

## Step 2: Identifying Possible Solutions

In problem solving, it is obviously very important to have a clear understanding of exactly what the problem is. That is Step 1, which you have now completed. As you identified the problem and worked to state it clearly, you will very likely have already started to consider some possible solutions. (It is a wonder of the human brain that it naturally attacks problem solving, consciously and subconsciously!) Because of this, some solutions are readily brainstormed “off the top of your head.” However, we all know that with tough problems, a simple moment of thought will not generate the answer(s) we need. Luckily, there are tried and true methods for helping your brain to help you to solve problems.

*“There are two ways of meeting difficulties.  
You alter the difficulties or  
you alter yourself  
to meet them.”*  
Phyliss Bottomn

**Important Note:** In generating possible solutions, don’t dismiss anything. Rejecting alternatives comes later in the process. Sometimes the fanciful or seemingly impractical alternatives you come up with lead to very creative and worthwhile solutions. Ideas piggyback onto each other so keep as many ideas as possible in the mix.

### Steps to Identifying Solutions (This is critical thinking.)

#### Step 1: Know the facts.

List specific observations about the problem: What steps or hurdles do you have to deal with?

**The problem is:** \_\_\_\_\_

**Observation 1:** \_\_\_\_\_  
(a step or hurdle) \_\_\_\_\_  
\_\_\_\_\_

**Observation 2:**  
(a step or hurdle)

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**Observation 3:**  
(a step or hurdle)

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**Observation 4:**  
(a step or hurdle)

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**Observation 5:**  
(a step or hurdle)

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The above list may help you with the next step to identifying possible solutions. Feel free to expand this list if there are more observations to be considered. If you are having a hard time getting started on this list, don't fret and waste time. Instead, go directly to Step 2.

**Step 2: Do background research on the problem.**

This could include:

- a. information research  
*(Gather the relevant facts and details at the library, via the Internet, etc.)*
- b. interviews with successful individuals  
*(Talk to people who have dealt with this or a similar problem.)*
- c. a poll of friends, teachers  
*(Talk to people who have dealt with this or a similar problem or who have relevant facts to share.)*
- d. a poll of individuals affected by the problem  
*(This will shed light on the dimensions of the problem or provide valuable leads.)*

**Note:** In doing the above you may discover that the ideal solution already exists, which means that you may not have to “re-invent the wheel.” You may simply have to refer to your sources, find your best solution, and document it.

## **Problem-Solving Research Guide**

This section includes forms that you can use to help you plan, structure, and carry out the information search that you need for effective problem solving. Before you begin, here are four golden rules for obtaining information:

1. **HAVE A FOCUS**  
Know the reason/purpose for your information search.
2. **BE CONFIDENT**  
Assume that the perfect answer does exist.
3. **HAVE A STRATEGY**  
Know or find out where information might be found.
4. **HAVE A TECHNIQUE**  
Know or ask how to use the many different types of information sources.

### **The Step-by-Step Search**

1. Have a clear problem statement from which to work. (If you don't exactly know what the problem is, it will be impossible to search for viable answers. You'll be wandering aimlessly.)
2. Highlight the key words in your problem statement, or identify the major concepts. (You'll need these for key word and topic search engines in the library.)
3. Find and read a broad overview--preferably one written in simple language. (An encyclopedia or magazine article often does this nicely.)
4. Focus your search. (From your general reading, select likely key words, synonyms, variations in spelling, abbreviations, etc.)
5. List at least five different possible sources of information. Be certain to consider the library's technology (CD-ROMs, the Internet, etc.). Here are some possible sources of information.

## Information Sources

### A. Libraries

School

Public

Academic (at colleges or universities)

Special (see the library directory in your local telephone book)

- For an overview or background information, use an encyclopedia.
- For definitions, use a dictionary.
- For an address, use a directory.
- For personal data, use biographical sources.
- For geographical facts, use an atlas or gazetteer.
- For current events, use a newspaper, magazines, or vertical file.
- For a review, use a product review index or periodical index.
- For multidisciplinary information, use a computer database.
- For statistics, use an almanac, yearbook or statistical source.
- For opinions, use a poll, survey or news database.

