

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

**COMMUNICATIONS SKILLS  
COMPARISON OF INFORMATION**

**AN ACADEMIC SKILLS MANUAL  
for**

**The Motive Power Service Trades**

This trade group includes the following trades:  
Automotive Service Technician, Heavy Duty Equipment Mechanic,  
Motive Power Parts Person, Transmission Mechanic,  
Truck & Coach Technician, and Truck & Trailer Service Technician

*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.

**The information in them is not intended to instruct you in your trade. Trade related material 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

## COMPARISON OF INFORMATION

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*An academic skill required for the study of the  
Motive Power Service Trades*

### **INTRODUCTION**

You make comparisons on the job every day. You compare size when you pick one size of fastener instead of another. You compare techniques when you decide to use one type of welder instead of another. You compare long-term costs when you order a better grade of steel for a project because it is more durable than a less expensive grade.

*When you make a **comparison**, you examine two or more things to find out how they are similar and how they are different.* While comparison examines both similarities and differences, contrast only looks at differences. Once you have made your comparison or contrast of the different options available, you are in a position to evaluate what is the best choice for a given situation.

In your trade, you compare products and equipment for a variety of reasons: to decide which one is more durable, which is safer or which will work better in a specific situation. You learn to compare techniques and procedures through your reading, from listening to teachers, supervisors and skilled tradespeople, and through your experience on the job.

In this skills manual, we will look at the following aspects of comparison:

- ◆ How comparison works
- ◆ Words that compare and contrast
- ◆ Using text and graphics to compare
- ◆ Making choices

### **PART I**

#### **HOW COMPARISON WORKS**

##### **From general to specific**

Most comparisons start with general information about a topic. This general information is your base. The topic could be anything from engines to welding techniques. From this foundation, you move to more specific topics such as choosing the right size engine or welding temperatures.

As you read about a topic such as engines, you begin with explanations, definitions or descriptions that apply to the large body of information about this kind of machine. This gives you an overview of the topic.

From this general information, you learn more specific information such as types of engines. As you learn the characteristics of each type, you see what the different engines have in common and how they differ.

Next, you sort out the similarities and differences between:

- features of different engines
- recommended uses of each type

You *compare* features, operation, procedures, conditions or costs related to the large group and to each item in the group. You can then compare the advantages or disadvantages of each. You are in a good position to choose the best method or product for a specific job.

Passage 1 shows you this typical pattern of moving from general to specific information. It starts with general information about lubricants. It then describes a type of lubricant, grease, and goes into detailed comparison of different soap greases.

**Read Passage 1.** As you read, pay attention to how using comparison leads you to understand the concepts.

### **Passage 1** **Lubricants**

Lubricants are substances such as oil, grease or graphite used on surfaces which slide or move against each other. Lubricants reduce friction and wear between components and increase their life.

#### **Properties of Grease**

Lubrication oils are thickened with a soap to produce greases. Adding thickener controls water resistance and thus resistance to machine breakdown resulting from constant use and temperature range. The grease also is better able to stay in place. The content of soap in *general purpose greases* is usually from 7% to 18%; for *special purpose greases* the range can be from 3% up to 50%.

#### **Grease Types**

**Simple Soap Greases** combine a fatty acid with a base metal (calcium, sodium, aluminum, lithium or barium).

*Calcium soap:* a small amount of water stabilizes this oil/soap structure. At temperatures of approximately 80<sup>0</sup>C (175<sup>0</sup>F), the soap and oil separate as the internal water works out. These greases are suitable for damp conditions but not for high temperatures.

*Sodium soap:* Soluble in water. High temperature range. These soaps are recommended only for dry conditions and high operating temperatures.

*Aluminum soap:* Used where adhesiveness is important because of stringy quality. Water-resistant; not recommended for high temperatures.

*Lithium and Barium soaps:* The most commonly used soap greases . . . Etc.

**Mixed Soap Greases** combine various types of soaps to increase the service life of a grease. A mixture of calcium and sodium soaps offers water resistance . . . Etc.

