This booklet is a reference guide and supplement to the shop orientation classes. Study of this booklet does not qualify any student to use Pratt Shops.
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INTRODUCTION

The Pratt Woodshop Orientation is designed to introduce you to the shop and to make you aware of the shop rules and safety regulations and procedures. You will also be instructed on the basics of how to use shop power tools safely. It is necessary to make you aware of some of the dangers inherent in working with these tools. You should be aware that it is impossible for you to adequately learn how to use them during this Orientation. That is to say, when you leave here you may know what a tool looks like and what its' function is and you will have performed some simple tasks, but you will not have sufficient experience with that tool to use it unsupervised.

Before beginning any work in the shop you must present your ID to the shop technician or work study on duty at the tool room window where it is kept while you work in the shop.

Your Orientation and shop ID sticker is valid for your entire matriculated stay at Pratt. However, failure to comply with the Shop Rules and Safety Regulations can result in the loss of shop privileges.

General Shop Safety

Wood and metal working machines are designed to cut, abrade, slice, drill, etc. They are very helpful when used properly but very dangerous when used carelessly. Lack of care, lack of attention or concentration, or lack of tool knowledge are the most common causes of injuries in the shop. It is a rare case where some external force causes an “accident”.

Students coming into the shop and attempting to work with improper clothing or shoes is a frequent problem and such dress code violators will be expelled from the shop. It is impossible for technicians to constantly monitor every student in the shop and therefore students are expected to be responsible for following shop dress codes and rules.

In many circumstances universities are the place where experimentation is to be encouraged and praised, but the shop is NOT a place for experimentation with tools. Students who attempt to use tools by “figuring it out on their own” may be ejected from the shop. The number one shop rule is “if you are not 100% sure about the operation of a tool or the safety of a cut - ask a technician”.

Injuries are more frequent during the end of semester rush when students are often sleep deprived and under extreme pressure to complete projects. If shop technicians suspect that any student is mentally impaired (due to lack of sleep, medication, drugs, alcohol, stress) that student will be expelled from the shop. We are very serious about protecting students in the shop.

With proper training and the cooperation of students most if not all injuries can be avoided.

Lastly, understand that shop rules are for your benefit and are necessary for a smooth running shop. There are approximately 300 plus students who have access to the shop. So please be respectful to the Wood Shop technicians and your peers.
Health hazards
Our respiratory system and our hearing are also at risk of being damaged in shop settings. Dust in the shop can contain allergens, toxins, and carcinogens. Manufactured sheet materials often contain formaldehyde and other chemicals which are harmful to breath. The dust of many natural woods can cause respiratory irritations, or skin reactions. For more information on specific woods look online under Health & Safety in the Arts: Woodworking, toxic woods.

We recommend good quality dust masks when working (especially when sanding) in the shop. For every ones sake, we also ask that you remember to have the technician or work study turn on the dust collector for the machines you intend to use. Students who repeatedly use machines without the dust collector on may lose their shop privileges for a period of time.

The sound decibel level in the shop is often high enough to cause hearing damage and therefore we recommend hearing protection. The tool checkout room has ear muffs for check out.

Types of material in the shop
Softwoods containing high amounts of pitch (sap) such as fir, pine, hemlock cause pitch build-up on the blades and other parts of machines. We may allow a few cuts to be done with these woods but if you come in the shop planning to do a whole project with any of these woods we will not allow it. Purchase hard woods such as poplar or bass wood (which are also good for painting). The terms softwood and hardwood refers to the botanical grouping of trees rather than the properties of the wood (though most hardwoods are hard). Softwood comes from coniferous trees and hardwood come from broad-leaved trees.

NO FOUND/RECLAIMED WOOD IS ALLOWED TO BE CUT IN OUR SHOP. Reclaimed wood can have sand, gravel, pieces of screws/nails, paint, any of which will ruin blades and possibly become flying shrapnel.

NO PRESSURE TREATED WOOD is allow to be cut in our shop. Pressure treated lumber (fir which has a green tint) contains a substantial amount of toxins which become airborne when cut or sanded.

examples of unsafe shoes which are not allowed in the shop.
SHOP RULES:

1 > YOU MUST BE SURE -
  If you are not 100% sure about any tool operation or the safety of a cut - ask a technician.
  DO NOT TRY TO FIGURE OUT HOW TO USE A MACHINE ON YOUR OWN !!!!!

