

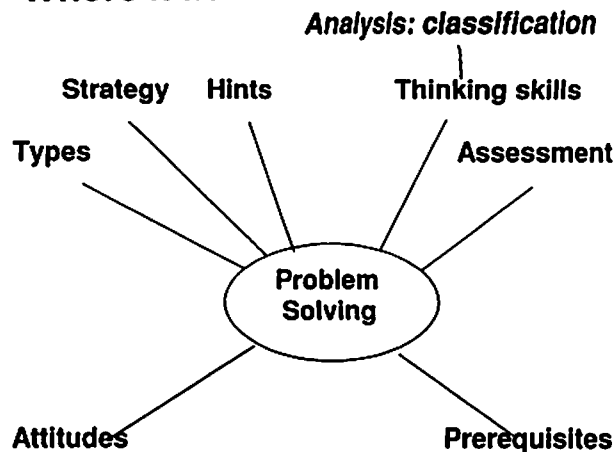


**Def: dividing a whole into parts such that there is a meaningful relationship among the parts**

**Why important?**

1. Vital analytical skill
2. To organize large sets of information
3. To see patterns, relationships, trends
4. To sort information

**Where it fits in..**



MPS 6: Analysis: classification Pretest, objectives

**Pretest: Use an "x" to rate your Awareness & Skill**

**Time 10 s Finish by \_\_\_\_\_**

**Objectives...  
Read over...**

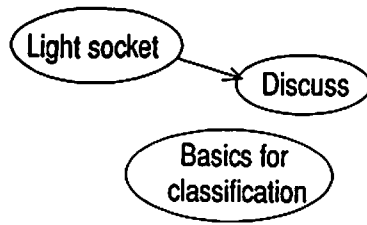
**Time \_\_\_\_\_ Finish by \_\_\_\_\_**

MPS 6: Analysis: classification **Route ahead** to be systematic and organized: range of Tables/charts; figures or codes

Purpose	Codes	Tables	Figures
See relationships	Circle, # code		Tree, Polya plot, Concept map, Gowin Vee, Fishbone
Decide Cause-effect	circle, underline tie line	cause-effect, truth tables, reasoning tables, CRE, decision tables, PPA	Venn, Decision trees, Gantt, PERT/CPM, tree
Plan actions		CRE, PPA, "To do" list	Gantt chart, CPM/PERT, Pareto plots, Force field diagram
Be complete		checklists, 5W & H, IS & IS NOT, Larkin	Why? Why? Why?
Focus			Force field, Pareto

Variety, multi purposes for some options

## MPS 6: Analysis: classification *Route ahead*



Relationships options: codes & figures.

Make decisions: options: tables & figures

Plan actions: options: specialized tables & figures

Be complete: options: mainly lists & tables

To focus: options: figures.

Summary

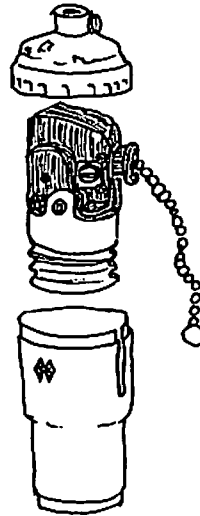
Option- 5

## MPS 6: Analysis: classification Summary

## MPS 6: Analysis: classification : **Light socket**

**Activity:** as individual, classify the parts of a light socket

TIME \_\_\_\_\_



**Discuss with neighbor**

TIME \_\_\_\_\_

Option- 6

MPS 6: Analysis: classification Criteria for a good classification

1. Define purpose for classification and create name
2. Label or name all the parts (if not already labeled)
3. For each level of classification must use **one** criterion and only one. (Called a basis of classification)
4. Be complete at each level
5. Must have at least two subclasses; no single
6. No faulty coordination (mistakes because titles not at same "level" of detail or generality)
7. No faulty subordination (mistakes because part is put in a category to which it does not belong).
8. Consistent level of detail

**MPS 6: Analysis: classification Purpose:**

Example: light socket

1. minimize cost?
2. materials of construction?
3. inside/outside?
4. moving/non-moving?
5. function/pretty?