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When you read Passage 1, it doesn't say anywhere that types of greases will be compared but this is what is happening. We will look at Passage 1 in more detail to see how the comparison is organized.

In paragraph one, you learn:

- *what* lubricants are: substances such as oil, grease or graphite;
- *where* they are used: on surfaces which slide or move against each other; and
- *why* they are used: [to] reduce friction and wear between components and increase their life.

The answers to *what*, *where*, and *why* are the type of questions that you could answer from this description. This description applies to all lubricants.

The next paragraph provides information about a specific type of lubricant – grease. The characteristics, advantages, and limitations of grease are described. The passage tells you:

- how machine grease is made;
- the effects of adding thickener (water resistance, stays in place, etc.); and
- the percentage of soap in two types of grease: *general purpose greases*, and *special purpose greases*.

This description applies to all greases. This is how they are the same. For specific comparisons, you have to read on. Paragraphs three to eight provide details about simple soap greases:

- similarities and differences in use and composition of different soap greases
- which grease to use in different situations

By comparing and contrasting such things as composition and use, you can find out which item is suitable or recommended for a specific application.

### **Using the information**

When you learn about materials such as lubricants, you get information and details that enable you to make comparisons. You could explain to someone else what to expect if you substituted one type of grease for another. Comparing greases can also show why an inappropriate choice, such as using sodium soap at low temperatures, could produce an unsuitable outcome, such as the grease thickening too much.

When you learn about one thing, in this case, greases, you will probably go on to learn information about the features and use of other lubricants. Be prepared to think about their similarities and differences. Consider making your own list of advantages and disadvantages so you have a handy reference.

### **Classification**

An important method of comparison is *classification*. ***Classification is a method of grouping things according to their similarities.*** Classifying materials, tools and techniques is a good way to keep organized. Classification can help you see how things are related and how they differ.

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Read **Passage 2** below to see how this works.

**Passage 2**  
**Simple Machines**

A *machine* is a device that makes work easier by changing the speed, direction or amount of force. A *simple machine* magnifies the effects of an applied force.

**Levers**

Levers are the simplest of basic machines. The point where the lever pivots is the *fulcrum* of the lever. There are three classes of levers:

- Class 1:** These levers have a fulcrum between the resistance force (load) and the effort. Crowbars, bolt-cutters, jacks, pliers and scissors are all examples of Class 1 levers.
- Class 2:** The resistance (load) in these levers is between the fulcrum and the effort. If you lift an object by one end, it is a Class 2 lever. Wheelbarrows are an example.
- Class 3:** The effort in these levers is applied between the fulcrum and the resistance. The effort arm is shorter than the resistance arm, and the effort is always greater than the resistant force. If you use your hand and arm to carry something, this is an example of a Class 3 lever. Cranes, backhoes and hammers are also examples.

Passage 2 sets up comparison in a series of steps. Paragraph one starts with general information:

- It introduces the large classification, *machines*, and defines what a machine is.
- It then describes a more specific classification: *simple machines*.

Then the passage focuses specifically on one type of simple machine – levers.

- You already know what a *simple* machine is or does. You can apply these facts to levers.
- You learn the definition of a lever.
- You also learn there are three classes of levers.

Next, you get a definition for each of the three classes of levers.

- You can compare each of the three types of levers as to:
  - fulcrum points,
  - the relationship between resistance and effort, and
  - how it operates.
- You are also given examples of each class of lever

By the end of Passage 2 you know how the different classes of levers are similar and how they differ. You also know how each type is used.

This description moves you gradually to a more detailed understanding. It is organized so that you build your knowledge gradually. *Comparison through classification* leads you to recognize the ways that something is similar to and different from others in its category. You can then use this information to generalize about how each will function in the workplace.

## Tables, charts and lists

*Tables, charts and lists are used to organize and compare information.* The information is easy to use for comparisons because it is already organized into categories. You will find tables in manuals, texts and on-line.

Tables cover a wide variety of material from metric and imperial measurement to categories of fasteners. You can use tables or lists to organize and compare information such as gear case clearance, spark plugs and carburetors or the advantages and disadvantages of four- and two-stroke engines.

