Critical Thinking and Problem Solving Task and Assignment

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1 Task - Page 33

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.

   I want to buy a new laptop to replace my old one, so it needs to be better. The informations that I need to pay attention are:

   - The processor type, whether it's AMD Ryzen or Intel
   - The screen type, whether it's an IPS or TN, it needs to be at least IPS
   - The screen resolution, it needs to have at least FHD (1920x1080) resolution
   - The amount of storage, it needs to be at least 256GB M.2 NVME SSD
   - The amount of RAM, it needs to be at least 8GB 3200Mhz
   - The brand, it needs to be a well-known brand

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.

Table 1: Unsorted Data

Car	Length of Journey (km)	Petrol Used (Litres)
Montevideo	120	10
Stella	150	16
Riviera	200	25
Roamer	185	21
Carousel	230	16

Table 2: Sorted Data

Car	Length of Journey (km)	Petrol Used (Litres)	Efficiency (km/litre)
Carousel	230	16	$230/16 = 14.375l$
Montevideo	120	10	$120/10 = 12l$
Stella	150	16	$150/16 = 9.375l$
Roamer	185	21	$185/21 = 8.8l$
Riviera	200	25	$200/25 = 8l$

3. The pie chart below 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?
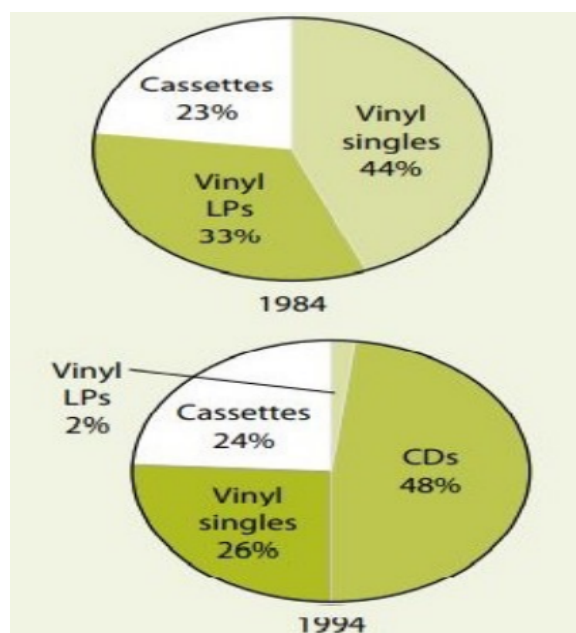

Figure 1: Pie Chart

From this chart, we can gather up some data. Since on the pie chart it is represented using percentage, we can multiply it with the actual number. After done calculating them, we can visualise the data using a table as such:

Table 3: Annual Sales of All Types of Records

Type	1984	1994
Cassettes	$23\% \times 170M = 39.1M$	$24\% \times 234M = 56.16M$
Vinyl Singles	$44\% \times 170M = 74.8M$	$26\% \times 234M = 60.8M$
Vinyl LPs	$33\% \times 170M = 56.1M$	$2\% \times 234M = 4.68M$
CD	-	$48\% \times 234M = 112.32M$

From this table, we can make a conclusion that the annual sales of vinyl singles between 1984 and 1994 went down 14 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?

From the text above, we can gather up these data:

- Sweet and Savory pancakes
- Savory pancake toppings (eggs, ham, tomatoes)
- Sweet pancake topppings (marmalade, lemon or strawberry with ice cream or fresh cream)

To find the combinations, we can use the permutation formula: $P(n, r) = \frac{n!}{(n-r)!}$ formula. The final result would be:

- Sweet pancake $\rightarrow C(3, 3) = \frac{3!}{(3-3)!} = \frac{6}{1} = 6$ combinations
- Savory pancake $\rightarrow C(5, 3) = \frac{5!}{(5-3)!} = \frac{120}{2} = 60$ combinations

All in all, there are 66 combinations for sweet and savory pancake.

2 Assignment - Page 64

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?

From the text above, these are the informations that we can gather:

- Distance from Jakarta to Ontario is exactly 14000km
- It takes 22 hours for a plane to depart from Jakarta to Ontario
- It takes 17 hours for a plane to depart from Ontario to Jakarta

To find an average speed, we need to sum the distance and the time it took to depart. We can write it as follows:

$$total\ distance = 14000 + 14000 = 28000 km \tag{1}$$
$$total\ hours = 22 + 17 = 39\ hours \tag{2}$$
$$average = \frac{total\ distance}{total\ hours} \tag{3}$$
$$= \frac{28000}{39} = 718 km/h \tag{4}$$

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?

These are the informations that we can gather from the text above:

- Everytime he has coins with a face value of 5 cents and 20 cents, he puts them into his piggy bank

- Each pile worth 1 USD

- The piles were of different heights

- 1 USD = 100 cents

- The thickness of the coin is exactly the same.

We can visualise the possible combinations using a table, assuming their height is 1mm:

Table 4: Table of Possible Combinations

No.	5 cents	20 cents	Height
1	20×	-	$20mm$
2	16×	1×	$17mm$
3	12×	2×	$14mm$
4	8×	3×	$11mm$
5	4×	4×	$8mm$
6	-	5×	$5mm$

From this table, we can make a conclusion that there are 6 stack classes based on their height.

