

**EVALUATING  
ACADEMIC READINESS  
FOR APPRENTICESHIP TRAINING**  
Revised for  
**ACCESS TO APPRENTICESHIP**

**COMMUNICATIONS SKILLS  
CLASSIFICATION OF INFORMATION**

**AN ACADEMIC SKILLS MANUAL  
for**

**The Small Motors Service Trades**

This trade group includes the following trades:  
Marine & Small Powered Equipment Mechanics,  
Motorcycle Mechanics, and  
Small Engine Mechanics

*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.**

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# COMMUNICATIONS SKILLS CLASSIFICATION

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*An academic skill required for the study of the  
Small Motors Service 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 screwdriver, 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'd 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?"

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### Which one?

When you ask the question, *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; and
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 to a lesson about *care of tools* in this way:

- **First**, you learn about proper care and maintenance of a category of tools such as *measuring tools*;
- **Next**, you learn how to care for tools according to their different *types of material* such as stainless steel;
- **Finally**, you look for information about caring for *specific measuring tools* such as vernier calipers or micrometers.

There is a good reason for these steps. Whether you are learning about using charts and tables, diagnosing problems 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 information

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 going to clean engine parts. Before you do anything, you need information. Your starting point is a list of questions: What part am I cleaning? What type of deposits am I cleaning? Are there any special problems or considerations with the solvents or deposits?

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, safety guides and tools. You can choose the right products and procedures for this situation. You can make appropriate choices by matching information to the requirements for the task. You can see that the job requirements set the conditions for all the choices.

### Application

When you read Passage 1 about the categories of washers and how they are used, you can understand why you would choose a particular washer for a task and reject another. You see that the characteristics of a washer are what make it useful for some purposes but not others. Note how classification using the category of characteristics is used to teach you about washers.

Look for information that moves from a general, broad category to smaller categories (or groups). In your trades, you will choose a washer, an engine or cleaning method depending on the job it is required to do. Although manufacturers usually determine the type or class of material for a design, you need to understand classification to work well with these products.

This process applies as you choose a fastener when assembling an engine. **Read Passage 1 and answer the questions that follow. Answers are at the end of this skill manual.**

#### Passage 1 Washers

If a bolt or screw is tightened against a metal that is softer (such as aluminum, copper or brass), the head of the bolt or screw can become embedded in the surface. During use, the fastener can work loose. Various types of washers are used to prevent embedding and the problems which result.

**Flat washers** give a wider bearing surface for a bolt, screw and nut. They provide a harder surface for the fastener to pull against.

**Lock washers** come in a variety of types. The *kantlink* is commonly used for locking nuts. Made of spring steel with bevelled ends, the slight helix of this washer allows it to cut into the mating surfaces of nut and component. As the nut is tightened, the washer is compressed flat. The toothed edges of the washer dig into the two surfaces and thus prevent any further loosening.

**Wide bearing lock washers** provide the hard surface of a flat washer and toothed edges of the *kantlink*.

**Multiple-toothed washers** are stamped from sheet metal. They come in three types: *internal*, *external* or *external-internal toothed*. This type of washer is used with screws to prevent the screw from twisting out. The teeth of these washers resist rotation in the direction that would cause the screw to loosen.

#### Questions:

1. Which of the following lists characteristics of lock and multiple-toothed washers?
  - a) made from sheet metal; bevelled edges
  - b) hard surface; toothed edges
  - c) toothed edges; resist loosening of fastener
  - d) all of the above

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2. Which are *not* characteristics of wide bearing lock washers?
    - a) provide the hard surface of a flat washer
    - b) have the toothed edges of the kantlink
    - c) made from aluminum, brass and copper
  
  3. Which types of washer would cut into mating surfaces?
    - a) lock and wide bearing
    - b) wide bearing lock and flat
    - c) either a) or b)
  
  4. You could choose any of the washers described in Passage 2 to prevent embedding of a fastener.

### T F

The questions above ask you to look at a product based on its features, its ability to do something, or because it can't do something.

