CSCI 250 - ASSIGNMENT 1

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Part A - 3 People Crossing

a.

A is Alice	Painting is 20
B is Bob	Vase is 12
C is Carol	Sculpture is 8

b.

$A_{20}B_{12}C_8$	— —	No one
No one	— —	$A_{20}B_{12}C_8$

c. The sum of the net worth of the individuals cannot be less than the sum of the value of the art on a given side of the river.

d.

$A_{20}B_{12}$	— —	C_8	*C would cross the river with C's painting*
$A_{20}B_{12}C$	— —	$_8$	*C would go to the starting side without their Sculpture*
$_{20}BC$	— —	$A_{12\ 8}$	*A would leave their Paining and cross the river with the Vase*
$A_{20}BC$	— —	$_{12\ 8}$	*A returns without the Vase and the Sculpture*
A_{20}	— —	$B_{12}C_8$	*Both B and C head over to the other side of the river*
$A_{20}B_{12}$	— —	C_8	*B heads back to the Western Bank with their Vase*
B_{12}	— —	$A_{20}C_8$	*A crosses with their Painting*
$B_{12}C8$	— —	A_{20}	*C would cross to the western bank their Sculpture*
$_{12\ 8}$	— —	$A_{20}BC$	*B and C cross with their art*
$A_{12\ 8}$	— —	$_{20}BC$	*A will cross to the west with no Painting*
$_8$	— —	$A_{20}B_{12}C$	*A would bring over B's Vase*
C_8	— —	$A_{20}B_{12}$	*C would return to get their art*
No one	— —	$A_{20}B_{12}C_8$	*C would return with their art*

2 new people arrive

e. Send Carol back because Elisha and Carol's net worth is equal to Dave's Statue.

f. A and B must leave with their artwork.

Part B

a. Yes it is possible to AAA in to AAABC. The conversion is very simple:
AAA -> BC (Rule 3)
BC -> AAAC (Rule 1)
AAAC -> AAAAAA (Rule 2)
AAAAAA -> AAABC (Rule 3)

b. Using the rules 3, 1, and 2, in that order will add 3 As to any set of 3+ As. Using this knowledge going from eight As to 29 is just repeating rules 3, 1, and 2 7 times and you will have 29 As.

c. Using the rules given the amount of As will only increment by 3. Due to this fact it would not be possible to get from 11 to 31.

Part C

a. $\Omega(g)$

b. $O(g)$

c. $\Omega(g)$

d. $\Theta(g)$

e. $O(g)$

f. $\Theta(g)$

g. $\Theta(g)$

h. $\Omega(g)$

i. $\Theta(g)$

j. $O(g)$

k. $\Omega(g)$

l. $\Theta(g)$

m. $\Omega(g)$

n. $O(g)$

o. $\Theta(g)$

p. $\Omega(g)$

q. $O(g)$

a. Given $c < 1$ and that c is a whole number c^n will always be less than 1.

b. Given that $c = 1$ and n is a whole number c^n will always equal 1. This is because when $\frac{1^x}{\infty}$ always equals 1.

c. As long as n is a even non-negative integer when calculating $\Theta(c^n)$ c will always be a positive. If $c = -5$ and $n = 2$ your result will be $\Theta(10)$ because the n is even it brings the negative c to a positive. Same rule applies with a positive integer for c.