2 > You must follow the directions of the technicians.

3 > EYE PROTECTION -
  Eye safety goggles/glasses must be worn while operating any power or hand tools in the shop. Regular eyeglasses are not considered safety glasses.

4 > PROPER ATTIRE –
  - Hair must be securely bound behind the head.
  - No shoes which expose the top of the feet.
  - No baggy or loose fitting clothing, no cords hanging, no scarves, no gloves, shirt-tails must be tucked in / long sleeves rolled-up.
  - No jewelry on the arms or fingers, nothing hanging from the neck, no wrist watches.

5 > No using tools when fatigued or under the influence of any mind impairing drugs (medication) or alcohol. Your mind must be alert and present.

6 > Never remove blade guards without permission from a technician.

7 > No head-sets / i-pods. The technicians must be able to call out and get your attention.

8 > No talking to someone who is using a power tool. Distracting a tool operator is dangerous.

9 > No horseplay or practical joking in the shop.

10 > You must pick up your off-cut pieces of material. Someone may slip or trip on your debris.

11 > CLEAN UP YOUR MESS BEFORE LEAVING THE SHOP!!!

Shop rules are in place for the protection of everyone. Non-compliance of rules can result in injury to oneself or others in the shop. All students are required to learn and practice the shop rules. Ignorance of the rules is not a valid excuse and violators may be expelled from the shop for an extended period of time.
The Jointer
The jointer is designed to make the surface of a piece of solid wood flat and straight. If used correctly the jointer will remove any twist, bowing, or warping from the face of a board (unless these defects are too severe). The edge can also be made straight, flat and perfectly square to the face. Your board can then be taken to the planer or table saw to do further cutting.
The jointer (and the thickness planer) will only work for solid woods - no manufactured boards (no mdf, particle board, pressed bamboo, acrylics, etc.)
How a jointer works can be understood by looking at the illustration below. The infeed table is adjusted slightly lower than the outfeed table. The outfeed table remains aligned with the top edges of the cutter knives (do not lower the outfeed table). This allows the cutterhead to remove material from the board while keeping the board on a level plane.
The fence supports the board for jointing the edge. The fence can be tilted to achieve angled edges.
Hazards of the jointer
Injuries that occur with the jointer involve hands slipping off the board and touching the cutter head. Kickback is also a possibility if too deep of a cut is attempted, and when jointing a board's face this is especially true because of the large area of blade/wood contact.
Carefully and correctly feeding your board into the jointer will prevent any injury.

Jointing the face surface
Check that the blade guard is in good working order.
When jointing the face of a board have the cupped side down to prevent the board from rocking as it passes over the cutterhead. (see ILLUS. 1B at right)
Check the depth of cut to be sure that it is not excessive. Excessive depth could result in kickback.
The fence may need to be moved to accommodate the width of your board. When jointing the face of a board 1/32" to 1/16" is a good amount to remove with one pass. It is far safer to make several passes than to attempt to remove a lot of material with one pass.

Hold your board down on the table using a push-pad on the leading end and a push board catching on the trailing end. As you feed the board over the cutterhead step forward to transfer your weight and keep your balance.
Jointing the edge of a board
If you want a truly square edge check the fence for squareness. Set the cut depth to 1/32” - 1/16”.
Place your board on the table so that the flat and straight jointed face is against the fence.

Holding the board firmly against the fence pass the edge over the cutterhead (as in illus. 7A). Feed the board with your right hand while keeping the left hand stationary. The left hand should not pass over the cutterhead. When about 12 in. of your board has passed the cutterhead guard stop and transfer you left hand to the outfeed side of the jointer (as in illus. 7B). You will need to shuffle your feet forward to maintain your balance. Next, continue to pass the board over the cutterhead while keeping the left hand stationary holding the board firmly against the fence.

With your left hand in this position (illus. 7C), as the board is being pushed over the table there is the chance that fingers could slip down into the cutterhead.

With your left hand in this position (illus. 7D), if your hand happens to slip down there is no chance of injury.

