EVALUATING
ACADEMIC READINESS
FOR APPRENTICESHIP TRAINING
Revised for
ACCESS TO APPRENTICESHIP

COMMUNICATIONS SKILLS
CLASSIFICATION OF INFORMATION

AN ACADEMIC SKILLS MANUAL
for
The Precision Machining and Tooling Trades

This trade group includes the following trades:
General Machinist, Tool & Die Maker, Mould Maker, Pattern Maker, and Machine-Tool Builder Integrator

Workplace Support Services Branch
Ontario Ministry of Training, Colleges and Universities

Revised 2011

In preparing these Academic Skills Manuals, we have used passages, diagrams and questions similar to those an apprentice might find in a text, guide or trade manual.

This trade related material is not intended to instruct you in your trade. It is used only to demonstrate how understanding an academic skill will help you find and use the information you need.

COMMUNICATIONS SKILLS:
CLASSIFICATION OF INFORMATION

An academic skill required for the study of the Precision Machining and Tooling Trades

INTRODUCTION

Classification *of information is a system that groups items together based on shared qualities or features, or uses.* When information is divided into topics, when tools are stored by how they are to be used or when fasteners are sorted by size, each collection is classified into a group according to characteristics they have in common.

Classification indicates an underlying similarity in grouped items. If you recognize features in a new material or tool that are similar to features you are familiar with, you will find it easier to figure out how it works and where to use it. By classifying information you learn to see common patterns in the different techniques you are learning. Being able to classify new information assists you in organizing things, finding material, and making good choices.

In this skill sheet, we look at the following aspects of classification:

- Classifying into Categories
- Using Categories to Get Organized
- Using Classification

PART I
CLASSIFYING INTO CATEGORIES

Belonging to a group

The word "tool" is a grouping or category. It is a broad, general category. If someone asked you to hand them a tool, you could give them a centre-punch, a hammer or a hacksaw. You couldn't make a wrong choice because *any* tool fits the category.

> **Example:**
> If someone asked for a screwdriver (a type or class of tool), you would choose a screwdriver. *Screwdrivers* are a smaller, more specific category, so you would choose a screwdriver and exclude every other tool.
>
> If someone asked for a screwdriver and there were dozens to choose from, you would have to ask, "Which one do you want?"

Which one?
When you ask *which one*, you are asking for more information. Because you need to select the right tool, you need a *list of features* or *criteria* that describes that tool. The answer to your question will provide a list. It will be something like this: "I need the Phillips, number 3, the one with the chipped, insulated handle." With these words to guide you, you can match the screwdriver to the description and hand it over.

You can make the right choice. There is probably only one screwdriver that matches the list (the given criteria), chipped handle and all.

***Note**: We use the terms "given criteria" and "list of features" to mean the same thing.*

From general to one
To make the right choice, we moved in three steps:

1. from a very broad category which included all types of tools;
2. to a narrower category which included screwdrivers only;
3. to a list of features that described one item: Phillips number 3, insulated, chipped handle.

Classification involves a process, moving from a broad category of information that gradually narrows to descriptions that apply only to one type or one item only.

Example: Classification may apply a lesson about *milling machines* in this way:

> **First,** you learn the different functions and capabilities of this category of machine.
> **Next,** you learn the functions and capabilities of a *type* of milling machine such as horizontal.
> **Finally,** you learn about *each* horizontal milling machine in detail.

There is a good reason for these steps. Whether you are learning about milling machines or caring for tools, you need to understand what to expect from a group of items so you can predict results. You need to understand what type of product is best suited to the job and what type is not appropriate. You need to know what is considered odd or unusual behavior in any group of products. This knowledge prepares you to react when something unexpected happens so you can look for the causes. It lets you work from broad patterns in a logical way.

The right choice
To make the right choice, we need to work from information. When you ask questions about a job or a tool, the answers will describe the conditions.

