If you are new to P.A. equipment, here's a terminology list and a basic indication of how to connect the necessary equipment:-

Basic Terminology

Amplifier- The part of the system that amplifies the sound. May be purchased independently (with a separate mixer) or can be purchased as an integrated unit (a powered mixer).
Channels - 'Input' channels usually relate to those items coming into the amplifier/mixer (microphones, or other equipment which needs to be amplified or mixed). 'Output' channels usually relate to those items leaving the amplifier/mixer (speakers/monitors etc.)
Delay - An electronic circuit or effects unit - purpose being to delay the audio signal for a specific period of time.
Equaliser - Equipment used to alter specific frequencies of the sound, thus having a precise overall effect on the sound heard from the speakers. This equipment is commonly integrated into an amplifier or mixer, and is now seldom used as a stand-alone unit.
Fader - Another name for an audio level control. Usually refers to a straight-line slider rather than a rotary control.
Jack - Commonly used term to refer to an 'input/output' socket.
Level - Another word for signal voltage, (volume, strength or power.)
Line-In (Input/Return) - This is where a signal enters the amplifier/mixer.
Line-Out (Output/Send) - This is where a signal leaves the amplifier/mixer.
Master Volume - Microphone volumes and backing track levels can be controlled independently via the input channels, however the master volume is used to increase or decrease the sound of the overall performance (microphone and instruments simultaneously.)
Mixer - This is the piece of equipment which enables you to control various settings such as the volume of individual microphones/ instruments, pan, bass, midrange and treble. There may also be onboard effects such as reverb, chorus, delay, echo etc. Many mixers are referred to as having 6, 8, 12, channels etc. This relates to the number of different microphones or instruments that can be connected to the mixer. E.g. three connected microphones would use 3 channels (or lines) of the available 8 on an eight channel mixer. A *powered mixer* is an integrated unit that can combine amplifier, equaliser, mixing deck and effects.
Monitors - Additional speakers, commonly placed in front of the vocalist/instrumentalist, enabling them to clearly hear their own sound/ performance.
Pan - This refers to controls on the mixer used to adjust the amount of volume sent between left and right speakers. Although very useful when sound from a left or right speaker may be hindered or obtrusive, many people usually leave the panning knobs central.
Phantom Power - A system providing power for condenser microphones from the mixer. Most quality microphones are designed to use +48 VDC phantom power.
Return - A mixer line input dedicated to the task of returning sound from effects devices such as reverb units, echo units etc.
Phono Plug/Jack - Commonly found on consumer audio equipment. One of the most inexpensive connection types - use alternatives if available on your equipment.
XLR Connector - Three-pin connector used in audio for transmitting a balanced signal (microphones etc.) - also referred to as a Cannon connector.

Basic P.A. setup

An easy way to remember the signal direction (whether to plug your equipment into inputs or outputs), is to remember that anything traveling from the direction of your microphone *into* the mixer should generally be plugged into the *inputs* of the mixer, whilst anything traveling *out* from the mixer (to the speakers/monitors etc.), should generally be plugged into the *output*. Always remember the amplifier/ mixer as the central piece of equipment, and you shouldn't go far wrong.

1. Firstly, make sure all plugs are removed from sockets and power is off.
2. Plug the end of the microphone cord into the *input* socket of the mixer (input line 1 of the mixer could be used). There may be two alternative input jacks - a standard jack plug or XLR connection. Many corded microphones have the XLR type connection, however either of these connections will suffice for a basic setup.
3. Plug one end of the speaker cable into the *output* socket of the mixer/amplifier. The speaker outputs are frequently found at the back of a mixer.
4. Plug the other end of the speaker cable into the *input* socket on the rear of the speaker.
5. Repeat steps 3 and 4 with the speaker cable for the additional speaker.
6. Plug the amplifier/mixer into the mains.
7. Switch on.

There we have it! Your first P.A. setup.

P.A. setup including monitors

Monitors, although not suitable for every environment, should become an essential part of every professional musician's equipment. The reason for this is that on many occasions a vocalist or instrumentalist will be stood slightly behind the speakers. This makes it almost impossible to hear the clarity and sound that the audience is hearing. The performer does not necessarily want to hear the sound as loud as the audience, however the monitor relays an isolated sound to the performer, so he/her can easily distinguish the clarity, without too many distractions. For this reason, monitors face towards the stage and are are usually angled from the floor directly toward the performer.

The setup should follow the same as above, however if your mixer/amplifier has a monitor out socket, this can be used with a separate amplifier to allow independent controlling of volume levels to the monitors (N.B. you would want to hear sound from the monitors at a lower level than that of the main speakers). Many monitors have their own volume controls for this purpose. Powered monitors (monitors which have their own built-in amplifier), are available which avoid the need of a separate amplifier.

Common questions :-

Q. Why can't I keep connecting more and more speakers to make my system louder?
A. All amplifiers are designed to deliver their maximum amount of power into a certain number of speakers. This number is indicated (usually located near the speaker jacks) as impedance and is rated in Ohms (named after the man who discovered this electrical property). The most common amplifier impedance is 4 Ohms. This means that the amplifier will put out the most amount of power (be loudest) when it has a total of 4 Ohms worth of speakers connected to it. It will put out less power (be quieter) if the total of the speakers calculates to be more than 4 Ohms. The goal in any P.A. setup is to try and get the speakers to calculate up to, but not less than, the amplifier's rated impedance. If the speakers add up to less than the amplifier's rated impedance, the amplifier tries to put out more power than it was designed to do and may overheat and cause damage.

Generally speaking, the more speakers you add to your P.A., the lower the impedance number becomes. This is why you cannot just add more and more speakers to make everything louder. Fortunately, most modern day amplifiers have built in protection to shut down the amplifier when it gets too hot. This is called load protection.

Q. What are the differences between microphones?
A. There are mainly two types of microphone used in a live P.A. environment :-
i. Dynamic microphones - Usually the most rugged, consisting of a coil that moves through a magnet field to introduce a small electrical signal (a similar principle to how speakers work). They tend to have a limited frequency response.
ii. Condenser microphones - now one of the most popular microphones. Although not usually as rugged as dynamic microphones, they usually have a broader frequency range, and require a power source to operate (either an internal battery, 'phantom power' as provided built-in by many mixers, or an external power pack).

Additional microphone info.
iii. Uni directional microphones - often sold as 'cardioid', these are usually the most common, as they only pick up sound from an area in front, and around the front of the microphone. Omni directional microphones are rarely used in live vocal environments, as they pick up sound from all directions. They are however quite regularly used in 'interview' environments, where the microphone does not travel a great distance, and the pick up of surrounding sound is not an issue.

Q. Should I use a corded or cordless (wireless) microphone.
A. This is really down to preference, and the nature of your act. Generally speaking, if you tend to move forward of the stage by some distance, or do not like the idea of a trailing lead, then a cordless microphone may be more suitable. Bear in mind that if you have a limited budget, or do not tend to need a cordless microphone, then you will always get a much better quality corded microphone than cordless for the same price. Beware of very cheap cordless microphones - these are usually not suitable for anything more than home use. You really do get what you pay for with microphones.