If your board is less than 6” wide use a push board on the trailing end to push it over the cutterhead.
The Thickness Planer

The thickness planer has a motor driven infeed roller which pulls a board through/over the planer table and past a cutterhead which planes off the surface of the board. (see ILLUS. 2A) The table and table rollers are set parallel to each other so that the opposite face surfaces of a board become parallel planes. As with the jointer, ONLY SOLID WOOD can be planed - NO MDF, PARTICLE BOARD, PLYWOOD, BAMBOO, PLASTICS, OR ANY MANUFACTURED COMPOSITE. ALSO NO RECLAIMED LUMBER IS TO BE PASSED THROUGH THE THICKNESS PLANER.

The thickness planer is often mistakenly thought of as a tool that can take a curved or twisted board and make it flat and straight - it will not. If your board is curved the thickness planer will give you a thinner curved board. Your board must first be made straight and flat on one face surface (with a jointer or hand plane) and then the thickness planer will make the other face surface parallel.

Hazards of the Thickness Planer

Used properly the thickness planer is a relatively safe power tool.

Kickback is a possibility if the table height is poorly adjusted (set much too low) and wood is improperly feed into the machine. (see ILLUS. 2B)

Reaching inside this machine to dislodge a jammed piece (while the power is on) with a stick or your hand is extremely dangerous and should never be attempted.

FOR USE IN THE PLANER - THE MINIMUM LENGTH OF WOOD IS 12 INCHES.
Using the Thickness Planer

Begin by checking the thickness at several places along the length to determine the thickest part of your board. This thickest measurement will determine the table height setting. Turn the table height hand wheel to where the indicator scale reads a position about 1/32 in. less than the thickest part of your board. This machine removes wood on the top side so place your straight/flat side down when feeding into the machine. The infeed roller should easily grab your board and automatically pull it through. After each pass through the machine you must raise the table (turn the hand crank clockwise) 1/4 to 1 full rotation. Repeat this step until you achieve your desired thickness.

Standing to the side, place your board down level with the table and feed it into the machine.

NEVER STAND IN FRONT OF THE MACHINE AND FEED A PIECE INTO THE MACHINE IN THIS WAY. Kickback is a possibility.

If your board passes only partially through the planer and stops - do not attempt to pull your board out and never attempt to use a push stick to push a jammed piece out the back. If a piece fails to exit the back turn the machine off and wait for it to completely stop then lower the table to remove your piece.

In illustration 9A someone is trying to push a jammed piece out the back of the planer while the power is on. This is extremely dangerous and should never be attempted.

YOU CANNOT PUT MDF OR PLYWOOD THROUGH THE THICKNESS PLANER. SOLID WOOD ONLY!
The Table Saw
The table saw is used to cut solid woods, sheet material (plywood, particle board, mdf, etc.), and various sheet plastics. Compared to the band saw the table saw will cut more quickly, straighter, and give a smoother edge. The table saw is the most versatile of wood shop tools. It is also the most dangerous power tool in the shop. Complete presence of mind and care must be used when operating the table saw. Carelessness or improper use can result in serious injury.
ALL STUDENTS (INCLUDING THOSE WHO HAVE PASSED THE CERTIFICATION TRAINING) MUST CHECK WITH A TECHNICIAN BEFORE USING THE TABLE SAW. Violators of this rule may be expelled from the shop for an extended period of time.

Basic features -
The blade can be raised or lowered to adjust the depth of cut desired. The blade may also be tilted to any angle between 90 and 45 degrees. The blade should be accompanied by a riving knife which helps prevent material from rotating during a cut and being kickedback. Some woods have internal stresses which cause the wood to close in on the blade as they are cut. The riving knife helps prevent the blade from being pinched in this way. The fence is used to guide the material when rip cutting.

Blades -
Circular saw blade come in various designs for different operations and different materials. Using the correct blade will give the best results and prevent blade damage. For example: ripping with a cross-cut blade will cause excess heat which may result in a burned edge. Rip blades have larger gullets which enable the blade to remove the large amount of wood chips created when ripping. There is a special blade for cutting acrylics. Please consult the technician about which blade is right for the operation you wish to perform. Dull or pitch coated blades add to the danger of kickback.
Making cuts on the table saw

There are basically two ways of cutting material on the table saw - **ripping** or **crosscutting**. Ripping or rip cutting means cutting along the length of a piece while crosscutting means cutting across the length of a piece.

