Methods:

5. **Applying**: An applying question is solved by using a known procedure, perhaps altered to be tailored to the given situation, but not altered to the point of drawing on other knowledge. Further, we include in this category tasks involving checking conditions in a definition or theorem.

4. **Analyzing**: A question at the analyze level is solved by interpreting the question in terms of knowledge gained in the course and adapting the relevant knowledge to the given question. Analyze questions are often novel questions, or are known situations phrased in novel ways.

5. **Evaluating**: An evaluating solution requires students to judge the veracity of a statement by drawing on their prior knowledge and to support this judgment with justification (e.g. stating relevant results or providing a counterexample).

6. **Creating**: Solutions to questions at the creating level involve synthesizing extant or newly-formed results into a new, coherent product.

Operationalized Level Definitions:

1. **Remembering**: The expected student response to a question at the remembering level is a statement of what was recalled without further interpretation or application.

2. **Understanding**: A response to an understanding question would be an interpretation or reformulation of information given in the question without integration with other knowledge.

3. **Applying**: Applying is solved by using a known procedure, perhaps altered to be tailored to the given situation, but not altered to the point of drawing on other knowledge.

**Second Stage**: Final Exam Rating

- Based on the cognitive level descriptions and operationalizations, two raters (the authors) categorized the problems on 15 final exams from the April 2014 session in UBC Math. The set was comprised of four 100-level exams, five 200-level exams, and six 300/400-level exams.

- Inter-rater reliability is 74% (based on proportion of exam points that received identical classifications).

- Problems that were not categorized identically were resolved by discussion and agreement between the raters.

**Future Work**:

- Develop a tool similar to Casagrand and Semsar’s “Bloom’s Dichotomous Key,” for quickly and consistently categorizing mathematics problems

- Categorize the problems on a larger, more representative set of final exams (possibly ALL exams from the 2013-14 academic year).

- Examine the constraints and decision-making process by which instructors choose their final exam problems. If there is a larger proportion of higher-level problems on 300/400-level exams, why?

**References**:
