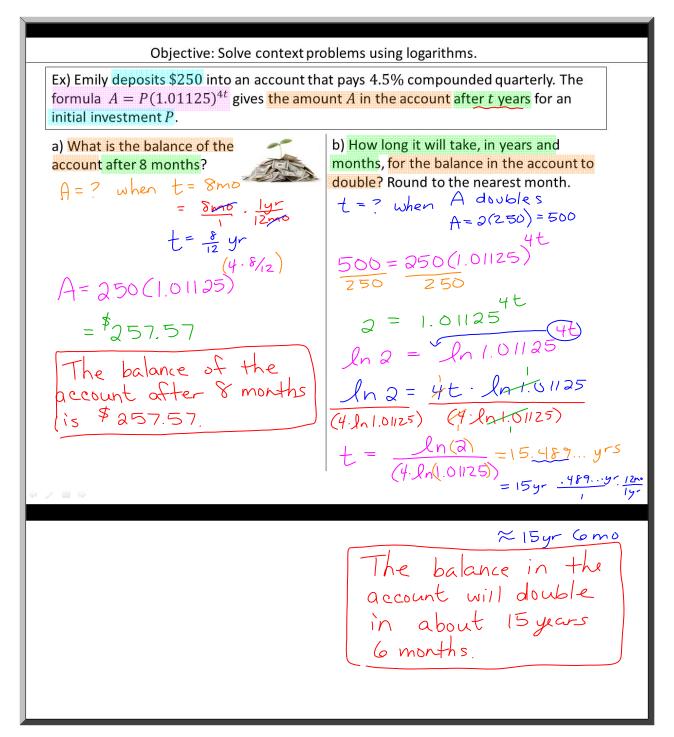
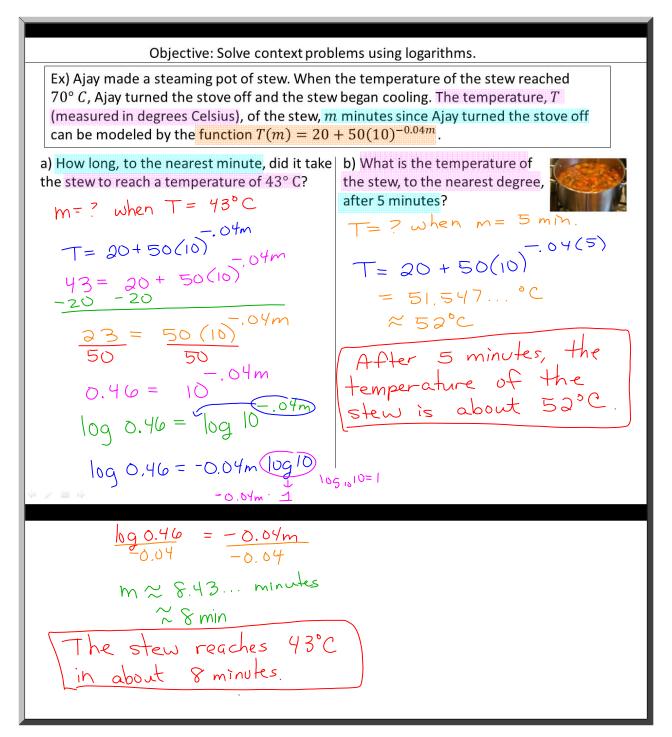
Concept

Steps to Solve an Exponential Equation Using Logarithms

- 1. Write the equation with a single power on each side.
- 2. Take the logarithm of both sides. (Common Logarithm or Natural Logarithm)
- 3. Use the Power Property of Logarithms: $\log_b a^x = x \log_b a$
- 4. Solve this equation using algebra. Approximate if necessary.
- State the solution to the exponential equation. Interpret in terms of the context.





Ex) A biologist in Nepal is studying the local population of red pandas, a vulnerable species that may soon be endangered. The biologist has determined that the number of red pandas, P, in the local population t years since the species has been monitored can be modeled by the function $P(t) = 800e^{0.0416t}$. When, to the nearest tenth of a year, will the red panda population in this area reach 2000?

$$t = ?$$
 when $P = 2000$
 $0.0416t$
 $P = 800e$
 $0.0416t$
 $2000 = 800e$
 $0.0416t$
 $2.5 = 0.0416t$
 $2.5 = 0.0416t$



$$t = \frac{\ln 2.5}{0.0416}$$
 $\approx 22.0 \text{ yr}$

The red panda population in this area will reach 2000 in about 22.0 years.

Ex) The distance an object travels in feet is modeled by the function $d(m) = 17 \ln(3m + 6)$, where m is in minutes. What is the average speed of the object during the first 5 minutes the object is in motion? Round to three decimal places.

AROC. From 0 to 5 min

 $\frac{\Delta d}{\Delta m} = \frac{(17 \ln(a1) ft - 17 \ln(6) ft)}{(5 min - 0 min)} \approx 4.259 ft/min$ feet per minute

The object's average speed during the first 5 minutes of motion is about 4.259 feet per minute.

Closure

Determine which type of logarithm is best to use when solving each of the following equations.

1)
$$70 = 45e^{0.056t}$$

b) Natural Logarithm

2)
$$70 = 10 + 45(3.2)^{0.056t}$$

c) Neither is best, either can be used

3)
$$70 = 45(10)^{0.056t}$$

a) Common Logarithm

- a) Common Logarithm
- b) Natural Logarithm
- c) Neither is best; either can be used
- d) Logarithms aren't needed to solve the equation