### B. The Telephone Book (White and yellow pages.)

Be prepared before phoning for information:

- What is the purpose of your call?
- Familiarize yourself with the topic enough to ask good questions.
- Prepare a list of questions and leave room to jot in the answers.
- Introduce yourself and the purpose of your call.
- Be polite and take notes as you listen.

### C. Government: (Provincial and federal.)

These offices are listed in a separate section of the phone book. Phone the Citizen's Inquiry Service if you are at a loss.

### D. Experts (Interview by phone or in person.)

- Is there a teacher, peer, or parent with expertise?
- Is there a professor at a college or university with expertise?
- Are there professionals in this field? In a related field?

E. Organizations, Associations, Societies

- Is there a special interest group dedicated to your field of inquiry? (If so, interview a member or official by phone or in person.)

F. Museums or Galleries

6. Follow an organized search strategy. Here is a suggested routine:

a. List your possible sources. For example . . .

Books:

- in stacks (general collection)--see catalogue
- in the reference section

Periodicals: (general and special interest)

- magazines
- newspapers (including vertical file contents)
- CD-ROM programs

Subject Files (pamphlets and clippings)

Multimedia resources:

- videos, films
- kits, cassettes
- CD-ROMs
- Internet sites

People with related expertise: teachers, professors, professionals in the field.

Places: Government offices

b. Find the relevant sources. (Don't be afraid to ask for help from a librarian or other expert) Here is a worksheet you may find useful:

## The Search For Information Begins . . .

Name: \_\_\_\_\_

Problem Statement: \_\_\_\_\_

Background/overview search: (check at least one)

- online catalogue
- encyclopedia
- subject files
- periodical index

Main ideas/ key words highlighted in my problem statement or found in the overview readings. (Make sure you have at least three key words; then find a synonym or alternate spelling for each.)

1. \_\_\_\_\_ Synonym = \_\_\_\_\_
2. \_\_\_\_\_ Synonym = \_\_\_\_\_
3. \_\_\_\_\_ Synonym = \_\_\_\_\_
4. \_\_\_\_\_ Synonym = \_\_\_\_\_

- c. Analyze and evaluate the sources. (For example, you may want to concentrate on recent material, thereby eliminating any sources published before 1980. Or you may want to disregard information on the cult problem if the web site you have found was created by members of the Solar Temple, etc.)

Here is a checklist you can use to judge the sources you are considering using.

### Judge the Source!

**Is it recent?**

(Within the last ten years?)

**Is it relevant?**

(Does it have something useful to offer on your topic?)

**Is the writer/editor an authority on the subject?**

(Academically or otherwise qualified and trained?)

**Is it complete?**

(Does it cover the topic or merely touch on it?)

**Is it accurate?**

(Are there facts, and are the facts correct?)

**Is it clear?**

(Can you read and understand it with relative ease?)

**Can it be verified?**

(Can the claims/information be checked or must you accept things “on faith”?)

**Are the statistics valid?**

(Does the author cite real studies or does he “make up” statistics?)

**Is it consistent internally?**

(Are there contradictions within the document?)

**Is it consistent with other sources?**

(Is this source consistent with other authorities or is it “way out in left field”?)

**Can facts be separated from opinion?**

(Does the writer signal/label his opinions or state them as fact?)

**How does it compare to other available sources?**

(Is this worth further reading or are there much better sources?)

- d. Take notes from the sources you have rated highly. (Use point form and your own words to avoid plagiarism) Be careful to record author, publisher, date, etc., for later use if a bibliography is required.

