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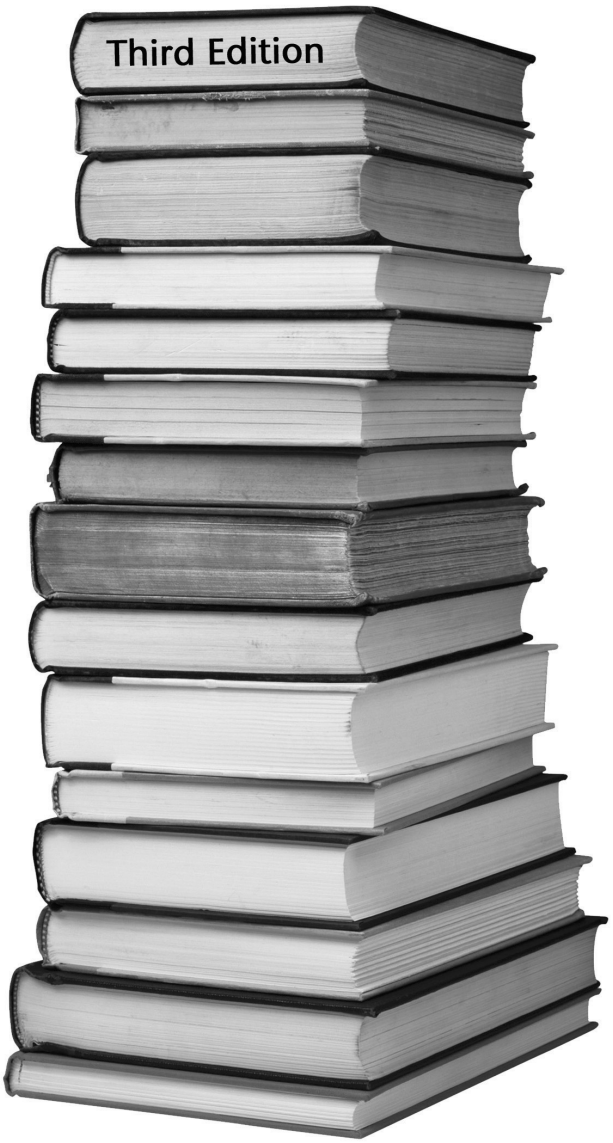
# Critical Thinking
## Readings in Nonfiction

## High School

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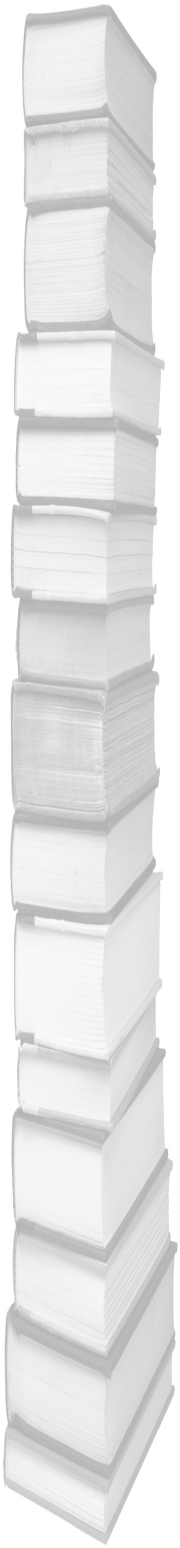
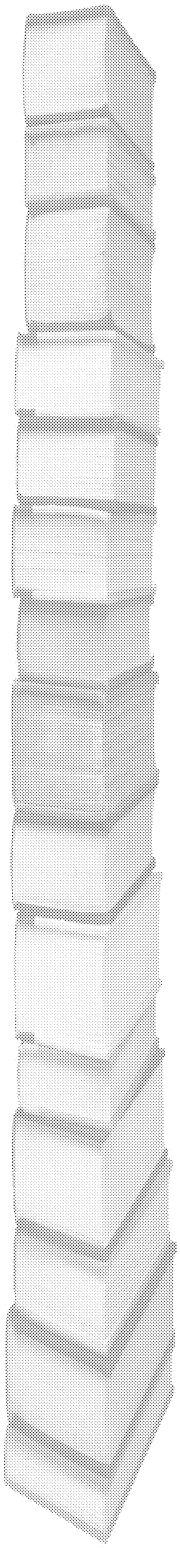


