



JURUSAN TEKNOLOGI INFORMASI

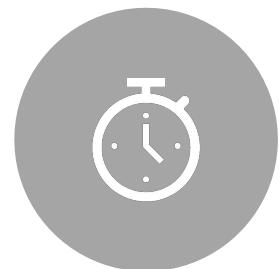
Critical Thinking & Problem Solving Course
Course 03. Basic Problem Solving Skills (Part-1)

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Outline



UNDERSTANDING THE
PROBLEM



HOW TO SOLVE
PROBLEMS



SELECT AND USE
INFORMATION



DATA PROCESSING

Process Analysis of Making a Cup of Instant Coffee



1. Preparing all tools and materials (cup, spoon, kettle, coffee, water and sugar)
2. Filling the kettle with water and boil it
3. Putting the coffee and sugar into the cup using a spoon
4. Pour boiling water into a cup
5. Mix well using a spoon
6. Clean and store all used items

Complicated but we do everyday without thinking and planning

Process Analysis of Putting Small Packages Into Big Cardboards



Method 1: Measuring large boxes and small packages, then count to get the best arrangement

Method 2: Trying until all the small packages can fit into the big box

Need strategy

What is that problem?

- A problem is a **situation** where we need to find a solution from a set of **conditions**
- A problem **consists** of a collection of **information** and a **question to answer**



What is needed
to solve the problem?

Strategy
Thinking
Planning

Strategy, Thinking, and Planning



- **Method for carrying out the process** can be systematic, logical, mathematical, or may involve trial and error.
- **Problem solving maker**
- **The essence of problem solving**

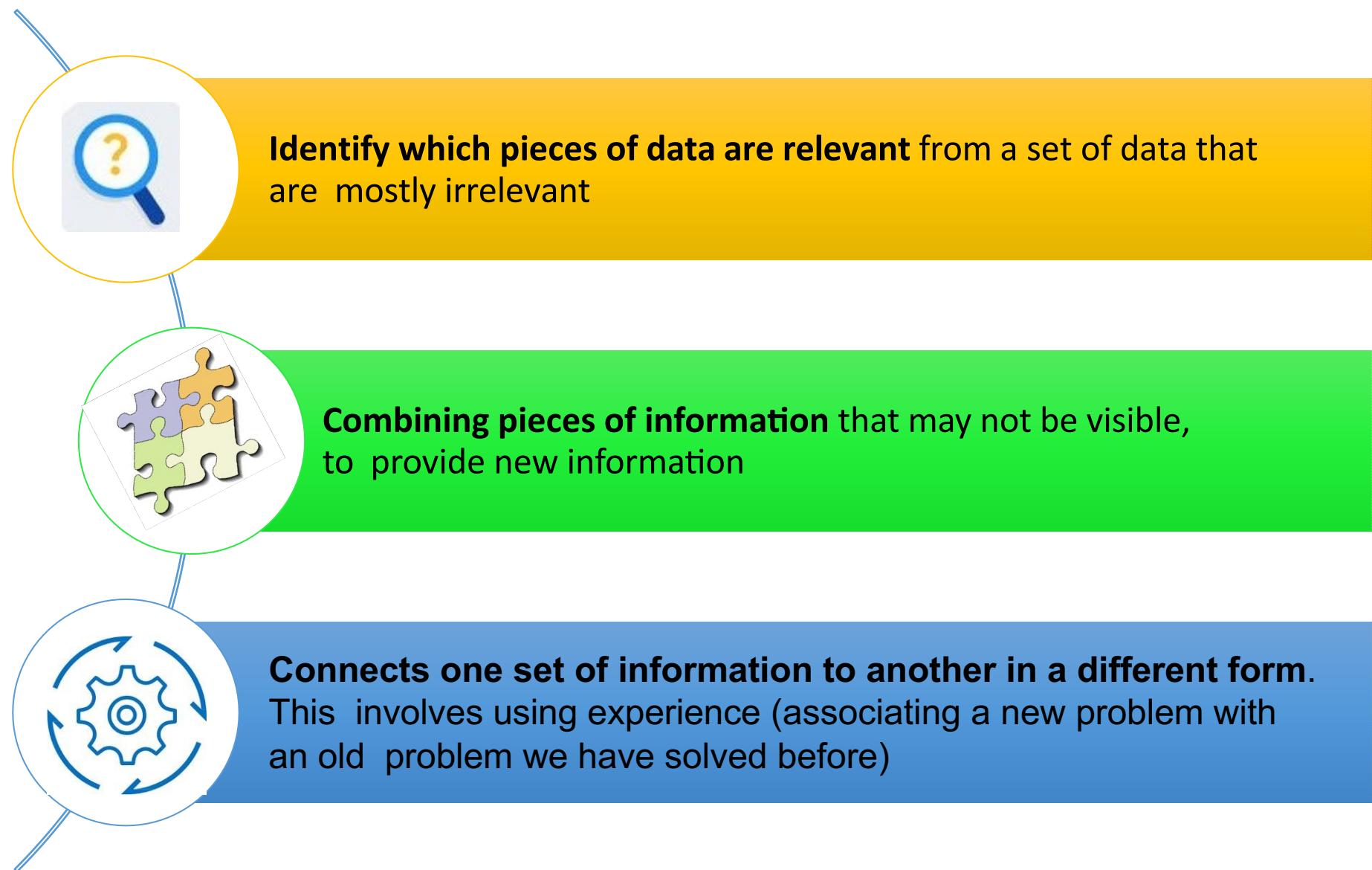
Problem solving

- Can be the result of a mathematical calculation, namely the number
- It can be a way of doing something

The problem solving tested in the thinking skills test does not ask for **formal proof**, but instead **asks for a solution**, which may be a calculated score or a way of doing something



Process In Problem Solving



Case study

Luke will have a meeting in a town 50 km away at 3 o'clock tomorrow afternoon. He planned to travel by train, walking to and from the station.



List the information that is needed by Luke to decide what time he should leave the house.



Case study

To find out what time Luke has to leave, we need to know what Luke needs to do at home to get to his destination and the duration of the time.

What Luke needs to do:

1. He left his house.
2. He walked to the station.
3. He bought a train ticket.
4. He went to the platform (place which sell ticket).
5. He was getting on the train when it arrived.
6. He sat in the carriage until it reached its destination.
7. He leaves the carriage.
8. He walked to the place where the

Information needed:

1. The time it takes to walk from his house to the station.
2. The time it takes to buy a ticket. (Calculate queue)
3. Time to walk to the platform.
4. Train schedule.
5. The time it takes to walk from the station to the meeting place.

was being held If all this information has been obtained then we just have to count down from 3 hours what time Luke has to leave.



How to solve the problem



There is **no definite formula** for solving problems
Every problem is solved with a different approach



When Solving Problems

Seeing the situation in a different way

Can use many different strategies

Have an open mind and be prepared to try a different approach

If you have found a solution, then re-evaluate

Evaluation can be used to find solutions again or to solve further problems

Problem Solving Approach

Bruteforce

- Referring to the so-called trial and error
- Usually takes longer

Heuristic

- A systematic, ordered and structured approach
- Usually faster



Problem Solving Approach

Imagine you go out and can't find your house keys.

Problem: How to find house keys???

1

Heuristic method: going around all possible places to see if the key is there. After the possible places, you start looking at the less likely places, and so on until the key is found

2

Brute Force: search every room of the house thoroughly until it is found. This is often the most reliable method but can take a very long time and most people will use it as a last resort.

3

Structured method: using experience, involves careful thinking about when was the last time you came into the house and what was done; this can be the fastest method.

Case study

- Julia had stayed at the hotel on a business trip. When he checked out, the hotel computer was not working, so the receptionist made the bill by hand from the receipt, totaling \$471. Julia thought she had been overcharged, so she checked the itemized bill carefully.
- Room: 4 nights for \$76.00 per night
- Breakfast: 4 people for \$10.00 per person
- Dinner: 3 each for \$18.00
- Phone: 10 units for \$1.70 per unit
- Bar: a variety of drinks for a total of \$23.00
- Laundry: 3 blouses for \$5.00 each

It seems the receptionist miscalculated one of the items when adding up the total. What item got Julia overcharged
????

Case study

- Although this example is simple, it illustrates the many methods used in solving the problem:
- Clearly and clearly identify the solution required. It is very important to read the questions carefully and understand them.
- View available data. Identify which sections are relevant and which are irrelevant.
- Do you need to make one or more intermediate calculations before you can reach the answer? It can define strategies for solving problems.
- You may need to search the data provided for a piece of information that solves (or helps solve) the problem.
- Past experience of similar problems helps.

If you've never seen a problem like this before, you should spend more time understanding it.

The above problems are solved by a systematic procedure

Case study

SuperSave sells Sudsy cleaning fluid for \$1.20 per bottle. At this price they charge 50% more than the price at which they purchased the goods from the manufacturer. Next week SuperSave is holding a 'Buy two free third' offer for this item. Supermarkets don't want to lose money on this offer, so expect manufacturers to lower their prices so SuperSave will get the same actual profit on every three bottles sold.

How much should producers reduce their prices?

- 1/6 B. 1/4 C. 1/3 D. 1/2 E. 2/3



Strategy?

- Guessing / trial and error / trial and error or systematic ?
- In the above case – and in many others – the method of finding a clear strategy is the most efficient.
- Strategy is not always found by strict methods
- Finding the right strategy usually depends on past experience of similar problems

Selecting and information

- In one very simple form, **problem solving involves understanding and using information.**
- To solve a problem it is necessary to **select the correct pieces of information and use them in the right way.**
- Information can come in many forms and, if you want to be good at using it, you need to practice extracting data from a variety of sources



Information Form

Table

include a survey summary, specification sheet or transportation schedule.

Graphic

used in science and business to provide information in such a way that it can be absorbed quickly and easily. For example, a graph can show variables such as temperature over time; Financial data can be displayed in a bar chart.

Word

numerical, spatial, logical and many other types of information can be summarized or described in words.

Image

Drawings, for example in the form of drawings of engineers or architects, can be used not only to show something looks like, but also to provide information about its relative size and position.

Diagram

diagrams in various forms: flowcharts, maps, schedules, decision trees and many other types can summarize numerical and spatial information

Case study

The table to the right shows the results of a survey on participation in three types of regular exercise by people of three age groups.

The row and column totals are correct, one of the individual numbers in the table has been typed incorrectly. Which one????