When you approach the table saw to make a cut you must first decide which support device is best for the operation you wish to perform. Ripping and crosscutting require very different devices and using the wrong device is very dangerous. Many students have difficulty understanding or remembering which device is correct for different cuts. The general rule is: **SUPPORT THE LONGEST SIDE OR YOUR PIECE**.

**Ripping**

Ripping is always done using a rip fence to guide the material parallel to the blade.

**Cross cutting**

Crosscutting is done using either the sliding table, the sliding tray or a miter gauge.

In both operations notice that the **longest edge** is supported by a cutting device. A WORKPIECE SHOULD NEVER BE CUT FREEHAND - MEANING CUT WITH OUT ANY SUPPORT DEVICE. FREEHAND CUTTING WILL RESULT IN KICKBACK!!!

All material cut with a rip fence must have one truly straight edge which would be the edge touching the fence during the cutting operation. Attempting to rip a piece with a wonky (not straight) edge against the fence could result in kickback.
Kickback is the term used to describe how a power tool can eject a piece of material towards the tool operator. A table saw has the power to throw a full sheet of 3/4" plywood across the shop. Kickback injuries are far more common than finger cuts. Besides the obvious danger of being violently struck by an ejected piece of wood, the instantaneous actions of kickback could pull your hand into the blade.

Causes of kickback
- A workpiece binding between the rip fence and the blade. (as can happen when cross-cutting with the rip fence)
- Internal stresses within wood pinching the blade.
- Cutting twisted and warped wood.
- Using a dull blade or a blade with excessive build up of pitch.
- Material dropping on the blade.

**Anatomy of a kickback**
Refering to illus. 1 whenever demension (A) is longer than demention (B) there is a strong danger of kickback. Even a piece that is correctly oriented to the fence (demension (B) being longer than (A)) can be kicked back if it is not correctly fed into the saw.

As the piece is pushed it is very difficult to keep the piece moving straight. The force of the blade causes the piece to rotate slightly. This creates a tremendous tension between the blade and the fence.

As the back edge of piece reaches the rear part of the blade the upward force of the blade causes the piece to climb up and over the blade.

With a frisbee like action, the blade then ejects the piece with great force and towards the saw operator.

The riving knife is a very important safety guide. It can prevent kickback in many situations, but not in all situations. The riving knife gets in the way of some crosscutting operations so it is often removed. Make sure that the riving knife is installed before making a rip cut.

The presence of the Rifing knife does NOT make it okay to attempt crosscutting with the fence.
The correct hand positions are very important to prevent injuries. The illustration at left shows the correct hand positions for ripping. The left hand is in the best place to hold the wood down and against the fence. The left hand knuckles are down (fingers curled in) and thumb is on top. **THE LEFT HAND REMAINS STATIONARY** at this point while the material is pushed past the blade by the right hand only. The left hand would not move beyond the red line in this situation. **IN BOTH ILLUSTRATIONS AT LEFT THERE IS NO NEED FOR THE LEFT HAND TO PUSH THE OFFCUT MATERIAL PAST THE BLADE.**

In ILLUSTRATION 13A the left hand is unnecessarily in danger. The left hand should be used to push the off cut part **ONLY WHEN THE SIZE AND WEIGHT** requires that it be pushed in order to maintain straight movement of the work piece. **IF YOUR PIECE EVER GETS JAMMED DURING A CUT - HOLD YOUR PIECE IN PLACE AND TURN OFF THE SAW - DO NOT LET GO OF YOUR PIECE OR PULL IT BACK.**

A common mistake is to stop pushing the piece when it separates from the off cut part. The illus. at right shows a piece that has not been pushed completely beyond the blade and is in danger of being ejected from the saw. **PUSH YOUR PIECE COMPLETELY BEYOND THE BLADE.**

If the off cut material is large the left hand is needed to keep the material moving straight. Both hands push at the middle point. The right hand presses in a slight angle toward the fence. Placing the hands as far away from the blade as possible may appear safer but as the cut comes near to being complete it would cause the blade to be pinched between the two pieces of plywood. This could result in kickback.
Any piece less than 7" wide passing between the fence and the blade should be pushed with a push stick. ILLUS. 3C shows the correct push stick position on the work piece. With the push stick in the position shown in ILLUS. 3D, as far as possible from the blade, the work piece tends to come away from the fence causing pressure against the side of the blade.