> **Example:** You are fabricating a jig. Before you do anything, you need information. What will the jig be used for? Under what conditions? What type of metal is being used, what is the gauge, the width? Are there any special problems or considerations with the pattern or anything else, such as cost?

The answers to these questions outline the conditions. The answers will guide you in your choices for each step of the project. You can select the right information, tables, diagrams, safety

guides and tools. You can choose the right metal and make the jig to suit this situation. You can make appropriate choices by matching information to the finished product. You can see that the finished product sets the conditions for all the choices.

When you read Passage 1 about metals, you can understand why a designer would choose a particular metal and reject another. You can understand the characteristics of different metals and gain a sense of what to expect from the metals you will work with. Also, note how classification is used to teach you about metals. Look for information that moves from a general, broad category to smaller categories (or groups). The preview below outlines the passage:

- All metals have most of the same properties.
- Sheet metal is classified by two standard gauges (thicknesses).
- Every metal has specific properties and, therefore, specific uses.

Read Passage 1 and answer the questions that follow. Answers are at the end of this skills manual.

Passage 1
Metals

Machinists need to understand the characteristics of the metals they work with. Metal has all (or most of) the following properties:

- solid at room temperature (except mercury)
- opaque (you can't see through it)
- conducts heat and electricity
- reflects light when polished
- expands when heated and contracts when cooled

Sheet metal thicknesses are classified by two standard gauges: The *Manufacturer's* or *United States Standard Gauge* for sheet and plate iron, steel or ferrous metals, and the *American Standard Wire* or *Brown and Sharpe Gauge* for nonferrous metals and stainless steel, aluminum, brass, copper and others.

Each metal has specific properties and uses:

Aluminum: This base metal has long-wearing, rust-resistant qualities and an attractive appearance. It is relatively soft and ductile and can be used where weight may be a problem.

Brass: This alloy contains copper and zinc. It is easily bent, tarnishes quickly, but does not corrode.

Cold-rolled steel: This base metal is a mild steel. It is less porous and smoother than sheet metal.

Copper: This base metal is a good conductor of heat and electricity. It is resistant to corrosion and easily worked because of its malleable quality.

Galvanized iron or steel: And so on...

Questions:

1. Which type of metal would ***not*** be suitable for uses where the property of rust resistance is needed?

   a) aluminum
   b) cold-rolled steel
   c) brass
   d) copper

2. All metals could be described as follows:

   Metals are opaque, are classified by their gauge and have the same ability to conduct heat.

   T F

3. The United States Standard Gauge would be used to classify sheet iron, steel and nonferrous metals.

   T F

4. Which of the following lists characteristics of copper?

   a) an alloy, resistant to corrosion, easily worked
   b) a base metal, good conductor of heat, malleable
   c) a base metal, tarnishes easily, does not corrode

The questions above ask you to look at a product based on its properties and classifications (by thickness or gauge).

- Each metal may have one or two characteristics similar to other metals.
- Each may be manufactured in a similar way.

Your ability to choose the appropriate material depends on your being able to match the product to the need. It depends on your familiarity with different materials and their ability to do something.

Ask questions:

- Where is it to be used?
- Why would light weight be an advantage (or disadvantage)?
- What result should I expect? Is appearance important?

The answers to this type of question will direct you towards the right information and the right materials. You will know if you have to choose a metal for its flexibility or its toughness. You will know whether the right metal for your job is going to be brass or steel.

The specific requirements and instructions will direct you to the right techniques, materials, tools and welds to get the right result.

Equipment
Sometimes you work from the other direction.

> **Example:** You will learn about new equipment and machines designed for your trade and the techniques for operating them. You can then find the category (or group) of conditions or materials where this equipment will be most suitable.

Organizing information and equipment in this way is also a form of classification or categorizing.

Passage 2 describes a type of shears. Shears may be an unfamiliar piece of equipment to you, though you probably know they are used to cut metals. Watch how information in your trade starts you with information that applies to the whole topic. Then notice how it moves you to information about the specific or individual items.

