EXIT TICKET

OPTION 1: Problem Solving Scenario - Foot Fungus Spread

A highly contagious foot fungus is spreading in a school locker room that is used by 400 athletes. Initially, 4 athletes are infected. After 5 days, the number of infected athletes has grown to 40.

Use this information to answer the following questions about the spread of the fungus using a logistic growth model.

1. What is the carrying capacity for the spread of this fungus in the locker room?

2. What is the initial number of infected athletes at time t = 0?

The general form of the logistic growth function is:

$$N(t) = \frac{c}{1 + Be^{-kt}}$$

3. Find the value of *B* by substituting the known values for c and the initial condition into the logistic equation. Show your work.

4. Use the data point N(5) = 40 to find the growth rate k. Show your work.

5. According to your model, how many athletes will be infected after 10 days? Show your work.

OPTION 2: Multiple Choice Quiz - Basement Mold Growth

A section of a basement wall has mold growth that can be modeled by the logistic equation, $N(t) = \frac{5000}{1+499e^{-0.8t}}$ where A(t) is the area of mold in square centimeters after t weeks:

1. What is the carrying capacity for the mold growth on the basement wall?
a) 499 cm² b) 500 cm² c) 5000 cm² d) 50,000 cm²

2. What is the initial area of mold on the wall at time t = 0?
a) 1 cm² b) 10 cm² c) 50 cm² d) 100 cm²

3. Approximately what will the area of the mold be after one week?
a) 22 cm² b) 25 cm² c) 30 cm² d) 50 cm²

4. What does the constant 499 in the denominator represent in this logistic growth model?
a) The initial amount of mold c) The growth rate
b) A value related to the initial mold area and carrying capacity d) The carrying capacity

5. How does the mold growth change as time increases according to the logistic model?
a) It grows exponentially without limit c) It decreases steadily
b) It slows down and approaches a maximum limit d) It remains constant

OPTION 3: Reflection Prompt

Logistic growth is not just used to model mold or communicable diseases—it can describe many real-world situations where growth starts quickly but slows as resources become limited.

Think about and respond to the following:

In what other real-life situations could logistic growth be used? Give **two examples** and **explain** why the logistic model makes sense in each case.

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EXIT TICKET ANSWERS:

OPTION 1: Problem Solving Scenario - Foot Fungus Spread

1. What is the carrying capacity? **400 athletes**
2. What is the initial number of infected athletes? **4 athletes**
3. Use the initial condition N(0) = 4 to solve for B: **B = 99**

$$N(0) = \frac{400}{1+B} = 4 \Rightarrow B = 99$$

4. Use N (5) = 40 to solve for k: **k ≈ 0.48**

$$N(5) = \frac{400}{1+99e^{-5k}} = 40 \Rightarrow k \approx \mathbf{0.48}$$

5. Predict how many athletes are infected after 10 days. **N(10) = 220 athletes**

$$N(10) = \frac{400}{1+99e^{-0.4796 \cdot 10}} \approx \mathbf{220}$$

OPTION 2: Multiple Choice Quiz - Basement Mold Growth

1. c) 5000 cm² *represented by the numerator (5000).*
2: b) 10 cm²
3. a) 22 cm²

Solution:

- Plug in **t = 1**: $N(1) = \frac{5000}{1+499e^{-0.8}}$
- Approximate: $e^{-0.8} \approx 0.45$
- Multiply: $499 \times 0.45 \approx 225$
- Add: $1 + 225 = 226$
- Divide: $5000 \div 226 \approx 22.1$

4. b) A value related to the initial mold area and carrying capacity
5. b) It slows down and approaches a maximum limit

OPTION 3: Reflection Prompt (Possible Answers):

- City population – Grows fast at first, then slows as resources and space run out.
- Disease spread – Quick early spread, slows as fewer people are left to infect.
- Fish in a lake – Rapid growth slows due to limited food and space.
- New technology sales – Early surge, then slows as most people already have it.
- TikTok trend – it spreads quickly at first, then slows as most people have seen it.