Example: I have a piece of plywood 20" x 26" which I want to cut to 18" x 26". I would set the fence 18" away from the blade so that the 2" off-cut would be on the outside (or left side) of the blade (as in ILLUS. A). ILLUS. B shows the wrong way to reduce the size of a board, with the unwanted part between the fence & blade.

Ripping an angle on the edge of a piece
On some table saw models the blade tilts to the right on others it tilts to the left. On all table saw you have the option on putting the fence on either side of the blade. When ripping an angle on the edge of a piece it is usually safer to put the fence in a position where the the blade tilts away from the fence (such as in ILLUS. 3E below). In ILLUS. 3E the piece is free to move upwards away from the blade. If the blade tilts towards the fence (as in ILLUS. 3F) the piece is trapped on three sides between the blade, the fence & the table and therefore is more prone to being ejected by the blade.
Using sliding trays

Sliding trays are very effective support devices for various purposes, the most common being 90 degree crosscutting. The sliding tray on the right is for smaller pieces. Long pieces cannot be supported by this small sled and should be cut with the sliding table.

The left hand holds the work piece down and firmly against the front fence (slightly pulling towards yourself) while the right hand pushes the sled at a point slightly to the left of the blade - never directly in line with the blade.

More on crosscutting

When crosscutting with the sliding tabe or sliding tray the hand positions are important. See ILLUS. 15A at left - the right hand does all the pushing forward as the left hand holds the workpiece back against the fence.

It is a mistake to push both the fence and the off-cut piece as in ILLUS. 15B - This could result in the blade being pinched and kicking back the piece.

The ID shop sliding table can crosscut panels up to 35" wide.
Larger panels must be cut with the panel saw. (at right)
With the panel saw you can rough cut pieces from a full sheet and then recut your pieces more precisely with the table saw.
ILLUS. 16A Shows the correct way to use a sliding tray or a sliding table to make a crosscut. The left hand holds the workpiece in place while the right hand pushes at the center of the tray. ILLUS. 16B Shows someone using the ripfence to measure the cut. Using the fence in for this purpose can easily result in kickback due to the tension which may occur between the fence and the blade.

If your work piece is so small that your hand comes within 4 inches of the blade the piece should be held with a clamp (or cut on the band saw).

The miter gauge can also be used to make crosscuts on smaller pieces. It is also adjustable for making angle cuts.
The Band Saw
As the name implies the band saw mainly consists of a steel band (blade) which is held in tension by two (or sometimes three) wheels and is driven through a table while being guided by upper and lower blade guides units.

The band saw blade allows freehand curves to be cut as well as straight rips or crosscuts. The band saw table may be tilted to make angled cuts. The upper blade guard/guide can be adjusted according to the thickness of the material being cut.

A wide variety of materials can be cut on the band saw depending on the type of blade installed. These include: all natural wood, manufactured sheet material, acrylics, aluminum and other non-ferrous metals, and mild steel (on a specified metal band saw).

Band saw blades come in a wide variety of tooth sizes and shapes all designed to cut materials of particular qualities. Therefore if you are not sure about which band saw and/or blade is suitable for your material please ask a technician before attempting a cut.

One disadvantage of the band saw is that it does not leave as smooth of a finish cut as the table saw.

Hazards of the Band Saw
The band saw is a comparatively friendly and safer power tool than circular saws. Fortunately, kickback is not a concern with the band saw because of the fact that the band saw blade moves downward through the table rather than spinning towards the tool operator.

In school shops band saws are the most frequently used cutting tool and consequently injuries do happen. Because of the fact that cuts are made by pushing a piece of material into the blade the fingers or thumbs are at risk of being cut if the operator is not very careful about hand positions. Fingers or thumbs may slip off of the work piece and contact the blade.

Illustrations below show good and bad thumb positions.
Choosing the right band saw
In the Pratt Shops there are a variety of band saws. Generally the thicker and denser the material the larger (and more powerful) the band saw should be. One of the most important factors in choosing a band saw is the blade installed on it. For ripping a wide blade is best since a narrow blade will tend to wander from side to side. If you need to cut a tight curve a wide blade will not be able to make the cut you want and you should choose a narrow blade. The number of teeth per inch is also an important factor. A coarse tooth blade will cut thick or hard wood easier without burning while a fine tooth blade cutting the same wood will clog up and cause burning. Consult the technician on duty if you are not sure about this decision.

