

Problem Solving Courses

Academic Learning Centre



**University
of Manitoba**



TRADITIONAL TERRITORIES — ACKNOWLEDGEMENT —

The University of Manitoba campuses are located on original lands of Anishinaabeg, Cree, Oji-Cree, Dakota, and Dene peoples, and on the homeland of the Métis Nation.

We respect the Treaties that were made on these territories, we acknowledge the harms and mistakes of the past, and we dedicate ourselves to move forward in partnership with Indigenous communities in a spirit of reconciliation and collaboration.

How to Study for Problem Solving Courses?

Exercise: Think of one skill or talent that you have developed in the course of your life.

(ex: piano, dance, sports, juggling, or playing chess).

Exercise: How did you develop that talent?

How to Get Started?

Common mistakes include:

1. Spending too much time reviewing the textbook, notes, or previously solved problems.
2. Trying to solve problems without understanding concepts.

Preparation for Problem Solving

Review course outlines, textbooks, and notes in order to:

1. Develop a basic understanding of concepts
 - ex: What are the features of a five number summary?
 - ex: What are some fundamental principals of Chemical bonding?
2. Learn the required procedural knowledge
 - ex: What steps are required to calculate a 5 number summary?
 - ex: What steps are required to build a Lewis Structure?
3. Make decisions and choose practice problems for review
 - review the methods of previously solved sample problems
 - choose a variety of similar problems for further practice

Five Number Summaries

1. What are the features of a five number summary?

(minimum, first quartile, median, third quartile, and maximum)

2. What are the steps required?

(110, 135, 133, 145, 120, 150, 166, 289, 100)

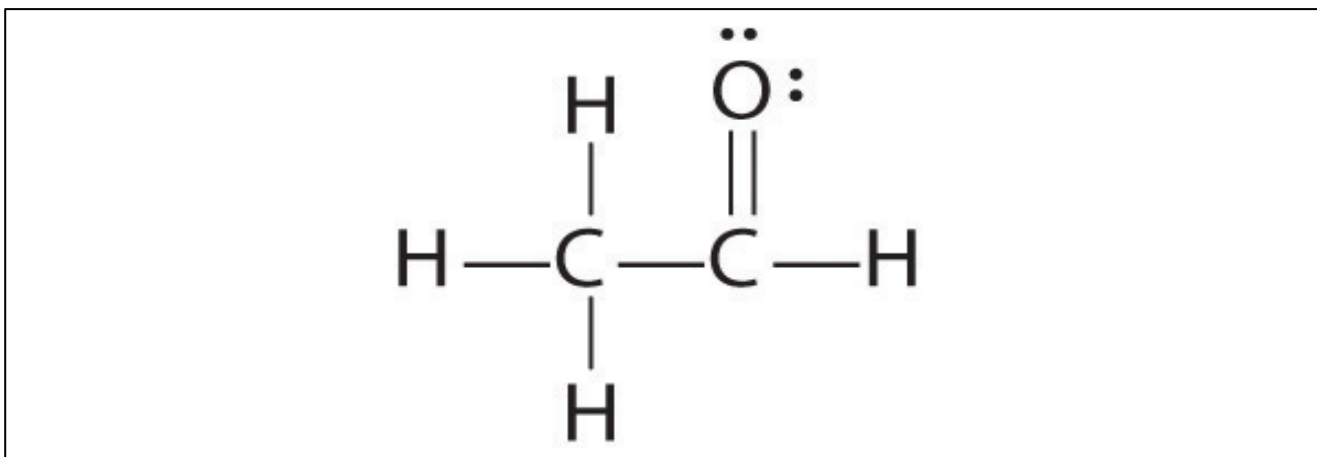
$$\frac{N + 1}{2}$$

1. Put you data in order
2. Identify the minimum and maximum
3. Identify the median
4. Find the quartiles

3. Look for some data sets so that you can practice creating a five number summary

Building Lewis Structures

1. What are the conventions for building Lewis Structures?
(atoms, valence electrons, single bonds, double bonds, triple bonds)
2. What are the steps for drawing a Lewis Structure?



