

Examples of Activities that Promote Higher Order Thinking

Examples of Activities: Science

Apply a Rule: The student could be asked to explain why a shotgun "kicks" when fired. His response would include a statement to the effect that for every action there is an equal and opposite reaction (Newton's Law of Motion), and that the "kick" of the shotgun is equal to the force propelling the shot toward its target. The faster the shot travels and the greater the weight of the shot, the greater the "kick" of the gun.

Classify: Given several examples of each, the student could be asked to classify materials according to their physical properties as gas, liquid, or solid.

Construct: The student could be asked to construct a model of a carbon atom.

Define: Given several types of plant leaves, the student could be asked to define at least three categories for classifying them. NOTE: Defining is not memorizing and writing definitions created by someone else -- it is creating definitions.

Demonstrate: Given a model of the earth, sun, and moon so devised that it may be manipulated to show the orbits of the earth and moon, the student could be asked to demonstrate the cause of various phases of the moon as viewed from earth.

Describe: The student could be asked to describe the conditions essential for a balanced aquarium that includes four goldfish.

Diagram: The student could be asked to diagram the life cycle of a grasshopper.

Distinguish: Given a list of paired element names, the student could be asked to distinguish between the metallic and non-metallic element in each pair.

Estimate: The student could be asked to estimate the amount of heat given off by one liter of air compressed to one-half its original volume.

Evaluate: Given several types of materials, the student could be asked to evaluate them to determine which is the best conductor of electricity.

Identify: Given several types of materials, the student could be asked to identify those which would be attracted to a magnet.

Interpret: The student could be asked to interpret a weather map taken from a newspaper.

Locate: The student could be asked to locate the position of chlorine on the periodic table. NOTE: To locate is to describe location. It is not identification of location.

Measure: Given a container graduated in cubic centimeters, the student could be asked to measure a specific amount of liquid.

Name: The student could be asked to name the parts of an electromagnet.

Order: The student could be asked to order a number of animal life forms according to their normal length of life.

Predict: From a description of the climate and soils of an area, the student could be asked to predict the plant ecology of the area.

Solve: The student could be asked to solve the following: How many grams of H₂O will be formed by the complete combustion of one liter of hydrogen at 70 degrees C?

State a Rule: The student could be asked to state a rule that tell what form the offspring of mammals will be, i.e. they will be very similar to their parent organisms.

Translate: The student could be asked to translate 93,000,000 into standard scientific notation.

Examples of Activities: Mathematics

Apply a Rule: Given a pair of equations such as $2 + 4 + 7 = 13$, and $7 + 2 + 4 = \underline{\quad}$, the student could be asked to apply a rule that would give him the solution to the second equation of the pair without adding the factors. His response should include a statement to the effect that the same numbers are to be added in each equation, but in different order (analysis) and that the order of addition makes no difference in the solution of the equations. Therefore, the sum of both equations is the same.

Classify: Given a series of numbers drawn at random from 1 - 1000, the student could be asked to classify them into categories of even divisibility by 2, 3, 4, and so on.

Construct: Given a straight edge, compass, and paper, the student could be asked to construct an equilateral triangle.

Define: Given an assortment of various kinds of coins, the student could be asked to define some categories into which the coins could be classified. His response would include definitions such as, "All of the pennies, all of the nickels, all of the dimes, etc., could be put in separate piles. Or all the coins containing silver could be put in one pile and those that don't into another pile."

Demonstrate: Given a sufficient number of concrete objects and an equation such as $3 \times 4 = 12$, the student could be asked to use the objects to demonstrate that multiplication is repeated addition. His response would include placement of twelve objects in three groups of four each or four groups of three each. He may also be asked to describe how the demonstrations show repeated addition.

Describe: The student could be asked to describe a method of determining a number of groups of five objects in a collection of 45 objects. The response would include a statement that groups of five members would be counted out and then the number of groups could be counted. The student *may* also be asked to demonstrate the process he described.