Purpose: inside/outside

Name: parts



2. "color"

In this example, we use a tree diagram to keep track of the information

8

**MPS 6: Analysis: classification Name/define**

For objects: *mouse trap*

"Functional"

"Looks like"

head squasher

Loop

bait pedal

Swing

*socket*

attachment base

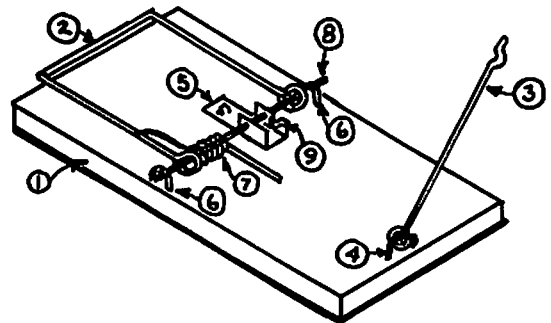
Cap

housing

Metal cylinder

insulating insert

"Paper" cylinder



9

**MPS 6: Analysis: classification**

Activity: p 603 label the parts for

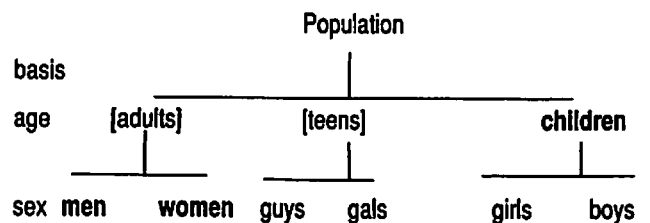
\_\_\_\_\_ or  
\_\_\_\_\_

TIME \_\_\_\_\_

**MPS 6: Analysis: classification Faulty basis of classification**

Fruits, vegetables, apples

Men, women & children [used a combination of "age" and "sex"]



- Option: coding:
- Population
  - 1. Adults
    - 1.1 women
    - 1.2 men
  - 2. Teens
    - 2.1 gals
    - 2.2 guys
  - 3. Children
    - 3.1 girls
    - 3.2 boys

**MPS 6: Analysis: classification** Which one doesn't belong? Recognize errors in classifications

**Activity:** p 602 activity 2-1, as individual identify if the classification is correct; correct if incorrect.

TIME \_\_\_\_\_

Discuss with neighbor TIME \_\_\_\_\_

Write reflections TIME \_\_\_\_\_

Option-11

**MPS 6: Analysis: classification** **Example**  
(with number code)  
**Purpose:** lab report

**Basis?**

**title page**  
**abstract**

**1. introduction**

**2. procedure**

**3. conclusion**

**4. graph**

**5. appendix of detailed calculations**

**6. references**

13

**MPS 6: Analysis: classification** Create classification

**Activity:** individuals complete: classification 2-4, p 602 for the purpose of assigning the fault to the correct area manager for action

Time 5 min

suggestion: use tree diagram or number code  
Discuss with neighbor TIME \_\_\_\_\_

