EXPLANATION OF MATH WORD PROBLEMS – CH 8 PROTISTS **Mr. Galloway BS, M.Div.**

SCIENCE MATH: *Use the data and math to answer the following questions.*

19. Under certain conditions, 100 percent of the cells in a protist A reproduce in 24 hours. The number of cells of a protist A doubles once each day. Day 1 = 10,000 cells Day 2 = 20,000 cells Day 3 = 40,000 cells Day 4 = 80,000 cell
HOW MANY CELLS AT 4.5 DAYS? (NOT a full 5 days) _____

PROBLEM 19 Explained. The struggle for students is how to read word problems and determine how to use the numbers it them. Number 19 tells them that the organisms double each day. That is the same as saying 100% of them reproduce.
Then the problem provides examples for 4 days as the population reproduces.
So, it shows the pop. doubling each day. Day 2's number was the result of 10,000 x 2 = 20,000.
That is the same thing as 10,000 + 10,000 = 20,000
Day 3's number was the result of 20,000 x 2 = 40,000, etc. for Day 4.
IF I had asked for the amount on Day 5 then it would be 80,000 x 2 = 160,000.
BUT I asked for the number after **DAY 4.5**, which is only an extra **half** day beyond day 4, **NOT** a full day like the example.
So, students must add NOT 80,000 to Day 4's 80,000, but add only half of that: 40,000 to Day 4's original 80,000.
So, the result after 4.5 days is 80,000 + 40,000 = 120,000.

20. When an antibiotic is added to the protist, the growth is reduced by **50 percent**. Only half the cells reproduce each day.
Day 2 = 15,000 cells Day 3 = 22,500 cells Day 4 = 33,750 cells
HOW MANY CELLS AT 4.5 DAYS? (NOT a full 5 days) _____

PROBLEM 20 Explained. is similar, **EXCEPT** that the increase is **NOT** by 100% per day (double), but **ONLY 50%** per day. 50% per day would be adding ONLY half of the given day's amount onto itself each new day.
For example:
Day 2 started with 15,000 cells. Since the antibiotic makes them increase by only 50% per day,
then I must add 50% of 15,000 onto the original 15,000. **So, 50% of 15,000 is 7,500.**
So, by Day 3 there will be 15,000 + 7,500 = 22,500.
That is why they give you 22,500 on Day 3.
Then to go from Day 3 to 4, they added 50% of 22,500 onto the original 22,500.
50% of 22,500 is 11,250. So, add 22,500 + 11,250 = 33,750 for the population on day 4.
NOW TO ANSWER MY QUESTION, which asks **ONLY** for the population on **DAY 4.5**, NOT a full day to Day 5.
The answer to **MY** question will **increase** by only half of what would be the population on Day 5.
IF DAY 5 would be 33,750 + 16,875 = 50,625.
THEN here is what increasing by only a half a day's worth of reproduction to Day 4.5 would be.
You should **ONLY ADD** (HALF of 16,875) to 33,750. So 16,875 divided by 2 = 8,437.50.
Therefore, the answer to the population at 4.5 days is 33,750 + 8,437.50 = 42,187.50

$N = (x) \times (2^f)$

n is the final number of PROTISTS that you want to predict

x is the starting number of PROTISTS

f is the number of times that fission occurs

EXAMPLE: 100 protists start to undergo fission and do it **3** times.

So **f** = 3. Therefore, 2^f means 2^3, which is 2 multiplied by itself 3 times. **2 x 2 x 2 = 8**

Since, **x** in this example is 100 starting PROTISTS, now plug these numbers into the formula:

$N = (100) \times (2^3) = (100) \times (8) = 800$ final protists after 3 fissions!

THE FINAL 4 QUESTIONS at the bottom of page 2 of the quiz simply require using the formula and example provided (see the box at the left).

This is a formula we have used before. Converting the answers to scientific notation is also something we have done before. My Sci. Notation tutorial and examples are on a separate sheet on my GSI webpage and on ITS LEARNING. Students you have it on your iPads.

1. If you start with 300 protists, how many will there be after 5 fissions? 300 x 2^5 = 300 x 32 = 9,600

2. Convert your answer to # 1 into scientific notation. 9.6×10^3

3. If you start with 100 protists, how many will there be after 4 fissions? 100 x 2^4 = 100 x 16 = 1,600

4. Convert your answer to # 2 into scientific notation. 1.6×10^3