- Each washer may have one or two characteristics similar to the others.
- Each may involve the same amount of time to attach.

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?
- What is the *desired* result?
- Would a more expensive item offer any advantage? Why or why not?

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 washer for its bearing surface or locking capability. You will know whether the right washer for your job should be made of spring steel or stamped from sheet metal.

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

### Equipment

Sometimes you work from the other direction.

**Example:** You have an engine part, or a tool, or a piece of equipment and you need to know more about it – how and where it works. You use classification to understand what it is, how it works and what you should do with it. When you ask questions, you may get this kind of answer:

- It is part of the carburetor.
- It is used for measuring inside diameters.
- It is a two-stroke engine.

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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.

### **Look from all angles**

You often have to look at the right choice from two directions.

- You need to understand what a tool or product is designed to do to know the class of job it's correct for.
- You need to know the requirements of a job to know the class of tool or product that's correct.

This may sound like going in circles, but whichever way you look at it, making the right choice is essential to the quality of the completed project.

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

**Example:** Maybe the aftermarket part that is the best one for a repair is not available from the manufacturer for four weeks and the price is going up. You know the requirements made you choose that particular part. After discussions with your supervisor, the supplier, and perhaps the client, you decide to make another choice.

Nevertheless, 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.

### **Application**

Depending on the category of job, 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 ½ or a ¼ 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.

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Classifying will give you a base of information to help you understand more about your topic and your purpose of the reading. Classification groups similar things together so that 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.

### **Ask questions**

The success of your efforts depends on information. Start with information about the job you are doing: like the type of repair and the conditions of the operation. Then choose the products and tools based on information about their characteristics. Understand which situation will call for solvent, fastener or washer. 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 sock 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.

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**As you read Passage 2, take note of the pattern of categorizing, grouping or classifying. Answer the questions that follow. Answers are at the end of this skills manual.**

**Passage 2**  
**Wheels**

Proper maintenance and service of wheels is essential to safety. A motorcycle wheel rotates on an axle and supports the rubber tire. Three types are used on modern motorcycles: wire, cast and stamped wheels.

**Wire wheels:** The hub of a wire wheel is suspended from the spokes. The spokes are attached to the rim in a crisscross pattern and secured to the rim by the spoke nipples. The weight of the motorcycle is not supported by the lower spokes; in fact, the hub hangs from the top spokes and, as the wheel rotates, weight is transferred from one spoke to another. The wheel is stronger if there are more spokes in the crisscross pattern because the load is distributed over a wider area on the rim. As the wheel rotates, each spoke is loaded and unloaded more gradually.

The different types of cross patterning affect the strength of the wire wheel. The *cross-zero* (no crisscrossing) pattern is not safe for street use because it is very weak. It is to be used for show only. Although the *cross-two* pattern is very common, it does not provide good support. The *cross-three* pattern provides very good support and results in a strong wheel.

**Cast wheels:** These are manufactured by pouring molten metal (usually aluminum or magnesium alloy) into a mould. The hub, spokes and rim are one piece which means this is a very strong and dependable wheel.

**Stamped wheels:** The hub, spokes and rim are separate parts fastened together. The stamped wheel is either bolted or rivetted together. It is similar to the cast wheel in appearance but is cheaper to manufacture.

**Questions:**

1. A) Why would anyone choose a wire wheel with a cross-zero type of spoke design?  
B) As a mechanic, what advice would you give your customer about the use of this wheel?
2. Which of the following would you choose if you wanted a strong wheel?
  - a) a cast wheel or cross-two wire wheel
  - b) a cross-two wire wheel or cross-three wire wheel
  - c) a cross-three wire or cast wheel
  - d) any of the above
3. All wheels require proper maintenance and service to ensure their safety.  
**T F**

Let's look at how this passage uses classification to guide you through a trade description. Systematically, it presents information in a format used for most technical writing. Information about a general category is presented first, and then the information is classified into more and more specific categories. It's like a tree trunk that divides into smaller branches; yet, everything belongs to the same tree, or main category. In Passage 2, it is wheels for motorcycles.

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Paragraph one tells us this about all wheels:

- service and correct maintenance are essential to safety,
- how they function:
- types used on today's motorcycles:

This general understanding prepares you for finding out about the different categories of wheels.

Paragraph two describes the first category, wire wheels. It describes:

- how wire wheels are designed:
- why wheels are stronger (or weaker):

Paragraph three describes further classification of this category by three types of spoke design.

Paragraphs four and five describe the other two main categories of wheels.

### **Which one to choose?**

If you have asked and answered all the questions, you will have you a complete list of conditions and factors for choosing a welding method. Your question and answer list will guide your task.

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 2 is an example of how we use classification to learn about something. You are classifying types of wheels. You can begin to see how types of wheels 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.

**Examples:** 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.*

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### ***The Language of Classification***

The language of classification provides valuable information. It indicates which category a material, design, or technique belongs. 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.

**Examples:**

Operate these machines *only after* receiving all training and instructions.

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

*Classification can point you to what you should avoid.* Restrictions like these direct you to 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.

**Examples:**

**Never** use air pressure to spin bearings while drying. The bearings could fly apart with enough force to blind, break fingers or kill.

**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.**

*Classification can instruct you 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 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.

Protect all cleaned parts from rust and corrosion with a coating of oil or light grease.

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

**Examples:**

Using incorrect lubricant fluids could result in tool failure.

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

### **PART III**

#### **USING CLASSIFICATION**

Use classification to achieve 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 find the workplace regulations that relate to the situation.

Examine it all to ensure you meet all of the criteria.

**Example:** Your job is 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. Therefore, 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 information related to the specific situation*, the recommended weld. This will begin your third list. You will find information about these topics:
- types of welds,
  - their characteristics,
  - which types suit these particular requirements, and
  - advantages and 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
- damaging any part or tool
- creating safety risks, and
- finding yourself with the wrong tools or short of material

Passage 3, below, describes a category of joining metals, welding. Look at the category, then the features (or group of features) to decide which type of welding might suit a set of conditions.

**Read Passage 3 and answer the questions that follow. Answers are at the end of this skills unit.**

### Passage 3 Welding

*Welding* is the most important metal-joining process. Heat is applied to pieces of metal to fuse them together into the desired shape. The correct process is related to the metal being welded. Three processes of arc welding are briefly described below:

**Shielded Metal-Arc Welding (SMAW):** This produces high quality metal at a high rate of production. Used in all positions, it welds a variety of metals, most often mild carbon steels and low-alloy steels. An arc is struck between the metal to be welded and the covered electrode. The arc creates enough heat to melt the edges of the base metal and the electrode that is deposited on the base metal forming a metal structure equal in strength to the metal being welded.

**Gas Metal-Arc Welding (GMAW):** Variations are commonly called **MIG**. It welds faster and allows welding of many different metals. Heat is generated between the electrode and the metals being welded. The gas metal-arc electrode, in the form of a wire, is continuously and automatically fed to maintain a steady arc. The deposited weld is as strong as the base metal.

**Gas Tungsten-Arc Welding:** Commonly known as **TIG**, this produces extremely high quality welds. Used primarily for non-ferrous metals which are difficult to weld such as aluminum, magnesium, and stainless steels. (Also nickel and copper alloys.) An arc is struck between non-consumed tungsten electrode and the base metal. The area is shielded by an envelope of inert gas. The heat produced by the arc melts the edges of the metal to be welded but not the tungsten electrode. Metal to fill the groove or to make the deposit is added independently into the arc becoming the weld metal that produces a metallurgical joint as strong as the base.

#### Questions:

1. According to Passage 3, which of the following would you choose to weld aluminum or stainless steel?
  - a) Shielded Metal Arc Welding (SMAW)
  - b) Gas Metal-Arc Welding (GMAW)
  - c) Gas Tungsten-Arc Welding (TIG)
  - d) All of the above.
2. The welding process you choose depends on the metals being fused.