For learning and studying purposes, you can convert information from a text into a list or table. After organizing material into a table, you can quickly recognize differences and similarities between products or techniques. You can also add row or columns to your table as you learn more about the topic.

Read Passage 3, below, about testing electrical systems. Examine the table and see how it compares the hook-ups of different testing meters.

### Passage 3 Maintenance and Testing Electrical Systems

The many different electrical systems require you to refer to the service manual for diagnosis and repair. Do a visual check when electrical problems occur.

Because improper meter connections can damage the meter or circuit, carefully read the explanation of proper hookup that follows.

**Voltmeter connection:** A voltmeter must be connected *in parallel*, **not** in series. It can be used to check voltage at any point in a circuit. Either a high or low reading may indicate circuit problems.

**Ammeter connection:** An ammeter is always connected *in series*. Current must flow through both the circuit and ammeter. A higher or lower than normal current reading may indicate circuit problems.

**Ohmmeter connection:** An ohmmeter can be connected *in series* or *in parallel*, but **never** to voltage or current. If connected to a live circuit, it could be damaged as it supplies its own power.

When testing continuity of a wire, no resistance is wanted. When testing continuity in a coil, a certain amount of resistance is common. Compare tested resistance to the specifications in a service manual to determine circuit or component condition.

Meters	Hook up
voltmeter	in parallel
ammeter	in series
ohmmeter	in series or in parallel

Table 1 below is a selection chart. *Before* you start, read the headings to see what features, functions or problems are compared. Also read the footnote. Cover all the details.

**Look at how Table 1 is organized and what it compares. Answer the questions that follow. Answers are at the end of this skills manual.**

**Table 1: Electrode Selection Chart**

Electrode	Coating Type	Penetration	Most Important Features	Applications
6010	Cellulose Sodium	Deep	Forceful arc; deep penetration; fast freezing makes out of position welding easier	Root passes, pipe welding; maintenance work – forceful arc penetrates rust, paint, etc. Out of position, light gauge welding (vertical down)
6011	Cellulose Potassium	Deep	Same as 6010 plus AC operation	Same as 6010 but on AC
6012	Rutile (Titania) Sodium	Shallow to medium	Soft arc, shallow penetration; fills gaps (bridging)	Light gauge sheet metal jobs with poor fit-ups (gaps)
7014	Rutile Powder *Iron 30%	Shallow to medium	AC operation; easy to use	All purpose electrode; not ideal for vertical welding
7018	Low-hydrogen *Iron Powder 25%	Medium	High quality welds; AC operation; good deposition rate	Most popular electrode fabrication, repair

**Note:** \* Indicates the percentage of iron powder in coating. Iron powder increases deposition rates.

**Questions:**

1. Penetration is the same for electrodes with cellulose sodium coating and low-hydrogen coating.  

**T            F**
2. Electrodes with the same penetration (such as electrodes 6010 and 6011, or electrodes 6012 and 7014) would be suitable for the same applications.  

**T            F**
3. Iron powder in the coating increases deposition rates. The deposition rate will be as follows:
  - a) Increase by the same amount as (be directly related to) the percentage of iron powder.
  - b) Increase by a different amount than the percentage of iron powder.
  - c) Chart does not give rate.

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### **Know your purpose**

If you need to select an electrode, you can look across the rows and headings in Table 2. Someone has tested and compared these electrodes under different conditions for a variety of jobs and then listed the information. *The table is a comparison in brief*, so you can quickly find information

Comparisons presented in a table have some of the work done for you when you are selecting the most suitable tools, materials and processes. Look carefully to compare the characteristics, details and application. This enables you to make the best choice.

### **Build from the base up**

Comparison comes in a variety of forms - some obvious and some not so obvious. However, the purpose remains the same: *to give you a base and then to show you similarities and differences*.

## ***PART II***

### ***WORDS THAT COMPARE AND CONTRAST***

In Part II, we look at some of the words and phrases that you can use to recognize when something is being compared or contrasted. Remember, *comparison* means both similarities and differences while *contrast* means differences only.

