

2. Pick any ONE of the following:

[5]

- (a) If you raise 3 to the 324th power, what is the units digit of the result?
- (b) Some children are standing in a circular arrangement. They are evenly spaced and marked in numerical order. The fourth child is standing directly opposite the twelfth child. How many children are there in the circle?
- (c) A lily pad grows so that each day it doubles its size. On the twentieth day of its life, it completely covers a pond. On what day was the pond half-covered?

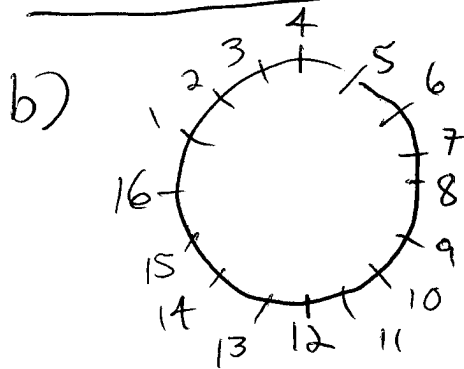
a)  $3^0 = 1$ ,  $3^1 = 3$ ,  $3^2 = 9$ ,  $3^3 = 27$   
 $3^4 = 81$ ,  $3^5 = 243$ ,  $3^6 = 729$ ,  $3^7 = 2187$

units digit goes 1, 3, 9, 7, 1, 3, 9, 7, ...

repeats every 4

$324 = 81(4)$  with 0 remainder so units digit of  $3^{324}$  is 1

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7 between 4 + 12 (5, 6, ... 11)

So 7 between 4 + 12 on other side need to include 1, 2, 3

so that leaves 13, 14, 15, 16

There are 16 children

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c) Each day it doubles in size, so the day before it is covered would be the day that it is half covered - so on the 19<sup>th</sup> day!