Passage 2 uses classification to lead you to an understanding of this equipment. It answers the kind of questions you need to ask: What are squaring shears? What types are there? How is each type used?

Passage 2
Squaring Shears

Squaring shears are used to make straight cuts on sheet metal and to cut sheets to square their sides. Various types of gauges are used as stops for the sheet metal when more than one blank is required. Squaring shears are used to cut all types of sheet metals.

Foot operated squaring shears: Two types of foot-operated squaring shears are used in precision sheet metal shops: one type is the *foot squaring shear*; the other type is the *foot gap shear*. *Foot-operated squaring shears* come in standard sizes ranging from 36" to 120". They will cut 16 gauge mild steel. Two types of attachments are used to clamp the sheet of metal to the bed: an *automatic clamp* and a *hand-operated clamp*.

A *gap-type shear* is a squaring shear with open housings. This feature makes it possible to shear sheets of metal that are longer than the cutting length of the shear. Gap-type shears range from 36" to 72". Cuts are limited to a width of 18".

Classification leads us systematically. It starts with the main category then it divides information into smaller groupings with details. Here is how classification works in Passage2:

Paragraph one tells you this about the main category – squaring shears:

- type of cuts: straight cuts and squaring sides
- type and use of gauges: various types used for stops when more than one blank required
- where used: on all types of sheet metals

Paragraph two tells about one category of squaring shears – foot-operated squaring shears (in sheet metal shops). This paragraph tells you that:

- foot-operated shears come in two types or categories: foot squaring shear and foot gap shear
- range of standard sizes: 36 inches to 120 inches

- suitable gauge and metal for cuts: 16 gauge, mild steel
- types of attachments: automatic and hand- operated

Paragraph three describes one category of foot operated squaring shears – gap-type shears. You learn these details:

- a feature (open housings) allows this shear to cut sheets longer than the cutting length of the shear.
- range of size: 36" to 72"
- width of cuts - limited to 18"

Why do you need to classify things like this? You do it so you know what to do with an item, machine, or product:

- when to use it,
- when **not** to use it,
- how long it will function, and
- what conditions are best or worst for it.

You are matching the characteristics of a tool or product to the right category (or situation) for its use.

Application

Depending on the category of work you are doing, you will decide on the category (type or class) of product you need.

> **Example:** You will use mild steel fasteners in some situations and alloy steel in others. Once you know the type or class of metal, you can decide on the specific item within that category. It might have a 1/2 or a 1/4 inch diameter, or be a Class 1 or Class 2 fit.

Once you know the set of conditions, you can consult the right information or table for that category and for that specific project.

Classifying will give you a base of information to help you understand more about your topic – the purpose of the reading. Classification groups similar things together so, you understand something in general terms first. Then you are ready to learn about the qualities and functions of individual items.

We have looked at the right choice from two directions.

1. When you understand what something is designed to do, you know where it can be correctly used.
2. When you know the specific requirements of a job, you can find the class of material that is best.

Whichever way you look at it, making the right choice is essential to the quality of the completed project.

Equipment
Sometimes you go through the process of finding information, only to discover you must compromise.

> **Example:** The steel you want for a particular job is not available for six or eight weeks, and the price is going up. You know the requirements made you choose that material. After discussions with your supervisor, the supplier and, maybe, the client, you decide to make another choice.
>
> But, you need to understand your reasons for this choice – how "the next best thing" will perform, delivery time and what it will cost. You must be sure it suits all the conditions and the purpose.

You may not always understand why a design or metal is recommended or why a product would be a bad choice, but you can't ignore directions like the ones in the passage about squaring shears. Such directions state the conditions for using a machine or metal. It is assumed that you will pay attention to these directions.

Ask questions
The success of your efforts depends on information. Start with information about the job you are doing: like the type of fabrication and the conditions of the operation. Then, choose materials and tools based on information about their characteristics. Does a hole have to be accurate in size and shape with a good finish, or can it be drilled to size? Understand which tools within a category can or cannot do the job required. When you ask questions, you address all of the requirements.