# Identifying Similarities Among People, Objects, Ideas, and Events



Everything you recognize in the world is known to you by its qualities or characteristics. You recognize your dog by its bark, size, color, and habits. Other animals, people, and objects also have distinctive physical properties and behaviors that allow you to recognize and remember them. Each of them is unique in certain ways. In addition, they may share certain attributes with other animals, people, and objects and be classified into groups.

Most of the knowledge we acquire comes through our senses. We have invented enormous numbers of adjectives, adverbs, and other parts of speech, particularly gerunds and participles, to describe the things we observe. Helen Keller's life story illustrates convincingly how broadening personal experiences and a growing command of language can transform a sterile, bitter existence into a life of exciting, productive adventures. At 19 months of age, Helen Keller was struck by an illness that left her unable to hear, speak, or see. In this condition, her failure to make herself understood caused her to fly into wild rages. She would fling herself to the ground, scream uncontrollably, and strike people who came near her. In her more rational moments, however, she would try to use motions to communicate. To ask for ice cream, she would turn a handle on an imaginary freezer. For bread and butter, she would go through the motions of cutting and spreading. She pretended to put on glasses when she wanted to refer to her father.

The turning point for Helen was the day her teacher helped her associate sensations and words. Miss Anne Sullivan took her to the pump house and drew some water. As it flowed into a mug and over the child's right hand, she spelled w-a-t-e-r into the other hand. With the spelling coming so closely upon the sensation of cold water rushing over her hand, Helen dropped the mug and stood transfixed. A new light came into her face. She returned to the house in a fever of excitement, touching everything as she moved, visibly seeking their names. Within the space of a few hours, she had added 30 new words to her vocabulary. From that point on, her education moved with lightning speed. As Helen and her teacher traveled, Miss Sullivan would spell into her hand fluent descriptions of passing scenes—the hills and rivers, hamlets and towns, the way people looked and what they wore.

Those of you who are familiar with Helen Keller's incredible life story know that she became known and admired throughout the world. She made speaking tours and films and wrote books that were translated into dozens of languages as well as Braille. The important thing to note here, however, is that the association of sensations and words made a world of knowledge accessible to this remarkable woman.

Very young children recognize people through their physical

attributes, voice qualities, and mannerisms. By the time students have reached high school, however, they have learned to compare people, objects, ideas, and events in an enormous number of ways. They can associate these things with various times and places (for example, the Colonial period or the polar regions); they can categorize them according to cost or value; and they can judge them by their own standards (to decide whether they are beautiful, good, or just, for instance). In addition, they can compare the people and events with accepted cultural norms and decide whether they are odd, foolish, wise, mundane, memorable, callous, thoughtful, treacherous, heroic, and so forth.

You and your dog see many of the same people and objects within your home and its surroundings. However, your rich storehouse of words, concepts, and meanings allows you to comprehend dimensions of thought and reason that are light-years beyond anything your dog can contemplate.

We compare people, objects, ideas, and events in an enormous number of ways. For the purposes of the brief exercise below, however, we will compare them on the basis of

a. behaviors or mannerisms;
b. physical characteristics or properties;
c. uses or functions;
d. material value or cost.

For example, what do the following have in common? *Swords, bows and arrows, nuclear weapons, rifles.* These can best be compared on the basis of function. They are used in warfare. They don't behave the same way, look alike, or cost the same amount of money.

Decide what characteristics from the list these things have in common, and write your answer on the line.

1. Animals belonging to this group have pouches. These animals can best be compared on the basis of

   _____ .

2. Huge diamonds, large yachts, elaborate estates. These items can best be compared on the basis of

   _____ .

3. Allspice, pepper, cloves, mint leaves, salt. These items can best be compared on the basis of

   _____ .

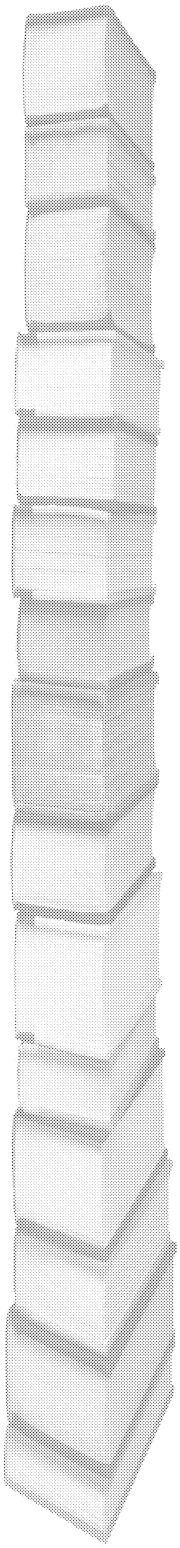
4. Tents, apartments, cottages, igloos. These dwellings can best be compared on the basis of

   _____ .

5. In the northern regions, animals often develop heavier coats of fur and store food just prior to the winter months. These animals can best be compared on the basis of

   _____ .

# The Unusual Life Cycles of Animals



If you happened to see a cicada (si KAY duh) laying her eggs in the bark of a tree when you were 10 years old, it is likely that you would be grown up before you saw those eggs changed into adult insects. The explanation is simple. The most common cicada is known as the 17-year locust. This strange creature lays 400 to 600 eggs in the bark of trees in the spring and early summer of the year. The eggs hatch in six to seven weeks. Small worms, or larvae, crawl out of the eggs and drop to the ground. They burrow under the soil and live on sap, which they drink from the roots of plants. In exactly 17 years, they return to the surface of the ground, where they are transformed into adult insects with dark brown bodies and glistening eyes.

If you were present when the cicadas returned to the surface, you might think that the earth was being swallowed up by mysterious creatures. As many as 40,000 17-year locusts may come out from under a single tree all at once! They climb on nearby bushes and trees. Sometimes you can hardly see the bushes because of all the cicadas! Fortunately, these adult cicadas do not stay with us very long. They live from 30 to 40 days. It is during this brief adult life that they lay eggs and start the whole 17-year life cycle over again.

Can you imagine swimming upstream for 3,200 kilometers (1,900 miles) or jumping over 3-meter-high (10-foot-high) rapids? These tasks would be impossible for most living things, but not for the adult salmon.

The Atlantic salmon begins its life in fresh water. When the brook or stream is no longer suitable, it swims to the ocean. There the salmon stays till it is full grown and ready to spawn.

To lay its eggs, the salmon must leave the ocean and return to the freshwater in which it was born. This often requires a trip of almost 2,000 miles against the river's flow. Salmon are famous for their perseverance on this trip. Almost nothing can stop them.

At the end of the trip, the female lays from 2,000 to 10,000 eggs. The male fertilizes them. During this whole time, the salmon do not eat. They live off body fat.

Worn out from the struggle, the salmon again try to go downstream to the ocean. On the way they may be caught by bears, beavers, or people fishing along the shore. If they do complete the journey to the ocean, they may return to the brook next spring.

The life cycles of cicadas and the Atlantic salmon are very different. On the lines provided, write your answer to each question comparing these animals.

1. Which has the shorter adult life span? _____
2. Which faces the greater number of dangers as an adult? _____
3. Which lays more eggs? _____
4. Which travels greater distances? _____
5. Which may have more than one opportunity to lay eggs? _____
6. Which has the longer total life span? _____
7. Which of these is of more benefit to people? _____
8. Which of these creatures exhibits the greater strength? _____
9. Which of these two living forms goes through more stages in its life cycle?