Write reflections TIME \_\_\_\_\_

12

**MPS 6: Analysis: classification** **Example**  
**Lab report: purpose:** Scientific method ( with number code)

1. Introduction

2. Experiment

2.1 Theory

2.2 Apparatus

2.3 Experimental method

2.4 Experimental results

2.5 Interpretation of results

2.6 Discussion of errors

2.7 Conclusion

3. Bibliography

4. Appendix

14

**MPS 6: Analysis: classification Critique  
classification**

**Activity:** as individual critique and correct 1A & 1B p 602

TIME \_\_\_\_\_

15

**MPS 6: Analysis: classification Critique**

**Activity:** critique each other's outline for your reports

or critique the outline given 608

TIME 10 min

17

**MPS 6: Analysis: classification Critique:  
Suggested improvement**

**1. Results**

1.1 How much affected

1.2 Part affected

**2. Advantages and disadvantages**

**A. Types**

1. Mixtures

2. Compositions

**B. Methods of application**

1. Stage

2. Rate

3. Amount

**C. Precautions**

1. Shrubs

2. Flowers

**D. Limitations**

16

**1. Introduction:**

A. Water power and it's significance for Canada's development

**2. The Crane Canyon Dam and Reservoir**

**A. Information about the damsite**

1. Suitability of the damsite

2. Character of the subsoil for the reservoir

3. Cost of constructing the dam on this site

4. Cost of preparing the area for the reservoir

5. Cost of constructing the power generation facility

6. Cost of transmitting the power

**B. Information about the water obtainable**

1. Minimum run-off available

2. Probably water loss from leakage and evaporation

**C. Information about the community**

1. Results from Public Input Meeting #1

2. Results from Public Input Meeting #2

3. Summary of the "No Damn Dam Here" Rally

**D. References**

**E. Appendices:**

1. Consultant's Report on the Soil

2. Minutes of Public Input Meeting #1

3. Minutes of Public Input Meeting #2

4. Newspaper Clippings about the "Damn" Rally

Option-17

**MPS 6: Analysis: classification Suggested improvement Report to inform about potential dam development**

1. Water power and national its significance
  - 1.1 National need to power and recreation
  - 1.2 Crane Canyon dam and reservoir
2. Suitability of the damsite
  - 2.1 subsoil and topology
  - 2.2 water availability
3. Power generation
  - 3.1 Amount of power
  - 3.2 Costs of power
4. Recreational uses of the reservoir
5. Construction cost analysis and financing
  - 5.1 Costs
  - 5.2 Financing
6. Impact on the wildlife and on the community
7. Public decision-making process
8. Summary

**MPS 6: Analysis: classification Research shows that we solve problems in Short Term Memory: that has limited storage capacity: about 7 chunks. Use diagrams, figures, tables and codes to keep us organized.**

1. Identify purpose
2. Select basis of classification
3. Consider options: code? Table? Figure?

**Route ahead:**

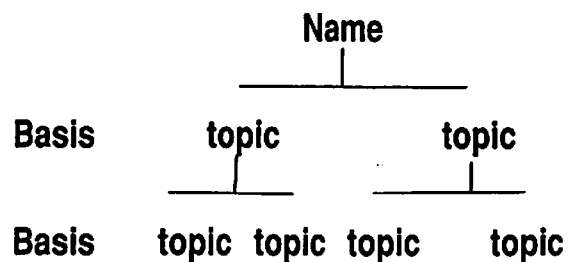
**For the different purposes, introduce some familiarity with at least one option.**

