Unit 2, Lesson 27

A Fermi Problem

Let's solve a Fermi problem.

27.1 Problems to Ponder

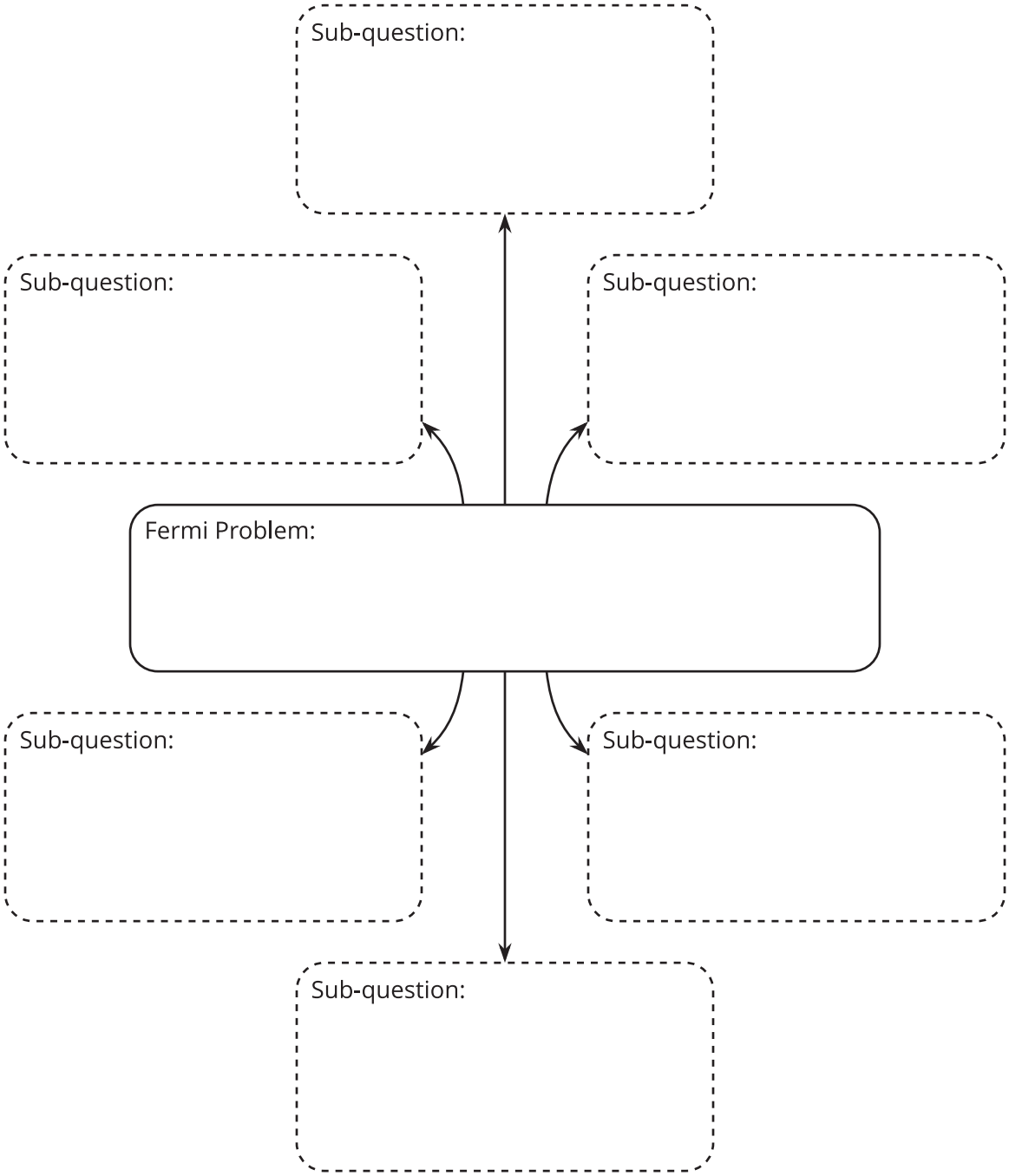
Here are some questions.

