Unit 2, Lesson 27

A Fermi Problem

Let's solve a Fermi problem.

27.1 Problems to Ponder

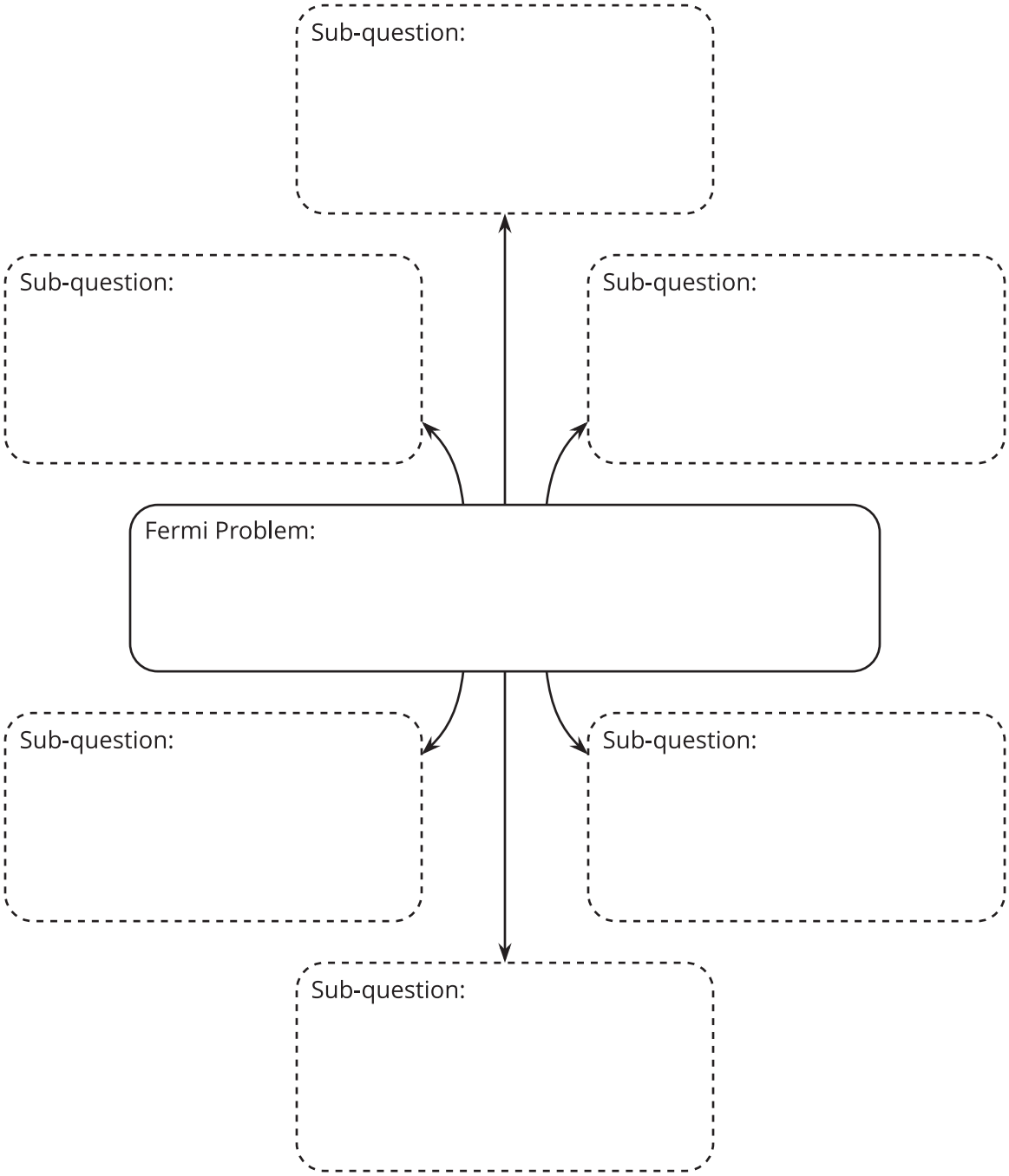
Here are some questions.

- How many times does your heart beat in a month?
- How many hours of television do you watch in a year?
- How many tubes of toothpaste would you need in a lifetime?
- Is one month enough time to read the dictionary out loud?
- Is one gallon of hand sanitizer enough to sanitize the hands of everyone in the school over a school day?
- How long would it take to paddle across the Pacific Ocean?
- How long would it take to give every dog in America a bath?

Which question do you find most interesting? Which question do you find the least interesting? Be prepared to explain your reasoning.

27.2 Solving a Fermi Problem

1. What are some smaller questions, or sub-questions, to figure out before solving the chosen Fermi problem? Record the Fermi problem and your sub-questions here.



2. Think about how the sub-questions should be organized. Label each sub-question to show the order in which they should be answered.

   If you notice a gap in your sub-questions (or that some information is needed before the next sub-question could be answered), write a new sub-question to fill the gap.

3. Let's start answering the sub-questions! Use the given organizer.
   - Write your sub-questions in order.
   - Find the information you need to answer each sub-question. Research, measure, estimate, and perform any necessary calculations.
   - Record any fact you find and any assumption you make.