   _____

## *Challenge Questions*

1. Which of these creatures do you think scientists can more easily study?

   _____

   Explain your answer. _____

   _____

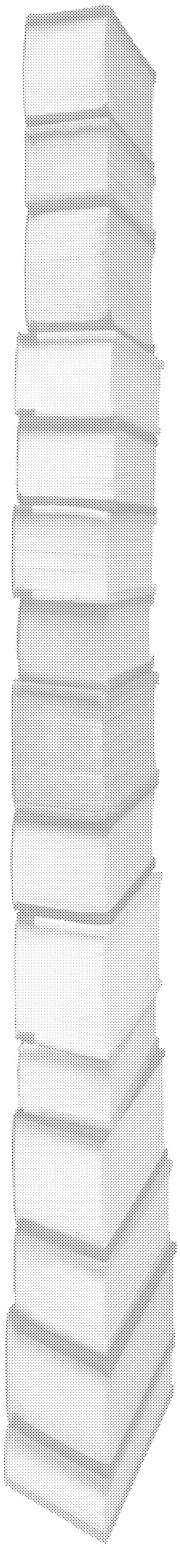
2. Are cicadas and salmon most alike in behavior, physical characteristics, cost, or function?

   _____

   Explain your answer. _____

   _____

# Amazing Insect Societies



Do insects think? Entomologists and other scientific observers of ants, termites, and bees say that insects at least appear to think. A half-dozen ants pushing a leaf toward an anthill can normally maneuver the leaf over obstacles to the correct destination.

As ants construct a hill, they appear to be living computers. For example, at a certain stage in hill construction, twigs are needed, and the ants rush madly about for twigs of the right size. As these tiny construction engineers progress to outer walls, another size twig is needed. As if each had received new orders, all of the workers hunt for the new-size twig. If the arrangement of twigs is disturbed, hundreds of ants will work together to reconstruct the framework.

If two or three termites pick up pellets and move them around, other termites will join in, and soon pellets are put on top of each other until there is a column. This soon arches and meets a column being constructed by another crew. The joining of the columns is perfect! How do the termites manage it?

Bees have teams of workers to do specific tasks. Those who tend maturing eggs and larvae, for example, work closely together. Who instructs them? How do they coordinate their efforts so meticulously and precisely? After a worker bee cares for larvae, it starts producing wax and building honeycomb cells. The bee only produces wax while it is constructing the cells. When the hive needs repairing, worker bees go to certain trees and collect "bee glue" to repair the hive's cracks. How do they know to do this?

These activities are not significantly different from our own construction organizations. A leader in one of our cities may want to build a new community center. Other people are consulted, and soon many workers are organized into teams, each group working on one phase of the building project. These groups are called carpenters, electricians, plumbers, and so on. They communicate through speech and writing, but how do the insects communicate in getting their projects completed, whether it's an anthill, termite nest, or beehive?

In comparing human engineering with the construction efforts of insects, we can find both similarities and differences. Place a check mark after each of the questions below to indicate which group is the correct answer. Some questions will have two checks. The first one is done for you.

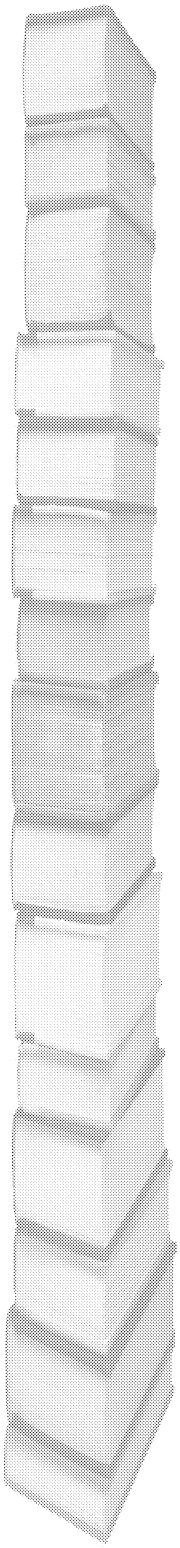
| | Insects | Humans |
|---|---|---|
| 1. Which group(s) (insects or humans) used cooperative building activities? | ☑ | ☑ |
| 2. Which group(s) makes use of specialized workers? | ❑ | ❑ |
| 3. Which group(s) knows enough to use different types of materials in various stages of construction? | ❑ | ❑ |
| 4. Which group(s) has members that use initiative in getting projects started? | ❑ | ❑ |
| 5. Which group(s) makes use of communication between and among workers? | ❑ | ❑ |
| 6. Which group builds more permanent structures? | ❑ | ❑ |
| 7. Which group can carry out the greater variety of tasks? | ❑ | ❑ |
| 8. Which group is more precise and accurate? | ❑ | ❑ |