**T F**

3. Which characteristics describe the SMAW process?
  - a) produces high quality metal, deposited weld is as strong as the base metal
  - b) can weld different metals, often used to weld stainless steel
  - c) produces high quality metal, often used to weld mild carbon steel
  - d) can weld different metals, produces welds faster

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4. All processes described here can be performed in all positions.

**T F**

In Passage 3, 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 process 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 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 gears 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.

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## 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.

As you tackle each new topic or chapter, look how *classification* teaches you your trade. Use it yourself to move from broad, general information (about welding or surfacers) that applies to all items in the category. Then move to information that focuses on and describes individual categories or types. Continue to move 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.

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**ANSWER PAGE**

**PART I      Passage 1, Washers**

1. Which of the following lists characteristics of lock and multiple-toothed washers?  
c) toothed edges; resist loosening of fastener

Read the passage carefully to see which set of criteria matches the washers. You will find both toothed edges and resistance to loosening listed as features of both the lock and multiple toothed washers.

2. Which are *not* characteristics of wide bearing lock washers?  
c) made from aluminum, brass and copper

We don't know what materials any of these washers are made from. Because fasteners become embedded in softer metals such as aluminum, brass and copper, it is unlikely fasteners themselves would be made of soft metals. Check this out with more reading.

3. Which types of washer would cut into mating surfaces?  
a) lock and wide bearing

We have no information from this passage to say that flat washers actually grip either surface. They provide a wider and harder surface.

4. You could choose any washer described in Passage 2 to prevent embedding of a fastener.  
**T**

Paragraph one states, "Various types of washers are used to prevent embedding and the problems which result." This applies to all the washers described in Passage 2.

**PART I      Passage 2, Wheels**

1. A) Why would anyone choose a wire wheel with a cross-zero type of spoke design?

From this passage, we know that the cross-zero pattern, "is not safe for street use because it is very weak. It is to be used for show only." It seems that someone would choose this spoke design for a bike used *only* for show. This design may be cheaper or more attractive and someone might choose it for these reasons, but we don't know this from the passage.

- B) As a mechanic, what advice would you give your customer about the use of this wheel?

You would advise them about safety concerns making sure they understand its use is limited to the category of *show* only. You could show a customer why this design is weak – perhaps compare it to a cross-three design, cast or stamped wheel. It is important that they understand why this pattern is weak so the safety risks are clear.

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2. Which of the following would you choose if you wanted a strong wheel?  
c) a cross-three wire or cast wheel

This information is found at the end of paragraphs three and four. Though different in design, the strength seems the same or similar.

3. All wheels require proper maintenance and service to ensure their safety.  
T

Paragraph one states, “proper maintenance and service is essential to safety.” This applies to every class of wheel.

## **PART II      Passage 3, Welding**

5. According to Passage 3, which of the following would you choose to weld aluminum or stainless steel?  
c) Gas Tungsten-Arc Welding (TIG)

This question asks you “which one” or “which type” can do a particular type of job. Neither SMAW or GMAW is suggested for these metals; therefore eliminate these as choices. Gas tungsten-arc is the only process described as being suitable for the non-ferrous metals that are difficult to weld such as aluminum, magnesium, and stainless steel.

6. The welding process you choose depends on the metals being fused.

**T** The first paragraph states this clearly: “The correct process is related to the metal being welded.” We don’t know which process is correct for every type of metal. Use a chart that covers processes and types of metal. This would also apply to question #1.

7. Which characteristics describe the SMAW process?  
c) produces high quality metal, often used to weld mild carbon steel

This is also a “which one” question. This process is used to weld mild carbon steel or low alloy steels.

8. All processes described here can be performed in all positions.  
**F** We know SMAW is used in all positions. We don’t know if this is true for the others, so choose false. If in doubt, check it out.