low frequencies.
- Different frequencies can be produced by all loudspeakers.



Step 5. Use of English**Practice Clauses of Contrast****Exercise 1: Fill in the gaps with: although even though in spite of despite**

1. current comes to the appliance, the motor doesn't work.
2. installing new features on my computer, the program doesn't work.
3. there is a spark in the cylinder, there is no ignition.
4. the good quality of the materials he used, the construction isn't safe.
5. electric cars don't pollute the environment, electric car factories do.
6. Computers can do many things there is still a lot they can't do.
7. the full instructions that I gave him, he wasn't able to do it correctly.
8. their efforts to survive, the company finally closed down.
9. Communication between us was perfect, we spoke different languages.
10. living in England for so many years, her Italian accent is still very strong.

Exercise 2: Join the two sentences with the word given in brackets.

1. He studied psychology. He never worked as a psychologist. (despite)
.....
2. She was born in the USA. She lived most of her life in Greece. (although)
.....
3. The general economic conditions were difficult. We managed to save the company. (in spite of)
.....
4. The government is trying to create new positions. Many employees become redundant. (despite)
.....
5. The building has a security system. It didn't work last night. (although)
.....
6. We tried to work fast. We didn't finish our project on schedule. (in spite of)
.....
7. He has a good salary. He decided to leave the job. (even though)
.....
8. I tried hard to explain the misunderstanding. She could not understand. (however)
.....
9. I travel all over the world. My permanent address is in Athens. (in spite of)
.....
10. Smoking is harmful. Some people will never give up smoking. (despite)
.....