Diagram: The student could be asked to graph the equation $y = 2x^2 - x + 3$.

Distinguish: Given pairs of numbers, one number of each pair a prime number, the student could be asked to identify the prime number in each pair.

Estimate: Given multiplication examples with three-digit numerals in both the multiplier and multiplicand, the student estimates the products to the nearest thousand.

Identify: The student could be asked to point to the numeral ninety-four on a numeration chart.

Interpret: Given a bar graph showing the per unit cost of food products when purchased in various size packages, the student interprets it by stating the lowest and highest per unit cost and by describing the relationship between increased package size and per unit cost of the product.

Locate: The student could be asked to locate a particular desk in his classroom by stating the row it is in and the ordinal position from the front of the room. "John's desk is the fourth one from the front, in the second row, from the east wall."

Name: What is the name of this collection of objects? Answer: "A set." What is the name of this type of equation? Answer: "A quadratic equation."

Order: Given a number of objects of different lengths, the student orders them from lesser to greater length.

Predict: The student could be asked to predict the next term in an increasing arithmetic series such as 2, 5, 9, 14 _____.

Solve: The student could be asked to solve the following: $2 + 3 = \underline{\quad}$. In this example, the type of operation is clearly indicated. Or, he could be asked to solve the following: "Jimmy, John, Bill, and Sam each had three marbles. John gave Bill two of his marbles. How many marbles did Jimmy and Sam have together then?" In this example, the operation to be performed is not specified, and extraneous factors are introduced.

State a Rule: In response to the question: "Why is the sum of two numbers no different if the order of adding them is reversed?" The student answers: "Because of the commutative principle," or "Because the order makes no difference in addition."

Examples of Activities: Social Studies

Apply a Rule: Given population data that illustrates the principle that the standard of living decreases if population increases without corresponding increase in production, the student could be asked to analyze the data to tell and tell how he is able to determine what effects changing population will have upon the standard of living.

Classify: Given photographs of various people and definitions of racial classes, the student could be asked to classify the photographs according to the races of the people portrayed.

Construct: Given appropriate materials, the student could be asked to construct a model of a city water system.

Define: Given a filmed or taped situation in which several forms of communication are portrayed, the student could be asked to define several categories of communication. His response could include definitions for verbal, non-verbal, pictorial, visual, auditory, or any of several other classes or categories of communication.

Demonstrate: The student could be asked to demonstrate the use of calipers to determine the measurements for obtaining cephalic indices. Or he could be asked to demonstrate use of a compass to determine direction.

Describe: The student could be asked to describe the culture of a particular Indian tribe.

Diagram: The student could be asked to diagram the steps involved in the passage of a bill through the legislature.

Distinguish: Given the names of ancient Greek and Roman gods paired according to function, the student could be asked to distinguish between them.

Estimate: Given the day of the year and the latitude, the student could be asked to estimate the length of daylight at a particular place.

Identify: Given the name of one of the U.S. presidents, and photographs of several, the student could be asked to identify the picture of the one which was named.

Interpret: Given a bar graph that shows production of steel in the U.S. during the last fifty years, the student could be asked to interpret the graph. His response could include references to times of production increases or decreases, total amount of decreases or increases, and differences in production between the years.

Locate: The student could be asked to locate, in time, the first battle of the American Revolution.

Measure: Given a string and a globe with a scale of miles, the student could be asked to measure the scaled distance between any two given points.

Name: The student could be asked to name the factors that contribute to natural population increases.

Order: Given the names of the declared wars in which the U.S. has engaged, the student could be asked to order them according to the time of occurrence.

Predict: The student could be asked to predict the type of economy that could be supported in described geographic regions.

Solve: Given tables of prices and costs, the student could be asked to solve problems related to the law of diminishing returns.

State a Rule: In response to the question: "What controlled the inheritance of family property in the European Middle Ages?" the student would respond with a statement that indicated that property was inherited by the eldest son.