If someone says to you, "I drive the same car as you do," you immediately know a lot about their car. You take what you know about your own car and apply that information to their car. To compare them thoroughly though, you have to ask some questions. You might compare this type of detail:

- make, model and year,
- engine size,
- colour and condition,
- number of kilometres,

### **Direct Comparison**

#### **Words and phrases that compare and contrast**

Some words and phrases immediately signal that a comparison or a contrast is to be made. When a comparison is signaled in this way it is called a *direct comparison*.

Words such as *same*, *like*, and *all* tell you about something and compare it to something else. And, note the different ways of saying *all* - *whatever the type* and *regardless of the type*.

#### **Examples:**

Whatever the type of lifting sling used, the diesel technician must always check for physical damage to ensure there is no failure.

All nuts on this system have right-hand threads.

Screwdrivers, *like any other tool*, are designed for a specific kind of activity. Never use them to pry items loose.

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All hard blades are heat treated all over. This makes them very brittle and easily broken if misused.

Some comparisons show similarities, then point out differences using words such as *some*, *many*, *most*, *different* and *unlike*. For example, if *most* or *some* snips cut heavier gauge metals, it means that *some others* will not.

**Examples:**

The carburetor float is a small sealed vessel made of brass or plastic. *Some* carburetor floats are made of solid flotation materials so possible leakage is eliminated.

Piston heads are manufactured in many *different* shapes depending on the type of engine and use.

A *different* fuel system setup is required to supply LPG and natural gas *than* the conventional type used to supply gasoline.

When comparing information, you might have to reread a few times to get all the details.

**Examples:**

These fires are put out by the same process as TYPE B , but the extinguishing material must be electrically non-conductive.

Recommended spark plugs for all models except 36S2 and 8S3-1 pumps is XXXX.

A DC generator works on the same principle as the alternator. Magnetism is used to induce current in the generator windings; however a generator differs from a simple alternator in three ways.

Words and phrases such as *while*, *except*, *unless*, *on the other hand*, *whereas*, *instead of*, *however* set up comparison, but they point out contrasting or different uses, design or applications.

**Examples:**

The standard micrometer is graduated in thousandths of an inch (.001"). The Vernier micrometer, *on the other hand*, is graduated in ten-thousandths of an inch (.0001").

Right-hand thread is understood, *unless* left-hand thread is specified in the diagram.

The power supply for an electric drill is the electric cord, *whereas* in a pneumatic drill, it is the air hose.

All threads do *not* take equal amounts of loading.

And, for something in between:

**Example:**

Heat loss decreases as insulation thicknesses increase, but not in a direct relationship. Add 1" insulation (for U-value .24) to reduce heat loss by 46%. A 2" increase reduces loss by only 10%.

Some comparison/ contrast words restrict you, or tell you not to do something. Words like: *only as stated*: *exclusively*, *excluded*, and *only*, tell you something is allowed or permitted.

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**Example:**

Fluid and air hoses are **made differently** and for this reason should not be interchanged. Study the **different** construction of fluid and air hoses.

Watch for these comparison words and suffixes:

less . . . than	Steel pipe is less flexible than aluminum.
more . . . than	A welded joint on flat metal will provide more strength than a soldered joint.
as . . . as	Arc welding will produce a weld as strong as an oxyacetylene weld
___er . . . than	Aviation snips can cut heavier gauge than the large bulldog snips. Duct tape is thicker than masking tape and provides more surface protection.
___est	The best way to cut rigid and flexible copper is with a tubing cutter.

**Indirect Comparison**

In some cases, a comparison is not obvious.

**Example:**

Experienced technicians know the advantages of tools of high quality purchased from reputable manufacturers: Most do the following:

- offer lifetime guarantees against failure,
- are made from quality materials,
- hold up under use,
- enable them to do better work.

Although no comparison is stated here, turn the information around to discover indirect comparison. The information indirectly implies that the *opposite* is true about poor quality tools. While you might find other opinions, you could conclude that many poor quality tools:

- **do not** offer lifetime guarantees against failure.
- Are **not** made from quality materials,
- **do not** hold up under use,
- **do not** enable installers to do better work.