- 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:

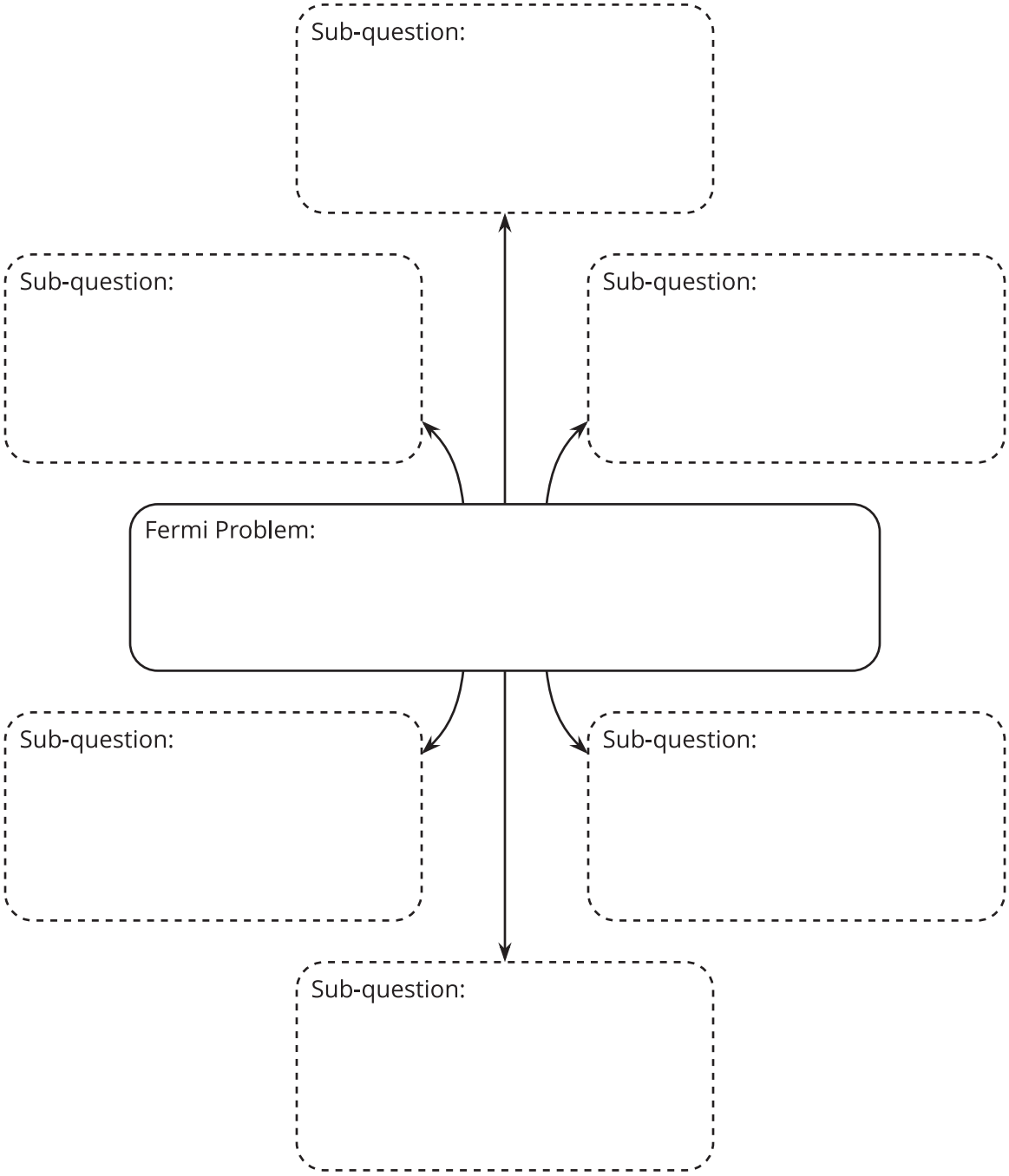
4. What is your answer to the Fermi problem? Explain or show your reasoning.

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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Facts or assumptions:

Answer:

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Answer:

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Facts or assumptions:

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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.