PART II
USING CATEGORIES TO GET ORGANIZED

We all use classification to separate people, things and information into groups and categories. Sorting by categories tells us:

1. where to find things - things that are alike are found together: socks are in the socks drawer, tools are in your toolbox, and instructions are in your blue manual;
2. how to use things;
3. how to make good choices; and
4. how to set priorities.

When you classify things, you organize them in your mind and you get a sense of the big picture. You can start with a general idea – class or type – before dealing with each individual detail.

> **Example:** You have to weld in a confined space, so you have to know what confined space means, in terms of the job you will do. Once you have a picture of the space and what angles you have to work at, you can deal with the details. These details include the choice of tools, equipment, safety gear and the types of materials for this situation.

Example: In precision machining, you will use a variety of equipment. The machines may be classified as grinding, milling, shaping and so on. In some situations, it is necessary to drill. *Drilling* becomes the new category or grouping. It is the given situation. If you start with the big picture, this means you will cut a hole in a metal piece. However, you need a lot more information before you select a machine and the right attachment.

***As you read Passage 3, take note of the pattern of categorizing, grouping or classifying*.**
Answer the questions that follow. **The answers are at the end of this skills manual.**

Passage 3
Drill Presses

The drill press grips, revolves and feeds a twist drill to produce a hole in a metal or other material. The revolving drill or cutting tool is generally fed into the workpiece manually on bench-type drill presses and either manually or automatically on floor-type drill presses. A variety of operations is possible with cutting tools and attachments, provided the workpiece is not too large.

The most common drill presses found in machine shops are the *bench-type sensitive drill press* and the *floor-type drill press*. Other types such as the upright, post, radial, horizontal etc. are variations of the standard machine, designed for special purposes.

The *sensitive drill press* has a hand-feed mechanism that allows the operator to "feel" the cutting action and, thus, regulate the down-feed pressure. These drill presses come in two categories: bench and floor type.

The *bench type* has a short column and a table to support the workpiece. It is mounted on a table or bench and is used for drilling holes in small workpieces. The *floor type* has a longer column on which the table is adjusted to accommodate longer workpieces. Both types can drill holes up to 12.7mm diameter. Specially designed *super sensitive* or *super speed* machines of this type are used for drilling small holes less than 6.35mm in materials such as copper, brass, aluminum and other non-ferrous metals.

Questions:

1. Which type of drill press would be suitable for drilling holes in small parts?

    a) the bench-type
    b) the floor-type
    c) neither bench- nor floor-type

2. Which of the following type of drill press would ***not*** be suitable for drilling holes up to 12.7mm?

    a) super sensitive type
    b) floor type
    c) bench type

3. For drilling large workpieces, you would choose the floor-type drill press.

    T F

4. Which characteristics describe the floor-type sensitive drill press?

    a) It has a longer column and can drill holes 12.7 or larger.
    b) Has both manual and automatic feed of cutting tool and will accommodate longer workpieces.
    c) It has a shorter column and can drill metals and other materials.

Look at the first sentence in Passage 3 again:

The drill press grips, revolves and feeds a twist drill to produce a hole in a metal or other material.

Note that this information applies to *all* categories of drill press. The general classification starts with a definition that applies to *all* categories of drill presses. From it, we can understand the following:

- the revolving drill (or cutting tool) is generally fed into the workpiece manually on bench-type drill presses...
- the workpiece can be fed either manually or automatically on floor-type drill presses, and
- a variety of operations is possible with cutting tools and attachments, provided the workpiece is not too large.

The general classification prepares you for the more specific categories: the definitions, details and descriptions of the different types of drill press that follow. Look back to the passage and note how each of the paragraphs describes a type of drill press.

To understand the reasons for using one type over another type, you would have to answer all of the questions:

- What is the size of the workpiece?
- What is the size of hole to be drilled?
- What type of metal is the piece?
- What result should I expect if the drill press (or any machine) is not the best choice for this operation?

