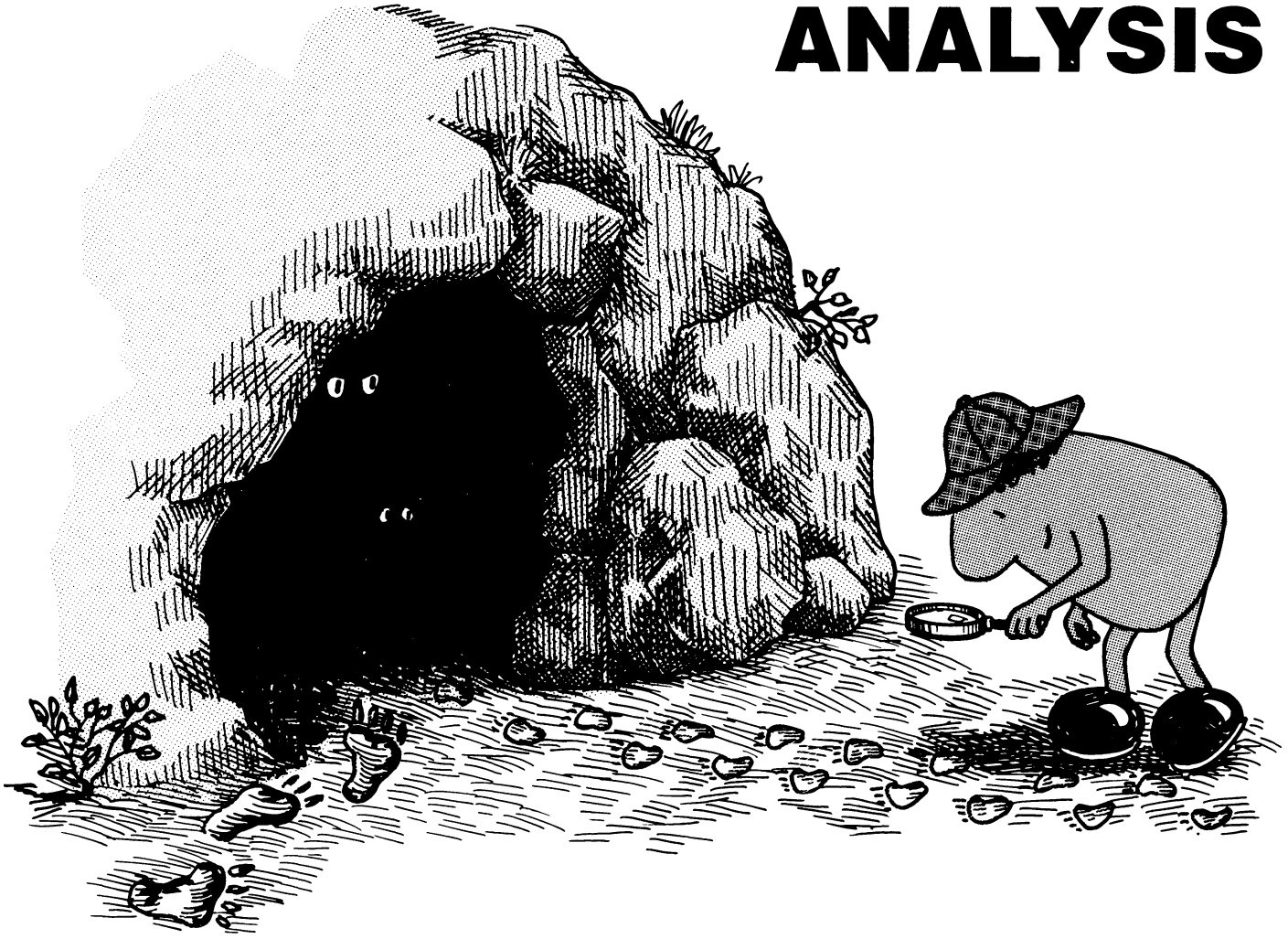
ANALYSIS



TASK CARD SERIES

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CONTENTS

INTRODUCTION

TEACHING NOTES

REPRODUCIBLE STUDENT TASK CARDS

Gathering Materials

Listed below is everything you'll need to teach this module. You already have many of these items. The rest are available from your supermarket, drugstore and hardware store. Laboratory supplies may be ordered through a science supply catalog. Hobby stores also carry basic science equipment.

