

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

**COMMUNICATIONS SKILLS
UNDERSTANDING SEQUENCE**

**AN ACADEMIC SKILLS MANUAL
for**

The Construction Trades (Structures)

This trade group includes the following trades:
Drywall & Acoustical Applicator, General Carpenter,
Mason (Brick & Stone and Restoration), Reinforcing Rod Worker, Roofer,
Terrazzo, Tile & Marble Mechanic

*Workplace Support Services Branch
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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

UNDERSTANDING SEQUENCE

*An academic skill required for the study of the
Construction Trades (Structures)*

INTRODUCTION

In the construction trades, it's essential to follow directions in the right order to successfully complete a job. The skills that enable you to read technical material and then follow directions accurately are essential for working in the construction trade. Most trade material is written in a step by step order called sequence so that you acquire information in a logical manner. This is especially important when you are learning the steps in a procedure.

Sequence refers to an ordered arrangement in which one step is followed by another. A sequence can be the step-by-step description to complete a complicated staircase or it can be a description of the parts and uses of a tool. Each piece of information (or step) is part of the whole thing. The steps work together, but you need to understand and follow each step on its own.

In this skill sheet, we will look at trade material to:

- ◆ Examine the order of information,
- ◆ Identify and follow steps in a sequence,
- ◆ Identify and follow sequence in diagrams, and,
- ◆ Identify errors in sequence.

PART I

EXAMINE THE ORDER

When we are learning something, we usually ask a lot of questions.

Example: Someone in your trade is talking about *stress values*. If you've never heard the term, you'll probably ask: What is it? Why do I need to know this?

Whatever the reasons for our questions, they tend to follow a logical sequence or order. We usually start with basic questions and then ask questions which demand more detailed or difficult answers. The questions should cover most of what we need to know: What is it? How does it work? How do I do this?

Technical material

Technical reading material is set up in a logical order. In many cases, the reason why you need the information comes first. In other words, technical writing often starts by answering the question: Why do I need to know this? The answer gives you the function, use or purpose of something as it relates to your trade and so it is the first information you will see.

Look for information to appear in this or a similar sequence:

- ◆ Why do I need this? (purpose)
- ◆ What is it? (definition and description)
- ◆ How does it work? (what is the correct procedure)

The correct procedure or information about “how to do something” often comes last. You get description, explanation and underlying principles first so the procedure will make sense as you follow it through to the end.

Some instructions don’t set up the steps so that you can clearly see the sequence. In this case, look for clues. Notice if there are letters or indicators such as commas to separate the points. Look for words such as *first, then, next*.

Passage 1, *Leveling Instruments*, illustrates how this might work. The object is to see the sequence of information. Read through the passage first to get a sense of the whole. Then go through it systematically to examine the *sequence*. See how the information helps you answer the questions above.

Passage 1 Leveling Instruments

When a job is too large for the chalk line, straightedge, level and square, you should use leveling instruments. The level and level transit are commonly used in laying out and checking construction work.

The *builders’ level* (dumpy or optical level) consists of an accurate spirit level and a telescope assembly attached to a circular base, enabling them to measure any horizontal plane. The *level-transit* works like the builders’ level with an additional feature which allows the telescope to be pivoted up and down in a vertical plane. You can accurately measure vertical angles such as when determining if a wall is plumb. Leveling instruments are more delicate than most other tools and equipment. Follow special precautions to ensure these instruments will provide accurate readings over a long period of time.

Setting up the instrument:

Set up the tripod securing the points firmly in the ground for a stable base. On hard or rocky surfaces, be sure the points will not slip. Check that the wing nuts on the adjustable legs are tight. Use a ½ inch open wrench to tighten the hex nuts.

Carefully lift the leveling instrument from its case by the base plate. Before mounting the instrument, loosen the clamp screws. The telescope lock lever of the level-transit should be in the closed position. Now, attach the instrument to the tripod. If it is to be located over an exact point, such as a bench mark, attach the plumbing bob and move the instrument over the spot. Do this before the final leveling.