**MPS 6: Analysis: classification Reflections: on applying rules for classification:**

**Reflections: use of "codes"  
C#1 to C#5**

**TIME \_\_\_\_\_**

**MPS 6: Analysis: classification Relationships Try #F1 Tree diagram**



**Easy to do**

**Just keep basis consistent**



MPS 6: Analysis: classification Relationships  
 Concept maps Example scoring

Scoring Model

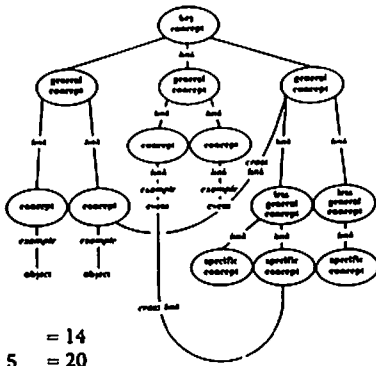
Hierarchy

Level 1

Level 2

Level 3

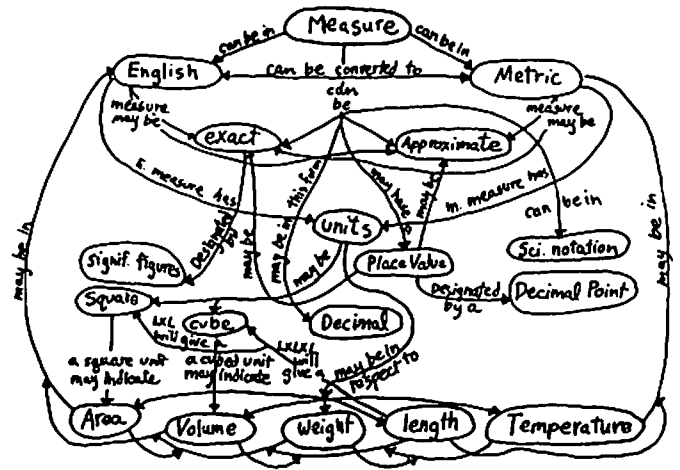
Level 4



Scoring for this model:

Relationships (if valid)	= 14
Hierarchy (if valid) 4 x 5	= 20
Cross links (if valid and significant) 10 x 2	= 20
Examples (if valid) 4 x 1	= 4
	<u>58 points total</u>

MPS 6: Analysis: classification Relationships  
 Concept maps Example:



Option-26

Option-27


MPS 6: Analysis: classification Relationships  
 Try #F4 Gowin Vee

This is a specialized visual for learning with emphasis on

6. Posing a focus question.
7. Doing an experiment
8. Gathering and interpreting data
9. Relating the results to concepts and theory
1. Draw a Vee about the *Posed Focus Question*
2. Put the *experiment* at the peak of the Vee
3. Up the right hand leg connect the experiment to the data collected and conclusions reached
4. Up the left hand leg connect the experiment to concepts and theory

Option-28

MPS 6: Analysis: classification Relationships  
 Gowin Vee Example

CONCEPTUAL	FOCUS QUESTIONS	METHODOLOGICAL
<p><b>Theory:</b> Newtonian mechanics</p> <p><b>Principles:</b> Velocity increases when objects are accelerated Acceleration of objects vary with slope of track</p> <p><b>Concepts:</b> acceleration slope time velocity</p>	<p>1. How can uniformly accelerated motion be described in terms of distance, velocity and time? (For our purpose this will involve plotting <math>s</math> &amp; <math>v</math> as functions of <math>t</math>.)</p> <p>2. How can we express the relationships among distance, velocity, time interval and acceleration in uniformly accelerated motion?</p>	<p><b>Value Claims:</b> Completing the experiment and analysis of the experimental results will lead us to understand uniformly accelerated motion more fully and more meaningfully.</p> <p><b>Knowledge Claims:</b></p> <ol style="list-style-type: none"> <li>1. <math>s</math> vs. <math>t</math> graph for a uniformly accelerated motion with <math>V_0 = 0</math> is </li> <li>2. The tangent of the curve <math>s</math> vs. <math>t</math> at a particular time <math>t</math> is equal to the <math>v</math> at the same time.</li> <li>3. The area under the curve <math>v</math> vs. <math>t</math> up to a particular <math>t</math> is equal to the value for <math>s</math> at the same <math>t</math>.</li> <li>4. Acceleration = the slope of <math>v</math> vs. <math>t</math> = twice the slope of <math>s</math> vs. <math>t^2</math> = <math>1/2</math> the slope of <math>s^2</math> vs. <math>s</math></li> <li>5. <math>g = \text{_____ cm/s}^2</math> = the slope of <math>s</math> vs. <math>t</math></li> </ol> <p><b>Transformations:</b> Graphs of data</p> <p><b>Records:</b> for <math>\theta</math> to 5 milliradian: 1. width of the card <math>\Delta x</math> the time for the card <math>\Delta t</math> to pass the second gate</p> <ol style="list-style-type: none"> <li>2. Plot <math>s</math> vs. <math>t</math>, <math>v</math> vs. <math>t</math> with <math>\theta</math> fixed, find the tangent to the former curve and the area under the curve up to a particular value of <math>t</math> of the latter curve.</li> <li>3. Plot <math>s</math> vs. <math>t^2</math>, <math>v^2</math> vs. <math>s</math>, find the slope of each graph, also the slope of <math>v</math> vs. <math>t</math>, for <math>\theta = 10, 15</math> milliradian:</li> <li>4. Find <math>a</math> directly from the following equations instead of finding the slope <math>\theta = v/t</math>, <math>\theta = v^2/2a</math>, <math>\theta = 2s/t^2</math> for all <math>\theta</math>'s.</li> <li>5. Plot <math>s</math> vs. <math>\theta</math> find slope.</li> </ol>
<p><b>Event:</b> Moving a glider on an inclined air track with initial velocity equal to zero. (Digital timer and photocell gates are used for data recording.)</p>		