Keep this classification key in mind as you review what's needed:

special in-a-box materials: Italic type suggests that these materials are unusual. Keep these specialty items in a separate box. After you finish teaching this module, label the box for storage and put it away, ready to use again the next time you teach this module.	general on-the-shelf materials: Normal type suggests that these materials are common. Keep these basics on shelves or in drawers that are readily accessible to your students. The next TOPS module you teach will likely utilize many of these same materials.
(substituted materials): A parentheses following any item suggests a ready substitute. These alternatives may work just as well as the original, perhaps better. Don't be afraid to improvise, to make do with what you have.	*optional materials: An asterisk sets these items apart. They are nice to have, but you can easily live without them. They are probably not worth the extra trip, unless you are gathering other materials as well.

Everything is listed in order of first use. Start gathering at the top of this list and work down. Ask students to bring recycled items from home. The teaching notes may occasionally suggest additional student activity under the heading "Extensions." Materials for these optional experiments are listed neither here nor in the teaching notes. Read the extension itself to find out what new materials, if any, are required.

Needed quantities depend on how many students you have, how you organize them into activity groups, and how you teach. Decide which of these 3 estimates best applies to you, then adjust quantities up or down as necessary:

Q_1 / Q_2 / Q_3

- **Single Student:** Enough for 1 student to do all the experiments.
- **Individualized Approach:** Enough for 30 students informally working in 10 lab groups, all self-paced.
- **Traditional Approach:** Enough for 30 students, organized into 10 lab groups, all doing the same lesson.

KEY: *special in-a-box materials* (substituted materials) general on-the-shelf materials *optional materials

1/10/10	small graduated cylinders — 10 mL
1/1/1	jar of sand
1/1/1	source of water
1/10/10	Bunsen burners (an electric hot plate or warm radiator)
2/20/20	Pyrex beakers — 50 to 100 mL capacity (crucibles or tuna fish cans)
2/20/20	watch glasses (tin can lids or crucibles or squares of cardboard)
1/10/10	tongs (clothespins)
1/10/10	scissors
1/10/10	lab balances — those improvised in TOPS module *Weighing 05* are suitable
1/1/1	*bottle sublimed sulfur*
5/50/50	*bottle caps*
1/10/10	index cards
1/1/1	roll masking tape
1/1/1	package: alum, baking soda, corn starch, salt and sugar; include a dispensing spoon with each box — see teaching notes 5
1/10/10	dropper bottles each of: white vinegar, iodine, water and ammonia — see teaching notes 5 and 9 for details
2/20/20	additional dropper bottles
1/10/10	paper clips
1/1/1	roll aluminum foil
1/10/10	candles with drip catchers (Bunsen burners or alcohol lamps)
5/10/5	baby food jars or equivalent
10/100/100	*strips each of red and blue litmus paper*
1/1/1	roll waxed paper
1/1/1	small portions each of *cleanser* and garden lime dispensed in labeled lids
1/10/10	*aspirin tablets*
1/10/10	straight pins
1/1/1	head red (purple) cabbage
1/2/2	lemons (bottled concentrate or ascorbic acid crystals)
1/1/1	can beets — see teaching notes 15
1/10/10	seltzer tablets