Why do I need the information?

The information in paragraph one explains the purpose of leveling instruments – for laying out and checking work for construction. This information is placed in the introduction to let you know why you should pay attention to the details that follow. It answers the question “Why should I learn this?” and it gives you a purpose for your reading.

What is it?

Paragraph two is about two types of levels. It gives you an answer to “What is it?” and gives you specific uses for each level. It also gives details to answer “How is it made?” and “How does it work?” Look again at paragraph two to see how this is laid out. You find:

- the names of the levels,
- something about the design and function,
- specific applications, and
- advice on care in handling these types of instruments.

You now know where this passage is going. It is leading in a logical way to answer, “How do I do it?” This is the next step in understanding.

How do I do it?

Once you know what something is, you then get to the “hands on” stage. Look at paragraph three to see how it guides you in precise steps. It tells you:

1. to secure the feet securely so it will not slip,
2. to be sure the wing nuts on the legs are tight, and
3. which wrench to use to tighten hex nuts.

Finally, paragraph four explains how to set up the leveling instrument on the tripod. It gives instructions, in sequence, for the set up. It tells you to:

1. Carefully lift the levelling instrument.
2. Loosen the clamp screws.
3. The lock lever of the level-transit should be in the closed position.
4. Now, attach the instrument to the tripod.
5. If it is to be located over an exact point, attach the plumbing bob and move the instrument over the spot; and
6. Do this before the final levelling.

Sequence of learning

As you read **Passage 1**, you should start to see the general order. It is organized so the learning moves from general information to more specific details. You also see how the practical steps are laid out in a sequence so that the first step comes before the second and so on. As you become aware of the order, you see how all the steps fit together. This leads to an understanding of the whole process.

As you read, think of other questions that may arise. Look for the answers as you go. Observe how information is organized to answer your questions. If it is organized in sequence, you will find the material easier to understand and act on. Use this system to your advantage. Give yourself enough time to carefully read technical material, noticing how it moves from step to step.

The first information you learn in your trade will become a base that you can later build on. *Because learning expands on what you have previously learned, you need to make sure you understand what you have read before you go on to new material.* You also need to recognize when information is related to something you learned earlier. The best way to understand how individual parts are related to the whole is to first learn the material one step at a time, and then think about how all the parts fit together in the correct order.

PART II

IDENTIFY AND FOLLOW STEPS IN A SEQUENCE

In this section, we will look at identifying and following the steps in a process or procedure. An awareness of the correct sequence of steps used in completing a project is necessary to achieve a satisfactory result.

Getting it right

At first, you may not see the reason for the sequence in a set of directions. Always follow the directions exactly as stated. The steps serve a purpose even if you don't know what it is. When you become expert with a process, you can decide if it is appropriate to make adjustments. Even after you become skilled, new products will come on the market with new procedures. You'll need to keep reading and learning in order to keep current.

Example: Imagine using any order that strikes your fancy to complete a job. What results would you expect if a worker drilled six holes and then read “*no more than four are recommended*”?

Read **Passage 2** for a straightforward example of sequence. You can clearly identify and follow the sequence, acting on each step.

Passage 2

Battery Charger

A battery charger converts 120 volts AC into 13 to 15 volts DC for recharging drained batteries.

Connect as below:

Connect red to positive and black to negative. The red lead on the charger goes to the positive terminal of the battery. The black lead goes to ground or the negative battery terminal.

After connecting the charger, adjust its settings as needed (12 volt battery, fast or slow charge, etc.). If a battery is low, it is best to slow charge the battery for several hours. A fast charge for a few minutes will not restore the battery charge properly.

The first paragraph answers *what is it, what's it used for* kinds of questions. It tells us what a battery charger is and what it is used for.

