Algebra I ECA

Depth of Knowledge PowerPoint
Depth of Knowledge

• Depth of knowledge can vary on a number of dimensions, including
  – level of cognitive complexity of information students should be expected to know,
  – how well they should be able to transfer this knowledge to different contexts,
  – how well they should be able to form generalizations, and
  – how much prerequisite knowledge they must have in order to grasp ideas.

Depth of Knowledge

• The depth of knowledge required by an expectation or in an assessment is related to
  – the number of connections of concepts and ideas a student needs to make in order to produce a response,
  – the level of reasoning, and
  – the use of other self-monitoring processes.

## Depth of Knowledge vs. Bloom’s Taxonomy

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Adapted from Wyoming School Health and Physical Education Network (2002)
Depth of Knowledge Level 1 (Recall)

• Recall of information such as a fact, definition, term, or a simple procedure

• Performing a simple algorithm or applying a formula.
  – A one-step, well-defined, and straight algorithmic procedure should be included at this lowest level.

• Other key words that signify a Level 1 include “identify,” “recall,” “recognize,” “use,” and “measure.”

• Verbs such as “describe” and “explain” could be classified at different levels depending on what is to be described and explained.

• What is the slope of the graph of $y = 3x - 2$?

• Simplify $(2x^2 + 5x - 1) + (x^2 + 8)$.
Depth of Knowledge
Level 2 (Skill/Concept)

• The engagement of some mental processing beyond an habitual response
• Requires students to make some decisions as to how to approach the problem or activity
• Keywords that generally distinguish a Level 2 item include “classify,” “organize,” ”estimate,” “make observations,” “collect and display data,” and “compare data.”
  – These actions imply more than one step.

• Solve $-3x + 5 = \frac{1}{2} (14x + 6)$.
• Solve the system of equations below.
  \[3x - 2y = -7\]
  \[-3x + y = 11\]
• Megan bought 7 charms for $31.50. Each charm costs the same amount of money. Write an inequality that can be used to find the maximum amount of charms Megan can buy with $75. What is the maximum amount of charms Megan can buy with $75?
• Graph $y = x^2 + 4x + 1$. 
Depth of Knowledge
Level 3 (Strategic Thinking)

• Requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels.

• Cognitive demands are complex and abstract.

• An activity that has more than one possible answer and requires students to justify the response they give would most likely be a Level 3.

Consider the statement: “For any rational number \( n \), \( n \) squared is always greater than \( n \).” Give a value of \( n \) that is a counterexample to the given statement.

The height of a certain insect, in feet, that jumps straight up into the air is modeled by the equation \( h = -16t^2 + vt \), where \( t \) is the time in seconds after the insect jumps, and \( v \) is the initial upward velocity of the insect.

Write an equation that can be used to find the height \( h \) of this insect, in feet, after \( t \) seconds if the insect’s initial upward velocity is 4 feet per second.

How many seconds will it take for the insect to hit the ground after it jumps?
Depth of Knowledge
Level 4 (Extended Thinking)

• Requires complex reasoning, planning, developing, and thinking, most likely over an extended period of time.
• The cognitive demands of the task should be high and the work should be very complex.
• Students should be required to make several connections—relate ideas within the content area or among content areas—and have to select one approach among many alternatives on how the situation should be solved, in order to be at this highest level.

Suggestions for the Classroom

• Assign the right amount of “routine” homework with 1 to 2 high level questions

• When practicing a skill in class, post high level questions on the chalkboard

• Problem of the Week (POW)
  - Resources: Textbooks, Test Generators, Dept. Meetings, Internet, etc.

• Have students explain how to solve POWs and other high level questions