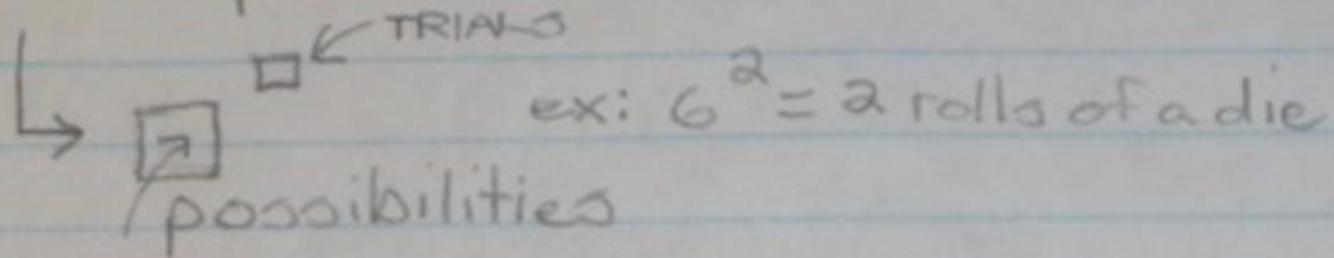
3. Can you draw the Lewis Structure for ***diethylamine***?
acrylonitrile?

Unit 5 – Extra Problems

1. A random variable X has a uniform distribution on the interval 9 to 14.
 - (a) What must be the height of this distribution in order for it to be a valid density function?
 - (b) Determine the following:
 - i) $P(X > 12)$
 - ii) $P(X \leq 13.4)$
 - iii) $P(10.3 < X < 11.8)$
 - (c) Determine the value of b such that the following is true.
 - i) $P(b < X \leq 12.4) = 0.52$
 - ii) $P(9.1 \leq X \leq b) = 0.9$
 - (d) What is the value of the first Quartile?
 - Recognize the importance of the tetrahedral shape in molecules.
 - Use the VSEPR model to predict the shapes of molecules with steric numbers 2, 3, 4, 5 and 6.
 - Understand the factors that influence bond angles, lengths and energies.

NOTES TO SELF:

- ① Read Table A carefully
- ② Draw and visualize
- ③ Don't confuse \hat{p} with p
- ④ Use exponential rule



Interleaving

Alternating between different types of problems

- improves test scores
- discriminate between ideas
- simulates testing environment



<http://creativecommons.org/licenses/by-nc/2.0>

Blocked Practice

Linear

Polynomial

Cubic

Quadratic

Linear
Linear
Linear
Linear

Polynomial
Polynomial
Polynomial
Polynomial

Cubic
Cubic
Cubic
Cubic

Quadratic
Quadratic
Quadratic
Quadratic

Interleaved Practice

Linear

Polynomial

Cubic

Quadratic

Linear
Cubic
Quadratic
Polynomial

Quadratic
Polynomial
Cubic
Linear

Cubic
Linear
Polynomial
Quadratic

Polynomial
Quadratic
Linear
Cubic

Anticipate Difficult Problems

- Hidden information
- Conversion of units
- Reverse order of steps
- Unnecessary information
- Preliminary calculations required

Focused and Diffuse Thinking

Focused Thinking

- attentive and engaged
- analytical and detail oriented

Diffuse Thinking

- at rest and relaxed
- big picture solutions

Formulate Specific Questions

Ex: I don't understand how to use the VSEPR model?

Ex: Can you explain Molecular Orbitals?

Ex: What am I doing wrong when it comes to problem 15.1.4?

Academic Learning Centre Services



Workshops and
Presentations



Supplemental
instruction (SI)



One-to-
One
tutoring



Tutor
training
program



Website
resources

Academic Learning Centre
academic_learning@umanitoba.ca
204-480-1481

References

- Fleet, J., Goodchild, F., & Zajchowski, R., (1999). *Learning for Success: Effective Strategies for Students*. Scarborough, Ontario. Nelson Thomson Learning.
- Oakley, B. (2014). *A Mind for Numbers*. New York: Tarcher Perigree.
- Rohrer, D. (2012). Interleaving helps students distinguish among similar concepts. *Educational Psychology Review, 24*(3), 355-367. doi:10.1007/s10648-012-9201-3