Age	Type of exercise				Total
	Gym	Swimming	Jogging		
10–15	14	57	32		103
16–20	86	92	45		232
21–25	67	58	44		169
Total	167	207	130		504

What information do we have?

Case study

- The graph shows the monthly average temperatures for Bangladesh. The lower end of the bar shows the lowest average daily temperature during the month and the upper end of the bar shows the highest average daily temperature during the month
- What is the difference between the lowest average temperature and the highest average temperature throughout the year?



Case Study Completion



There are two skills involved here. First we must understand the verbal description of what the graph means. Then, based on the question, one has to interpret the chart in the required way.

The solution is quite simple and involves subtracting the lowest point on one of the bars from the highest point on one of the bars. These values (read as accurately as possible) are 14° and 34° , so the total range is 20° .



Data Processing

Associated with how to
use data in the right way
to solve the problem

Case study

Luiz and Bianca are brothers and attend the same school. Luiz walks to school using a path, a distance of 900 m, and he walks at a speed of 1.5 m/s. Bianca cycles to school all the way, a distance of 1.5 km, and she cycles at a speed of 5 m/s. They both planned to arrive at school at 8.55am. Who left the house first and for how long?

- A Bianca, 5 menit
- B Luiz, 5 menit
- C Mereka pergi pada waktu yang sama
- D Bianca, 10 menit
- E Luiz, 10 menit lagi



Case Study Completion

- The skill in this question is to use the right information correctly and at the right time in calculations.
- There are five relevant pieces of data (two distances, two speeds and the fact that they arrived at the same time). It's pretty obvious that the solution method is to calculate each trip time, so in this case there's no method to find it.
- Luiz walks 900 m at 1.5 m/s, so this takes $900:1.5 = 600$ seconds or 10 minutes.
- Bianca cycles 1.5 km (1500 m) at a speed of 5 m/s, which takes $1500:5 = 300$ seconds or 5 minutes.
- Since Luiz needs 5 more minutes, he has to leave the house 5 minutes early, so B is right.

Case study



- Cheng has a garden pond. At the beginning of each week, Cheng fills the pool as much as 60 liters taken from the water reservoir. The water reservoir is initially filled with 200 liters of water, and then filled with rain water. The average weekly summer rainfall where he lives is 5 mm. The water reservoir to fill the pool has an area of 6 m².
- For how many weeks did Cheng expect to have enough water in the reservoir to fill the pond completely?

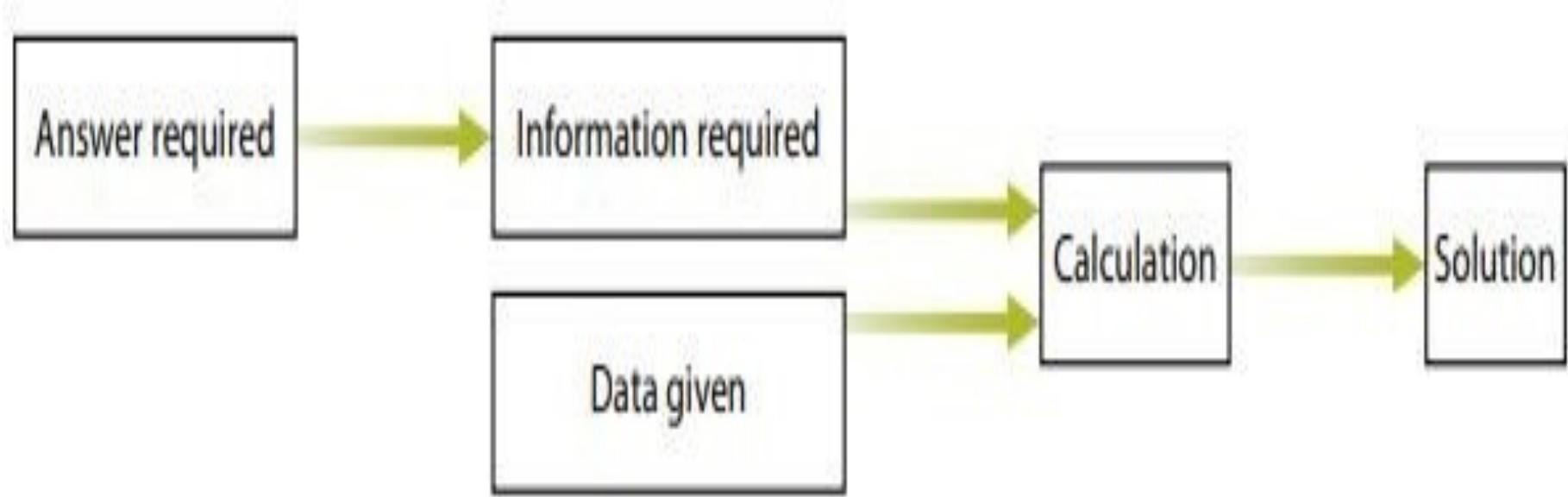
Case Study Completion

This question has a lot of data presented verbally. We must identify the important variables to be calculated to answer the question.

This is done by working backwards, we need the number of weeks the water in the reservoir will last. This, in turn, depends on the amount of water in the reservoir at the outset (already known) and the average water loss per week. The average water loss per week is the amount collected minus the amount used (which we also know). So, the only thing that is unknown is the amount collected. This is what we have to calculate first.

- Weekly rainfall is 5 mm, which is collected in a 6 m² storage tank. In consistent units (using meters) the volume collected is $6 \text{ m}^2 \times 0.005 \text{ m}$ of rain or 0.03 cubic meters. One cubic meter is 1000 liters, so the collected volume is 30 liters.
- Because Cheng uses 60 liters per week and collects 30 liters, he loses 30 liters net every week. So the water in the 200 liter tank will last for 5 weeks; at the start of the sixth he will have only 50 liters, which is not enough to fill his pond.

Problem Solving Approach Method







Thank You!

A large, elegant cursive script of "Thank You!" is centered on the page. Below the text is a horizontal brushstroke underline composed of several thick, textured lines in various colors, including blue, purple, pink, red, orange, and yellow.

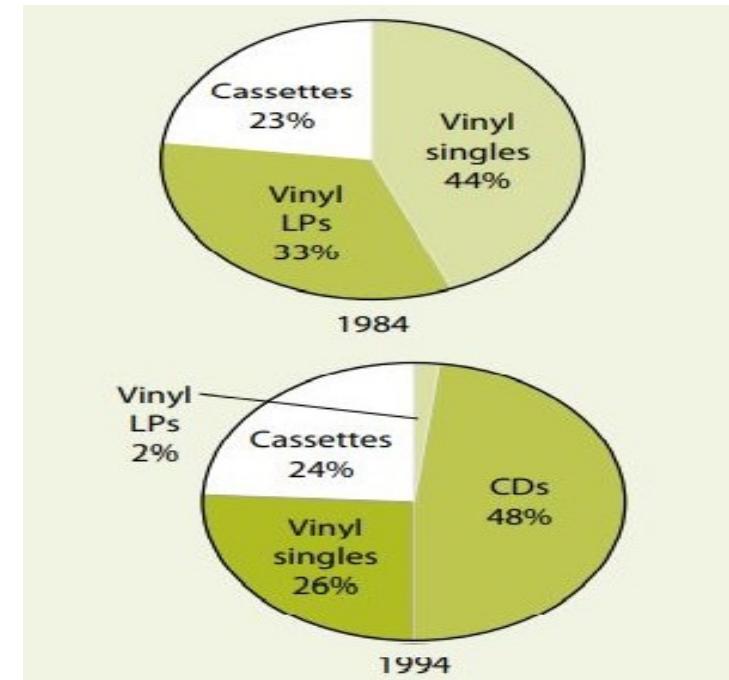
Task

1. Consider something you might want to buy, such as a car, cell phone, or computer. List the information you need to make a decision about the model or certain type to buy.
2. The gasoline use of a number of cars has been measured. Each car starts with a full tank, then travels (all travels on the same road). After the trip the tank is refilled, the amount of gasoline needed to fill it is recorded. The results are shown below. Sort the car's fuel efficiency (km/liter), from lowest to highest.

Car	Length of journey (km)	Petrol used (litres)
Montevideo	120	10
Stella	150	16
Riviera	200	25
Roamer	185	21
Carousel	230	16

3. The pie chart beside illustrates the changing introduction of CDs in 1985 in the recorded music market. The total annual sales of all types of records in 1984 was 170 million and in 1994 they were 234 million. What do you think happened to the actual annual sales of vinyl singles between 1984 and 1994?

- A They are down 14 million.
- B They are down 5 million
- C They don't change.
- D They went up 17 million.
- E They went up by 64 million.



4 . Pancake stall selling sweet pancakes and savory pancakes. Savory pancakes can have three toppings (eggs, ham, tomatoes) that can be used in any combination. The sweet ones are topped with marmalade (orange jam), lemon or strawberry with ice cream or fresh cream. How many combinations does the kiosk sell?



JURUSAN TEKNOLOGI INFORMASI

Critical Thinking & Problem Solving
Course 03. Basic Problem Solving Skills (Part-2)

Rokhimatul Wakhidah, S.Pd., M.T. - (CTPS Course Teaching Team)



1. Finding Troubleshooting Ways
2. Solving Problems with Searching
3. Recognizing Patterns
4. Hypothesis, reason, explanation, and Inference

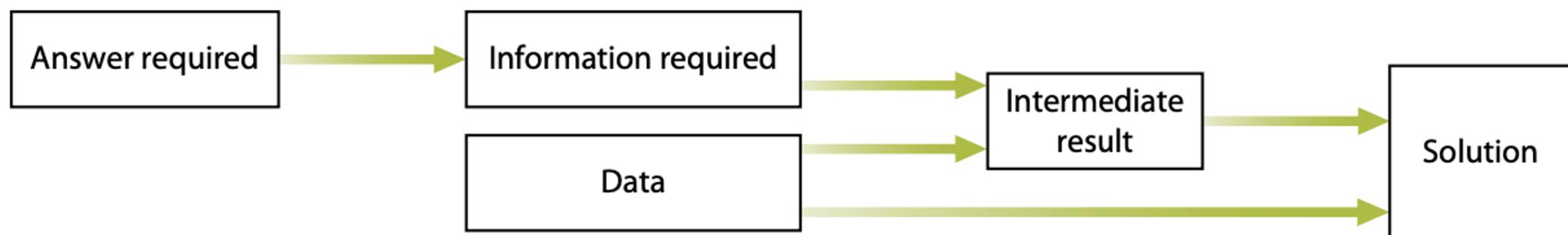


Topic-1: Finding Troubleshooting Ways



1. Finding Ways to Solve Problems

- The path to solving a problem is not always clear and bright so it is easy to find. Could be because:
 - It is necessary to find an **intermediate solution** first.
 - Must be done **simultaneously** from **2 directions**:
 - Going **forward**, from known data/information -> To find out what can be calculated.
 - Going **backwards**, from the requested answer -> To find what needs to be taken into account.
- **Intermediary Solution** -> The result of calculating/processing known data, which is not a final solution yet, but helps us get there.
 - Similar to the **intermediate conclusion** in the previous material about complex arguments.