Which one to choose?
If you have asked and answered all the questions related to the assignment, you will have you a complete list of conditions and factors. Your question and answer list will guide your task and the task of your supplier.

A decision may involve comparing two (or more) lists:

- One list may describe the situation you are facing;
- the other list may describe the features of a material.

The choice you make will depend on your understanding of both the situation and that material. Each result you get depends on the kind of information you select to answer the “which one” question you encountered on page one of this unit.

Passage 3 is an example of how we use classification to learn about something. You are classifying types of drill presses. You can begin to see how types of drill presses are the same,

and how they are different. You learn to match the characteristics of a product, tool, or procedure to the right category, and see how that might apply to its use.

Classification in Tables and Charts

Tables and charts also classify information. For example, you might see tables used in the following ways:

- electrode classification, wire type and applications,
- common problems in troubleshooting guides, and
- shielding gases and wire depending on the type of work you plan.

Note: *Read all the information related to a table or chart. Important or essential explanations and details are often placed above or below the listed details.*

Classification is used in Table 1 (in part) to help you make the correct choice in a cutting fluid. At a glance, you can see the type of metal and the type of cutting operation. When you understand more about the characteristics of individual metals and operations, you can understand why a particular type of cutting fluid is recommended.

Note: Read all information related to a table or chart. Important details and essential explanations are often placed above or below the table.

Table 1: Cutting Fluids for Metals and Cutting Operations

Metal	Drilling	Reaming
Aluminum	soluble oil kerosene kerosene and lard oil	soluble oil kerosene mineral oil
Brass	dry soluble oil kerosene and lard oil	dry soluble oil
Bronze	dry soluble oil mineral oil lard oil	dry soluble oil mineral oil lard oil
Etc.		

Note: Chemical cutting fluids can be used for most of the cutting operations above. Follow the manufacturer's recommendations for use and mixture. Concentrates diluted with water ranging from a low of 1 part cutting fluid to 15 parts water to a high of 1 part to 100 parts water.

The note below Table 1 gives another class of cutting fluids (chemical) used on *most* metals. Make sure you find which metals are included – or excluded – by *most*.

The Language of Classification

The language of classification gives you valuable information. It indicates which category a material, design, or technique belongs in. This will make some job decisions easier.

Classification is used to limit your choice to one type or category only. You may not know why you should only choose from a certain category or follow a particular procedure, but the directions tell you how to act.

Example:
Greases from different manufacturers should ***never*** be mixed in the same bearing.

Classification can point you to what you should avoid. Restrictions like these direct you to only choose materials or techniques that are allowed and to comply with all relevant codes. You classify materials and operations so you can match codes and standards to appropriate actions.

Example:
Caution!
Do not clean, oil, adjust or repair *any* machine while it is running. Stop the machine and lock the power switch in the "off" position.

Example:
When working with other workers, *only one* should operate the switches.

Classification can instruct you in how to proceed. To follow directions, you need to know which things are included in the general classification term (solvents, industry standards, safety codes) and which the details you need to classify. Then you can apply the instructions properly.

Examples:
Clean air regulations prohibit the use of some solvents. Check local regulations.

All work must comply with up to date industry standards and safety codes,

Classification can define a category of items, and what you must know about its use, safety, and handling etc.

Example:
Controlled products fall into six classes of hazards. Each class is identified by a symbol. For each class, identify uses, ingredients, hazards, clean up, etc...

Classification directs or restricts your actions:

Example:
Table 4 is for mild steel electrodes only. The figures are averages of suggested amperages from a number of suppliers. Use these as a starting point but you must fine-tune the amperage setting yourself. Use a piece of scrap that is the same thickness as the job you are to perform. Do this *before* attempting the weld.

Example:
A variety of operations is possible ... *provided the workpiece is not too large*.

Classification identifies problems and causes. Once you have know where to look for the causes of a problem you can begin to classify specific details of the cause of a particular problem.

Example:

Using incorrect lubricant fluids could result in tool failure.