Sequencing Task Cards

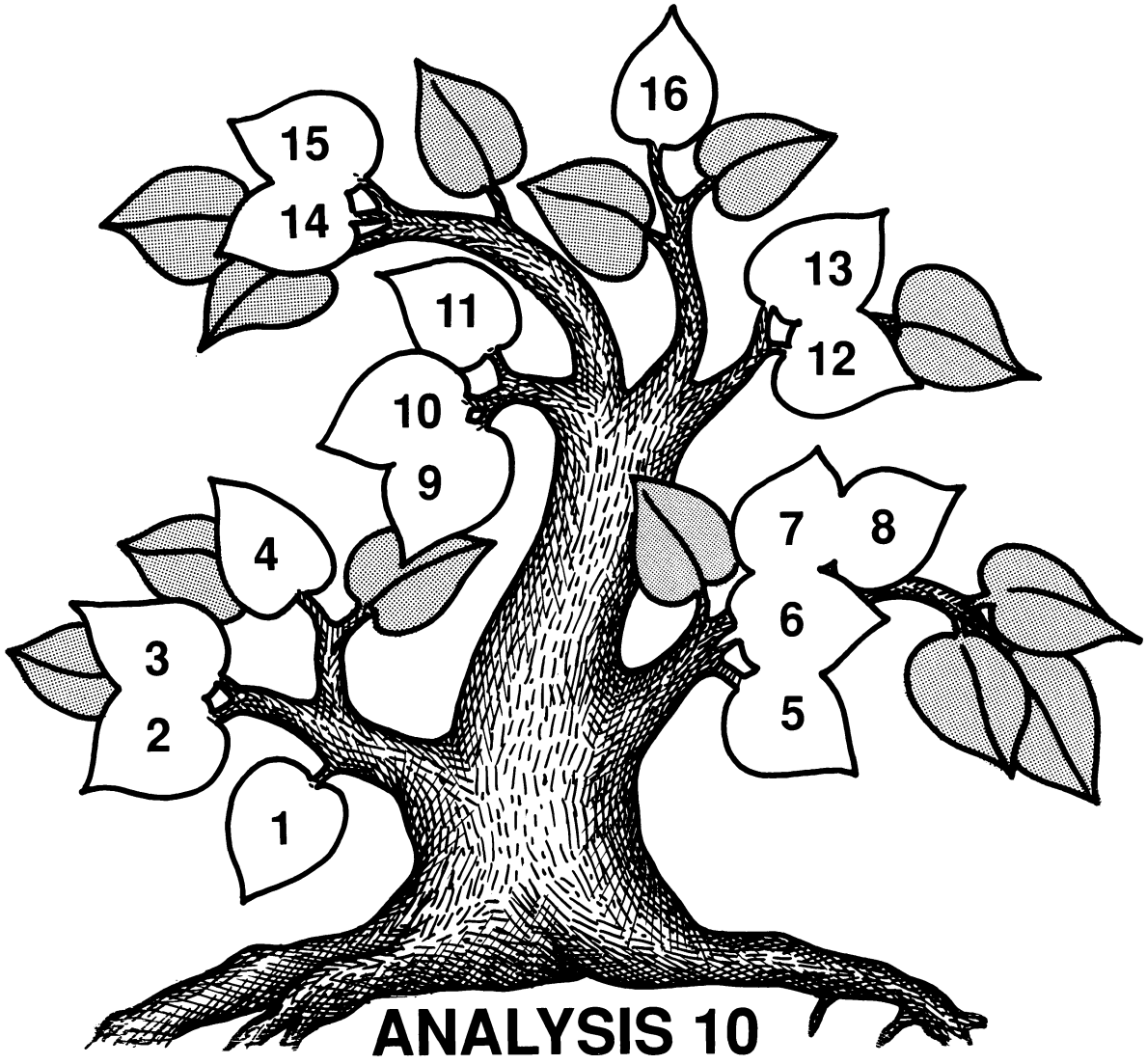
This logic tree shows how all the task cards in this module tie together. In general, students begin at the trunk of the tree and work up through the related branches. As the diagram suggests, the way to upper level activities leads up from lower level activities.

At the teacher's discretion, certain activities can be omitted or sequences changed to meet specific class needs. The only activities that must be completed in sequence are indicated by leaves that open *vertically* into the ones above them. In these cases the lower activity is a prerequisite to the upper.

When possible, students should complete the task cards in the same sequence as numbered. If time is short, however, or certain students need to catch up, you can use the logic tree to identify concept-related *horizontal* activities. Some of these might be omitted since they serve only to reinforce learned concepts rather than introduce new ones.

On the other hand, if students complete all the activities at a certain horizontal concept level, then experience difficulty at the next higher level, you might go back down the logic tree to have students repeat specific key activities for greater reinforcement.

For whatever reason, when you wish to make sequence changes, you'll find this logic tree a valuable reference. Parentheses in the upper right corner of each task card allow you total flexibility. They are left blank so you can pencil in sequence numbers of your own choosing.

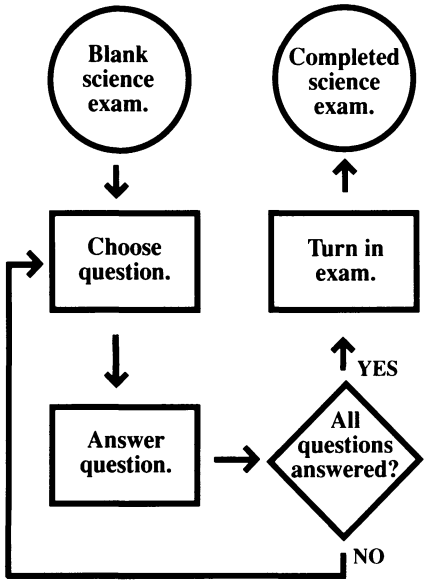


Review / Test Questions

Photocopy the questions below. On a separate sheet of blank paper, cut and paste those boxes you want to use as test questions. Include questions of your own design, as well. Crowd all these questions onto a single page for students to answer on another paper, or leave space for student responses after each question, as you wish. Duplicate a class set and your custom-made test is ready to use. Use leftover questions as a review in preparation for the final exam.

