Name _____   Date_____

MiSP Worksheet #2 - Population Growth

Introduction: One of the characteristics of living things is that they reproduce. Population size in places increases because the individuals produce "new" individuals – young, babies, seedlings, offspring. Sometimes populations increase because new individuals move into the area (immigration).

Problem: What happens if a population grows unchecked?

Many years ago, a **Star Trek** television episode called *Trouble with Tribbles* was broadcast. Tribbles are very cute little creatures that look like balls of fur. Member of the Star Trek crew fall in love with them and buy them from an unscrupulous trader. The tribbles reproduce very quickly and soon eat all of the wheat on a space station that the crew of the Enterprise was supposed to protect. Your teacher may be able to show you a video clip from the episode.

Our tribbles do not reproduce as fast as the ones featured on **Star Trek**. Each pair of tribbles produces four (4) new tribbles every twelve hours. New tribbles are able to reproduce almost as soon as they are born.

Two pairs (4) tribbles were introduced into a space station with a source of food. The table below shows the increase in the number of tribbles over time.

Time (in hours)	Reproduction	Number of Tribbles
0	-	4
12	4 reproduce 8	12
24	12 reproduce 24	36
36	36 reproduce 72	108
48	108 reproduce 216	324
60	324 reproduce 648	972
72	972 reproduce 1948	2920

Graph the data on the next page.
   ☐ Label the X axis with the hours (0 – 100 hours)
   ☐ Label the Y axis with the Number of Tribbles
   ☐ Give your graph a title
   ☐ Connect the data points with straight lines.

1

Discussion

1. If population growth continues in this tribble population, what will the population be

- After 42 hours?   _____

- After 90 hours?   _____

2. Look at the sections of the tribble population graph between 0 and 24 hours and the section between 48 and 72 hours. How do the line segments compare? When is the size (number) of the tribble population growing faster?

_____

_____

_____

3. Use the information from the data table to calculate the rates of change for the tribble population. Use the formula to complete the chart below.

Rate of Change = $\dfrac{\Delta \text{Number of tribbles}}{\Delta \text{hours}}$

Rate of Change (slope)

Graph segment Ordered pairs	Δ Number of tribbles Δ y	ΔHours Δ x	Rate of Change Δ y/Δ x
Tribble population from 0-24 hours (0 hr,) (24 hr,)			
Tribble population from 48-72 hours (48 hr,) (72 hr,)			

3

4. What do the two unit rates of change (slopes) calculated above tell you about those sections of the tribble population growth graph?

_____

_____

5. Suppose you were studying a population of tribbles and you had collected data only at 0 and 24 hours and then wrote a report predicting how long it would take for the population to reach 2000. How long would your report claim this would take? Show your work. What is wrong with your analysis?

6. Focus again on the two segments of the tribble graph between 0 to 24 hours AND between 48 to 72 hours. Using the unit rate of change that you already calculated in #3, and one of the ordered pairs, determine the y-intercept for both lines. The equation for a line is y = mx + b, where m is the unit rate of change (slope) and b is the y-intercept.

Y Intercept – Tribble graph line from 0 – 24 hours	Y Intercept – Tribble graph line from 48 – 72 hours
m = Ordered pair (x, y) = (___ , ___) y = mx +b Solve for b:	m = Ordered pair (x, y) = (___ , ___) y = mx +b Solve for b:

7. Based on the slopes you calculated in #3 and the y intercepts calculated above, write an equation for the lines on the tribble curve from 0 – 24 hours and 48-72 hours.

Equation - Tribble graph line from 0 – 24 hours	Equation - Tribble graph line from 48 - 72 hours

8a. Using each of the equations, above, calculate the tribble population in hour 144.

8b Why are the results of the population in hour 144 different? Is either equation/answer correct?

_____

_____

_____

9. Populations in nature generally are not able to continue to grow forever. Usually they level off around a certain number – Sometimes a little higher and sometimes a little lower. That means that births approximately equal deaths. List three (3) things that keep a population from not increasing forever.

_____

_____

_____