Option-29



**MPS 6: Analysis: classification Decide**

**Purpose:** to reason, keep relate data

**Try basis on classification:** consistency among data. To keep us organized use T#3 Reasoning tables.

1. Create table: list the option on both top and sides of table;
2. as gather information
  - put "x" if it can't be true
  - put ✓ if it is possible
  - put "o" if it's true.

**MPS 6: Analysis: classification Decide**

**Reasoning tables (T#3) Example:**

**Clue #1:** "Mrs Archway told Grover that their sons (Kurt and Jules) were planning a bike trip"

	D	E	F	G	H	I	J	K	L
A				x			✓	✓	x
B									
C									
G									
H									
I									
J				✓					
K				✓					
L				x					

Continue p 603 And match up the families  
**TIME** \_\_\_\_\_ Could also use a tree diagram

Option-30

Option-31

**MPS 6: Analysis: classification Decide**

**Purpose:** reasoning T#1 Cause effect tables

1. List evidence across the top of table.
2. In the first column, list hypothesis as to what is the fault or cause.
3. For each hypothesis, note whether the hypothesis is consistent with each piece of evidence.
4. Find most-likely hypotheses as those that are consistent with all the evidence.

Hypothesis	Evidence		
	Temp 10C higher	Usual pressure	Usual noise
Upstream condenser malfunctioning	✓	✓	✓
Pump impeller backwards	x	x, much lower	✓
Temperature Instrument wrong	✓	✓	✓

**MPS 6: Analysis: classification Decide**

**Purpose:** reasoning Sequence of equations to solve:

**Use #T4 Column and row elimination CRE from a structural matrix**

1. Number each equation
2. Create a matrix with the columns representing the variables and the rows the equations.
3. Indicate which variables are in which equation.

$$A = \frac{\pi}{4} D^2 \quad (1)$$

$$\langle v \rangle = \frac{F}{A} \quad (2)$$

Eqn	A	D	F	<v>
1	✓	✓		
2	✓		✓	✓

Option-33

Option-34

**MPS 6: Analysis: classification Decide**

**Purpose: reasoning #T4 CRE** This structural matrix

- Helps us visualize connections  
Helps identify the number of variables we must know initially to solve the equations. Need to have a square matrix where the number of variables = number of unknowns. Thus we need to know values for two variables: D and F, A and <v>; D and <v> to solve this set.
- Column and row elimination to determine the sequence of calculations:
  1. Identify the column with only 1 entry
  2. Eliminate both the column and the row.
  3. Note the sequence in which the equations are thus eliminated. This represents the reverse of the sequence for sequential solution.

If you are left with no column with a single entry, then the remaining set of equations must be solved together or by trial and error.