task 1-2

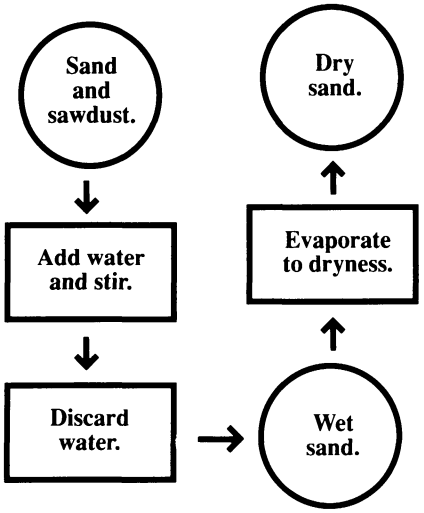
Consider this flow chart.



a. Why do the boxes have different shapes?
b. Why does the flow chart have a loop?

task 3-4

A mixture with a mass of 23.4 g was separated according to this flow chart, resulting in 15.3 g of sand.



a. How much sawdust was in the mixture?
b. Name a source of error (other than errors in weighing) that might make this value too high.
c. Name a source of error (other than errors in weighing) that might make this value too low.

task 3-4

A student recorded the following data about the mass of a sample of Raisin Bran breakfast cereal:

Raisin Bran in bowl = 238.9 g
empty bowl = 203.2 g
raisins = 15.0 g

Find the mass of the bran flakes.

task 3, 8

Distinguish between a quantitative analysis and a qualitative analysis.

task 4

Design a flow chart for separating a mixture of sand and iron filings with a magnet.

task 5

List the powders (alum, baking soda, corn starch, salt and/or sugar) that give positive reactions to each testing agent.
blackens with iodine:
fizzes with vinegar:
fizzes with baking soda water:
melts with heat:
burns with heat:

task 6-8

Which mixture of powders is harder to identify: sugar + salt, or corn starch + baking soda? Explain.

task 7-8

An unknown powder partially melts as it is heated, but it will not burn.
a. What *must* be in the mixture? Explain.
b. What *can't* be in the mixture? Explain.
c. What *might* be in the mixture? Explain.

task 9

Summarize how litmus paper responds to:
a. water.
b. ammonia.
c. vinegar.

task 10

Can basic ammonia be changed to acid by diluting it with water? Explain.

task 9-11

Both lemons and limes are highly acidic fruits. Propose an experiment using litmus paper to find which contains the stronger acid.

task 12-13

Cabbage water is added to a test tube of clear ammonia. The solution is then titrated drop by drop with vinegar until it turns highly acidic.
a. Describe the full range of color changes in the test tube as vinegar is added.
b. In what direction does the pH change in this test tube?

task 13-14

Cabbage water turns bluish green with baking soda, and pinkish purple with alum.
How would a mixture of these powders react with cabbage water? Explain.

task 13-14

Five solutions with pH's of 3,5,7,9 and 11 are placed in unlabeled glass vials. Can you order them from low pH to high pH...
a. using just litmus paper? Explain.
b. using just cabbage water? Explain.

task 15

Blueberry juice is known to change color in response to changing pH. How would you investigate its properties?

task 16

Aspirin dissolves in water to form an equilibrium of negative and positive ions.

$$AH \rightarrow A^- + H^+$$

How does this equilibrium respond if you...
a. Take away hydrogen ions by neutralizing with ammonia?
b. Add more hydrogen ions by acidifying with vinegar?