***Forms to Use When Conducting  
Problem-Solving Research***

You may wish to copy and use the forms that follow to help you keep track of your background research. Use whatever will be most helpful to you. **Remember, there is no need to do all of these activities.**

**a. Information Research Log**

Topic Heading I Used	Source Title/ Web Address	Useful Facts/Information Found

**b. Interview Log: A Successful Individual/Expert**

Individual Interviewed	Position Held	Information/Advice Received

**c. Interview Log: Poll of Friends/Teachers**

People Talked to (may be anonymous)	Information/Advice Received



specialty area. Together, the results of each company's solution combined to create a working space shuttle. To use an example closer to your own life and experiences, if you want to solve the problem of how to achieve 15% higher grades in math, you may need to break the problem down into smaller components like this:

- a) How can I make more time available after school for homework?
- b) How do I arrange for peer tutoring?
- c) How can I get to school for the 8:00 a.m. tutorial?

***Stimulate Ideas***

Answer whichever of the following questions relate to your problem:

**1. What are its characteristics?** (You may use the following categories.)

- a) Physical dimensions/description

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- b) Time and money available vs. time and money needed.

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- c) Social consequences (Who will be happy? Why?)

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- d) Any characteristics specific and unique to your problem?

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e) Find an analogy that might help and state how it works.  
(For example, "Improving in math is like wringing cash out of my parents." This would help because one approach is not enough for either situation--you have to use several different tactics.)

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f) What would you do if there were none of the above-mentioned obstacles? (Let your imagination go: Think of a fantasy solution.)

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g) How could you make your fantasy solution work?

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h) Which ideas offer you a chance to learn a new skill or explore a new topic?

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i) What skills, ideas, strengths of your own can you apply?

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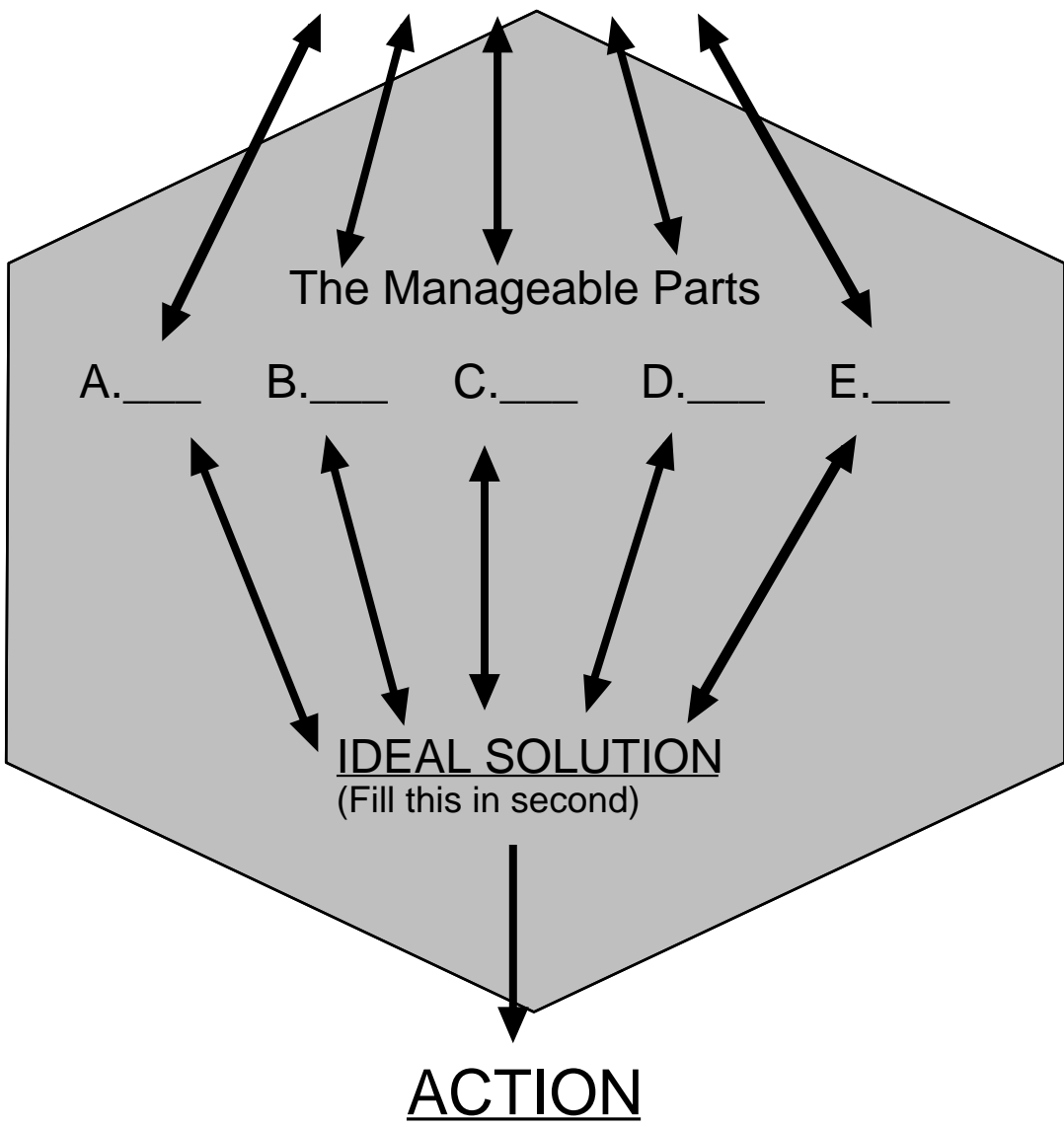
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# PROBLEM (STATED)