Option-35

**MPS 6: Analysis: classification Decide**

**Purpose: reasoning #T4 CRE** Pumping a fluid that detonates:

$$F = \exp\left(-\frac{A}{L}\right) \quad (1)$$

$$\langle v \rangle = \frac{F}{A} \quad (2)$$

Eqn	A	L	F	<v>
1	✓	✓	✓	
2	✓		✓	✓

Given L and <v>

Eqn	A	F
1	✓	✓
2	✓	✓

Conclude: solve by trial & error

Option-37

**MPS 6: Analysis: classification Decide**

**Purpose: reasoning #T4 CRE** given F and D

Eqn	A	<v>
1	✓	
2	✓	✓

Eqn	A	<v>
1	✓	
2	✓	✓

1

Eqn	A
1	✓

2

Solve 2 then 1, solve sequentially 3.

Option-36

**MPS 6: Analysis: classification Decide**

**Purpose: reasoning Try #T4 CRE** Example

- 1 a = 5
- 2 b = 2a<sup>2</sup>
- 3 c = a + 3b
- 4 d = a + 5c
- 5 e = b + 3c + d + f
- 6 0 = a + c<sup>3</sup> - e
- 7 g = f<sup>1/2</sup>

	a	b	c	d	e	f	g
1	x						
2	x	x					
3	x	x	x				
4	x		x	x			
5		x	x	x	x	x	
6	x		x		x		
7						x	x

Option-38

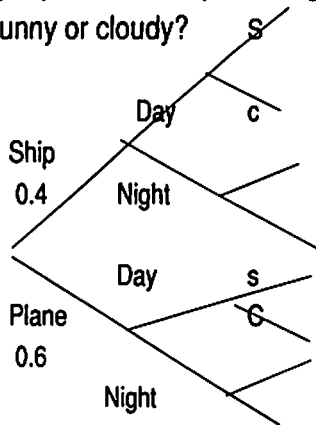
**MPS 6: Analysis: classification Decide**

Try #F6 Decision trees.

1. Identify options at each branch point, label.
- . Add probability at each branch. Sum of probabilities at each point = 1.

*Example: Choose mirror or matches to signal for rescue in the Caribbean.*

Likely to be seen by a plane or a ship? During day or night? If daytime, sunny or cloudy?



Option-41

**MPS 6: Analysis: classification Decide & Plan actions**

Try #F8 CPM & PERT Critical path method; CPM; Project Evaluation & Review Technique, PERT

1. List jobs needed to be done to complete the task.
2. For each job, list what has to be done before the job can be started and what jobs can be done concurrently.
3. For each job, list the estimated amount of time needed to complete the job. (For PERT list min, likely & max)
4. Draw a diagram showing the connections.
5. Sweep through from the start and calculate the earliest start and earliest finish for each job. When ever there is a merge, then the job at the merge starts with the maximum of prerequisites.
6. Sweep through from the end and calculate the latest finish and latest start for each job. When ever there is a burst, the job at the burst has the latest finish that is the minimum of the subsequent jobs.
7. Calculate the total float for each job as the difference between the earliest and latest start (or finish).
8. The jobs with 0 total float are on the critical path.

Option-43

**MPS 6: Analysis: classification Decide & Plan actions**

Try #F7 Gantt charts

1. List jobs needed to be done to complete the task
2. For each job, list what has to be done before the job can be started and what jobs can be done concurrently
3. For each job, list the estimated amount of time needed to complete the job.
4. List who is responsible for completing each job.

Option-42

**MPS 6: Analysis: classification Decide**

Try #F10 Pareto plots Search for the 20% that causes the 80%.

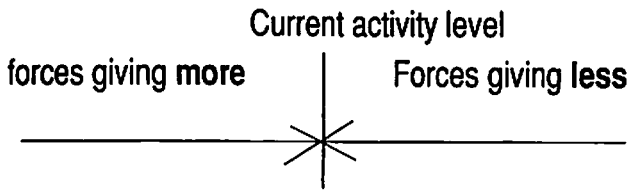
**Activity** For the steel mill data, create a Pareto plot.