1. Finding Ways to Solve Strategic Problems Strategy

The problem model that is "not obvious" solution, we often encounter in everyday life.

Problems with family/friends/work.

Problems at the time of the test / exam.

- To solve this kind of problem, a strategy is needed.

Experience solving similar problems would also be very helpful.

Ask the older ones -> They are more experienced.

If you want to pass the psychological test/TIU, do a lot of practice questions.

- One good strategy that can help us: Problem Analysis.

- Problem Analysis Steps:

1. Organize

2. Write down or underline

3. Simplify

4. Look and Decide

5. Visualize

- Also, always pay attention to the possibility of an intermediate conclusion to our problem solving.

The solution to a problem can be like an argument that initially leads to one conclusion, which in the end after adding other information will lead to a final conclusion.

1. Finding Ways to Solve Problem Analysis Problems

1. Organize

Organize, classify, and pay attention to data/information or other things that are known.

2. Write down or underline

Choose the most important points from step-1.

3. Simplify

Get rid of unnecessary information.

4. Look and Decide

Pay attention to the main question of the problem we are facing and decide which pieces of information have the potential to lead us to the final answer we seek.

5. Visualize

Make sketches, doodles, lists, tables, or diagrams to describe in general our work in solving problems.



1. Finding Ways to Solve Problems

Discussion-1.1: Use of Intermediate Solutions



- Ani and Doni are two brothers and sisters who live in a house 400 km apart. One day by chance, without telling each other they both drive to their respective relatives' houses. Ani goes to Doni's house, Doni goes to Ani's house. Ani leaves at 8 am while Doni leaves at 10 am. Both of them drive at the same speed of 120 km / h on the path that directly leads to their respective homes.
- What time did they meet on the street?

1. Finding Ways to Solve Problems

Discussion-1.1: Use of Intermediate Solutions - Discussion



Known data:

Distance: 400 km

Speed: both 120km/h

Start: Ani at 8, Doni at 10.

Intermediate Calculations:

By the time Doni left, Ani had already traveled for 2 hours.

Thus he has covered 240 km ($120 \text{ kmph} \times 2 \text{ hours}$)

The distance from Doni, when Doni departs = $400 - 240 = 160 \text{ km}$

Combined with other information:

The speed of both is 120 km / h. When combined (because they are in opposite directions), then the speed becomes 240 km / h.

Travel time to the distance = $160/240 = 2/3 \text{ hours} = 40 \text{ minutes}$.

Final answer:

They will meet 40 minutes after Doni departs at 10.40 am.

1. Finding Ways to Solve Problems

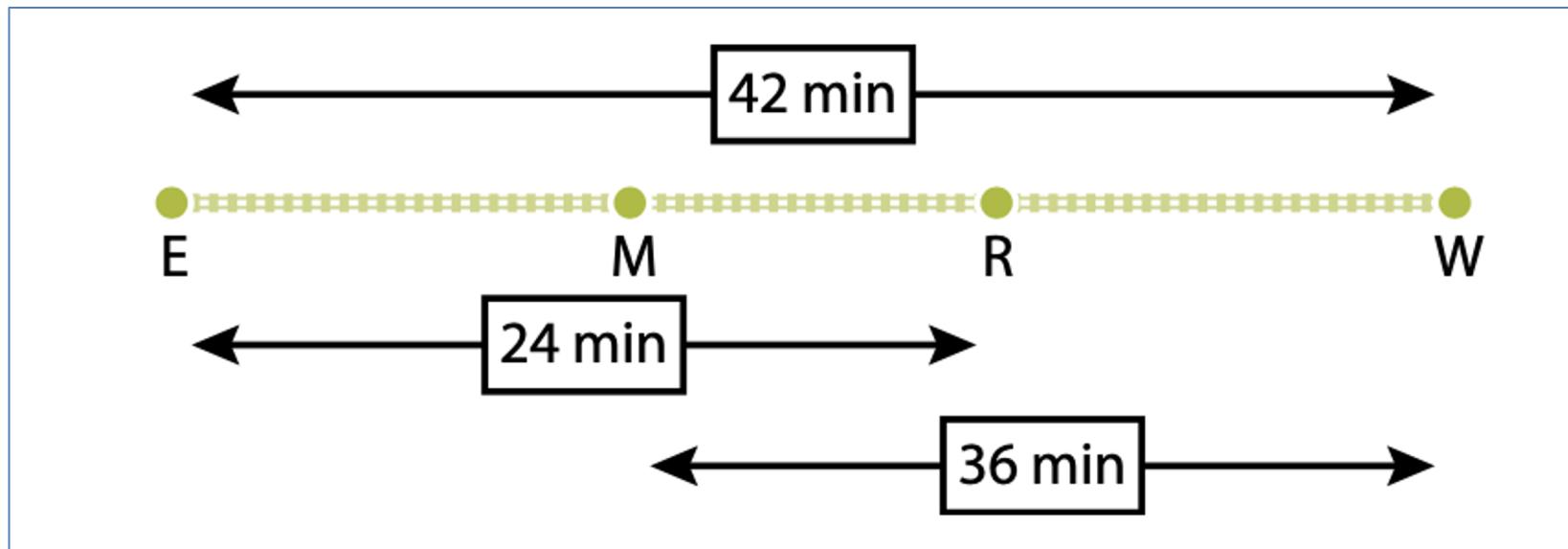
Discussion-1.2: Representing Problems in Different Ways

- In the year 2545, the Indonesians had migrated to a planet outside the solar system called Kepler-452b. On this planet, there is an island called New Karimun Jawa where from the west end to the east end stretches a maglev railroad that passes through 4 cities, namely Energiharjo, Margorejo, Ringinpolis, and Waylandpuro. Super-fast trains run from end to end every day at a constant speed, stopping at each station for 3 minutes.
- From Energiharjo to Waylandpuro the total journey time is 42 minutes.
- From Energiharjo to Ringinpolis 24 minutes.
- From Margorejo to Waylandpuro 36 minutes.
- How long does it take to get from Margorejo to Ringinpolis?

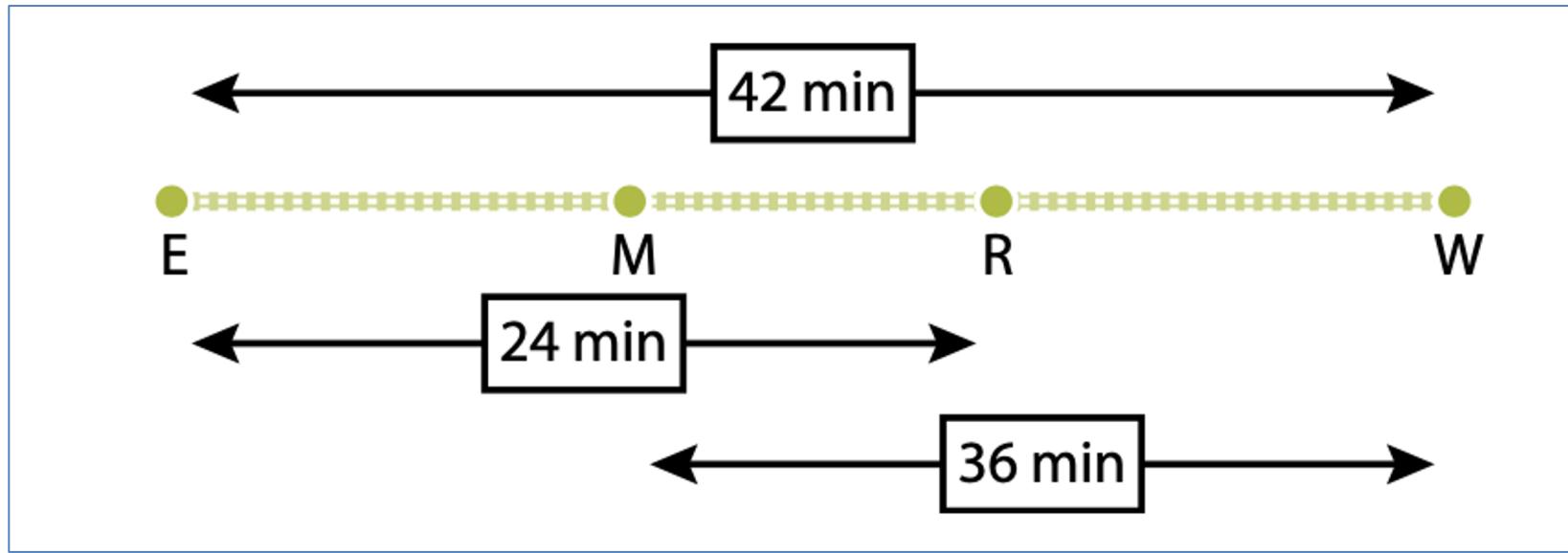
1. Finding Ways to Solve Problems

Discussion-1.2: Representing Problems in Different Ways - Discussion

- From the description of the problem it seems very complicated and complicated.
- Because a lot of text and information that we read.
- It would be much simpler if we represented the problem in another form.
- For example by using a diagram like the following:



1. Finding Ways to Solve Problems Discussion-1.2: Representing Problems in Different Ways - Discussion



- From the diagram it is now clearer that:
- $ER + MW = EW + MR$
- ER & MW 1 stop each; EW 2 stops; MR 0 stops.
- The number of stops on the left and right sides of the equation is the same. So it can be ignored.
- So the travel time from M to R:
- $MR = (ER + MW) - EW = 24 + 36 - 42 = 18 \text{ minutes.}$



Topic-2: Solving Problems with Searching



2. Solving Problems with Search

- Sometimes a problem cannot always **be solved by calculation method**.
Often have **more than one solution**.
We are **required to find the maximum or minimum**.
- In such cases we need a systematic way of evaluating the data to find all the possible ones (**or at least some of the most relevant ones**).
This method is known as **search**.

• Types of search (search)

Exhaustive Search

Find and check all the possibilities.

Directed Search

Find and check the possibilities one by one and stop when you have found a solution (don't look for other possibilities).

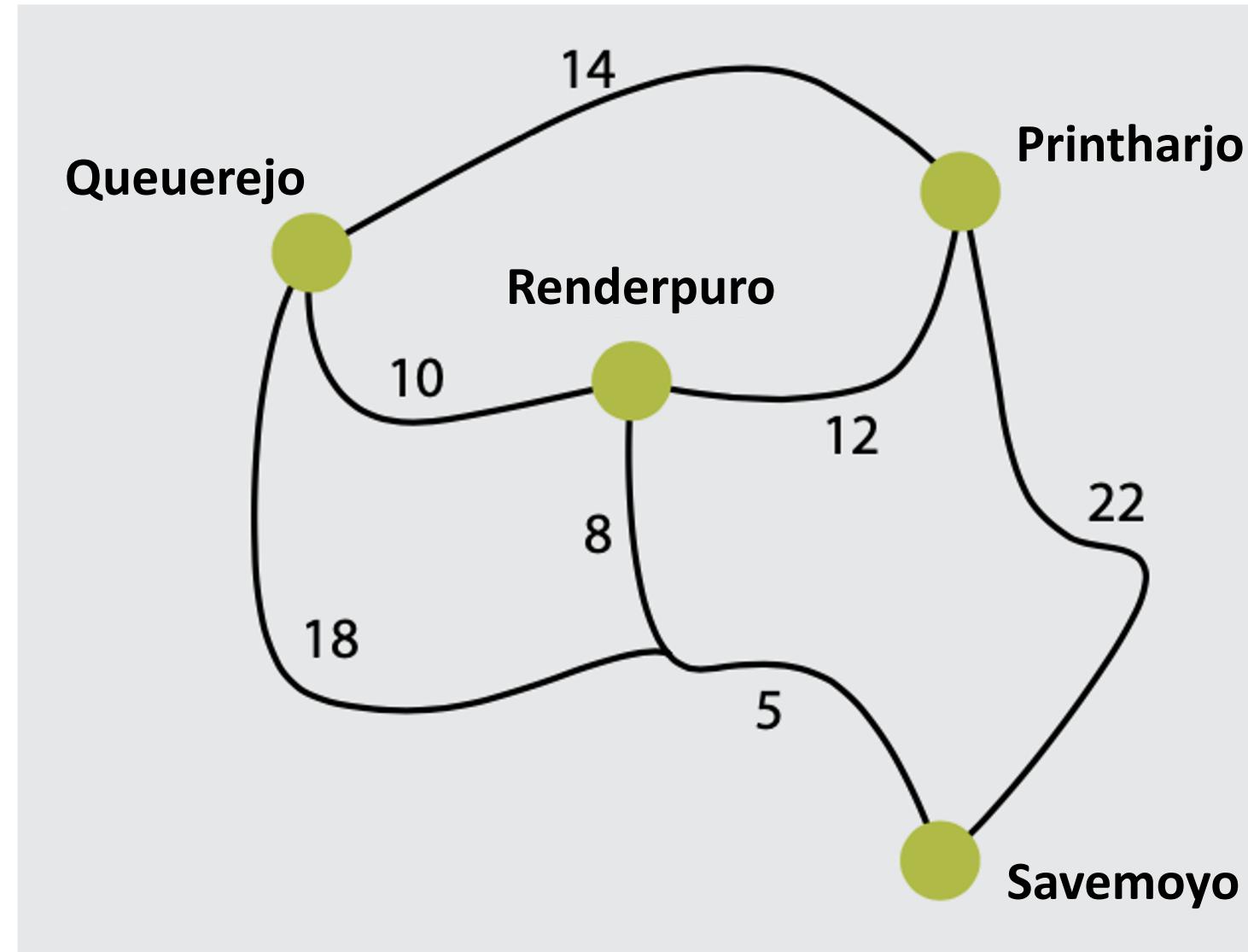
Selective Search

Perform a partial analysis on the problems encountered, then minimize the number of searches and concentrate on certain areas that are possible or eliminate areas that are not possible.

2. Solving Problems with Search

Discussion-2.1: Shortest Route Search

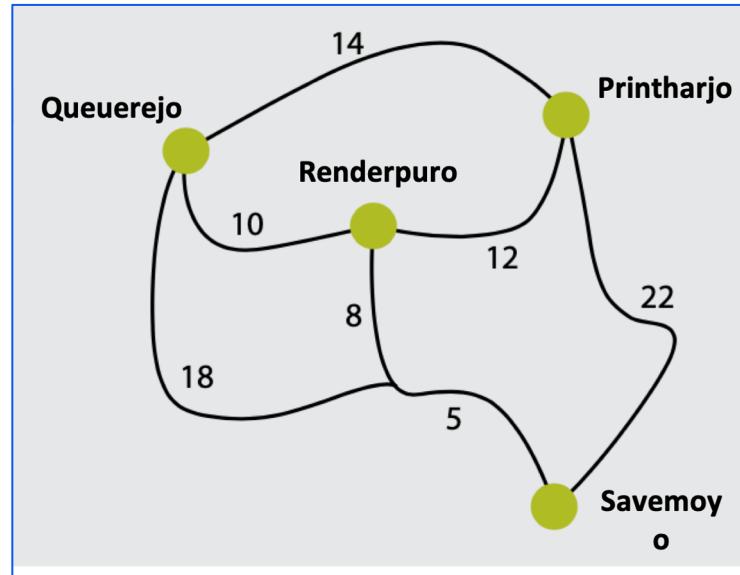
- The map on the side shows the roads connecting 4 villages in a sub-district in kilometers.
- I work in Prinharjo and have to deliver orders to three other villages regardless of the order, before finally returning to my village.
- Which is the shortest route I can take?



2. Solving Problems with Discussion Search-2.1: Shortest Route Search - Explanation

- To find a solution to this problem we need to find all possible routes and write them down.
- Possible routes are:
 - P-Q-R-S-P
 - P-Q-S-R-P
 - P-R-Q-S-P
 - P-R-S-Q-P
 - P-S-R-Q-P
 - P-S-Q-R-P
- After that calculate the distance:
 - 59 km The shortest route!
 - 62 km
 - 67 km
 - 62 km
 - 59 km
 - 67 km

- If you are observant then you will realize that there are 3 routes with the exact same distance -> Because it is the opposite of the other routes.
 - Will save your time.





Topic-3: Recognizing Patterns





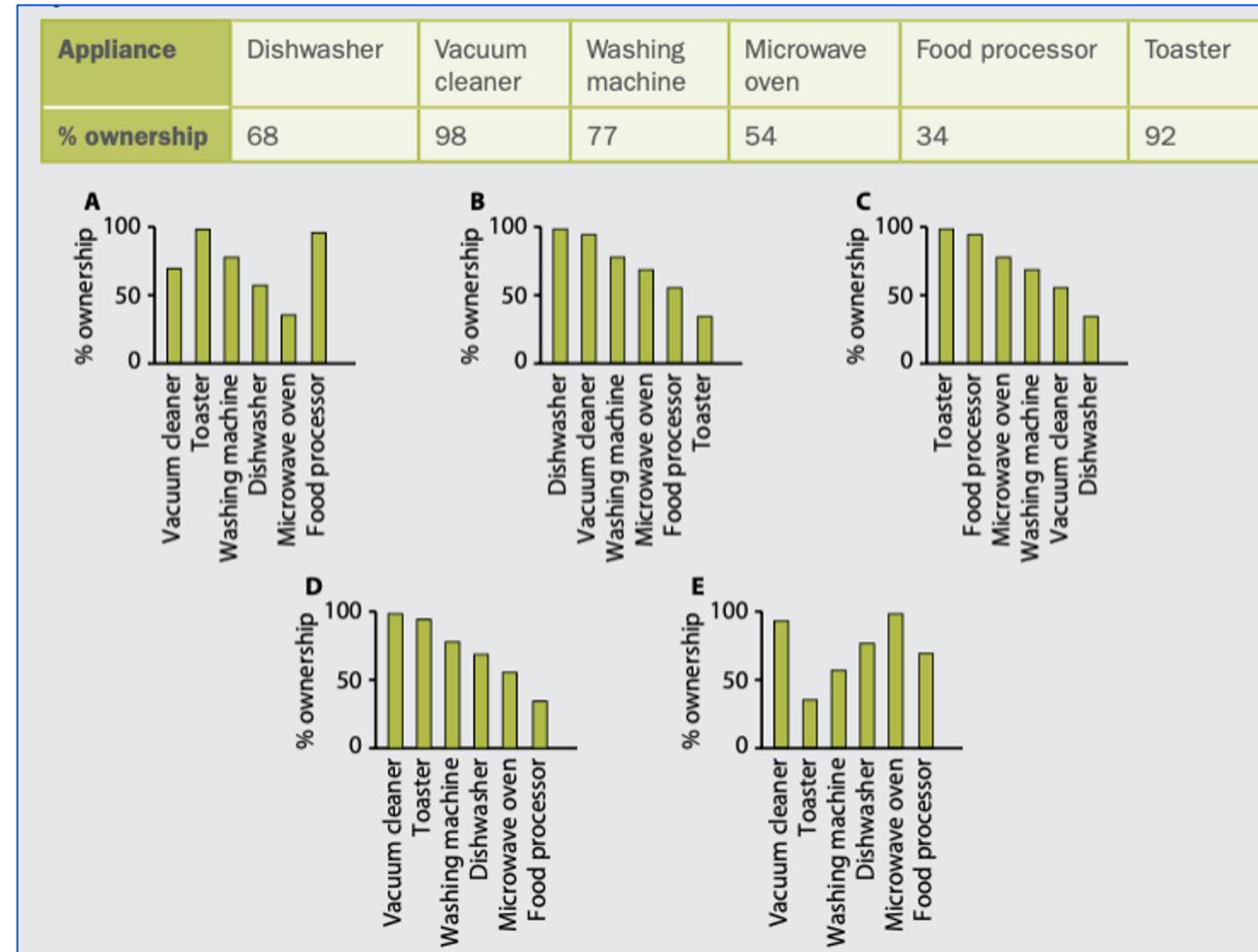
3. Recognizing Patterns

- As stated in the previous meeting, **there are 3 important skills that can help us in solving a problem:**
 - 1.Identify important information**
 - 2.Combining pieces of information**
 - 3.Identifying pieces or sets of information in different but actually the same form.**
- In this section we focus on a **third skill that involves different forms of the same information.**
In graphic, verbal, and tabular form.
- There are also other skills that are related to this skill, namely:
Identify possible reasons for data variation.
Experience dealing with similar questions/problems in the past will also be very helpful.

3. Recognizing Patterns

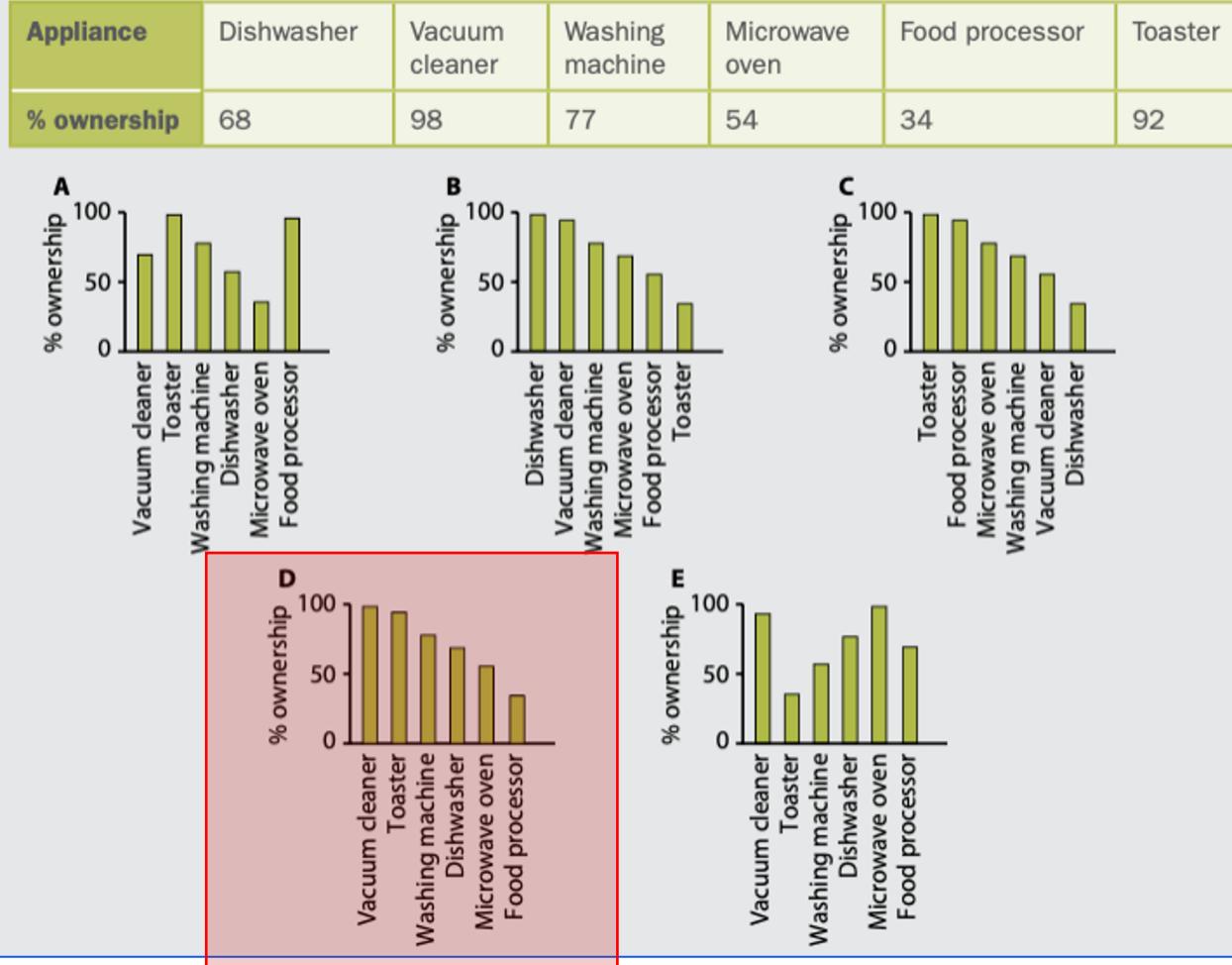
Discussion 3.1: Recognizing the same information in 2 different forms

- The table below shows the results of a survey of household electronic equipment ownership in a city. Which graph is appropriate in describing the data in the table?



3. Recognizing Patterns

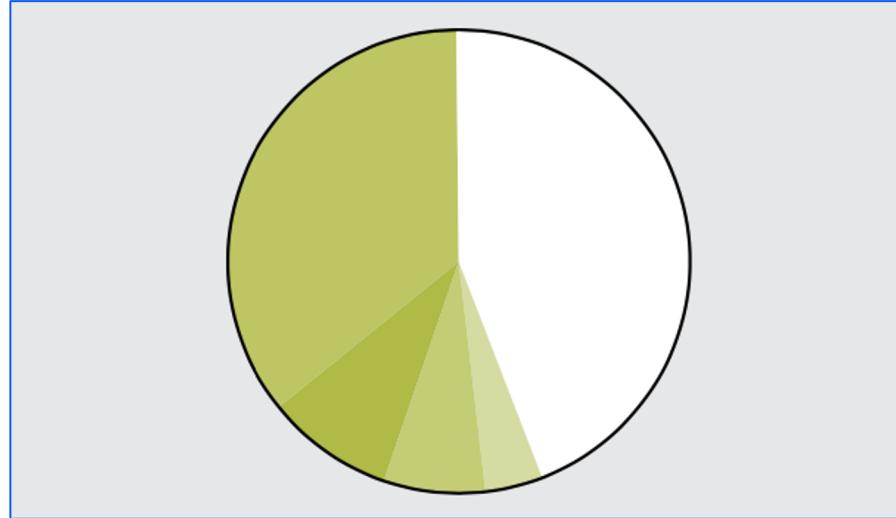
Discussion 3.1: Recognizing the same information in 2 different forms - Discussion



- The problem is actually quite easy.
Just need to be careful in matching the number to the bar height of the graphs displayed.
The height of the bar cannot be ascertained. It can only be estimated.
- Pay close attention that the order of the equipment shown in the graph is not the similar as in the table.
- Pay attention to the height of the bar relative to the other bars.
- The correct one is graph D.
The equipment shown is sorted from largest to smallest presentation

3. Recognizing Patterns

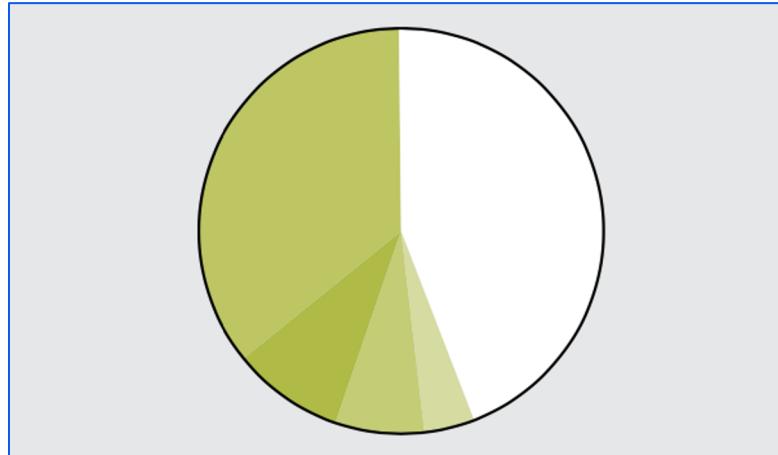
Discussion 3.2: Recognizing Patterns from Pictures and Matching to Information



- A student draws a pie chart to show the various price elements that determine the final selling price of fuel in several countries on the planet Kepler-452b. The data used is the data in the table on the side, with the prices listed in accordance with the currency of each country. After he finished drawing 1 of 4 pie charts for all countries, he fell asleep and forgot to label the price components on the pie chart.
- Which country did the student draw?

	Sevia	Idlib	Aurelia	Borland
Crude Oil	0.70	18.68	0.40	0.50
Purification	0.02	4.67	0.02	0.02
Distribution	0.09	3.63	0.05	0.14
Retailer	0.06	2.08	0.06	0.05
Tax	0.50	22.84	0.80	0.34
Total	1.37	51.90	1.33	1.05

3. Recognizing Discussion Patterns 3.2: Recognizing Patterns from Pictures and Matching to Information - Discussion



	Sevia	Idlib	Aurelia	Borland
Crude Oil	51.09	36.00	30.10	47.62
Purification	1.46	9.00	1.50	1.90
Distribution	6.57	7.00	3.76	13.33
Retailer	4.38	4.00	4.36	4.76
Tax	36.50	44.00	60.27	32.38

- This problem is the opposite of the problem in the previous discussion.
- Information Appropriate graphics
- Graphics Appropriate information
- The final selling price of BBM in the original table is in the currency of each country.
- Put everything in % for consistency and easier comparison.
- The largest area of the pie chart is white, almost half of the total. Means:
 - Could be **tax prices in Idlib vs crude oil in Borland**.
- In Borland, the distribution price is approximately 3 times that of the other elements while on the chart, it looks more proportional.
- Therefore the answer is Idlib.



Topic-4: Hypotheses, reasons, explanations, & inferences





4. Hypotheses, reasons, explanations, & inferences

- Both in critical thinking and problems solving, **2 things are often needed:**

1. Make inferences from data.
2. Estimating the reasons behind the variation in the data.

- **Inference:**

“a conclusion or opinion that is formed because of known facts or evidence” – Merriam Webster.

A conclusion or opinion formed based on known facts or evidence.

- In the fields of work in the realm of finance or science, it is often necessary to have the ability to analyze the data provided to obtain conclusions.

Remember: **Ability is not born from birth, but acquired through practice.**

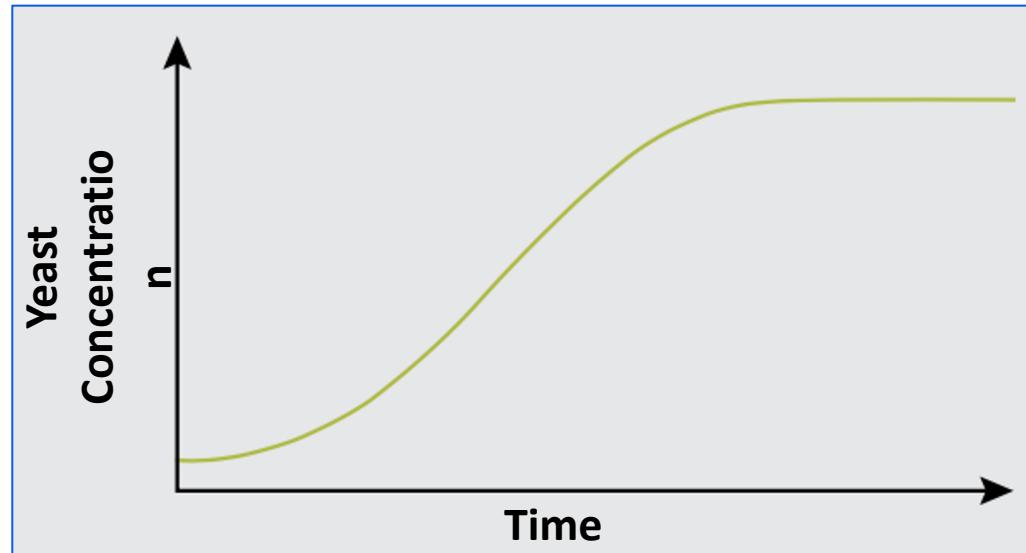
If you want to be successful in both areas, **practice often!**

Sharpen your ability to think clearly and logically.

The problems in the following discussion describe drawing conclusions in the form of an explanation of the variations in the data provided.

4. Hypotheses, reasons, explanations, & inferences

Discussion 4.1: Explaining Variations in Data



- The graph above shows the results of an experiment to determine the growth of yeast cultures on a nutrient medium. A nutrient-filled liquid is prepared and then a small amount of yeast is added. After that at every certain interval, the mixture is stirred then a drop of sample is taken and the yeast concentration is measured. The green line on the graph represents the yeast concentration at each sampling.

Which of the following explanations is consistent with the shape of the curve in the graph? (Choose as many as appropriate.)

- A. Yeast cells divide when they are old enough and then grow exponentially when there are enough nutrients.
- B. The growth rate of yeast cells depends only on the availability of nutrients.
- C. In the end the growth of yeast cells will stop when the available nutrients are depleted.
- D. Yeast cells die when there are not enough nutrients.
- E. The shape of the curve for the increase in yeast cells is linear and the decrease in nutrient availability is linear as well.

4. Hypotheses, reasons, explanations, & inferences

Discussion 4.1: Explaining Variations in Data – Discussion

Points	Explanation	Analysis
A	Yeast cells divide when they are old enough and then grow exponentially when there are enough nutrients.	This statement explains the initial spike in growth rates that looked exponential. (The numbers are increasing at a constant growth rate.)
B	The growth rate of yeast cells depends only on the availability of nutrients.	This statement does not explain early growth. If that's the case, then the chart should have been high at the start, and then down consistently over time.
C	In the end the growth of yeast cells will stop when the available nutrients are depleted.	This statement explains the fall in the growth rate to 0 over time, which is related to the less available nutrients.
D	Yeast cells die when there are not enough nutrients.	No indication of cell death; if so, then the line on the curve should be going downhill.
E	The shape of the curve for the increase in yeast cells is linear and the decrease in nutrient availability is linear as well.	If the two processes are indeed linear, then the combination of the two will also produce a linear (straight) line.

4. Hypotheses, reasons, explanations, & inferences

Discussion 4.2: Estimating Reasons from Variation in Data

- The graph on the side shows the inflation rate in the province of East Java in percent compared to the overall inflation in the Republic of Indonesia in the period 2006 to 2006. 2012.
- Which of the following makes the most sense to explain the reasons for the variation in the data shown in the graph?
- During this period, overall inflation in Indonesia was consistently high.
- During this period, the overall inflation in Indonesia increased progressively higher.
- The rate of increase in food prices in East Java is lower than the rate of increase in food prices in Indonesia as a whole.
- Food prices in East Java are affected by seasonal fluctuations more strongly than in Indonesia as a whole.
- The inflation rate in East Java declined due to the high unemployment rate.



4. Hypotheses, reasons, explanations, & inferences Discussion

4.2: Estimating Reasons from Variations in Data - Discussion

- Remember! The graph presented shows the inflation ratio in East Java in percent instead of the actual inflation rate in Indonesia.

Points	Explanation	Analysis
A	During this period, overall inflation in Indonesia was consistently high.	The graph presented only explains the inflation ratio (comparison) between East Java vs Indonesia. High inflation in Indonesia cannot explain the rise and fall of the ratio graph.
B	During this period, the overall inflation in Indonesia increased progressively higher.	A consistent increase in inflation in Indonesia will only cause the graph of the inflation ratio to decline if inflation in East Java is smaller or negative. We cannot confirm this from the graph presented.
C	The rate of increase in food prices in East Java is lower than the rate of increase in food prices in Indonesia as a whole.	If food prices have risen less in East Java than in Indonesia as a whole, this could explain why the ratio has decreased – even though inflation in East Java is rising.
D	Food prices in East Java are affected by changes in the rainy-dry season more strongly than in Indonesia as a whole.	Changes in seasons result in fluctuations within the same year, not between years.
E	The inflation rate in East Java declined due to the high unemployment rate.	Although inflation in East Java is decreasing, we don't know the actual inflation across Indonesia, so we can't conclude that the inflation rate in East Java is really decreasing.





Thank you

Assignments (1/2)

1. If the distance from Jakarta to Ontario – Canada is exactly 14000 km, a plane takes 22 hours to depart. Meanwhile, from Ontario to Jakarta, the time needed is only 17 hours due to the wind conditions blowing in the direction of the plane's speed. Assuming the aircraft is moving at a constant speed in both directions of flight (depart & return) and in stable clear air without clouds, what is the average wind speed on that flight?
2. Yasmin has been saving for a long time to buy a gift for her sister's birthday. Every time he has coins with a face value of 5 cents and 20 cents, he puts them into his piggy bank. Today he broke his piggy bank and counted all the money in it. He calculated by stacking the coins so that they became piles worth 1 USD in each pile. When he finished, he realized that the piles of coins he made were of different heights. If 1 USD = 100 cents, and if the 5 cent vs 20 cent coin thickness is exactly the same, then how many stack classes are there based on their height?
- A.5
 - B.6
 - C.10
 - D.20



Assignments (2/2)

3. At the bank where I deposit money, the ATM pin consists of a 4-digit number. It can be very difficult to always remember the Pin. To make it easier to remember, I created my ATM pin in the following way:

- The first 2 digits are my date (day) of birth, reversed.
- The remaining 2 digits are my birth month, reversed as well.
- If the date or month is 1 digit, then 0 is added before it is reversed.

Which of the following PINs CANNOT be my PIN?

- A. 3221
- B. 5060
- C. 1141
- D. 2121
- E. 1290

4. I went to buy fruit at a market in Wayandpuro and asked one of the fruit sellers there: "Sir, how much do you buy 1 orange for?". The seller said, 1 orange plus 1 lemon costs Rp. 2000. Then he said again (which confused me even more), if 1 lemon equals 1 grapefruit it becomes Rp. 3000. He said the price of each fruit is different. Based on this unhelpful information, which of the following can be confirmed?

- A. 1 orange is more expensive than 1 lemon.
- B. 1 lemon is more expensive than 1 grapefruit.
- C. 1 grapefruit costs more than Rp. 1000.
- D. 1 orange costs less than Rp. 1000.

Discussion Topic



SPATIAL
REASONING



NECESSITY
AND
SUFFICIENCY



CHOOSING
AND
USING MODEL



CHOOSING
AND
MAKING DECISION

Spatial Reasoning

Spatial reasoning involves the use of common skills in normal life to many professionals: surgeons must be able to visualize the inside of the body in three dimensions and, of course, architects use these skills every day of their lives.



Problems with spatial reasoning

Spatial reasoning questions can involve two- or three-dimensional tasks, or relating solid objects to flat images.

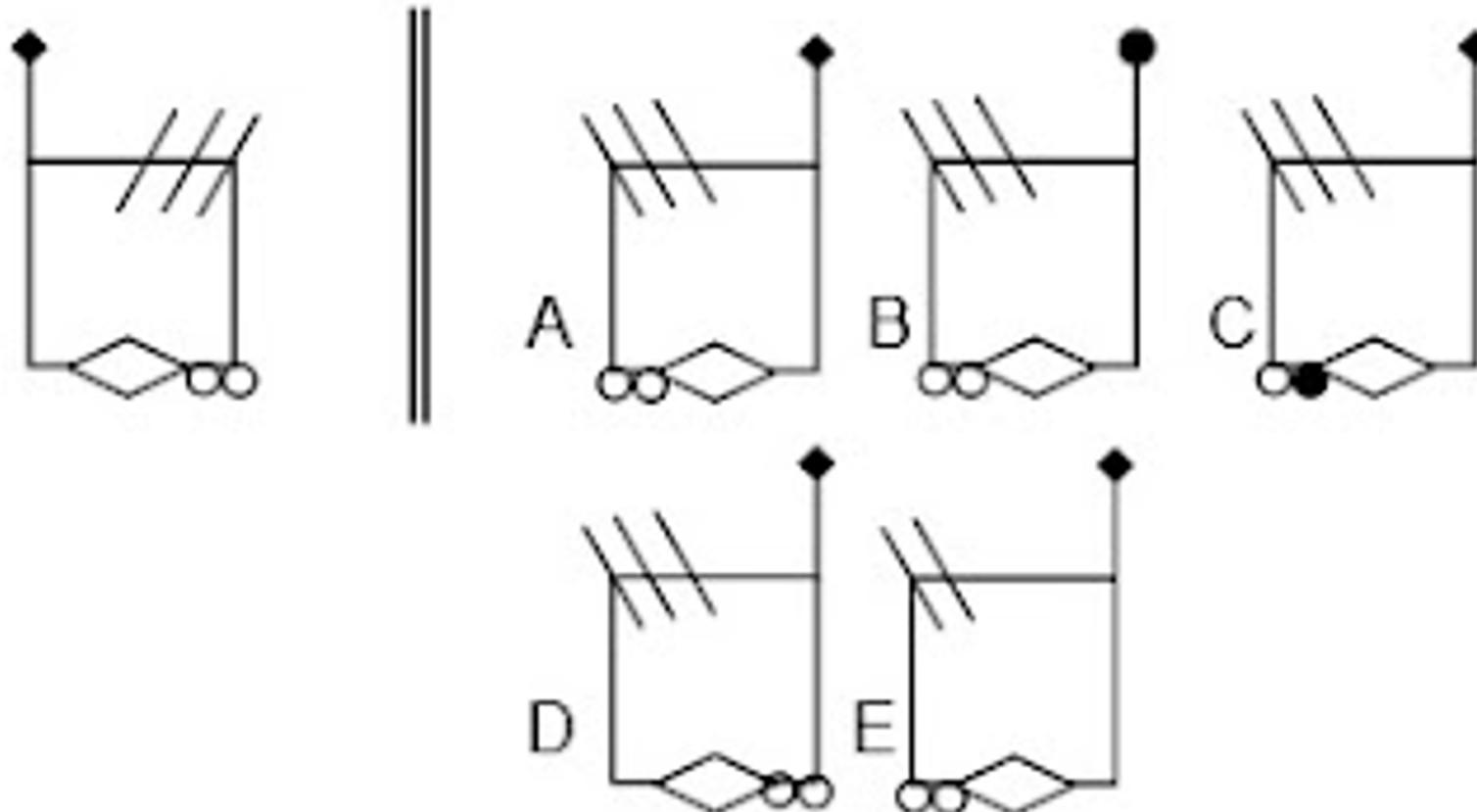
Thinking in three dimensions **is not something that is easy for all people, but practice can undoubtedly improve this ability.**