Though the steps are not numbered, paragraphs 2 and 3 give us the “how to” steps in a clear order:

1. connect red to . . . black to . . .
2. red lead on charger goes to . . .
3. black lead goes to . . .
4. after connecting charger, adjust . . .
5. if battery is low, it is best to . . .

By reading and following these steps, you should be able to correctly charge a battery. The passage adds to your knowledge by explaining why a slow charge is better than a fast charge.

Did I miss something?

Passage 3 below is an example of what we mean by building on what has already been taught. An earlier chapter or section has provided answers to these questions:

- What is it?
- Why do I do this?

The passage assumes you have read the previous material. For this reason, you may not understand all the information perfectly. You will be able to recognize the sequence of steps used for starting a tap but some details about the technique and materials may not be clear.

Read Passage 3 and answer the questions that follow it. Each question asks about sequence (order). Start at the beginning, read carefully to the finish and then answer the questions below. **Answers are at the end of this skills manual.**

Passage 3 Waterproofing

In most areas, basement walls made from poured concrete or concrete masonry should be waterproofed on the outside below the finished grade. Drain tile should also be installed.

Masonry (block) walls can be waterproofed by an application of cement plaster followed by several coats of an asphaltic material. The wall surface should be clean and dampened with a water spray just before the first coat of plaster is applied. The plaster can be made of cement and sand (See Guide) or mortar can be used. When the first coat has partially hardened, it should be roughened with a scratcher to provide a better bond for the second coat.

After the first coat has hardened at least 24 hours, the second coat is applied. Again, dampen the surface just before applying the plaster. Both plaster coats should extend from about 6 inches above the finished grade to the footing.

A cove of plaster should be formed between the footing and the wall. This precaution prevents water from collecting at the joint and seeping through. The second coat should be kept damp for at least 48 hours.

Questions:

1. Which is the correct sequence of activities for the first coat of plaster?
 - a) apply coat of plaster; roughen with a scratcher; let partially harden
 - b) clean masonry walls; dampen with water spray; apply coat of plaster
 - c) dampen with water spray; apply coat of plaster; keep damp for at least 48 hours
2. When would you roughen the first coat?
 - a) just before applying the second coat
 - b) after the first coat has hardened
 - c) after the first coat has partially hardened
3. The second coat is applied after 48 hours.

T F
4. Dampening the plaster is done just before each application of plaster?

T F

Look back to question 1 above. You are asked to choose the correct sequence of activities. Notice that looking for the correct sequence refers to what comes first, second, third or fourth *in that group* of activities. It doesn't necessarily mean first, second, or third step in the whole project. You know that waterproofing basement walls is a task that comes late in the sequence of constructing a building.

You may be asked to follow a procedure which comes *in the middle* or *towards the end* of a task. You still follow activities in sequence, but you may pick up the job halfway through the project.

Numbered Steps

It is usually easier to follow a sequence when the steps are numbered. Numbering steps also helps you identify areas that seemed clear when you read the sequence, but aren't so clear when you come to do the job. You can figure out where you are getting lost.

If the sequence isn't numbered, as in **Passages 2 and 3**, you can break the information into steps to see the order and note any steps that you don't understand. Or when a procedure is long and only the general steps are numbered, you may want to break the numbered instructions into smaller units to separate each step.

Example: You could number the steps in Passage 3 as follows

1. clean wall surface,
2. just before first plaster coat, dampen with water spray,
3. apply first coat,
4. let partially harden, then rough with scratcher,
5. etc.

The last paragraph in Passage 3 tells you to apply plaster and to form a cove of plaster; however, there is no instruction on the steps or technique for this. There is no *how to* guide on this. *If you*

did not know how to perform this step, you would have to search for and find “how to” information yourself.

You may not need to waterproof a basement at this stage. You do need to know how to accurately read and follow a sequence of information and identify when you need more, detailed instruction. With this knowledge, you are on the way to learning how to perform a job accurately and how to identify when you need to ask for help.