(Fill this in first)



## Step 3: Evaluating Alternatives

When evaluating each alternative, you must make a complete and thorough list of all the pros and cons. In order to do this properly, you have to gather the facts. You cannot go on gut instincts or choose the path of least resistance and believe you can solve the problem effectively this way! Good problem solvers base their actions on solid factual ground, and evaluating several alternatives requires effort-- plenty of it. If the problem is worth solving, however, it is worth the time it takes to do it right, right? How do you weigh each of the alternatives? Read on for some tips.

### Criteria For Evaluation

1. Consider the importance of such things as:
  - research results  
*What do the authorities on the subject seem to think?*
  - classroom theory  
*For example: What does the physics theory you've learned in class say about each possible option?*
  - acceptable results of the majority  
*For example: What have most people found to be satisfactory alternatives to similar problems?*
  - criteria that may be defined by your instructor  
*For example: If your teacher tells you that one of your alternatives is against the safety rules, listen!*

2. Consider and weigh the costs of the various alternatives:

Tangible (measurable) Costs may include the following:

- a) dollar cost  
\_\_\_\_\_
- b) time needed vs. time available  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- c) materials needed  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

d) other people's time needed

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e) space needed

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f) Other tangibles?

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Intangible Costs may include the following:

a) effort/energy required

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b) stress/pressure caused by deadlines (can be avoided sometimes by starting right away)

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c) emotional consequences to self/others

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d) changes in attitude required (Are they possible?)

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e) effects on relationships involved

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f) Who gains—One? Some? All?

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g) long term vs. short term solution

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h) What other problems does it create and how difficult/serious are they?

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i) Does it solve the entire problem? If no, what does it miss?

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j) Does it solve or only cover up the problem?

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k) Is it acceptable to everyone involved?

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## Choosing

When you are weighing your identified solutions, if you find that one is not clearly superior, it is back to the evaluation stage. (Don't just pick from a hat, or play eeny-meeny-miney-mo!) Using the same criteria, evaluate the best two or three alternatives once more, but this time you could also enlist the help of someone you trust (a classmate, instructor, parent, counsellor, etc.) who has experience or expertise in the particular area.

Do not be afraid to choose a solution that is quite unusual, but seems really good to you. Be brave. Face the tension that may arise if you try something new. Remember, progress depends upon new ideas.

**Note:** Sometimes the “most ideal” solution to the problem may have to be ruled out due to its lack of feasibility for you and your circumstances.

Before you go on to actually commit to a certain alternative, try to write a convincing rationale for your tentative choice. If you have difficulty developing this rationale, you may not have fully evaluated this choice or it may *not* be your best choice. Remember, the best solution to your problem will be selected on the basis of tangible and intangible costs. Sometimes you must weigh one against the other. **Think** before you decide. The next section of the learner guide will help you to make wise decisions in selecting the best alternative for you and your situation.