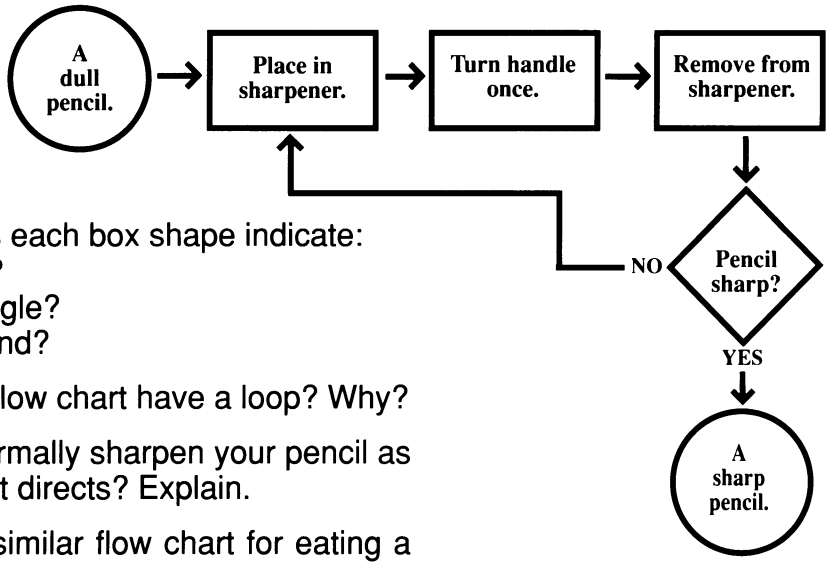
task 16

How might you compare commercial antacids (Rolaids and Tums, for example) to see which is the stronger buffer.

Task Objective (TO) learn how to interpret flow chart instructions.

READING A FLOW CHART ○ Analysis ( )

1. This flow chart tells you how to sharpen a pencil. Read it through.



2. What does each box shape indicate:
   a. a circle?
   b. a rectangle?
   c. a diamond?

3. Does this flow chart have a loop? Why?

4. Do you normally sharpen your pencil as this flow chart directs? Explain.

5. Design a similar flow chart for eating a banana.

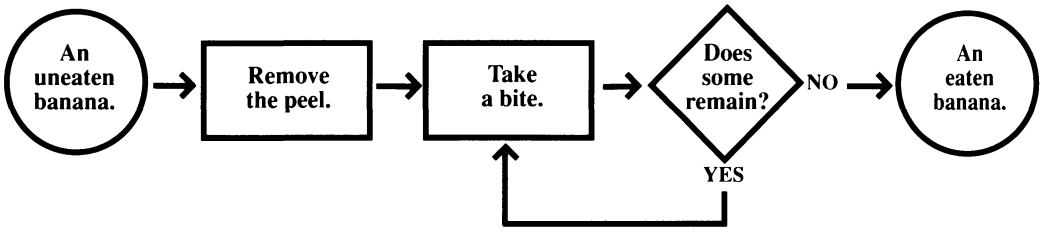
Answers / Notes

2a. A circle tells you what you have.
2b. A rectangle tells you what to do.
2c. A diamond asks you to make a decision.

3. Yes. The pencil may not be sharp after only one turn of the handle. The "NO" track out of the decision box loops you back to the first command box, instructing you to give the handle another turn.

4. No. You normally don't take your pencil out of the sharpener to evaluate its sharpness after each turn of the handle.

5. Flow chart designs will vary. Here is one possible answer:

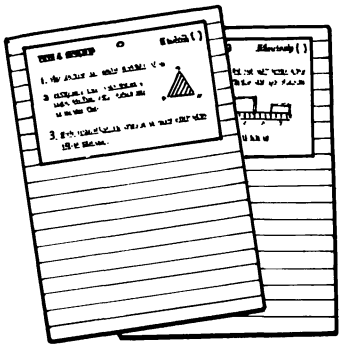


Materials

None required.

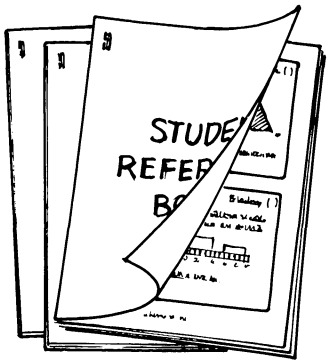
Task Cards Options

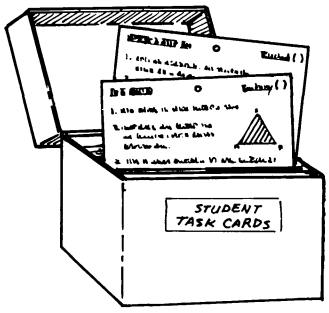
Here are 3 management options to consider before you photocopy:



1. Consumable Worksheets: Copy 1 complete set of task card pages. Cut out each card and fix it to a separate sheet of boldly lined paper. Duplicate a class set of each worksheet master you have made, 1 per student. Direct students to follow the task card instructions at the top of each page, then respond to questions in the lined space underneath.

