

BIG PICTURE of this UNIT:

- How do we WORK WITH & EXTEND the concept of “functions”
- Why are exponential equations written in different forms?
- How do we EXTEND our knowledge of exponential functions, beyond the basics of IM2?

This lesson will be based upon a STUDENT DIRECTED DISCUSSION model ..... in your groups, you should be having DISCUSSIONS about how to think and work through and then present the solutions to the following questions. The questions will involve basic ideas from IM2 including (i) exponential functions, (ii) functions in general, (iii) linear functions, and (iv) number patterns. EVERY LESSON this semester will involve spiralling through these 4 major concepts as you will be given the opportunity to deepen and extend your conceptual knowledge & skill set on these 4 major themes as you see them multiple times in our lessons.

So, in your group, discuss & prepare solutions to the following questions. Record the key ideas of your discussions/solutions in your notebook. Then, once you have had your discussions, present your solutions on the board. Solutions do NOT necessarily NEED to be correct – they simply form the basis for DISCUSSIONS !!!! If your group has (i) multiple solutions that lead to the same answers OR (ii) same/different solutions that lead to different answers, present them ANYWAY!!

1. Use your TI-84 to help answer these questions. Then, try to figure out HOW to come up with the answer without the use of the TI-84. {1}

$$16^{\frac{1}{2}}$$

$$144^{\frac{1}{2}}$$

$$\left(\frac{1}{625}\right)^{\frac{1}{2}}$$

$$8^{\frac{1}{2}}$$

$$27^{\frac{1}{3}}$$

$$343^{\frac{1}{3}}$$

$$\left(\frac{1}{1000}\right)^{\frac{1}{3}}$$

$$100^{\frac{1}{3}}$$

2. Use your TI-84 to help answer these questions → try to figure out HOW to come up with the answer without the use of the TI-84. {1}

$$8^{\frac{1}{3}}$$

$$8^{\frac{2}{3}}$$

$$8^{\frac{4}{3}}$$

$$8^{\frac{5}{3}}$$

$$27^{\frac{1}{3}}$$

$$27^{\frac{2}{3}}$$

$$27^{\frac{4}{3}}$$

$$27^{\frac{5}{3}}$$

$$16^{\frac{1}{4}}$$

$$16^{\frac{2}{4}}$$

$$16^{\frac{3}{4}}$$

$$16^{\frac{5}{4}}$$

3. Use the Future Value (Compounding) formula  $FV = PV\left(1 + \frac{i}{n}\right)^{nt}$  to answer the questions: {4,11,20}
- Find the future value of \$5,000 invested for 5 years compounded monthly at 8% p.a.
  - What amount must be invested NOW at 5% p.a. compounded quarterly to earn \$10,000 in 8 years time?
  - If \$20,000 is invested at 7% compounded semi-annually, how long does it take to double in value?
  - What annual rate needs to be applied if \$30,000 grows to \$40,000 in 7 years time?
4. The population of a small town appears to be increasing exponentially. Town planners need a model for predicting the future population. In the year 2000, the population was 35,000, while in the year 2010, the population grew to 57,010.
- PREDICT: What will be the town's population in 2030?
  - Create an exponential algebraic model for the town's population growth.
  - Check your population model by using the fact that the town's population was 72,825 in 2015.
  - CALCULATE: What will be the town's population in 2030?
5. The value of Mr. Santowski's car has been exponentially decreasing at a rate of 9% every year. My car was originally purchased four years ago for \$25,000. What will be the value of this car in 2 years from now? {4,11}
6. The number of students at CAC has been exponentially increasing at a rate of 4% every year. Three years ago the student population was 750 students. How long will it take for the school population to reach 850 students?  
{4,11}

7. A total of \$7,000 was invested at 9% p.a compounded annually. {4,11}
- Determine the future value of this money in 8 years time.
  - How long does it take for this money to double in value?
  - If the same \$7,000 was earning 9% interest compounded monthly, what would the value be in the same 8 years time? Explain why this value is greater than the value from question (a).



**Higher Level Questions for More Complex Concepts OR an EXTENSION of basic concepts involved with Exponential and Logarithmic Functions.**

- Work through [Newton's Law of Cooling PROBLEM](http://mrsantowski.tripod.com/2015IntegratedMath3/Homework/Newtons_Law_of_Cooling.pdf) and develop an equation to model the data set.  
( [http://mrsantowski.tripod.com/2015IntegratedMath3/Homework/Newtons\\_Law\\_of\\_Cooling.pdf](http://mrsantowski.tripod.com/2015IntegratedMath3/Homework/Newtons_Law_of_Cooling.pdf) )