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

We can decode those PINS back to its original form using the rules above and verify if the date or the month is valid.

A. 3221 → The date is 23 and the month is 12 → Valid

B. 5060 → The date is 5 and the month is 6 → Valid

C. 1141 → The date is 11 and the month is 14 → Invalid

D. 2121 → The date is 12 and the month is 12 → Valid

E. 1290 → The date is 21 and the month is 9 → Valid

The **C** option is invalid, because on our calendar system, the month can only go up to 12 which is December. There is no 14th month.

4. I went to buy fruit at a market in Waylandpuro 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

From the unhelpful information above, we can gather up these data:

- 1 orange + 1 lemon = 2000
- If 1 lemon = 1 grapefruit, then it becomes 3000
- Each fruit price is different

From the information above, we can say that **1 grapefruit costs more than Rp.1000** because there's a statement which says *if 1 lemon equals 1 grapefruit it becomes Rp.3000*, which means each grapefruit could cost Rp.3000 which is more than Rp.1000

3   Task - Page 85

1. The solid on the right (figure 2), 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 (figure 3) is suitable for creating the shape?
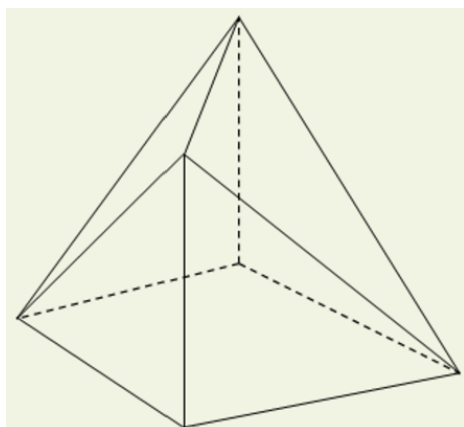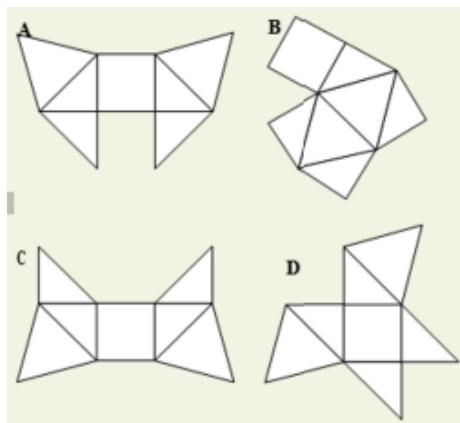

Figure 2: Cube with two corners cut off

Figure 3: Cardboards

To determine which cardboard fold is suitable, we can imagine how each cardboard folds will form.

   A. Unsuitable, because the left and right part will overlap with each other
   B. Unsuitable, because there is a part that will overlap with the bottom layer
   C. Unsuitable, because the left and right part will overlap with each other
   D. Suitable, there will be no overlap and it will form a cube with 2 corners cut off

2. I use the tripmeter 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!

Firstly, we can make a list of informations to make it easier to analyse.

- The next service is scheduled after 20,000 km has been covered
- Some time later, the writer lent the car to his brother
- The writer forgot to tell his brother and his brother pressed the zero button and drove 575km
- The writer drove again without realising what his brother had done
- What additional information needed to know how much the trip meter should read when the next service is due?

Based on the information above, the writer needs the trip meter value from the last time he resets it up to when he lent the car to his brother, and then add 575km to that value.

3. A new marketing company is selling an unusual liquid watch. The liquid clock consists of two tubes as shown (figure 4). The righthand 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

Figure 4: Unusual Liquid Watch

We can start by dividing each tubes into equal parts, and then fill up based on the time shown. We can illustrate it as such (figure 5). The left tube is divided based on each hour and the right tube is divided based on every 15 minutes
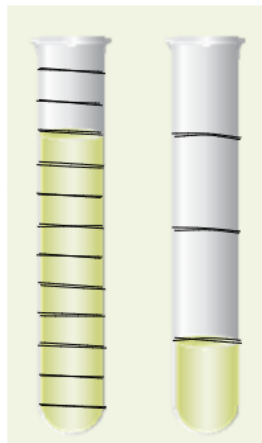

Figure 5: Liquid with Marks

After we divide the tubes into equal parts, we can make draw colour over them (figure 6) that (roughly) represents 4.20
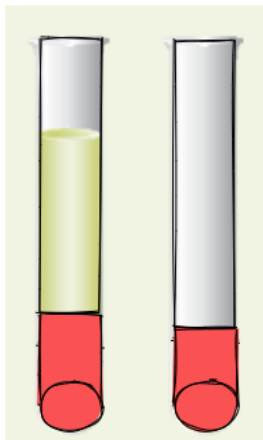

Figure 6: Liquid with Marks

4. 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. Table 5 shows how choices can be made. Students must select one subject from each column. The fourth subject can come from any column.

Table 5: Choices that can be made

1	2	3
Geography	French	History
Technology	German	Religious Study
Art		Physical Education
Music		Latin

Which of the following combinations is not allowed?

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

First thing first, we can check if the first 3 comes from different column. After checking each one, we can see that **D** has incorrect choice. It doesn't have a subject from the third column