TIME \_\_\_\_\_

Option-45

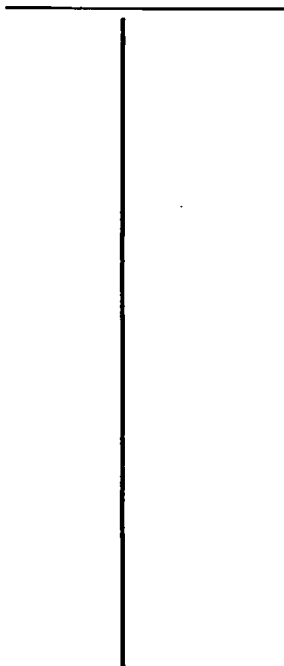
**MPS 6: Analysis: classification Plan actions & focus**  
Try #F11 Force field diagram

1. Identify the current situation of concern  
"I want to watch less TV" & represent this as a vertical line.
2. List factors that cause you to do more or that promote. Show these as horizontal lines with a separate line for each.
3. Horizontal arrows in the opposite direction are shown for factors that cause you to do less or that inhibit or oppose the activity.
4. Continue until you have a rich set of options driving the current situation in either direction.



Option-47

**MPS 6: Analysis: classification Plan actions & focus**  
Try #F11 Force field diagram



Option-49

**MPS 6: Analysis: classification Plan actions & focus**  
Try #F11 Force field diagram

<b>Activity:</b> as an individual, do a force field analysis of _____
TIME _____

Discuss neighbor

- I want to reduce my anxiety when I write exams
- I want to develop a study plan
- I want to find a summer job
- I want to watch less TV
- I want to \_\_\_\_\_

Option-48

**MPS 6: Analysis: classification Be complete**

Try #T7 Checklists

*Example:* for time management

1. Phone Jake
2. Solve homework
3. Plan weekend
- 4.....

Option-50

MPS 6: Analysis: classification **Be Complete**

Try #T9 Creativity triggers.

Rationale: whenever a brainstorming session alters, we need to bring in a new perspective to restart the flow of ideas. We call these triggers.

Many such checklists have been created. See MPS 7.

Here is **SCAMPER**

**S** substitute, who? What? When?

**C** combine purposes? Appeals?

**A** adapt copy, use similar idea with twist

**M** modify; change size, shape, location?

**P** put to other, substitute who else instead?

**E** eliminate; minimize

**R** reverse or rearrange; interchange

Option-52

MPS 6: Analysis: classification **Be complete**

Try #T10 & 11 For situation

complete:

	IS	IS NOT
Who		
What		
When		
Where		
Why		
How		

Apply: p 603 Use 605 TIME \_\_\_\_\_

Option-54

MPS 6: Analysis: classification **Be complete**

Try #T10

*Purpose:* to define problems; to see things from other perspectives, to be complete

*Try as Basis of classification:*

5W's & H:

who, what, where, when, why & how

combine with #T11

IS & IS NOT

Use a table to keep us organized & systematic

Option-53

MPS 6: Analysis: classification **Be complete**

Try #T12 Use checklist

When anticipating safety, environmental hazards on a process, consider many potentially hazardous events that might occur. To Be Complete use checklist

**H AZOP**

Consider

- none, no or not
- more of
- less of
- more than or As well as
- part of
- reverse
- other than

Option-55

**MPS 6: Analysis: classification You select**

**Activity: RCMP Identikit**  
You are to analyze the human male face, front view and classify the parts. Assume a white Caucasian. The purpose is to create an identikit that can be used to create a view when an artist is not available. For each part, estimate the number of options you think you would need.

**TIME** \_\_\_\_\_ **Finish by** \_\_\_\_\_

**MPS 6: Analysis: classification Smith & Wesson**  
**Tops 230**  
**Bottoms & ears: 31**  
**Eyes: 109**  
**Eye brows: 16**  
**Mouths: 37**  
**Noses: 34**  
**Additions: Glasses 27; hats, 39; Facial tones 12**  
**Beards 24**

**Feedback:**

Option-57

**MPS 6: Analysis: classification Facts vs Opinions**

Apply definitions to classify information:

Use whatever technique you want:

We often confuse the value of information with whether it is **fact** or **opinion**.