Ripping on the band saw
Ripping means cutting a piece lengthwise to a certain width. The fence is used to guide your material. Feed your material into the blade at a moderate speed. Excess feed speed puts strain on the blade, the blade guides and the motor. The sounds of the machine will tell you when you are causing undue stress which means “slow down on your feed speed”.

THE BLADE GUARD UNIT SHOULD ALWAYS BE ADJUSTED TO THE CORRECT HEIGHT BEFORE CUTTING. There should be about 3/8 in. clearance between the blade guides and the top of your work piece. Do not come to a band saw and accept whatever blade guard setting is there - adjust it.

If the fence is set closer than 3 inches from the blade or whenever your cut requires that you push close to the blade use a push stick or some piece of scrap wood to complete the cut.

If your piece is small you can use a second piece of material as a pushing device.
Crosscutting
As the term implies crosscutting means cutting across the length of a piece. The miter gauge is used to make crosscuts. The miter gauge can be set square or to any angle between 90-45 degrees. The work piece is held firm against the miter gauge as you push it into the blade.

Cutting cylindrical pieces takes extra care. Dowels must be held very firmly to prevent spinning when contacting the blade. A round object may spin as it contacts the blade. This may cause your fingers to be pulled into the blade before you have any chance to react. Discs or spheres must first be attached to a secondary square piece which can add stability and prevent spinning.

If we find you attempting to make any cuts like these you may be ejected from the shop.

Never attempt to cut a spherical or disc shaped piece. These cuts will always spin and possibly pull your fingers into the blade.

Tall narrow pieces are not stable and can easily move in a way that pulls your fingers into the blade.
Cutting curves

Before beginning a curved cut there are a few things to consider:
Is the blade the correct width for the radius or tightness of the curve you wish to cut?
A narrower blade will cut a tighter curve (or smaller radius). Attempting to cut a curve with a blade that is too wide will result in harmful stress on the machine & blade and could cause the blade to break.
Do you need to make relief cuts? (see illus. below ) Relief cuts reduce stress on the blade and can prevent jams.
Will the work piece run into the vertical frame member and get trapped?
Marking your work piece on the correct side will avoid getting into a jam. If your work piece gets jammed do not try to pull it out with the power on. First turn off the power and carefully retrieve you work piece.
When cutting on the band saw avoid pulling back work that is partially cut. Pulling back work (while the power is on) may pull the blade off the wheels!

This cut cannot be completed because the corner of the work piece ran into the vertical frame member.

Strategically drilled holes make this operation much easier.

Two ways to achieve a radius or curved end cut.

Relief cuts prevent the blade from getting trapped.
The Drill Press

The drill press enable you to bore holes in material exactly square or at an angle and with great precision and control.
It has a depth stop mechanism which can limit the depth of a hole.
The table can be tilted for drilling at an angle.
The shop has a variety of jigs and holders which can make your drilling operations easier and more precise.

The Twist Drill Bit

The twist drill bit is the most common. It is a general purpose bit which works for wood, metal, acrylic & other materials. For wood the twist drill bit will cause some rough edges on the hole.
The acrylic bit has a special taper and cutting edge which scrapes away the acrylic material as it penetrates. This action causes less cracking and break out on the bottom side of the work piece.
On wood the brad point or forstner bit will give a hole with sharp edges. The brad point, spade bit, and forstner bit are only for wood or other soft materials, never for steel or abrasive material such as stone/concrete.
The hole saw is can make larger size holes in wood, acrylics, aluminum and (if is a bi-metal type) steel.
The countersink bit give a cone shaped hole which allow the head of screws to fit flush with the surface.
The pilot countersink bit will drill a pilot hole and countersink in one operation.
Drilling operations

Choose the correct drill bit for the material you are drilling. Consult a technician if you are not sure which bit is correct - DO NOT GUESS!

Always have a piece of sheet material (provided by the shop) covering the bed (under your piece) when drilling. This helps prevent drilling into the table bed which will damage the bed and possibly ruin the drill bit you are using.