Questions and relationships

Information is organized in a specific order for a reason. As you read, think about questions related to sequence. Stating the questions and then looking for answers can be a useful way to test your understanding when you are studying for homework or doing a job. The questions below relate to **Passages 1, 2 and 3**. They will also apply when you study other technical material.

1. Which activity or step is first, second, third?
2. Which step starts the process; which concludes the process?
3. What happens **before** or **after** a certain step?
4. What happens if I skip a step?
5. Where do I turn if I can't ...?

Look at and understand the order in which things happen in a project, or task. If you can see the relationship of one step to another you will understand the whole picture and you can apply the information appropriately.

Read it through first

When you read instructions completely *before* starting a job, you will be prepared in several ways. You have a clear idea of the steps involved. You can plan for which ones will be easy and which will need more help. You can plan for the amount of time the job will take.

Example: Passage 3 tells you to: *let harden for at least 24 hours before the second coat is applied. . . the second coat should be kept damp at least 48 hours.* If you have read the complete instructions before you start, you know you are on a three or four day job

Each of passages 1, 2, and 3 gives you a sequence of activities. Each passage prepares you to work in sequence when you are on the job site. Look at Passage 3:

1. It first prepares you for the task of waterproofing.
2. Next it tells you:
 - what you will do,
 - how to prepare the surfaces for waterproofing,
 - where to find more information, (See Guide), and
 - the sequence of tasks to follow.

By reading the entire set of instructions before you start, you can assess the job and prepare for each step.

Before we go – a word about numbering

You will see many directions with numbered steps. Usually numbering indicates the steps in a sequence and their order. Number one (1.) indicates the first step; number two (2.) indicates the second step and so on. In some cases, numbering does not indicate a sequence.

Example:

1. Maintain fire extinguishers to safety standards and place where they will be used.
2. Follow Construction Safety Association of Ontario guidelines.
3. Follow safety guides when working with flammable materials.

As you can see, these numbers do not indicate order. Here they act as a checklist. The tasks on the checklist must all be done, but they are not sequential.

You know how to number steps in a procedure to make the correct sequence clear. You can also divide information into individual points. This will help you see where the pieces of information belong.

Example: You are reading about preparing a handsaw and workpiece where the information is presented in a long paragraph, you might break it into the points:

To prepare a handsaw and workpiece:
First, choose the correct blade for the job.
Then make sure the blade is mounted properly.
Next, adjust the tension.
Lastly, secure the workpiece.

You can also mentally separate information into a sequence or point form. You will find this useful when you are figuring out how to organize the steps of a project. By taking the time to put things in order before you start working, you will have a clear picture of where you are going and how to get there.

A different order

Earlier we suggested that you start reading new material at the beginning and move forward in a logical sequence to the end. However, once you've carefully read through from start to finish, you may want to look at the information in a different order. When you understand how steps are connected, you can move backwards or forwards in a diagram or passage without getting confused. This is particularly true when you are looking for exact details or when you need to find the causes of or solutions to a problem.

Example: You may want to know why moisture penetrates through to the basement in a certain situation. To answer the question, you need to find out what caused the problem. You may have to start in the middle of the sequence and work backwards to find the cause. You may search through another manual to find answers. You are still aware of sequence

of steps but you are jumping around to find precise information about a missed or poorly performed step.

And so it goes

Example: To build a wall you have to move the plumbing, to move the plumbing you have to move the water meter, to move the meter you have to call in the town's water services.

And so it goes. To do a job properly and safely, you need to perform each step in the correct order. And, at every step, you find yourself with new conditions to manage that require new steps.

What does this have to do with sequence? Even before you start a task, you need to pay attention to the sequences of preparing for the job. When you are doing a job, each step depends on the step before it. If the first (second, third or any other) step is left out, performed too quickly or inaccurately, you will not get the desired results. The finished product depends on the successful outcome of each step.