2. Nonconsumable Reference Booklets: Copy and collate the 2-up task card pages in sequence. Make perhaps half as many sets as the students who will use them. Staple each set in the upper left corner, both front and back to prevent the outside pages from working loose. Tell students that these task card booklets are for reference only. They should use them as they would any textbook, responding to questions on their own papers, returning them unmarked and in good shape at the end of the module.

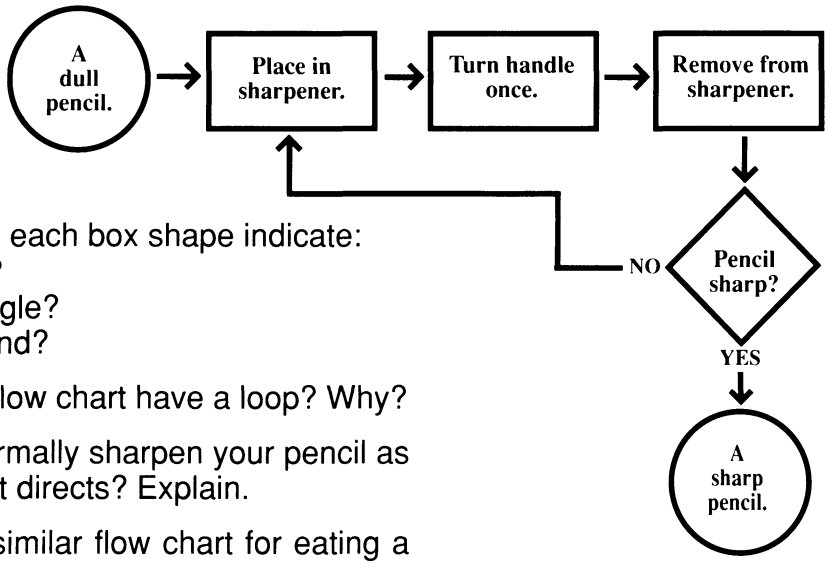




3. Nonconsumable Task Cards: Copy several sets of task card pages. Laminate them, if you wish, for extra durability, then cut out each card to display in your room. You might pin cards to bulletin boards; or punch out the holes and hang them from wall hooks (you can fashion hooks from paper clips and tape these to the wall); or fix cards to cereal boxes with paper fasteners, 4 to a box; or keep cards on designated reference tables. The important thing is to provide enough task card reference points about your classroom to avoid a jam of too many students at any one location. Two or 3 task card sets should accommodate everyone, since different students will use different cards at different times.

READING A FLOW CHART ○ Analysis ( )

1. This flow chart tells you how to sharpen a pencil. Read it through.



2. What does each box shape indicate:
   a. a circle?
   b. a rectangle?
   c. a diamond?

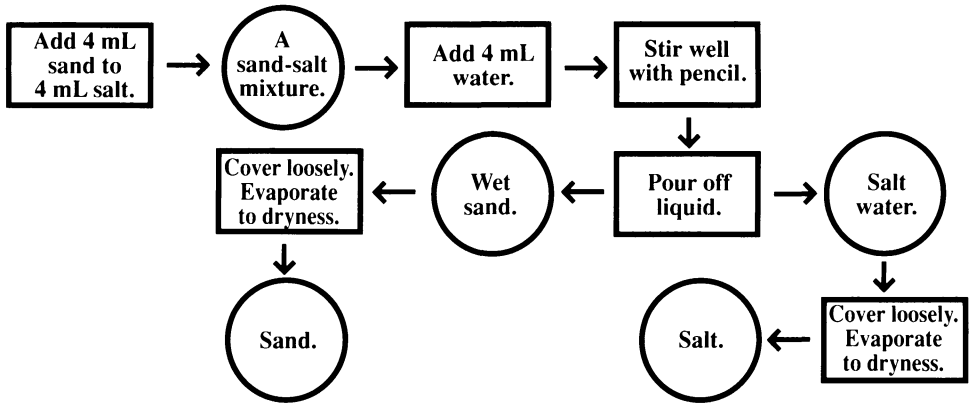
3. Does this flow chart have a loop? Why?

4. Do you normally sharpen your pencil as this flow chart directs? Explain.

5. Design a similar flow chart for eating a banana.

SAND FROM SALT (1) ○ Analysis ( )

1. Mix sand and salt together in a heat resistant container as directed below. Follow this flow chart to separate them again.



2. Is your sand-salt separation complete? How do you know?

3. Save your container of salt-crusted sand for the next activity. You may discard the dingy salt.