In the simplest sense, problem-solving questions involving **spatial reasoning can require visualizing how an object would look upside down or in reflection.**

More complicated questions might involve relating a three-dimensional image of a building to a view from particular direction or the visualisation how movement will affect the view of an object.

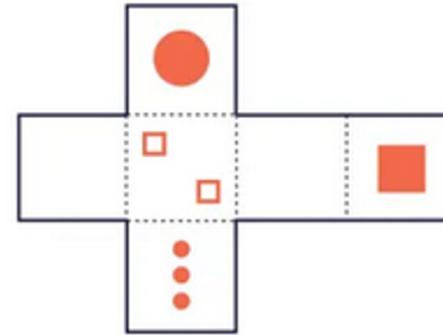
Examples of Spatial Problems

- The image on the right is a reflection of the image on the left, which one is correct?



Examples of 3-Dimensional Spatial Reasoning Problems

If the image on the top right is folded into a cube, what will it look like?



A



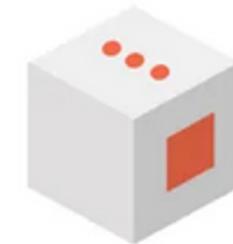
B



C



D





JURUSAN TEKNOLOGI INFORMASI

Critical Thinking & Problem Solving Course
Course 03. Basic Problem Solving Skills (Part-3)

Rokhimatul Wakhidah, S.Pd., M.T. - CTPS Course Teaching Team

Necessity and sufficiency



There are **types of problems** that involve identifying whether there is enough data to solve the problem and, if not, which data is missing.



The **missing data** is like a puzzle pieces that are useful in solving problems.



One of the key elements of problem solving is **finding a way to solve the problem without**, in this case, having to perform any arithmetic calculations.

The Importance of Knowing Necessity and Sufficiency

1

The words 'necessity' and 'sufficient' are used in mathematics but have exactly the same meaning as in normal language.

2

An individual piece of data is needed to solve a problem if we cannot solve a problem without it.

3

A set of data is sufficient to solve a problem if it contains all the information we need.

4

Identifying which data is needed to solve a problem can save effort in searching for unnecessary data or in making unnecessary calculations.

Case study

Suppose a person is traveling by car.

We know their departure time and we know the average speed they will travel at.

We want to know the time of their arrival.



What other information is needed for us to calculate this?

Case study

The solution is very simple: we need the distance traveled.

We can calculate the travel time (distance divided by speed) and thus the arrival time can be found.

The three pieces of data that we have now required are sufficient to perform these calculations.



Choosing and Using MODEL

The most obvious and familiar use of the word '**model**' is that of a replica of an object, for example a car, at a smaller scale.

In critical thinking, the model has a **broader meaning**

Models can be pictures, graphics, descriptions, equations, word formulas or computer programs, which **are used to represent objects or processes.**

Model Usage

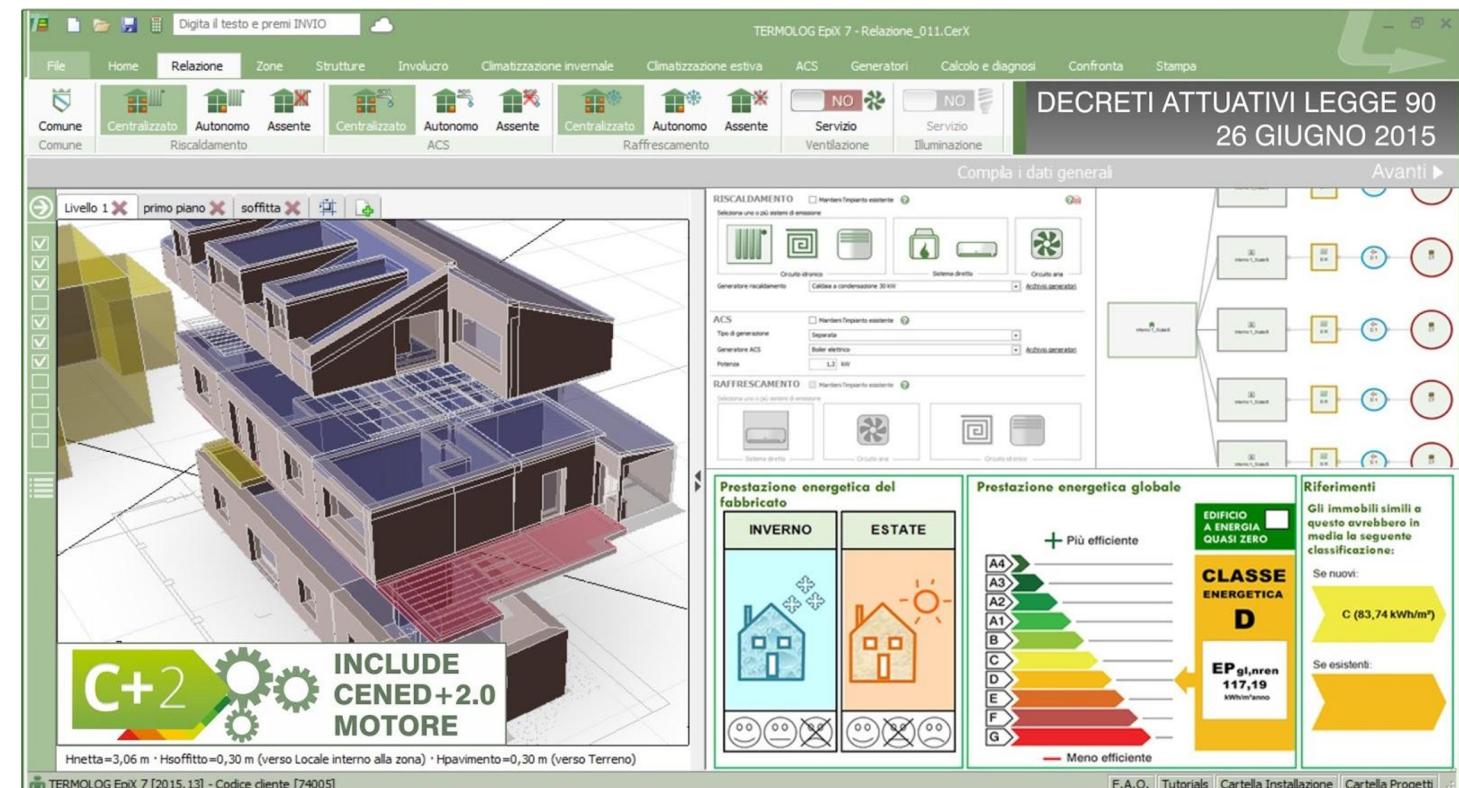
Architects, for example, use a variety of models.

They may build a scale model of the building for the client to see and give a better impression of how it looks.

Their drawing is also a model of the structure of the building.

In modern practice, these drawings are created on a computer, which will contain a three-dimensional model of the building in digital form.

It can be used to estimate material costs and carry out structural calculations as well as generate three-dimensional 'street' images on the screen





Examples of Mathematical Models

- A simple example of a model is the formula used to calculate costs.
- Suppose Amount of electricity bill can be described as
- 'Fixed cost of \$35 plus 10¢ per unit of electricity used'.
- It is formulated with an algebraic formula as:

$$c = 35 + 0.1u$$

- where c is the amount to be paid (in dollars) and u is the number of units used.