Evaluating to make the right choice

To follow a sequence, you must read and follow the directions as they are written. But sometimes, you also need to evaluate the steps and make decisions as you proceed. Look for words that suggest a choice: **if, when, or.**

Example: Here are some of the first steps for inspection of a scissor lift.

1. Check that guardrails are in place and access ladder is in good condition.
2. Check tires for inflation when applicable.
3. Check for full charge on batteries if electrically powered.
4. If internal combustion engine, check oil /fuel . . .

You can see that you have to follow steps in sequence to properly inspect this type of lift.

However, you may have to interrupt one sequence to follow through on another series of important details:

1. Are the guardrails in place?
2. Is the ladder in good condition?
3. Are the tires properly inflated?
4. Is the battery fully charged?
5. Are the oil and fuel levels good?

You may be diverted from the original situation to find further information or to carry out a different sequence of steps to deal with the rails or the battery. When this task is complete, you can go back to the spot where you left off and continue inspecting the scissor lift.

The results of the finished product depend on the results of each step.

Read Passage 4 about stringer layout. The questions that follow ask you to find the correct answers in a sequence: Answers are at the end of this skills manual.

Passage 4

Stringer Layout

When laying out the stair stringer, first determine the riser height. Place a story pole in a plumb position from the finished floor below through the rough stair opening above. On the pole, mark the height of the top of the finished floor above.

Set a pair of dividers to the calculated riser height and step off the distances on the story pole. There will likely be a slight error in the first layout so adjust the setting and try again.

Continue to adjust the dividers and to step off the distance on the story pole until the last space is equal to all the others. Measure the setting of the dividers. This length will be the exact riser height to use in laying out the stringers.

Questions:

1. Here are the first two steps to take when laying out the stringer:
Place story pole in a plumb position.
Place from the finished floor below through the rough stair opening above

Which activity would be the correct third step in this sequence: **A or B?**

- A.** Set a pair of dividers to the calculated riser height.
B. Mark the height of the top of the finished floor above.
2. The following is a sequence of directions from the passage. Which directions would you need to switch in order to put the list in the correct sequence?
 1. set a pair of dividers to calculated riser height
 2. step off distances on story pole
 3. adjust the setting
 4. adjust dividers and step off distances
 5. step off distances on story pole again
 6. if last space is equal to all others
 7. measure setting of dividers
 - A.** switch #2 and #3
B. switch #4and #5
 3. At what point in this sequence will you need to stop, make an evaluation and decide whether to continue or go back to redo something?

Sequence in Trade Mathematics

Bedmas

You have to follow the required steps in the proper order to complete any project you are assigned. When you are doing math problems, you also have to work in the correct order. If you accurately complete each step in a problem but if the order is wrong, the answer will be wrong. The proper order of basic math operations is called ***bedmas***.

Bedmas (brackets, exponents, division, multiplication, addition, subtraction) prescribes the order in which you have to do these operations to get the right answer, whether it is determining welding speed or figuring out mathematically how much sheet metal is required for a project.

PART III

SEQUENCE IN DIAGRAMS

In technical manuals and texts, many passages are accompanied by a diagram. A diagram can illustrate the sequence of steps in a procedure (such as laying out forms) or it may show you what you can't see (such as the sequence of wood shrinkage). It can show the point when something happens

Passages with diagrams

It is important to understand diagrams that accompany writing. The passage and the diagram are designed to be used together but you may examine them separately at first to find out what each has to teach you.

When you read diagrams, your eyes will move between the writing and the diagram – like watching a hockey puck on the rink. Focus on one section until you understand it, and then move to another, repeating this process until you understand the whole.

Passage 5 and Figure 1, below, show the relationship between moisture content and shrinkage. Together, they make it clearer why carpenters make allowance for future shrinkage when measuring lumber.

