PRINCIPLES OF MATHEMATICS 12

COGNITIVE LEVELS

*The following three cognitive levels are based on a modified version of Bloom's taxonomy (*Taxonomy of Educational Objectives*, Bloom* et al.*, 1956). Bloom's taxonomy describes five cognitive domains: Knowledge, Understanding and Application, Analysis, Synthesis, and Evaluation.*

Knowledge

Knowledge questions emphasize the recognition or recall of terminology, specific facts, conventions, classifications, and notation.

Understanding and Application

Lower-Level Understanding and Application questions may require students to recognize a correct answer after performing a single computation, to substitute values into a given formula, or to identify specific characteristics of a graph or diagram.

Included at *Higher-Level Understanding and Application* are questions that may require students to form and solve equations, manipulate expressions, or produce or interpret a graph or diagram.

Higher Mental Processes

Included at this cognitive level are the processes of analysis, synthesis, and evaluation.

Analysis involves the ability to recognize unstated assumptions, to distinguish facts from hypotheses, to distinguish conclusions from statements that support them, to recognize which facts or assumptions are essential to support an argument.

Synthesis involves the production of a unique communication, the ability to make generalizations. Students may be required to apply concepts from several topics to a novel situation, or to identify and solve sub-problems that lead to a final solution.

Evaluation includes making judgements about the value of ideas, solutions, and methods. It involves the comparison of various methods of solution, the justification of results by presenting a clear argument, and the identification of logical fallacies in arguments.

Questions at the higher mental processes level subsume both *knowledge* and *understanding and application* levels.