If the process of gathering and organizing information seems long, remember the purpose: To make the right choices to meet the standards of your trade.

PART III
USING CLASSIFICATION

Use classification to get the right result. What are the results of a wrong or poor choice?

Example: What results can you expect from cutting tools if you use a lubricant only when you happen to think about it? What if you've stored the lubricant in a rusty container? To maintain the life and performance of tools, you need information about the right type of lubricant, how often to use it, and how to store it.

Getting the wrong information
If you are not using the right information the result of your choice could be very different from the desired one. Tools may be well designed and manufactured, but choosing the wrong lubricant could result in corrosion of metals and excessive wear to parts. In fact, it could result in tool failure.

Getting the right information
Understanding information often involves sorting out one set of details from another. When you read, pay attention to special instructions, manufacturer's directions or textbook directions that use classification to point out or tell you how to proceed.

Example:
Clean air regulations prohibit the use of some solvents. Check local regulations.

Solvents are a class of liquids. To follow the directions above, you need to know what liquids are included in the term *solvents*, and which ones are regulated by local codes (by-laws or ordinances). You then need to read the workplace regulations.

Examine it all to ensure you meet these criteria.

Example: Suppose you are asked to weld two pieces of metal.
1. Understand the conditions. The weld must do the following:
    - meet industry standards,
    - come in at the right cost, and
    - be excellent in appearance.

2. Understand the factors or group of factors to get you these results. So, you list the factors that relate to the list above. It will include, but not be limited to the following:
    - proper heat,
    - proper shielding of weld,
    - choice of equipment,
    - condition of equipment, and
    - your skill level.

3. Assemble information for a detailed, complete list of conditions and product factors. You can then relate this list to the next task:
    - find the right weld, and
    - ensure excellent strength.

4. Search for the recommended weld. This will start you on your third list. You will find information about these topics:
    - types of welds,
    - their characteristics,
    - which types suit these particular requirements, and
    - advantages/disadvantages of various types.

As you read to understand characteristics of products and equipment, you will learn how to avoid defects. When you have collected and assessed information, you can find the right fit. You can investigate the range of choices and select the best one.

At some point, you will put two (or several) lists of information together to make a choice. You may also have to decide which feature on your list is the most or least important. Often, you will need one, two, or more sources to complete your task.

What is the situation?
To make the right choices, assess the situation:

- ♦ look at a requirement or group of requirements;
- ♦ understand them; and
- ♦ choose a product or process to suit the requirements.

Example: You are to choose fasteners to join metal sections. Before you get out any tools, you need to understand the conditions and the specific job you have to do. You know that the right fastener installed with the right tool will ensure the right quality of joint. But, which type of fastener should you choose?

- What's being joined? Is the fastener required to connect different metals or the same metals but of a different thicknesses?
- Are there any tricks or problems?
- What's available?

You need to be sure you create solutions, not problems. You will want to avoid:

- redoing the job,
- damage to any part or tool,
- creating safety risks, and
- finding yourself with the wrong tools or short of material.

Passage 4 below (in brief) describes a category of sheet metal fasteners. Look at the category, then the features or group of features to decide which screw would suit a set of conditions. **Answer the questions that follow. Answers are at the end of this skills unit.**

Passage 4
Sheet Metal Screws

Sheet metal screws (also called *self-tapping screws)* are designed for sheet metal work. As they are driven in, they tap their own mating threads into the material. Because these screws are threaded the full length of the screw, they fasten the two pieces of metal tightly together. Most types of sheet metal screws come with slotted, Phillips and hex heads.

Sheet metal screws are classified by the type of point and by the threading. Types A to C are *thread forming*. As they are driven, the pressure forms the mating threads in the metal. The other types of screw are *thread cutting*. These make threads by cutting and removing part of the metal.