Passage 5

Moisture Content and Shrinkage

When a living tree is cut, more than half its weight may be moisture. Before wood is used commercially, a large part of the moisture must be removed.

Lumber used for framing and outside finish should be dried to a moisture content of about 15 percent.

The cell cavities of wood contain moisture that is called free water. Moisture in the cell walls is called bound water. As the wood is dried, moisture first leaves the cell cavities. When all the moisture leaves the cell cavities, but the cell walls are still full, the wood has reached a condition called the *fibre saturation point*. For most woods this is about 30 percent. See Figure 1.

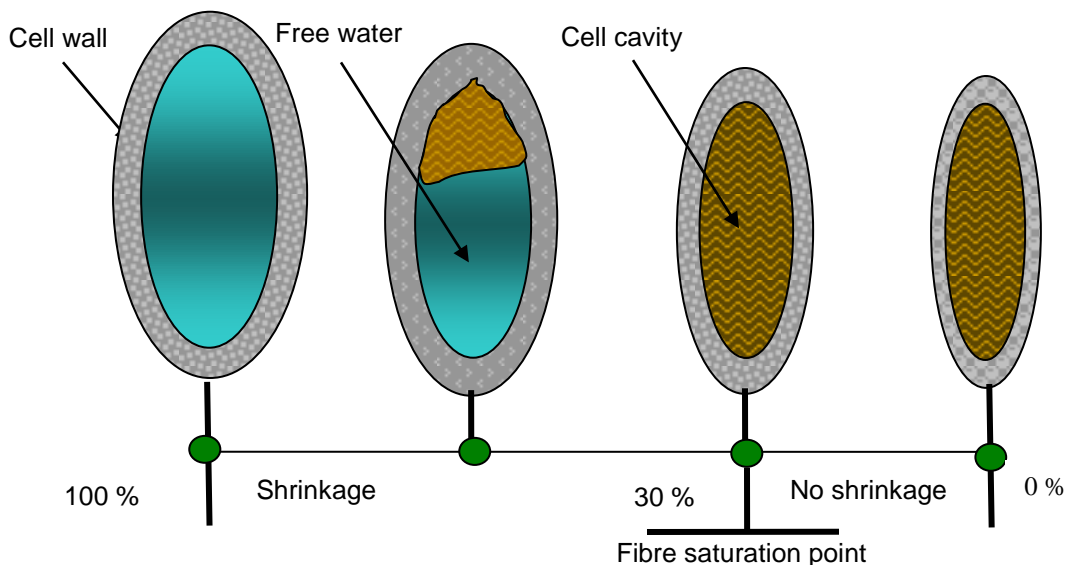


Figure 1: Stages in the drying of a wood cell
1. First the free water in the cell cavity is removed
2. Next the bound water in the cell wall dries
3. Lastly the cell wall shrinks

The diagram relates to the information in Passage 4. It clearly illustrates the sequence of drying in the cells. At each point in the sequence, you can see the differences in the cell walls and the cell cavities, the change in water content, the shrinkage in the cell wall. If you were not sure about the causes or effects of lumber shrinkage, Figure 1 should make it clearer. The diagram provides an illustration of the words.

To be certain you've understood it, the diagram also shows the percentage points marking the decrease in moisture. It might give you a better sense of the sequence of shrinkage. The importance, the direction and the sequence have been clearly stated for you through the passage and by the diagram. The combination, you should help you understand why a carpenter makes allowance for shrinkage – especially where the structure is affected.

Diagrams will often show you the steps to follow, just as the written passage does. As you read, observe **when** to look at the diagram, and **what** to look for. Ask yourself, “What part of the diagram does this sentence or step refer to?”

Focus on sequence to understand how a passage or diagram is organized. It helps you see the order of steps in a procedure. Apply the suggestions below when you are reading a passage that includes a diagram. This way, you get the most information from the passage.

1. Read the whole passage.
2. Look at the diagram.
3. Look back to note how the passage and diagram are organized.
4. Match the diagram to information in the passage.