Watch for information that is not directly stated. You may have to pull out the details.

**Example:**

The disadvantage of open-end wrenches is that they only grip two faces of the nut. This rounds off the nuts and may cause injury to hands.

Use comparison and contrast to gather information. If open-end wrenches have these disadvantages, another *more suitable* tool might be available. Select the proper product to avoid problems.

## Math language

In math, the concepts of *proportion*, *ratio*, *decimals* and *percentages* are forms of comparison. Each of these terms is used to compare one amount or measurement to another. They are fundamental to mixing products, determining slope or finding safe bearing weights. They are also used to compare quality, strength of materials and cutting speeds.

### Examples:

A ten-tooth gear will make three revolutions for each revolution of a thirty-tooth gear. The large gear will turn at  $\frac{1}{3}$  the speed of the small gear.

The camshaft/crankshaft rotation for machine reaming is  $\frac{1}{2}$  that of HSS.

Discard this if wear on bearing surfaces is more than 10%.

Knots reduce rope strength by half (50%).

## PART III

### USING TEXT AND GRAPHICS TO COMPARE

Text and graphics often work together to compare different aspects of a relationship. The text explains and gives examples while graphics list items or illustrate specific parts or procedures. When you use both sources of information, they work together to provide you with complete data on which to then base your comparison.

Read Passage 4 and Table 2 below to compare the relationship between distance and pressure in hoses. **Use the text and the table to answer the questions that follow. Answers are at the end of this skills manual.**

#### Passage 4 Hose Size

The proper size and type of hose will deliver air from the compressor and material from its source to air tools and guns.

When air is compressed and travels a long distance, its pressure begins to drop. However, you can keep this pressure drop to a minimum (for a distance up to 100 feet) when you use proper fittings and a hose of the proper diameter.

Table 3 shows hoses of different lengths (5 feet and 50 feet) and different *internal diameters* ( $\frac{1}{4}$  inch up to  $\frac{3}{8}$  inch). You can compare the pressure drop at different pressures for these hoses. Compare PSIG for 5-foot lengths (column 2) and PSIG for 50-foot lengths (column 3).

At low pressure and short lengths of hose, the drop is not significant. At higher pressure and longer lengths, the pressure drop becomes much greater. It must be compensated for.

**TABLE 2: AIR PRESSURE DROP**

**ID** stands for Inner Diameter  
**PSIG** stands for Pounds per Square Inch Gauge

Size of Air Hose (ID)*	5-foot length	50-foot length
1/4 inch @ 40 PSIG 60 PSIG 80 PSIG	PSIG ^ 0.4 4.5 5.5	PSIG 16.0 20.0 25.0
5/16 inch @ 40 PSIG 60 PSIG 80 PSIG	PSIG 0.5 1.0 1.5	PSIG 4.0 6.0 8.0

**Questions:**

1. Low pressure and short lengths of hose may cause a significant drop in air pressure.  
**T F**
2. Higher pressure and longer lengths would result in approximately the same drop in air pressure as lower pressures and shorter lengths.  
**T F**
3. Which of the following would you compensate for?
  - a) low pressure and short lengths of hose
  - b) higher pressure and longer lengths of hose
  - c) higher pressure and hose of proper diameter
4. An inner diameter of 1/4" with a 60 PSIG will experience pressure drop of 4.5 at 5-foot lengths.  
**T F**

**Text and graphics work together**

When information is complex, using both text and graphics to compare and contrast helps you *get the whole picture*. Text and graphics – diagrams, tables, charts, illustrations, photos – work together to describe and illustrate what you need to know in order to make good choices.

Read Passage 5 and Table 3, below, to compare the relative activities of metals. Note the language cues and patterns of comparing as you read the passage. **Use the text and the table to answer the questions that follow. Answers are at the end of this skills manual.**

**Passage 5  
Galvanic Corrosion**

When two dissimilar metals are in contact with each other, *galvanic corrosion* occurs. The metal that is more chemically active will corrode. See Table 3. For example, zinc will corrode, cover, and thus protect, steel.