Types of Screws

Type AB has a sharp point and coarse threads and is recommended to fasten thin sections. Type B has a blunt point and similar threading to Type AB. Used to fasten thicker sections. Type C has finer threads than AB or B. Used for heavier sheets and for greater strength. Types D, F, G, T and Z have blunt points and fine threads. They are used mainly to join heavy metals, metals of different thicknesses and to fasten sheet metal to structural members or castings.

It is important to use the right sized drill bit when drilling holes for sheet metal screws. The screws will not hold if the hole is too large. The screw may be difficult to start or turn or may break if the hole is too small.

Questions:
Need to re-do the numbering below….

1 Which type of screw would you choose to fasten heavier types of metals together?

a) Type AB and Type C
b) Type C and Type D
c) Type D, F and B
d) all of the above

2. Which are *not* characteristics of Types A to C?

a) thread cutting; provides greater strength
b) thread forming; most are available in hex, slot or Phillips heads
c) threaded the full length of the screw; fastens metals tightly

3. Which of the following lists characteristics of Types G, T and Z?

a) blunt point; coarse threads; similar threading to Type AB
b) sharp point; fine threads; fastens thinner sections
c) blunt point; fine threads; fastens metal of different thicknesses
d) all of the above

4. Any type of screw could break off if the drilled hole is too large.

T F

Make sure you understand all of the factors that affect your goals. Make sure you look at the following:

- product features (question 3),
- what a product can't do (question 2),
- what a product can do (question 1), and
- problems that result from wrong choices or actions (question 4).

In Passage 4, you had information in front of you from which to work. As you looked for answers, you may have underlined words or made notes in the margins that help you eliminate details that don't apply or to highlight something important. Regardless of how you approached this passage, your object is to match the given products and materials to the situation.

To make the right choice, you need to do the following:

- look at a requirement or group of requirements;
- understand them; and
- choose a product or process to suit the requirements.

To make the good decisions, you need to know about each situation in detail. It is just as important to understand why you would **not** choose a product or procedure as it is to understand why you would choose it.

Organize the information

The process of pulling information together will help you make your decisions. Take the time to consider each factor and to understand it. Keep asking questions. Consider the details you would pull together to answer your supervisor's questions. Make sure you cover all possibilities to fit the requirements of a job.

Headings

Apply classification of information to your own notes to organize information. Underline or highlight what is relevant to your project or studies. Eliminate or set aside details that are not. Enter details under headings in a notebook. This is classification of information applied to your own notes.

> **Example:** You can group information about machining tools or types of fasteners together. As you proceed through a course, or a job, you can add to this information in a logical, ordered way. It will help you keep the big picture clearly in sight. As you develop the big picture, it is easier to sort out and understand the details about individual items.

Organize your thoughts

You need to organize information methodically. By classifying information, you can learn why a principle or technique applies to a group of situations or why it applies to one situation only. You

can identify types of problems, determine their causes and find solutions. You understand and why a recommended welding technique failed to make a good weld. You can record what changed and whether or not you need to change a product or procedure.

CONCLUSION

Your job is to assemble information as thoroughly as possible to help answer the question: "Which is the best choice for this situation?" By starting from broad categories and working toward the specifics of single products, you can investigate the range of choices and select the best one.

Work from reliable sources found in text and trade books, tables, manufacturers, suppliers and the experts in your field. As you tackle a new topic or chapter, look at how *classification* teaches you your trade. Use it yourself to move from broad, general information (about welding or engines) that applies to all items in the category. Then move to information that focuses on and describes individual categories or types. Continue to learn in this way until all the details about each item are covered.

Summary

1. **Classification is a process**. A general, broad group or category contains a large number of items. A narrower category will hold fewer items.

2. **Match a list of features against a list of requirements**. Match products, information, and methods to a list of features. The question, "*which one",* narrowly defines the items that will fit.

3. **Use questions in your research to find relevant factors and conditions**. Look for the items that fit the grouping or classification.

4. **Know your purpose for classifying information**. Some of the details fit what you want; others can be eliminated because they do not fit the criteria.