5. Go through any step by step directions, looking at both the passage and diagram to see how the steps described in each are related.

When answering questions about sequence, whether in written material or in diagrams, go back through the passage. Find the appropriate place and read each step. You may have to trace the steps with your finger while your eyes move back and forth between diagram and passage. You might have to read the section several times to make sure you have the correct match. You may have to retrace your steps to make a correction. In some cases, there may be steps that are almost the same. But, “almost the same” usually won't get you correct results.

Make it easy for yourself

From your manuals and textbooks, you can see that steps or pieces relate to the whole process. The best way of understanding the steps and the whole is the same way you learn anything – one step at a time, in the correct order.

CONCLUSION

Sequence is an essential system for organizing information and procedures. When information is presented in a logical sequence, it is easier to understand. Make sure you read all the steps in a set of instructions before you act on them. You can then follow them in the correct sequence, completing a job correctly and safely.

Keep in mind:

- ◆ Information builds on what you have previously learned. Just as you would build a strong house foundation, *make sure your trade foundation is strong.*
- ◆ If a passage of information is building on past learning and you don't understand a definition, term or principle, you might have missed something that was already taught. *Find where this information is. Then go back and reread it.*
- ◆ You might read steps which clearly outline correct procedure but the precise measurements, techniques or length of time are not laid out. *Know when and where to find this information.*

When you understand the steps or pieces, you can understand the relationship to other steps or pieces; this leads to an understanding of the whole process.

Summary

1. **Ask questions** that guide you through systematic instructions or descriptions.
2. **Technical material is organized so that you can understand it.** It will walk you through a process or principle step by step. Give yourself time. Read carefully.
3. **Information builds on what you have already learned.** Follow procedures and understand them to build a strong foundation.

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4. **Understand how steps relate to each other:** what is first, second, third; what comes before or after; what is cause and what is result.
 5. **Match the steps in a passage to a diagram** and vice versa. Match everything to the job you are doing.
 6. **A sequence of information can explain a principle** as it applies to your trade.
 7. **The result of the finished product depends on each step.**
 8. **Evaluate steps to make the right choice.**
 9. **Follow accurately** to ensure error-free and safe work habits.

ANSWER PAGE

PART II **Passage 3, Waterproofing, page 5.**

1. Which is the correct sequence of activities for the first coat of plaster?
 - b) clean masonry walls; dampen with water spray; apply coat of plaster
 - This is a straightforward order in activity question.
2. When would you roughen the first coat?
 - c) after the first coat has partially hardened
 - This is a *before /after* type of question. The passage clearly states this in the last sentence of paragraph two.
3. The second coat is applied after 48 hours.

F

You apply two coats, the second coat *after* the first coat has hardened, at least 24 hours, but not 48 hours.

4. Dampening the plaster is done just before each application of plaster?

T

The same sequence of dampening is used for both coats

PART II **Passage 4, Stringer Layout,**

1. Which activity would be correct as step c): **A or B**?
 - B.** Mark the height of the top of the finished floor above.

Look at the passage and find the first two steps. Now, look at the next step. You see that **B** would be the correct third step.

2. Read the sequence of directions from the passage. If you find an error in the first layout, which activities would you switch for correct order?
 - b)** Switch #4 and #5.

The passage clearly shows us that steps #1 to 3 are in the correct order, so rule out answer **a**). By reading further we see that if the layout “has a slight error” you will need to adjust the setting and “try again”. This means you will go to #5 and then to #4. Answer **b**) is correct.

3. At what point in this sequence will you need to stop, make an evaluation and decide whether to continue or go back to redo something?

You need to evaluate after you step off the riser height as there may be an error in the first setting (see the end of paragraph two). You will have to adjust the dividers and step it off again, and perhaps again, until the spacing is equal from top to bottom. Then you can go on with the sequence.