**TABLE 3: Relative Activity of Metal**

Magnesium	<b>Most Active</b>
Aluminum	▲
Zinc	
Chromium	
Iron	
Cadmium	
Cobalt	
Nickel	
Tin	
Lead	▼
Copper	<b>Least Active</b>

With other metals, galvanic corrosion can cause problems. For example, the coatings on galvanized steel and tin plate are corrosion resistant. If the seams of these metals were welded, the welding process would burn off the protective coating. This would result in a product that fails. For wood-shingled roofs, only rust resistant nails are recommended. Hot-dipped, zinc-coated nails with the strength of steel and corrosion resistance of zinc are recommended.

**Questions:**

1. According to Passage 4 and Table 3, aluminum is more chemically active than nickel.  
**T F**
2. If iron and nickel are in contact with each other, the nickel will corrode.  
**T F**
3. Galvanic corrosion may cause problems even when dissimilar metals are in the *least chemically active* range.  
**T F**
4. The following will prevent accelerated (faster) galvanic corrosion:
  - a) using the least active metals
  - b) using specialized (dielectric) fittings
  - c) using two dissimilar metals

By comparing what you read and what you see, you are using an important technical tool. When data is simple, you can get what you need from either written text or diagrams. When information is more complex, you usually need both.

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**PART IV**  
**MAKING CHOICES**

To follow steps correctly, to double-check work or to understand a problem, you are constantly making comparisons. Think about how this works. To follow instructions, you have to compare what you are reading in a manual to what you are actually doing. Comparing what is shown in the text to the results in front of you will help you decide if you are on the right track

The list below suggests questions you might ask when you are making a decision:

- What features do these products or methods have in common?
- How do they differ?
- Is one better in certain situations than the others? Why?
- How do costs compare?
- Which is the better choice for my situation? Why?

Passage 6 compares and contrasts features of two types of wrench. **Read the passage and answer the questions that follow. Answers are at the end of this skills manual.**

**Passage 6**  
**Wrenches**

Box-end wrenches have a closed end for better holding power. The jaws fit completely around a bolt or nut and grip each point on the fastener. The box-end wrench is thus the safest. More force can be applied without slipping and causing damage to the bolt or nut head.

The 6-point wrench is the strongest because it completely surrounds the hex nut and brings force to bear on all six sides and points. The 12-point wrench also grips the six points but does not bear on the face surfaces of a hex nut; this means there is a greater potential for slippage. The advantage of a 12-point wrench is that the wrench can grab the nut in twelve different positions. In confined spaces, the additional engagement points increase the possible turning radius. The handle of a box-end wrench is often offset 10 to 60 degrees to reach into an area without the handle hitting the part.

**Questions:**

1. Which of the following describes advantages of box-end wrenches?
  - a) closed end, offset handle, jaws fit completely around a nut
  - b) more force can be applied without slipping, the box-end grips in twelve different positions
  - c) both a) and b)
2. In confined spaces, the 6-point wrench will give an increase in turning radius.

**T      F**
3. Both the 12-point and 6-point wrench have equal grip on a bolt or nut.

**T      F**

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4. Which wrench would you choose for greatest strength?
- a) either 6 or 12-point
  - b) 6-point
  - c) 12-point

**A final point about how comparisons work.**

When you start with good basic knowledge about something, you can understand and evaluate the details that follow. You will be ready for each new idea as it is presented. When you know how a tool or fitting works, you can understand why it is designed the way it is. This foundation will also help you decide which tool or fitting to choose.

Once you know how to select an electrode, you are on your way to learning how to weld. Textbooks, manuals and supervisors assume you understand basic information as you move through the course. If you are missing basic information, you may find you can't make effective comparisons as new ideas are presented. *Make sure your basics are sound before going on.*

And remember, a change in a routine or a product might affect the outcome. For example, you might always get 80% or more on tests. If you change the number of hours you study, or skip breakfast, your results may be different. If you compare such cause and effects over a period of time, you learn something about the relationship between behavior and outcome. This can lead you to think about how you make choices in your learning and your job.

**CONCLUSION**

Information in your texts is set up so you can create a base of knowledge. From your base, you can compare and contrast the different materials, tools, procedures and methods that you have learned.