5. **Classify features and conditions to determine errors, inappropriate or unsuitable choices**. Your own experience, knowledge and access to experts will help direct your search.

6. **You may have to decide which feature is the most important**. A choice may mean a compromise or a balance of factors.

7. **Understand characteristics of products**; understand the advantages and disadvantages of features. This will help you understand why something is a good choice, the best choice or *the only choice* for a particular situation.

ANSWER PAGE

PART I Passage 1, Metals

1. Which type of metal would **not** be suitable for uses where the property of rust resistance is needed?
   b) cold-rolled steel

   Each of the metals listed is followed by a brief description: Aluminum a) is described as having rust-resistant qualities, brass c) does not corrode and copper d) is resistant to corrosion. Only cold-rolled steel is **not** described as having rust resistant qualities, so b) is the correct choice. To discover which type of metal has the best or least rust resistance, compare this property to other metals.

2. All metals could be described as follows:
   Metals are opaque, are classified by their gauge, and have the same ability to conduct heat.

   F All metals are opaque, so this part is true. The passage states that *sheet metal* is classified by gauge, but it does **not** say all metals are classified in this way. So this part is a question mark (?). The passage states that metals conduct heat, but it doesn't compare metals; this means you can't state that each has *the same ability*.

3. The United States Standard Gauge would be used to classify sheet iron, steel and nonferrous metals.

   F This gauge is used to classify ferrous but is **not** used for nonferrous metals.

4. Which of the following lists characteristics of copper?
   b) a base metal, good conductor of heat, malleable

   Some metals share characteristics. Find the answer to this question by a process of elimination. Compare the details (list of features) to match with the question – the desired features.

PART II Passage 3, Drill Presses

1. Which type of drill press would be suitable for drilling holes in small parts?
   a) the bench-type

   This question asks "which one" or "which type" can do a certain type of job. Find the answer by comparing the description of the type of drill to its use. Compare to eliminate the wrong uses for a drill.

2. Which of the following type of drill press would ***not*** be suitable for drilling holes up to 12.7mm?
   a) super sensitive type
   b) floor type
   c) bench type

   This is similar to Question 1, except that you want to eliminate a type which is not able to perform an operation. This type is suited to small holes (less than 6.35mm) while the floor-type and bench-type (Answers b) and c) are suited to drill larger holes.

3. For drilling large workpieces, you would choose the floor-type drill press.

   F State False unless the answer is clear. The passage does not say which type is suited to larger workpieces. It says the bench-type is suited to small workpieces and the floor-type is suited to *longer* pieces, but it is not clear if *longer* pieces is the same as *larger* pieces.

4. Which characteristics describe the floor-type sensitive drill press?
   b) Has both manual and automatic feed of cutting tool and will accommodate longer workpieces.

   You may have to search to find this answer as the first feature is found in paragraph one and the second feature is in paragraph two.

PART III Passage 4, Sheet Metal Screws

1. Which type of screw would you choose to fasten heavier types of metals together?
   b) Type C and Type D

   This asks "which one" or "which type" can do a certain type of job. Find this answer by comparing the type of screw to its use. Eliminate the wrong choices (uses) to find the correct screws to select.

2. Which are ***not*** characteristics of Types A to C?
   a) thread cutting; provides greater strength

   Answer a) does **not** describe characteristics of this group of screws. Types A to C screws are thread forming **not** thread cutting. Type C provides greater strength, but strength is not listed as a characteristic of Types A or AB. Answers b) and c) apply to Types A to C or to all types of sheet metal screws.

3. Which of the following lists characteristics of Types G, T and Z?
   c) blunt point; fine threads; fastens metal of different thicknesses

   This question asks you to find characteristics of a fastener. It asks you to identify the features and understand what this type of fastener can do. Use the same process of elimination as is question 1.

4. Any type of screw could break off if the drilled hole is too large.

   F This question asks you to read accurately so that you identify a type of problem to its cause. The passage states that a screw may break off if the hole is too small. Other types of problem occur if the hole is too large.