## *Challenge Questions*

Robots are programmed to carry out specific tasks. How do robots compare with insects? Use check marks below to indicate your answers.

| | Insects | Robots |
|---|---|---|
| 1. Which group(s) (insects or robots) follows patterns in carrying out tasks? | ❑ | ❑ |
| 2. Which group can more easily adjust its activities to other members of the group? | ❑ | ❑ |
| 3. Which will last longer? | ❑ | ❑ |
| 4. Which depends more on human beings? | ❑ | ❑ |
| 5. Which group is more precise and accurate? | ❑ | ❑ |

# Ancient Architectural Wonders



Most of the famous pyramids of ancient Egypt were built over 4,000 years ago. Enormous in size to begin with, ever larger ones were constructed as the Egyptians perfected their techniques. The last of the pyramids towered over the others. Yet, the Great Pyramid is not the largest structure ever built. Both the Great Wall of China and the pyramid at Cholula, Mexico, are larger.

Scientists and architects have marveled over the Egyptian pyramids for many years. They have wondered about how they were designed and constructed. There are a few pictures on the walls of the tombs that help us understand some of the clever methods the ancients developed in constructing these giant memorials to their kings. One scientist, who wrote the book *The Riddle of the Pyramids,* believes that the building of the pyramids provided work for thousands of farmers during the three months of each year when the Nile River flooded the region. The workers came from hundreds of villages and were formed into teams.

The stone for the pyramids was cut from the ground and pulled on wooden sleds across the desert. As the rows of stones became higher, mounds of dirt were piled up near them to form a ramp. The ramps were used in getting stones to the top. Teams of workers had special names, such as "The Vigorous Gang." Surely somebody had to be vigorous to build the Great Pyramid! This huge structure took about 400,000 workers over 20 years to build.

The Great Wall of China winds across the country like a giant stone snake. The wall crosses mountains and rivers. It reaches from the ocean on the east to the desert on the west. It is 2,400 kilometers (1,500 miles) long.

The Chinese began their wall more than 2,000 years ago. They worked on it for hundreds of years in order to keep enemies from invading their country.

At the bottom, the wall is 25 feet wide, and at the top it is 16 feet wide. The sides of the wall are made of stone and brick, and the inside is filled with earth.

Parts of the wall rise as high as a three-story building. All along the wall are tall towers used to watch for approaching enemies. Lookouts can stand in the towers and see for several miles. The road on the top of the wall is wide enough for two wagons to pass.

The Chinese built their wall by hand. If the wall were in the United States, it would stretch from New York to Nebraska. The Great Wall was the only human-made object the astronauts could see from space on their way to the moon!

The pyramids of Egypt and the Great Wall of China were constructed differently, and they served quite different purposes. Answer the questions below by writing *pyramids* or *Great Wall* on the lines.

1. Which of these architectural wonders was made of solid rock? _____
2. Which required the greater amount of material to build? _____
3. Which of these served as a tomb? _____
4. Which required the greater amount of time to construct? _____
5. Which of these marvels served mainly as a line of fortification? _____
6. Which of these architectural wonders is older? _____
7. Which required the more unusual engineering skills? _____
8. Which of these is taller? _____

## Challenge Questions

1. Why is it that scientists are more intrigued with the construction of the pyramids than the building of the Great Wall?

2. Why have architects concluded that the Egyptians developed greater construction skills than the Chinese over the centuries that these structures were built?