Fermi Problem:

Sub-question 1:

Facts or assumptions:

Answer:

Sub-question 2:

Facts or assumptions:

Answer:

Sub-question 3:

Facts or assumptions:

Answer:

Sub-question 4:

Facts or assumptions:

Answer:

Sub-question 5:

Facts or assumptions:

Answer:

Sub-question 6:

Facts or assumptions:

Answer:

4. What is your answer to the Fermi problem? Explain or show your reasoning.

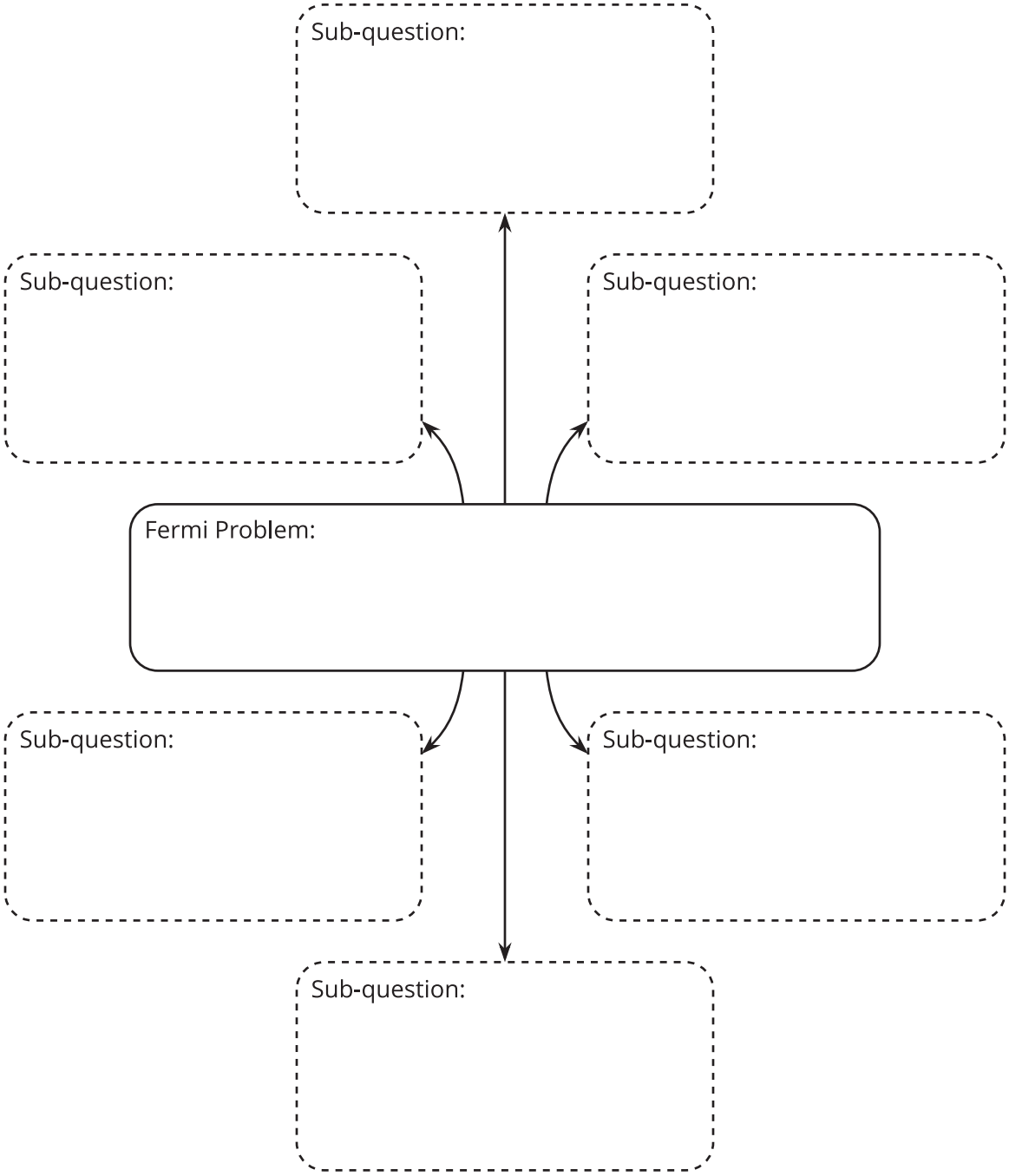
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27.3 Researching Your Own Fermi Problem

1. Brainstorm at least five Fermi problems that you want to research and solve. If you get stuck, consider using these starters:
   - How much (or how many) . . . would it take to . . . ?
   - How long would it take to . . . ?
   - Would . . . be enough to . . . ?

   Discuss your ideas with your teacher and then select one problem.

2. What are some smaller questions, or sub-questions, to figure out before solving the chosen Fermi problem? Record the Fermi problem and the sub-questions here.



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3. Let's start answering the sub-questions! Use the given organizer.
   - Write your sub-questions in order.
   - Find the information you need to answer each sub-question. Research, measure, estimate, and perform any necessary calculations.
   - Record any fact you find and any assumption you make.

Fermi Problem:

Sub-question 1:

Facts or assumptions:

Answer:

Sub-question 2:

Facts or assumptions:

Answer:

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Facts or assumptions:

Answer:

Sub-question 4:

Facts or assumptions:

Answer:

Sub-question 5:

Facts or assumptions:

Answer:

Sub-question 6:

Facts or assumptions:

Answer:

4. What is your answer to the Fermi problem? Explain or show your reasoning.

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