10

Answers

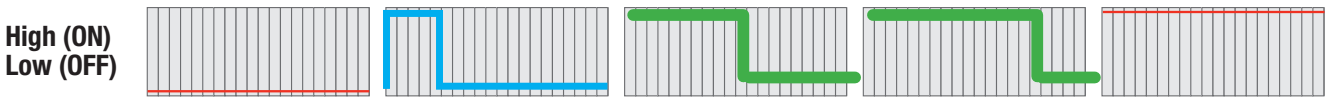
2

Computers and microprocessors only understand two things, ON and OFF. These are represented in a few different ways. There is ON and OFF, One and Zero, or HIGH and LOW. Ones and Zeros are used in the computer language Binary, HIGH and LOW are used with electricity, ON and OFF are plain old human speak.

But what if we want to turn something digital less than 100% ON? Then we use something called PWM, or Pulse Width Modulation. The way your Arduino microprocessor does this is by turning the electricity on a PWM pin ON and thenOFF very quickly. The longer the electricity is ON the closer the PWM value is to 100%. This is very useful for controlling a bunch of stuff. For example: the brightness of a light bulb, volume of sound, or the speed of a motor. **These are very basic examples, what else might you need to control that is not only ON or OFF? Explain at least two examples.**

A microprocessor creates a PWM signal by using a built in clock. The microprocessor measures a certain amount of time (also called a window or a period) and turns the PWM pin ON (or HIGH) for the first part of this window and then OFF (or LOW) near the end of the window. The window is filled up with a different length ON (or HIGH) signal depending on the PWM value. If the PWM value is 50% then the PWM signal is ON (or HIGH) for half of the window. If the PWM value is 25% then the PWM signal is ON (or HIGH) for a quarter of the window. The only time the window will not have a LOW value is if the PWM signal is turned completely ON the whole time and therefore equal to 100% ON. The opposite is true as well, if the PWM signal is set to 0% or OFF, then there will not be any HIGH value at the beginning of the window. **Explain in your own words what a PWM window is.**

Below are five different PWM windows. A PWM signal is simply a bunch of PWM windows one after another. Some are missing labels and some are missing diagrams. Please fill in the blanks on the middle three.



PWM percent 0% (No wave)

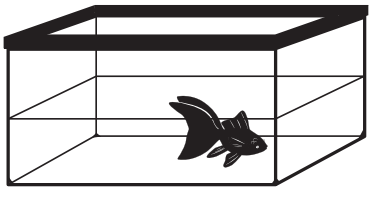
PWM percentage 25

PWM percent 50% (Draw in window)

PWM percent 75% (Draw in window)

PWM percent 100% (No wave)

Below are three different metaphors for a PWM window and a PWM signal. Write the physical item that represents the window and the item or items that represents the signal. Then estimate the PWM percent.

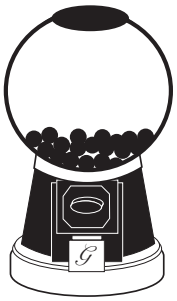


Window: Fish Tank

Signal percentage: Water

Window: Glass

Signal percentage: Water



Window: Gumball Machine

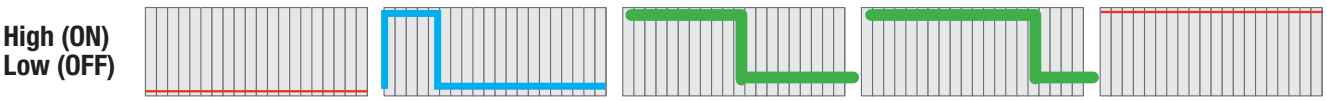
Signal percentage: Gumballs

Computers and microprocessors only understand two things, ON and OFF. These are represented in a few different ways. There is ON and OFF, One and Zero, or HIGH and LOW. Ones and Zeros are used in the computer language Binary, HIGH and LOW are used with electricity, ON and OFF are plain old human speak.

But what if we want to turn something digital less than 100% ON? Then we use something called PWM, or Pulse Width Modulation. The way your Arduino microprocessor does this is by turning the electricity on a PWM pin ON and thenOFF very quickly. The longer the electricity is ON the closer the PWM value is to 100%. This is very useful for controlling a bunch of stuff. For example: the brightness of a light bulb, volume of sound, or the speed of a motor. **These are very basic examples, what else might you need to control that is not only ON or OFF? Explain at least two examples.**

A microprocessor creates a PWM signal by using a built in clock. The microprocessor measures a certain amount of time (also called a window or a period) and turns the PWM pin ON (or HIGH) for the first part of this window and then OFF (or LOW) near the end of the window. The window is filled up with a different length ON (or HIGH) signal depending on the PWM value. If the PWM value is 50% then the PWM signal is ON (or HIGH) for half of the window. If the PWM value is 25% then the PWM signal is ON (or HIGH) for a quarter of the window. The only time the window will not have a LOW value is if the PWM signal is turned completely ON the whole time and therefore equal to 100% ON. The opposite is true as well, if the PWM signal is set to 0% or OFF, then there will not be any HIGH value at the beginning of the window. **Explain in your own words what a PWM window is.**

Below are five different PWM windows. A PWM signal is simply a bunch of PWM windows one after another. Some are missing labels and some are missing diagrams. Please fill in the blanks on the middle three.



PWM percent 0% (No wave)

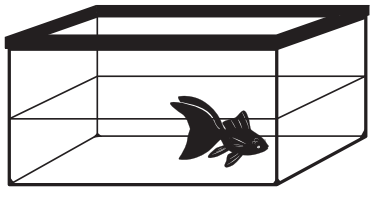
PWM percentage 25

PWM percent 50% (Draw in window)

PWM percent 75% (Draw in window)

PWM percent 100% (No wave)

Below are three different metaphors for a PWM window and a PWM signal. Write the physical item that represents the window and the item or items that represents the signal. Then estimate the PWM percent.

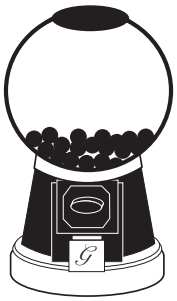


Window: Fish Tank

Signal percentage: H20

Window: Glass

Signal percentage: Water



Window: Gumball Machine

Signal percentage: Gumballs