

# CS 2104

## Introduction to Problem Solving

# Analogies



*Faryaneh Poursardar*  
*Virginia Tech*

# Analogies

Analogy in communication promotes understanding.

Bad analogies can promote misunderstanding.

Use of analogy in nature supports creative problem solving (mechanical inventions from biological analogy)

I can solve this problem in a way similar to how that problem was solved.

Tunnelling underwater solved through analogy of how worms eat through wood.

Alexander Graham Bell developed the telephone by observing how a light membrane in the human ear caused movement in heavy inner ear bones.

Louis Pasteur discovered that infection in human wounds was caused in a way analogous to fermentation of wine.

# Analogy and Problem Solving

Working analogy problems requires

- Spelling out ideas fully
- Formulating precise relationships of facts
- Developing correspondences between ideas
- Comparing relationships for similarities and differences

These skills are central to all problem solving.

# Simple Analogy Example

*Gills* are related to *fish* as *lungs* are related to *humans*.

Restate:

- *Gills* are used for breathing by *fish*.
  - *Lungs* are used for breathing by *humans*.
- (Where did “used for breathing” come from?)

Define a “relationship sentence”:

\_\_\_\_\_ are used for breathing by \_\_\_\_\_.

# Analogy 1

The key issue in analogy problems is picking the proper relationship sentence.

*Carpenter is to saw as plumber is to wrench.*

- A \_\_\_\_ is a \_\_\_\_.
- A \_\_\_\_ cuts wood with a \_\_\_\_.
- A \_\_\_\_ connects pipes with a \_\_\_\_.
- A \_\_\_\_ uses a tool called a \_\_\_\_.

# Analogy 2

*Stewardess is to airplane as waitress is to restaurant.*

- A \_\_\_\_\_ is a(n) \_\_\_\_\_.
- A \_\_\_\_\_ works in a(n) \_\_\_\_\_.
- A \_\_\_\_\_ gives safety instructions in a(n) \_\_\_\_\_.
- A \_\_\_\_\_ takes care of the needs of customers in a(n) \_\_\_\_\_.

# Analogy 3

*Guitar is to pick as fiddle is to bow.*

- A \_\_\_\_\_ is played with a \_\_\_\_\_.
- A \_\_\_\_\_ is plucked with a \_\_\_\_\_.
- A \_\_\_\_\_ is a \_\_\_\_\_.
- A \_\_\_\_\_ is a musical instrument that may be played with a \_\_\_\_\_.

# Analogy 4

*Fence is to garden as bumper is to car.*

- A \_\_\_\_\_ helps protect a \_\_\_\_\_.
- A \_\_\_\_\_ keeps trespassers out of a \_\_\_\_\_.
- A \_\_\_\_\_ surrounds a \_\_\_\_\_.

Which is the best relationship?



# Analogy 5

20 is related to 10 as 50 is related to 40.

- \_\_\_\_\_ is larger than \_\_\_\_\_.
- \_\_\_\_\_ is ten more than \_\_\_\_\_.
- \_\_\_\_\_ is twice \_\_\_\_\_.
- \_\_\_\_\_ is one-half of \_\_\_\_\_.

# Analogy 6

50 is related to 48 as 67 is related to 64.

- \_\_\_\_\_ is two more than \_\_\_\_\_.
- \_\_\_\_\_ is larger than \_\_\_\_\_.
- \_\_\_\_\_ is smaller than \_\_\_\_\_.

# Define the Relationships

*Mouth is to talk as hand is to grasp.*

6 is related to 2 as 21 is related to 7.

70 is related to 30 as 35 is related to 15.

*Arrive is to depart as find is to lose.*

*Roots are to plant as mouth is to animal.*

*Peacock is to bird as tuxedo is to suit.*

50 is related to 20 as 90 is related to 60.

# Standard Test Analogy Problems

Now we look at the standard form of analogy problems on tests.

- One pair is given, you pick another pair that has the same relationship.
- It helps if you can define a relationship sentence.

# Analogy Problem 1

*Thermometer* is to *temperature* as \_\_\_\_\_ is to \_\_\_\_\_.

- a) telescope : astronomy
- b) clock : minutes
- c) scale : weight
- d) microscope: biologist

# Analogy Problem 2

*Horse* is to *animal* as \_\_\_\_\_ is to \_\_\_\_\_.

- a) cow : milk
- b) farm : pig
- c) oak : wood
- d) saddle : stallion

# Analogy Problem 3

2 is to 6 as \_\_\_\_\_ is to \_\_\_\_\_.

- a) 6 : 2
- b) 12 : 36
- c) 3 : 1
- d) 12 : 60

# Analogy Problem 4

*Pack* is to *wolves* as \_\_\_\_\_ is to \_\_\_\_\_.

- a) alphabet : letters
- b) wheel : spokes
- c) garage : cars
- d) aquarium : fish
- e) murder : crows



# Analogy Problem 5

Same idea, just a different format.

\_\_\_\_\_ is to dollar as year is to \_\_\_\_\_.

- a) money , calendar
- b) penny , century
- c) dime , month
- d) savings , century

# Analogy Problem 6

Try each choice. If the relationships are different, the answer is wrong. If the relationships are unclear, then hold the answer to reconsider.

\_\_\_\_\_ is to *cave* as *car* is to \_\_\_\_\_.

- a) Modern , primitive
- b) Stone , steel
- c) Primitive , modern
- d) Apartment house , horse

# Some Common Types of Analogies

## Contrasts

negligence is to careful as bravery is to cowardice

## Part to whole

keyboard is to computer as trunk is to car

## Part to part

keyboard is to mouse as trunk is to hood

## Activity to result

heat is to warmth as rain is to flooding

# Some Common Types of Analogies

Individual to object

doctor is to stethoscope as painter is to brush

Measure

clock is to time as decibel is to sound

Degree of difference/similarity

cool is to frozen as breeze is to gale

Use

pencil is to write as scissors are to cut