Case study

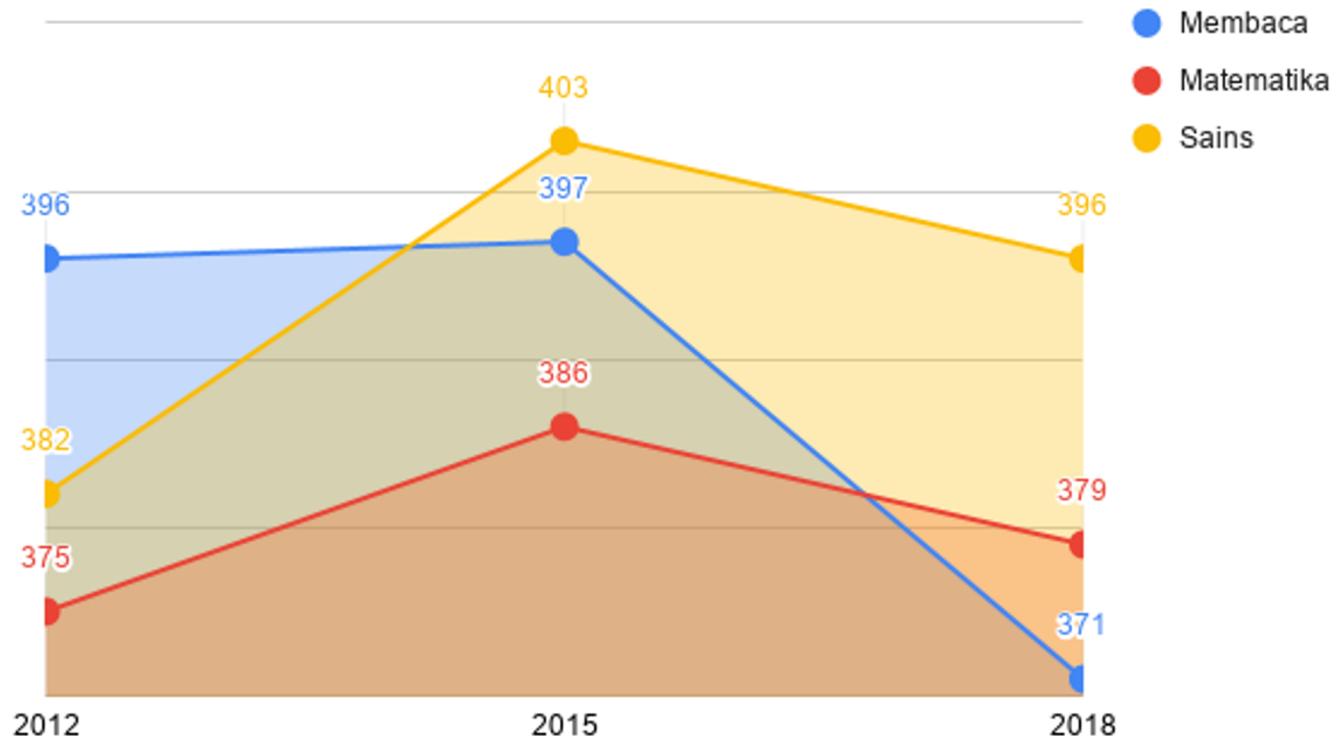
- The 2018 PISA scores are out, and what is sad is that Indonesia has not moved from the bottom of the table. Respectively, the scores for Reading, Mathematics, and Science from the test results in 2018 were 371, 379, and 396. This value has decreased compared to the 2015 test, where our Reading, Mathematics, and Science scores were 397 respectively., 386, 403. Of all the scores, Reading has the lowest decline in scores, and even below its 2012 score of 396.
- <https://www.zenius.net/blog/ranking-pisa-di-indonesia-dan-pembahasan-soal#:~:text=Ranking%20PISA%20Indonesia%20dibandingkan%20dengan,ke%2D74%20dari%2079%20negara.>

How to Model the Pisa Value
Article above to make it easier to understand

Graphical Model

From the data provided in the previous slide, a graph can be drawn that illustrates the change in PISA scores from year to year in which the test is held

Skor Pelajaran PISA Indonesia (2012, 2015, 2018)



Choosing and Making Decisions

- Many of the problems we face in everyday life involve making choices and decisions.
- To buy or not to buy? Which one to buy? How much to buy? Which train?
- These are the types of choices and decisions that contribute to the problem-solving process and involve the use of testable skills with problem-solving questions.
- These questions may involve the skills discussed in previous chapters: extracting information, processing data and finding solution methods.
- The only real difference is that the question requires decision making.



A simple case study of making a buying decision

- All the coffee shops in my city have different discounts for a jar of coffee.
- Which of the following is the most profitable for me?
- Sidomulyo : 30 thousand for a 150 g jar
- Amstirdam: 50k for 200g, buy one get one free
- Nomaden: 35k for 150 g, buy one 50% discount on the second purchase



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A simple case study of making a buying decision



- The solution, can it be calculated per 300 grams?
- Sidomulyo : $30k \times 2 = 60k$ per 300g
- Amstirdam : $50k \times 0.75 = 37.5k$ per 300g
- Nomaden: $35k + 17.5k = 52.5k$ per 300g
- From the calculation above, the most profitable is to buy in Amstirdam

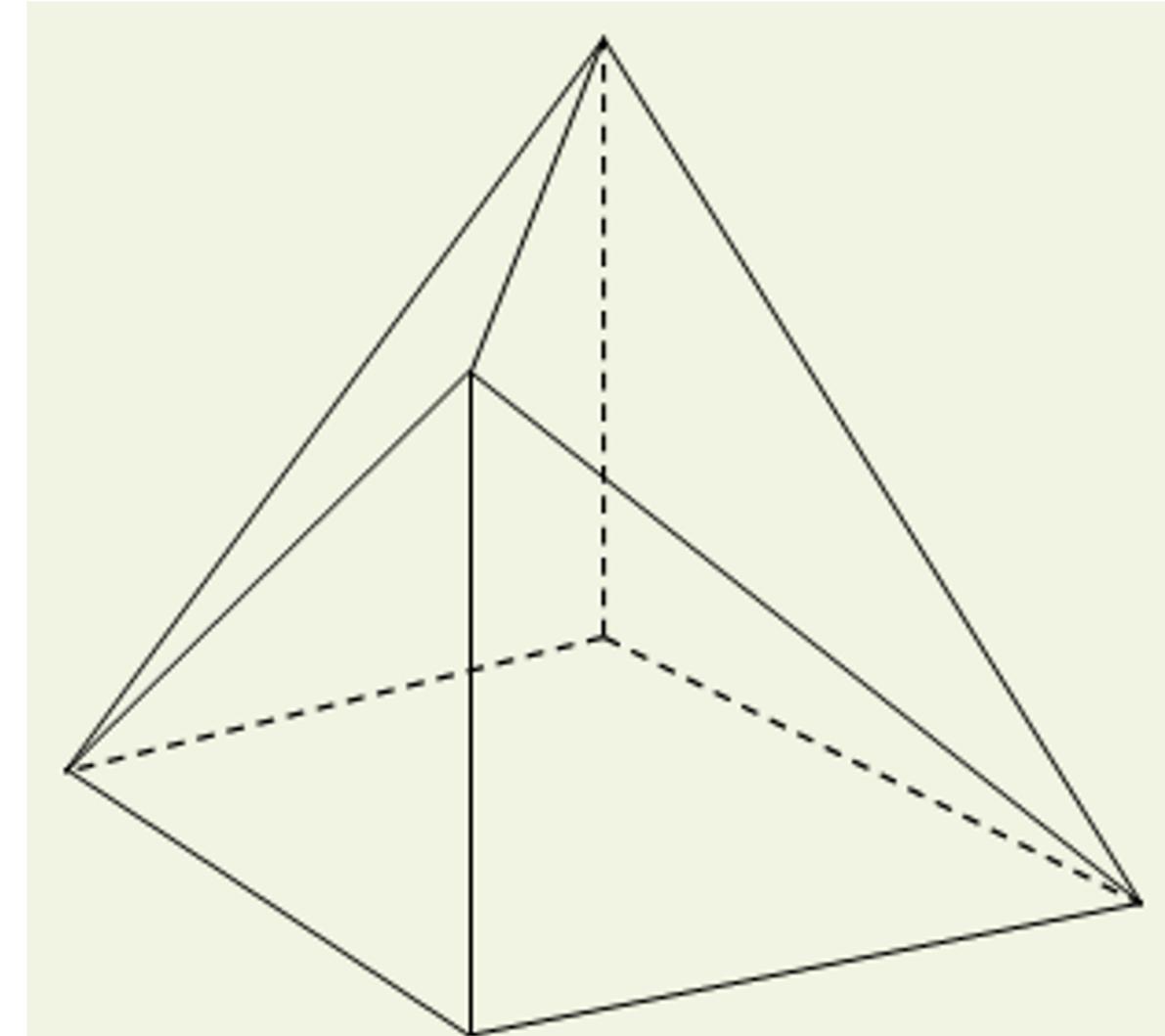
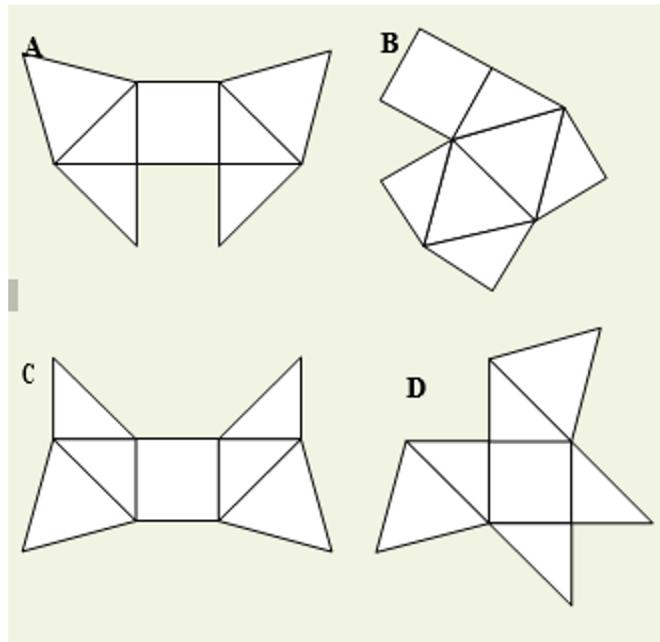


Thank You!



Task

- 1. The solid on the right, a cube with two corners cut off, is made of a piece of cardboard that is shaped and folded. (The dotted line represents the hidden edge.) Which of the following folds of cardboard is suitable for creating the shape?



Task

2.

I use the trip meter in my car to measure the distance traveled since the last time my car was serviced, so I know when the next service is due. The trip meter can be set to zero at the push of a button and records the kilometers traveled since the last reset.

I set the trip meter to zero after my last serve. The next service is scheduled after 20,000 km has been covered.

Some time later, I lent the car to my brother. I forgot to tell him about the trip meter; he pressed the zero button and drove 575 km.

I then started driving again without realizing what he had done.

If I want to know how much the trip meter should read when the next service is due, what additional information do I need? Explain!



Task

3.

A new marketing company is selling an unusual liquid watch. The liquid clock consists of two tubes as shown. The right-hand tube is gradually filled until it is full at the end of each hour, and then it is emptied and started again. The left tube does the same in 12 hours. The time shown on the clock is 9.15. Draw what the liquid clock looks like at 4.20



Task

1	2	3	4
geography	French	history	Students at the school must decide what subjects they will study next year. English, science, and math are all compulsory, but they can choose from the remaining four subjects. The table shows how choices can be made. Students must select one subject from each column. The fourth subject can come from any column.
technology	German	religious studies	Which of the following combinations is not allowed?
art		physical education	A French, geography, physical education, art B French, German, Latin, music C technology, German, art, history D French, German, geography, music E geography, music, French, religious studies
music		Latin	