Rotation speed

The bit rotation speed can make a big difference in the cutting action of the bit. For example using very high speeds may cause burning of your work piece and dulling of the bit. In some cases high speeds are appropriate. There are several factors involved in the choice of bit rotation speed - ask a technician.

Some drill presses have a variable speed control while other drill presses require changing the belt placement on pulleys.

Your work piece should be secured in some way - either clamped directly to the bed or in a vice or a jig that is clamped to the bed. Material that is not secured can easily be grabbed and spun by the bit causing injury. The larger the bit the more likely that the bit will try to spin the piece being drilled.

Cylindrical pieces (such as dowels) can be held in a V-block (see below).

Drilling metal is far more risky than wood. With metal the drill bit usually binds in the work piece as it penetrates. Metal work pieces should always be clamped or secured in a vice. If you are not experienced with metal drilling please ask a technician for assistance.
Stationary Sanders

Pratt shops have several types of stationary power sanders: From left to right below - The disc sander, The combination disc & belt sander, The edge sander, The spindle sander.

A variety of materials may be sanded including wood, acrylics, foams, and aluminum. Sanders may be designated for certain materials so check with the technician if you are not sure about which sander is appropriate.

It is very important to remember to ask the technician or work study on duty to turn on the dust collection for the sander you wish to use. Although you may not be concerned about being harmed by dust inhalation others in the shop are very concerned.

IT IS THE RESPONSIBILITY OF THE STUDENT TO SEE THAT THE DUST COLLECTION IS ON.

NO POWER SANDING PLASTER !!!

Rules for all stationary power sanders
- Do not attempt to sand very small pieces of material which cause your fingers to come close to the abrasive surface.
- Never attempt to sand spherical shaped pieces or organic shapes (for example: pear shape) as these shapes will spin as they contact the abrasive surface and come out of your hand. Your fingers may then contact the abrasive surface.
- When ever possible hold material down on the table of the sander.
- Do not remove paint with any shop power sander. Occasionally a student attempts to remove paint from a piece of wood worth about 50 cents and in the process ruins a $10 abrasive belt or disc.
- Avoid sanding at one point on the abrasive surface for long periods of time. In just a few seconds your piece could be burning and the abrasive surface will clog up.

The disc sander
The disc sander will give the flattest surface because the abrasive disc is adhered to the backing plate.
A miter guage can be used to achieve very accurate square or angled ends to your work piece.
The rotation of the disc determines which side is safe to use as only the downward moving side should be used. Not all sanders rotate in the same direction. If the sander rotates right to left (as in ILLUS. 23A) then the left side is the correct side to use. Sanding on the upward moving side will cause your work piece to come off of the table and possibly out of your hands. The result could be your fingers contacting the abrasive surface, or the results could be your piece hits you in the face. You should, whenever possible, keep your work piece in contact with the table as you sand.
The table can also be tilted to achieve angles. The table should be tilted downwards rather than upwards (as in ILLUS 24B). When the table is tilted upward the action of the abrasive surface pulls the work into the wedge formed by the angle (see ILLUS. 24A). This can cause the work piece to burn and jam the machine to a stop.

The vertical belt sander
The abrasive action of the vertical belt sander is somewhat different than the disc sander in that the belt moves straight downwards rather than in a circular motion. The entire surface of the belt may be used for sanding, although (as with the disc sander) work pieces should be held down on the table as much as possible. The belt may become warped as it gets hot and worn so the sanding surface may be less than flat.

The illustrations above show three ways that the same operation could be performed. Two have potential hazards. Can you see what these hazards are? In ILLUS. 6D the piece could get wedged between the miter gauge slot and the sanding belt. In ILLUS. 6E the edge of the piece could get pulled into the gap between the table and the sanding belt. These examples apply to the disc sander as well.
The spindle sander
The spindle sander is designed to sand inside curves. Various size (diameter) spindles are changeable. The throat plate must also be changed to fill the throat. Leaving excess throat space may result in the work piece being pulled down inside the machine (as in ILLUS. 25). The table may be tilted to achieve an angle.

You will be better able to control the sanding action if you move your work piece against the spin of the sander.

The above piece is in great danger of being grabbed by the sanding cylinder and spun. There must be at least 1/2 in. clearance on all sides of a hole or opening.