When reading technical material, look for words that compare and contrast. They can alert you to comparisons. This enables you to make sound choices as to what is most suitable for each situation

Charts and table provide easy ways to compare and contrast because the information is organized into categories.

Principles and measurements may not change but tools, applications, materials, equipment, conditions and seasons do. To adapt to change, compare the old with newer information. This will enable you to keep up to date in the metal trade and have happy employers and clients.

**Summary**

1. **Understand how comparisons work:**
  - from the large topic to an item by item comparison
  - through classification
  - through tables and charts

2. **Build from a solid base.** If a comparison doesn't make sense, stop and get help before going on.
3. **Look for patterns and language that compare and contrast.** Watch for tables and passages that compare without telling you (indirect comparison).
4. **Use text (written) and diagrams together** to compare information. Use all details available to you.
5. **Change in one area results in change to another area.** Compare details to make the right adjustments to adapt to the change.
6. **Compare what you read with what you do.** It is an important technical tool.

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**Answer page**

**PART I Table 1, Electrode Selection Chart**

1. Penetration is the same for electrodes with cellulose sodium coating and low-hydrogen coating.  
**F** This question asks you to compare one detail – penetration. Find the appropriate electrode on the chart and compare under the heading **Penetration**.
2. Electrodes with the same penetration (such as electrodes 6010 and 6011, or electrodes 6012 and 7014) would be suitable for the same applications.  
**F** One of the guidelines is to “cover all the details listed for a complete comparison.” This question asks you to check two aspects of an electrode: penetration and application. If you check 6010 and 6011 for penetration and application you find they are the same but if you continue down the chart and check electrodes 6012 and 7012, you find that the applications are different. Therefore, the answer is false.
3. Iron powder in the coating increases deposition rates. The deposition rate will be:  
c) Chart does not give rate.

**PART III Passage 4, Hose Size and Air Pressure Drop**

1. Low pressure and short lengths of hose may cause a significant drop in air pressure.  
**F** Although there is a relationship between the two, Paragraph 4 states that this combination would **not** cause a significant drop. However, at higher pressure and longer lengths the drop becomes greater.
2. Higher pressure and longer lengths would result in approximately the same drop in air pressure as lower pressures and shorter lengths.  
**F** You need to compare low pressure and short lengths to high pressure and long lengths. When you do this, you find the effects in air pressure are significantly different.
3. You would compensate for  
b) higher pressure and longer lengths of hose

Answer b) is clearly stated in the last paragraph. Answer c) higher pressure and hose of proper diameter is probably also correct. We don't know, however, what the proper diameter of hose would correct the problem.

4. An inner diameter of 1/4" with a 60 PSIG will experience pressure drop of 4.5 at 5-foot lengths.  
**T** This question asks you to compare information in a question to data in a table to find the right answer.

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**PART III      Passage 5, Galvanic Corrosion and Table 3**

1. According to Passage 6 and Table 4, aluminum is more chemically active than nickel.  
**T** You can see aluminum close to the top (Most Active area) of the table.
2. If iron and nickel are in contact with each other, the nickel will corrode.  
**F** If in contact with each other, the iron would corrode, because it is the more chemically active metal.
3. Galvanic corrosion may cause problems even when dissimilar metals are in the *least chemically active* area.  
**T** Corrosion may be a problem regardless of the metal.

**PART IV      Passage 6, Wrenches**

1. Which of the following describes advantages of box-end wrenches?  
**a)** closed end, offset handle, jaws fit completely around a nut.
2. In confined spaces, the 6-point wrench will give an increase in turning radius.  
**F** It is stated that a 12-point wrench increases the turning radius. The passage doesn't tell us about a 6-point. This is a question where you will need more information
3. Both the 12-point and 6-point wrench have equal grip on a bolt or nut.  
**F** Paragraph 2 states that the 6-point surrounds the hex nut. The next sentence states that the 12-point does not bear on face surfaces and has a "greater potential for slippage."
4. Which wrench would you choose for greatest strength?  
**b)** 6-point. This is stated in paragraph two.