Rule #1: a fact is a fact; this is independent of time, us and our needs

Rule #2: the value of information depends on our needs and our problem.

**Three classes of Facts:**

Class #1 Fact: definition: something capable of being observed. *"Oxygen is a colorless, odorless gas which bursts into flames when ignited."*

Class #2 Fact: Conclusions correctly drawn from the observations: *Because the gas was colorless, odorless and burst when ignited, I conclude that the gas is oxygen.*

We must have sufficient steps in the argument, sufficient Class #1 facts and correct logic..

Option-59

Option-58

**MPS 6: Analysis: classification Facts vs Opinion**

Class #3 Fact: Quotation marks indicating that this is an accurate statement of what someone said or wrote. John said, "It's a cold day today." Class #1 fact might be that the temperature is 20C. Many of us might interpret this to be a warm day. Nevertheless Class #3 fact is that John said "It's a cold day today". Just because someone writes something or says something **does not** make it a class #1 or #2 fact.

Everything else is opinion.

Example *John said that it was a hot day.* Is opinion. We really do not know for sure exactly what John said.

Opinionated fact: A factual statement is made but the author also includes opinion. The modifiers can express significance, "incidentally," "only" value (good or bad) a generalization (use of "All.. Everybody knows...", the verb "to be", or emotive phrases "everyone should accept that the temperature is 45C. " Obviously" "It stands to reason.."

Option-60

MPS 6: Analysis: classification Fact vs opinion.

	#1	#2	#3
John said "The gauge reads 200 kPa."	Y		Y
John said "The pressure is 200 kPa."	N		Y
John said that the pressure gauge reads 200 kPa.	Y		N
John was surprised that the gauge reads as high as 200 kPa.	Y O-F		N
John said "The pressure gauge reads 200 kPa, the gauge was calibrated yesterday, the pressure tap is clear. If I increase the pressure slightly, the gauge reading increases slightly. I conclude that the pressure is 200 kPa."	Y	Y	Y

Option-61

MPS 6: Analysis: classification Facts vs opinions

General observations about facts:

- Communicating just the facts is boring.
- We usually want to hear opinion.
- We usually want to give opinion.

First aid, so what? :

State the Class #1 facts and then add your opinion.

State the Class #1 facts, then add a qualifier...

"The gauge reads 200 kPa, if that is the pressure then...."

Reflections:

TIME \_\_\_\_\_

Option-63

MPS 6: Analysis: classification Fact vs Opinion

**Activity:** as \_\_\_\_\_  
for task p. 604 Identify  
Class #1 Facts: raw data  
Class #2 Facts: valid conclusions  
Class #3 Facts: direct quotations  
include such clarification as Class #3 Facts of Opinion; .... of Class #1 Facts etc.

TIME \_\_\_\_\_

Discuss neighbor TIME \_\_\_\_\_

**Activity:** based on the scenario, consider the 10 statements, are they True? False? Cannot tell?  
p 604 as Individuals \_\_\_\_\_

TIME \_\_\_\_\_

Option-62

MPS 6: Analysis: classification Be complete

Try #T13 How to read a paper. Apply checklist and definitions of facts, opinions and opinionated facts. Also apply logic and reasoning from MPS 30.

Checklist:

1. Identify the **goals**: what was the purpose?

2. Identify the **conclusions**: Sort them into

new conclusions: new conclusions previously unknown

confirmation of past conclusions: prove what we already know from previous publications?

refutation of past conclusions: disprove what others claimed

3. Identify the **evidence** supplied: use fact vs opinion to identify Class #1 and Class #2 facts.

Do cross checks between tables of data, graphs of data: are they consistent?

Check the Class #3 facts: has the author quoted and interpreted the previous publications correctly?

4. Does the evidence support the conclusions?

Option-64

**Return to pretest: Use a circle to summarize your rating of your Awareness Skill**  
**Time 10 s**

**The Objectives are:...**